



Fluid and Motion Control

Directional Control Valves
Check Valves
Pressure Control Valves
Flow Control Valves
Motion Control Valves
Proportional Valves
Explosion Proof Valves

Solenoids and Connectors
Pressure Switches
Connecting Plates, Manifolds
Hydraulic Power Packs
System Solutions
Accessories

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Filtration



Suction filters



Clogging indicators



Ventilating filters



Return filters



Pressure filters



Return-suction filters



High pressure filters



Return-suction filters

Description

ARGO-HYTOS produces sophisticated filter solutions together with hydraulic and lubrication systems. The range of solutions we have implemented extends from fixed-position industrial plants to mobile applications.

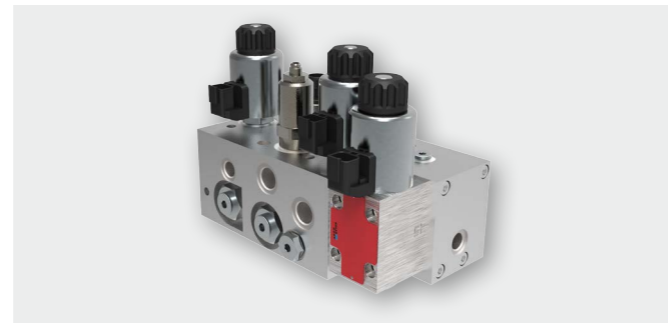
As well as customized developments, exactly adjusted to the individual requirements of the customer, ARGO-HYTOS offers a comprehensive range of innovative standard solutions for a wide variety of applications:

- › Suction filters
- › Return-suction filters and return filters
- › Pressure and high-pressure filters
- › Filling and ventilating filters
- › Filter accessories

Fluid and Motion Control



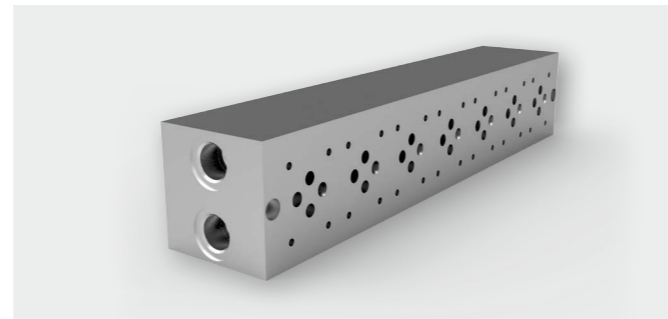
Customized solutions



Control solutions



Gear pumps



Plates

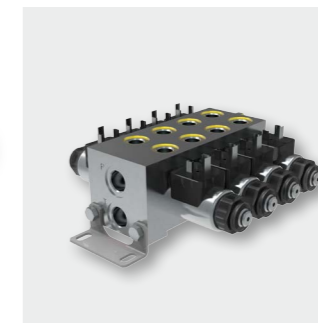
Fluid and Motion Control



Directional and proportional valves



Modular valves



Sandwich valves



Screw-in cartridge valves



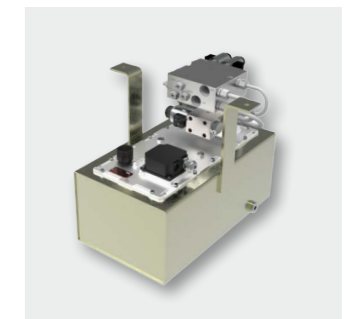
Slip-in cartridge valves



Load motion cartridges



Explosion proof valves



Hydraulic power packs

Description

ARGO-HYTOS' expertise in control technology is the fruit of more than 65 years' experience. We focus here on a wide range of valves, power units and integrated manifolds featuring all commonly used design features and functions, together with proportional valves and the associated control electronics:

- › Directly operated directional valves in CETOP 02 to CETOP 05 and pilot operated directional valves in CETOP 07 and CETOP 08
- › Valves sub-plate and sandwich type – flow control, pressure and check valves in CETOP 02 to CETOP 05
- › Cartridge valves
- › Directly activated proportional valves with compensator sandwich valve, in CETOP 02 to CETOP 05
- › Analog and digital control electronics – on-board, or for installation in control cabinets
- › Power pack assembly kits
- › Customized control blocks

Fluid Management



Off-line filter



Off-line filter



Off-line filter unit



Off-line filter unit



Oil service unit



Oil service unit



Dewatering system



Dewatering system

Description

As well as reducing maintenance and servicing costs, effective fluid management is also a key factor in boosting the reliability, productivity and cost-effectiveness of the operation. ARGO-HYTOS supplies application-oriented products for manual and automatic cleaning of hydraulic fluids:

- › Off-line filters
- › Off-line filter units
- › Filter cooling systems
- › Oil service units
- › Dewatering systems

Sensors and Measurement



Portable particle counter



Portable particle monitor



Particle monitor



Wear sensor



Condition sensors



Software



Remote interfaces / display units



Valve electronics

Description

Systems that provide reliable assessment of the condition of hydraulic fluids are the key feature of continuous fluid monitoring. Sensors and measurement technology from ARGO-HYTOS precisely target this range of tasks. Our fluid monitoring products comprise equipment and system solutions to enable online monitoring during continuous operation as well as analysis of bottled samples under laboratory conditions.

- › Portable oil diagnosis equipment
- › Stationary and portable particle monitor
- › Oil condition sensors
- › Software to evaluate data and analyze trends

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1. General information

1.1. Long tradition

Hydraulic components have been manufactured in Vrchlábi since 1956 and this tradition continues to today. We have gained insight and experience, developed innovative ideas, and optimized design parameters using mathematical models, computer analytics and simulation and physical prototypes for many years. All of this is a prerequisite for the development and production of new modern products intended for both stationary and mobile applications. Our product portfolio includes the valves designed for the control of hydraulic circuits, manifolds, and power packs used as hydraulic drives. We manufacture both standard products which can be found by the customer in our catalog and custom-made products for specific applications. We participate in the development and implementation of technical projects together with our customers. Complex projects represent a welcome challenge for us.

1.2. Quality of products

Customer satisfaction is our number one priority. Only properly functioning equipment brings our customers and us satisfaction. The certified quality assurance system is fully implemented in our manufacturing and assembly processes. High-quality engineering materials purchased with the certification of reputable suppliers are used to manufacture the parts. High precision machining is performed on CNC machine tools. Key valve parts undergo heat treatment to be able to withstand wear and meet the high demands on service life. Functionality of all products is verified on computer-controlled test benches. Therefore, the decision on the product conformity is independent of human error. Climate resilience of surface treatment against corrosion is verified by an accredited laboratory. The chosen products were certified by the internationally recognized certification authorities such as TÜV or CSA.

Service life of hydraulic valves (unless otherwise specified in the catalog)	
Solenoid operated valves	1 × 10 ⁷ cycles
Manually / mechanically operated valves	1 × 10 ⁶ cycles

1.3. Notice

Please pay attention to the following general rules concerning the safety principles, installation and operation of hydraulic equipment. The points marked with the following symbols throughout this text are of paramount importance.

	DANGER	This symbol indicates the possibility of damage to health. Special attention and care are required for any procedures that could result in injury or death due to improper design or non-compliance with the given conditions.
	CAUTION	This symbol indicates the possibility of product or equipment damage. Special attention is needed for any procedures that could result in product or equipment damage due to improper design or non-compliance with the given conditions.
	NOTE	This symbol indicates operating procedures or other information important for the proper product functioning.

2. General technical information

2.1. Cleanliness of working fluid



Minimum cleanliness class of working fluid 21/18/15 acc. to ISO 4406 (at operating pressure from 160 to 210 bar) is required for the use of our products. It must be not forgotten that the demands on fluid cleanliness increase together with the equipment operating pressure. For example, fluid cleanliness 19/16/13 acc. to ISO 4406 is recommended for the operating pressure 350 bar. The fluid must not contain any abrasive particles (e.g. quartz grains or other abrasive materials) causing excessive wear on parts. Poppet type valves, pilot operated valves and proportional valves are particularly sensitive to impurities which can easily cause the loss of functionality. Effective filtration with filter fineness between 5 and 12 microns ($\beta=200$) is recommended to be included in the circuit.

2.2. Working fluids

Our products are intended in particular for working fluids based on mineral oils of the power class **HM, HV acc. to ISO 6743/4**. Before using other fluids, e.g. hardly inflammable (ISO 6071) or ecological fluids, consult the manufacturer. The main issue is to verify the mutual compatibility of the applied sealing material and the working fluid.

2.3. Temperature and viscosity of working fluid

The temperature range of the working fluid is generally dependent on the applied seal material and whether the valve is operated by a solenoid. Kinematic viscosity is significantly influenced by temperature and its range should be **between 10 and 500 mm²s⁻¹**. It is recommended to keep the working temperature in the range of 40°C to 50°C, for the following reasons:

- › chemical degradation of the working fluid begins at a temperature higher than 40°C
- › pressure energy transfer gets worse at a high temperature and low kinematic viscosity
- › rubber seals are damaged at a high temperature (> 100°C) and they must be replaced by Viton seal
- › pumps and filters are overloaded at a low starting temperature and high fluid viscosity, i.e. the bypass check valve of the filter is open.

Group of products	Working fluid temperature	
	NBR seal	FPM (Viton) seal
Valves without solenoids	-30°C up to +100°C	-20°C up to +120°C
Valves with solenoids	-30°C up to +80°C	-20°C up to +80°C

Group of products	Viscosity range
Valves without solenoids	10 up to 500 mm ² s ⁻¹
Valves with housing and solenoid	20 up to 400 mm ² s ⁻¹
Built-in valves with solenoid	10 up to 500 mm ² s ⁻¹

2.4. Working environment

2.4.1 Ambient temperature

The working environment temperature for solenoid operated valves should not exceed the maximum allowable temperature (usually 50°C) due to the increase in winding resistance and the decrease in coil output power. There are no limit temperatures for the valves not operated by solenoids, however, the temperature significantly affects the working fluid viscosity and the seal material. Some built-in solenoid operated valves are designed for higher ambient temperature (80°C) because they are expected to work near heat sources, e.g. combustion engines. Placing the hydraulic circuit into an enclosed space can result in a critical temperature rise. If the hydraulic system cooling through heat convection and radiation is not sufficient, a cooler with sufficient cooling capacity will have to be connected to the system.

Group of products	Ambient temperature
Valves without solenoids	unspecified
Valves with solenoid	-20°C up to +50°C
Built-in "high performance" valves	-20°C up to +80°C

2.4.2. Cleanliness of working environment

Protect the working fluid from ingress of particulate pollutants, especially when filling the tank of hydraulic system with fluid. The tank must be fitted with the filter of fineness between 2 and 3 microns.

2.4.3. Potentially explosive atmospheres

The components with ATEX and IECEx certifications meeting the demands of Directive EU 2014/34/EU or regional legal regulations may be used for potentially explosive atmospheres (mines, environments with flammable and explosive vapors and gases, operations with high dustiness).

2.4.4. Corrosion protection

The steel and cast iron parts are zinc-coated or phosphated. Climate resilience is verified by the accredited laboratory using the salt spray test (NSS) acc. to ISO 9227. Detailed information on the basic and supplementary surface treatment can be found in the catalogs.

Designation of surface treatment	Applied technology	Climate resilience in NSS (ISO 9227)
A	zinc coating Fe/Zn	min. 240 h
B	zinc coating Fe/Zn	min. 520 h

3. Overview of products

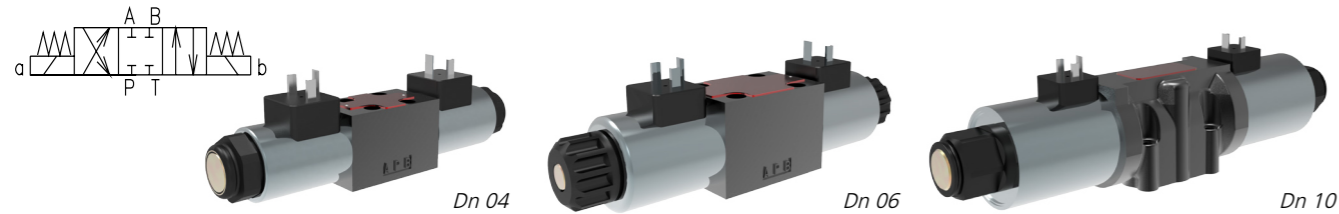
3.1. Valves - divided into groups

Hydraulic valves are components used for the control of hydraulic circuits.

A. Valves depending on the connection into the circuit

Valves with housing

These valves are intended for a subplate mounting. Their port outlets are positioned on only one connecting surface. The mounting surface of given size (Dn) is usually standardized acc. to ISO 4401. The directional control valve is a typical example of such a valve.

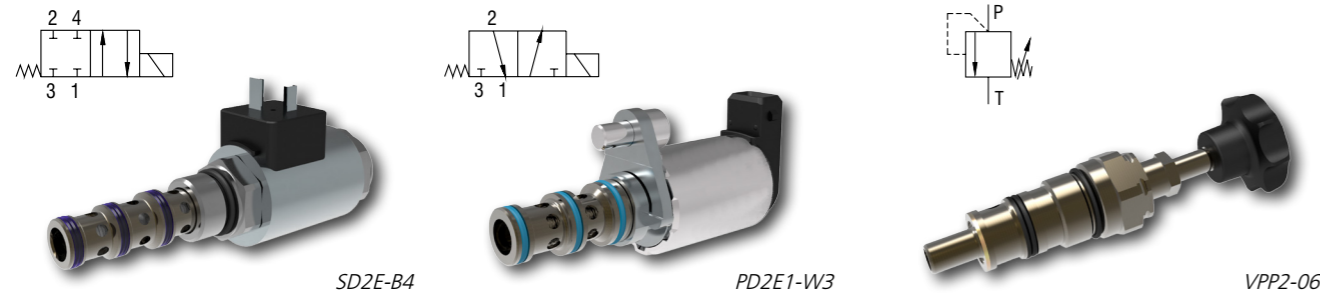


Built-in valves

The valve housing is replaced by the steel sleeve. This type of the valve is designed for the mounting in a manifold or a modular plate. The connecting thread corresponds to the UNM standard or it is of metric type.

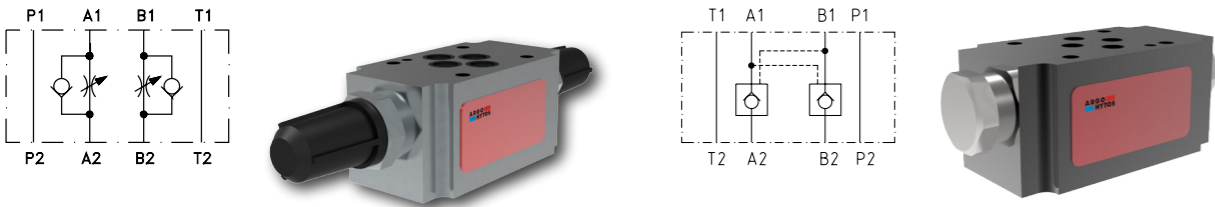
So-called slip-in valve is a special built-in valve without a connecting thread.

Its position is secured by the steel flange and the screw after slipping into the cavity. These simplified valves are designed in particular for mobile applications without demands on high pressures and flow rates. They are characterized by a favorable price.



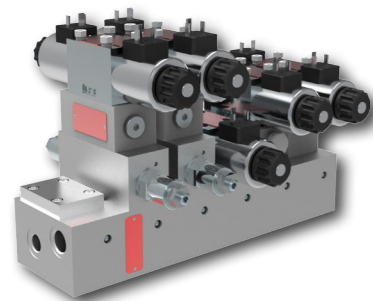
Valves built into modular plates

Modular plates equipped with through ports are intended for a vertical or horizontal stacking assembly. The mounting surface of given size (Dn) is usually standardized acc. to ISO 4401. Modular plates are combined into a single unit using studs. The maximum number of assembled plates is limited by the maximum stud lengths. Stacking assembly of modular plates enables the creation of very sophisticated hydraulic circuits. The big advantage of this solution can be seen in the flexible connection design.

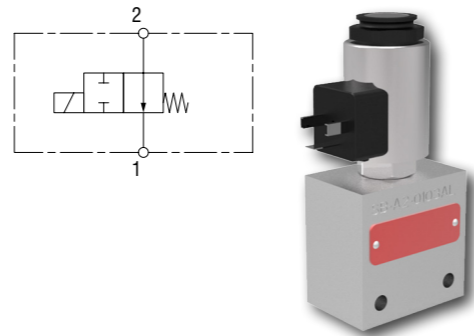


Restrictor valve with reverse flow check 2VS3-06

Double pilot operated check valve 2RJV1-06



Manifold with valves placed in modular plates used for the vertical stacking assembly



2-way, built-in directional control valve SD2E-A2 in SB manifold used in an in-line design

In-line valves

These valves have the outlets with connecting threads, allowing them to be connected to the line. The built-in valves can be connected to the line after their installation onto a manifold.

B. Valves depending on the control process

Directly operated valves

The control element (spool or poppet) of direct-acting valves is directly controlled by the operating element, e.g. solenoid. The valve power is limited by hydrodynamic forces which act on the spool against the force of the operating element.

Pilot operated valves

For pilot operated valves, only the valve control stage is operated by the operating element and the main stage (spool, poppet) is operated hydraulically. It allows control of higher hydraulic powers. The valves are equipped with the orifices necessary for the control, however, these small openings are sensitive to contamination of the working fluid.

C. Valves depending on the function in the circuit

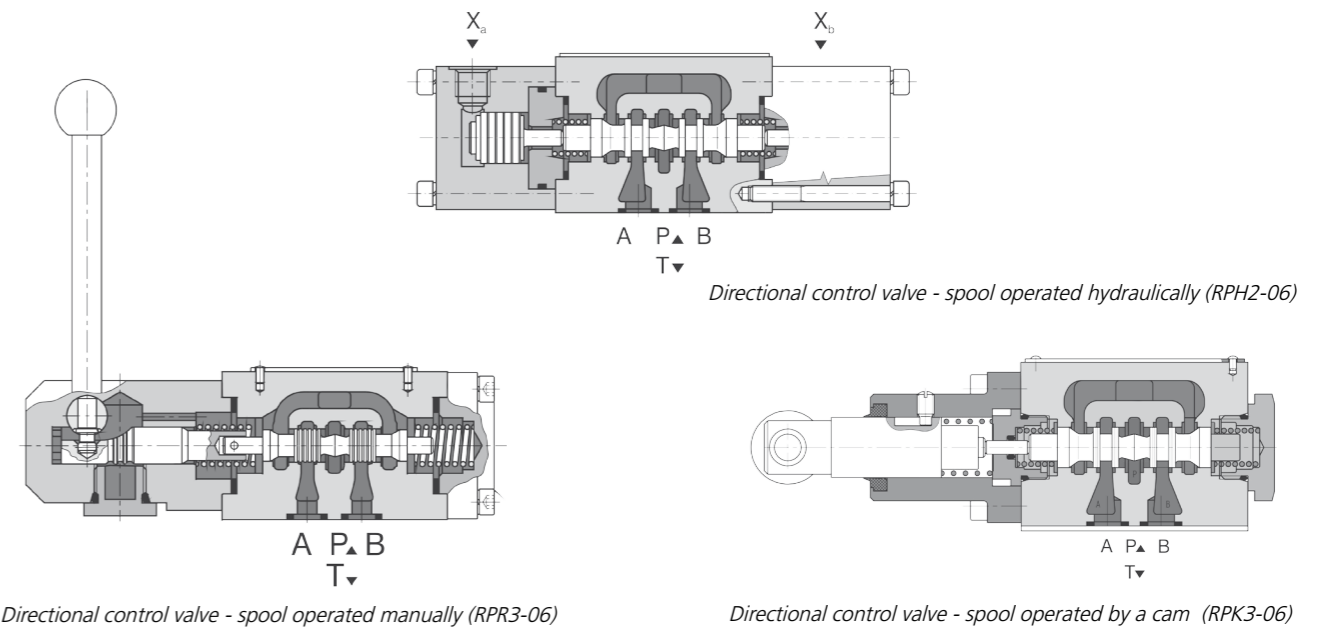
3.1.1. Valves for fluid flow direction control – directional control valves

These valves allow the direction change of fluid flow or its blocking. They are designed to stop the actuator or control its movement direction.

Spool type directional control valves with housing

The precision-ground, hardened steel spool as a control element is shifted in the hole of the cast iron housing. The spool interconnects the ports mutually and closes the prefilled ports. In the basic position, the spool is held by the force of the return springs. There are a lot of ways to operate the spools of directional control valves, such as hand lever, foot switch, mechanical cam or eccentric piece, or even hydraulically or pneumatically. However, they are mostly commonly controlled by a solenoid.

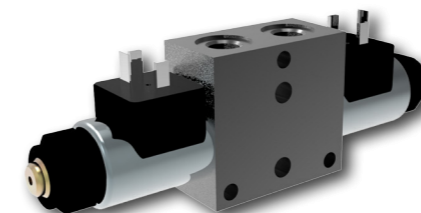
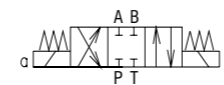
Overview of the spool symbols is given in the catalog. For other possible interconnections consult the manufacturer.



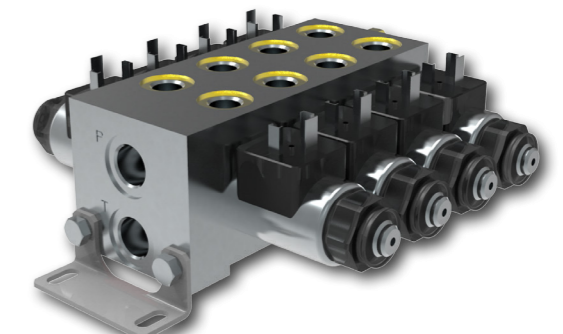
Bankable directional control valves of size Dn 03

These valves are the smallest directional control valves of size Dn 03. The spool is incorporated in the modular plate for the horizontal stacking assembly. The directional control valve consists of a supply unit with a pressure relief valve and 1 to 8 bankable directional valves. Ports P and T are common for all sections. Maximum flow rate through one directional control valve is 20 l/min. Their advantages are small dimensions, flexibility of use and compactness.

The bankable directional control valve is also the basic construction element for the modular valve assembly RPEK1-03/B.



Bankable directional control valve RPEK1-03



Monoblock directional control valve RPEK1-03 with 4 sections

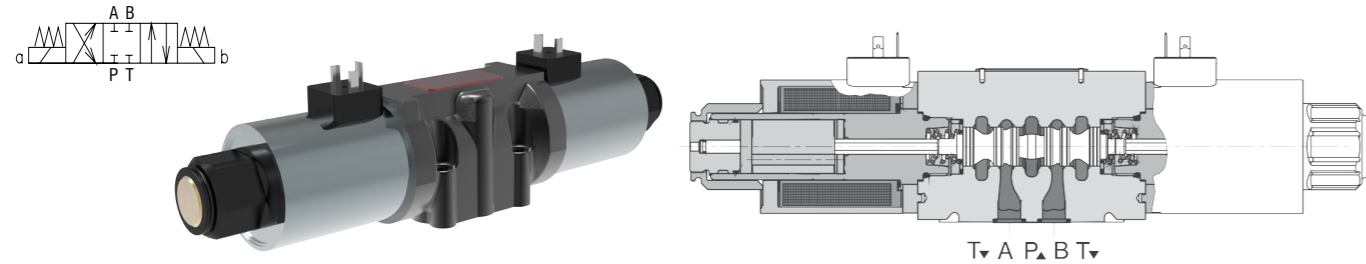
Solenoid operated valves with housing - sizes Dn 04, 06, 10

The 4-way valves with one operating solenoid (2-position) or two solenoids (3-position) manufactured in three sizes.

Size of directional control valve	Maximum pressure	Maximum flow rate
Dn 04	320 bar	40 l/min
Dn 06	350 bar	80 l/min
Dn 10	350 bar	140 l/min

For all three sizes, valves operated by two solenoids are available with spool detent assembly. It allows the change of spool position applying a short-time pulse switching of the solenoid. For dangerous machines, such as presses or molding machines, the directional control valves of sizes Dn 06 and Dn 10 are used with the non-contact spool position sensor of type PNP. Information on the spool position is necessary for the machine safety control system.

It is possible to supply directional control valves with CSA certification (Canadian Standard Association) on request.



4-way, 3-position (4/3) directional control valve operated by two solenoids

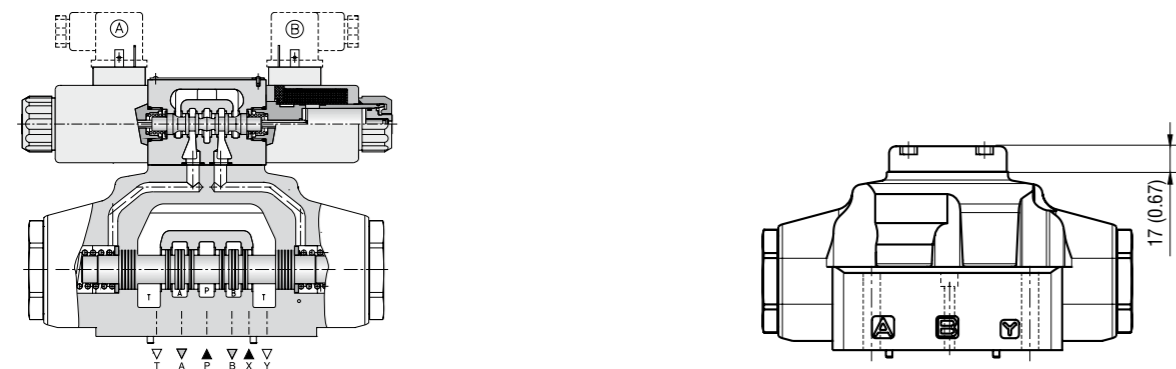
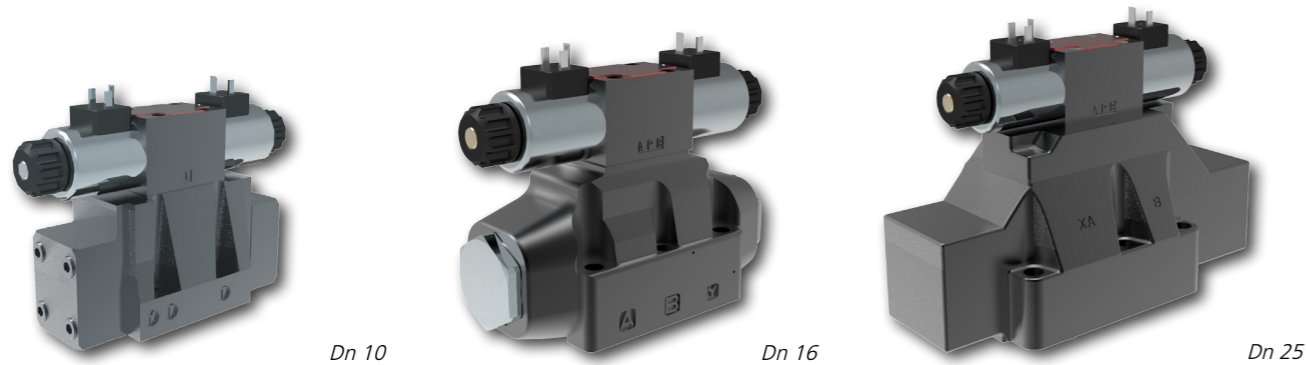


- For directional control valves with two solenoids, one solenoid must be deenergized before the other solenoid can be charged.
- For directional valves with detent assembly, the solenoid switching time shall not be less than 60 ms to allow a secure shift of the spool.

Directional control valves of sizes Dn 10, Dn 16 and Dn 25 with pilot valve

They are designed to control high flow rates up to 150 l/min (Dn 10), 300 l/min (Dn 16) or 600 l/min (Dn 25). The pilot valve is the directional control valve of size Dn 06 used for distribution of the fluid under pressure toward spool faces of the main valve. While the spool of the pilot valve is operated by the actuating solenoids, the main valve spool is operated hydraulically. There are versions with internal or external supply to the pilot valve. Another option is to operate the main valve spool hydraulically by external ports without any pilot valve. The high pressure version, offered as an option, has the main valve housing made of cast iron with the increased strength and pressure resistance up to 420 bar. For example, this version is suitable for presses characterized by pressure peaks at reaching the tool contact point.

The catalog of the products includes also control options of spool switching times of the main valve, flow restrictions in both flow directions by setting the stroke limiter control option of the main valve.



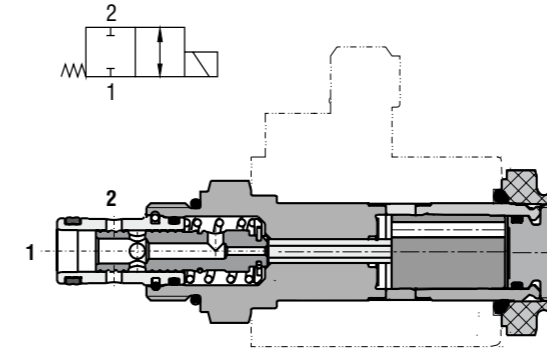
Directional control valve of size Dn 16 with a pilot valve of size Dn 06 operated electromagnetically. Port X is used for external supply of the pilot valve. Port Y serves to drain the oil from the pilot valve.

Directional control valve of size Dn 16 with the spool of the main valve operated externally by ports X and Y. Mounting surface for the pilot valve is closed by the blanking plate containing T line bridges.

Built-in directional control valves and poppet type valves

Built-in spool type directional control valves

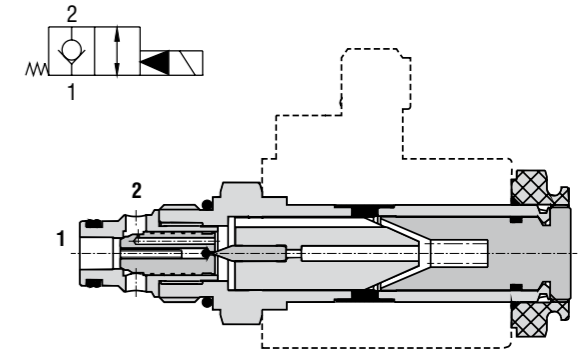
The spool shifts in the steel sleeve and opens or closes radial holes in the sleeve. The 2-position 2-way valves, 3-position valves or 4-way valves are manufactured in two sizes. The valves with the connecting thread 3/4-16-UNF correspond to size Dn 04 owing to their flow rate. Similarly, the valves with the connecting thread 7/8-14-UNF correspond to size Dn 06.



Built-in, 2-way, spool type directional control valve

Built-in poppet type valves

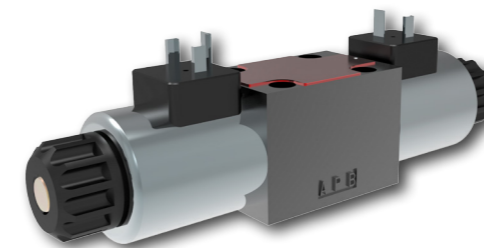
The spool is here replaced by a hardened cone closing the fluid flow by slipping into the poppet sealing edge. The main advantage of poppet valves is very low leakage. These valves are more sensitive to contamination of the working fluid. They are manufactured as 2-position, 2-way valves, directly or pilot operated.



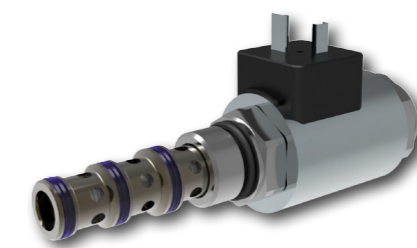
Built-in, poppet type valve, pilot operated

"High performance" and "Lightline" versions

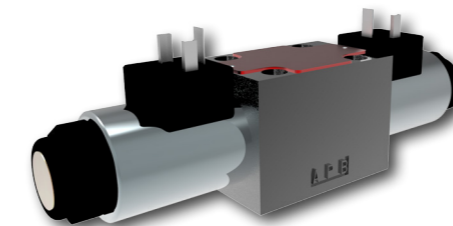
While valves of the "high performance" series are designed for high hydraulic power, the "light line" series is suitable for low power applications. Lower power allows the integration of smaller solenoids, and justifies therefore a lower price. The design quality of both series remain the same.



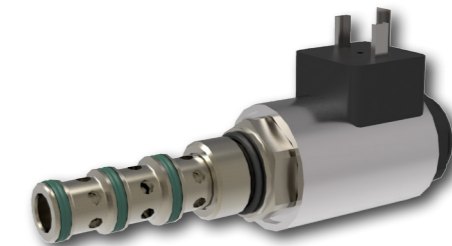
Spool type directional control valve with housing RPE3-06



Built-in, spool type directional control valve SD2E-B4



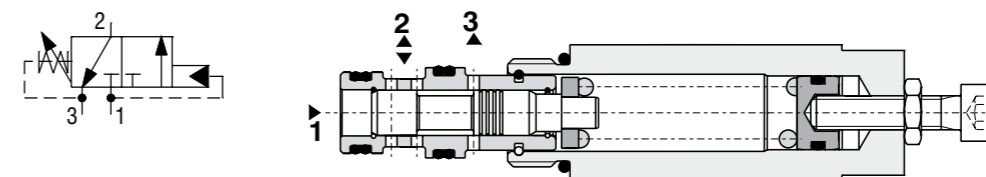
Spool type directional control valve with housing RPEL1-06 - "Lightline" version



Built-in, spool type directional control valve SD2E-B4/L - "Lightline" version

Bankable valves

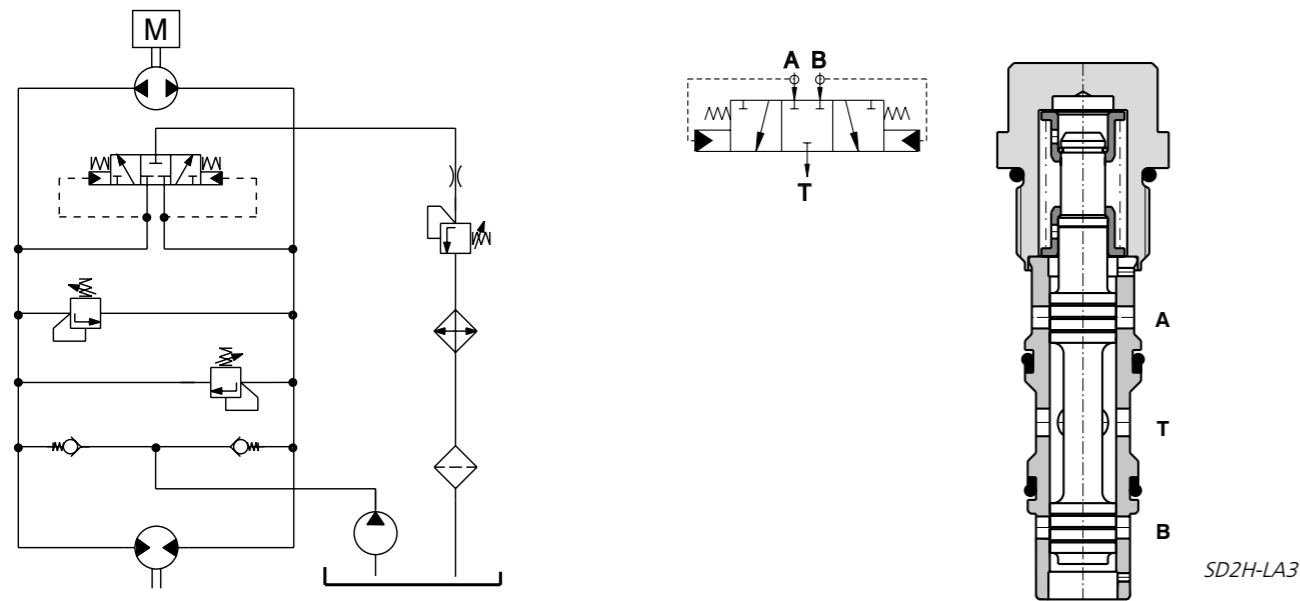
Spool type valves operated hydraulically for ensuring a specified sequence of functions in a hydraulic circuit. Under the condition that the pressure in the control circuit, acting on the spool face area, reaches the value set by spring compression, the spool is shifted and the parts of the circuit are connected.



Bankable valve SS4A-A3, operated hydraulically

Hot oil shuttle valve for closed hydrostatic circuits

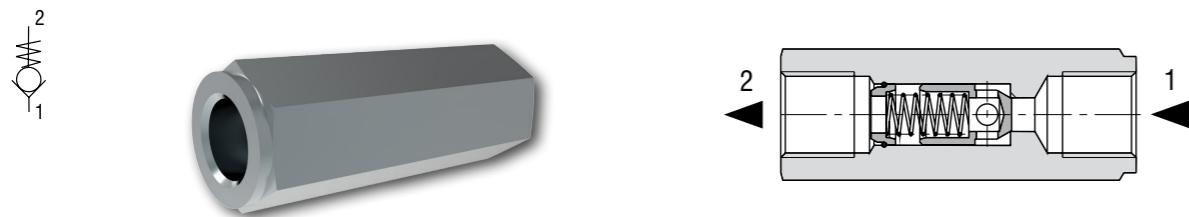
Especially for heavy vehicles (such as quarry damper) with the demands on a low speed and high torque on wheel axles, the closed hydrostatic circuit with variable displacement pump and reverse hydraulic motors are often used to drive the wheels. Such systems use a relatively small volume of the working fluid while high power is transmitted. This leads to a rapid heating of the fluid and its portion must be drained from the low pressure branch of the system toward the cooler and back to the tank through the filter. Afterward, the cooled and filtered fluid is refilled to the low pressure branch by a small filling pump. Built-in 3-way valves, operated hydraulically, allow to drain the fluid from the low pressure branch depending on the flow direction (acc. to movement sense of the actuator).



SD2H-LA3

3.1.2. Check valves

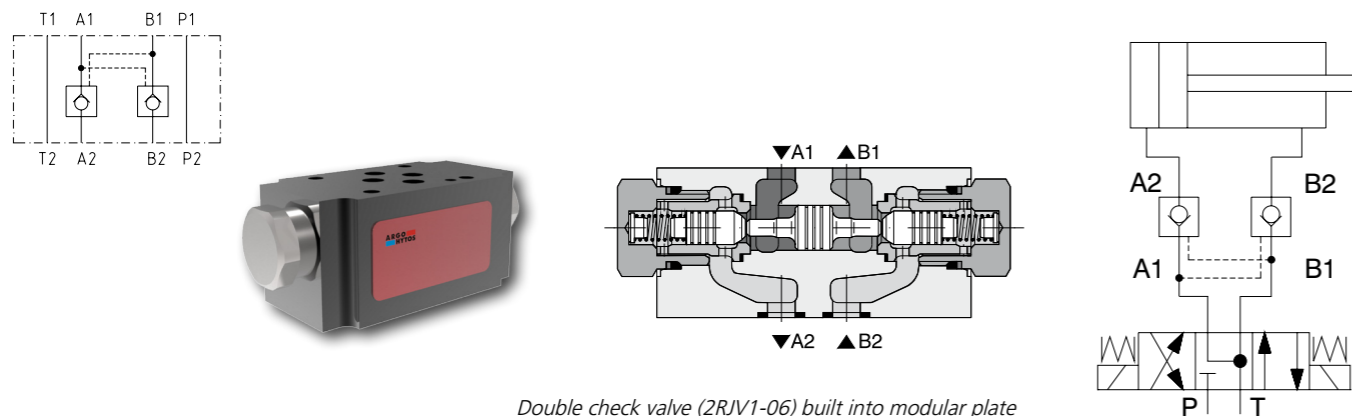
Poppet type valves allow working fluid flow only in one direction. In the reverse direction, the working fluid pressure acts on the hardened cone or ball towards the valve sealing edge. The resting position of the cone or ball is enforced by a spring of low stiffness. The check valves fitted with a stronger spring are sometimes used as back pressure valves creating a slight overpressure, or simple pressure relief valves.



Check valve VJ3 used for in-line mounting

Controlled check valves

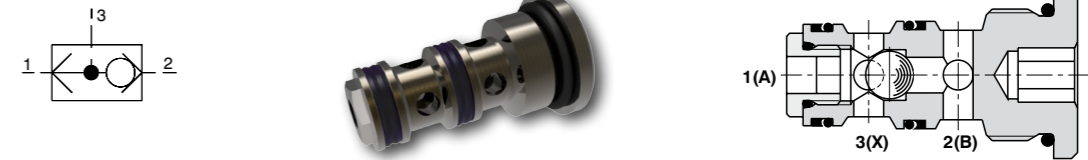
These check valves are opened in the reverse direction or closed in the free direction mechanically using an auxiliary piston actuated by the fluid pressure from the second branch of the actuator. Controlled check valves, opened in the reverse direction, are pilot operated check valves used to secure the position of a load. They are integrated as screw-in valves into modular plates. For Dn 06 and larger sizes, the valves are manufactured with the decompression valve reducing the pilot pressure needed to open the valve completely and so dampen the pressure shocks during the opening.



Double check valve (2RJV1-06) built into modular plate

Load shuttle valves

Poppet type valves securing automatically certain logic functions in the circuit. The valve shown in the figure connects port X with port A or B depending on the higher pressure.



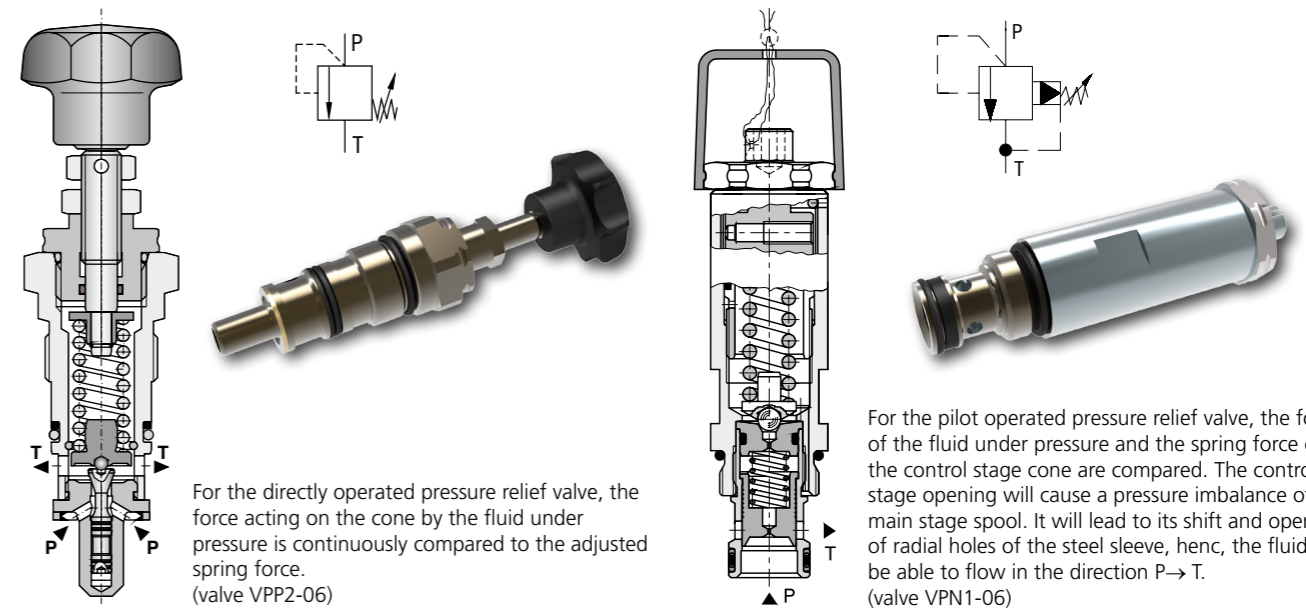
3-way load shuttle valve LV1-063 used as screw-in valve

3.1.3. Pressure valves

The pressure valves are designed for the pressure control in the circuit and thus for the force control on the actuator - the force acting on the piston rod of the hydraulic cylinder or the torque on a hydraulic motor shaft. They are manufactured as pilot operated and directly operated valves.

Pressure relief valves

2-way valves operated by inlet pressure are connected to the circuit parts in parallel and protect them against overpressure. If the pressure in the circuit exceeds the adjusted value of valve cracking pressure, the valve will open and the fluid will be drawn to the tank. The valves have a relatively large pressure drop. Therefore, they should be used as pressure relief valves but they are not designed for the permanent pressure control in a circuit. The directly operated valves are equipped with suitable hydraulic damping to ensure the valve stability in the circuit. Moreover, the spring force increases when the valve flow rate increases.



For the directly operated pressure relief valve, the force acting on the cone by the fluid under pressure is continuously compared to the adjusted spring force. (valve VPP2-06)

For the pilot operated pressure relief valve, the force of the fluid under pressure and the spring force on the control stage cone are compared. The control stage opening will cause a pressure imbalance of the main stage spool. It will lead to its shift and opening of radial holes of the steel sleeve, hence, the fluid will be able to flow in the direction P→T. (valve VPN1-06)



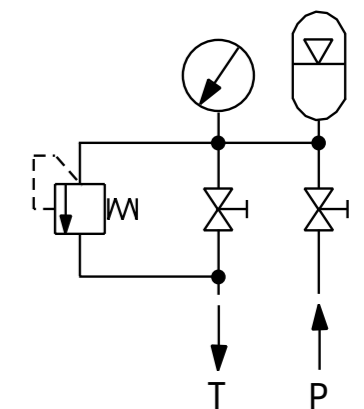
If the spring chamber is connected to port T, any pressure change in this port will cause a change in the adjustment of the valve cracking pressure. If the pressure changes significantly in port T, it is recommended to use a valve with external drainage of the fluid from the spring chamber.

Pressure reducing-relieving valves with certification for pressure equipment (PED)

Certified valves are intended for the protection of circuits with dangerous elements, such as pressure tanks of hydraulic accumulators. They must be reliable as it concerns their functionality. The certification meets the requirements of directive 2014/68/EU. The valves are offered in two versions - without any adjustment or with adjusted cracking pressure and adjustment screw secured using a lockwire.



According to the requirements of the standard ISO 4126-1, the system pressure at the valve opening may overshoot no more than 10% of the adjusted cracking pressure. Therefore, the usage of such valves is limited by maximum flow rate.

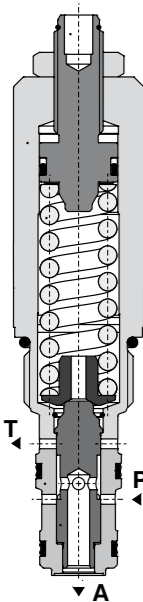




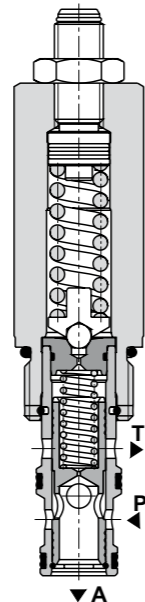
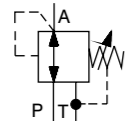
Certified valves (PED) SR1A-B2 and VPP-R-16

Pressure reducing-relieving valves

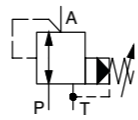
These valves are controlled by the outlet pressure and they hold a constant pressure after the valve. These 3-way pressure reducing-relieving valves provide two functions: flow control (flow direction P → A) and circuit protection after the valve against pressure overload (flow direction A → T).



For directly operated reducing-relieving valves, the fluid flows toward the actuator P → A. If the pressure at the valve outlet rises (e.g. because of load increase on the actuator), the increased pressure will act on the spool face and shift it against the spring force. The radial input ports P start to close and the pressure in port A decreases due to a throttling of the flow. If any sudden significant pressure rise occurs at the valve outlet A, the spool will shift in such a way that the input ports P will be closed completely and Port A will be connected to the tank by the reverse branch T. Port A is unloaded to protect against overloading. (Example: valve SP2A-B3).

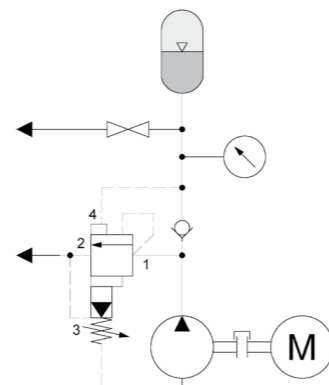


For pilot operated pressure reducing-relieving valve, the main stage spool is operated hydraulically using the pressure difference created by the control stage opening (Example: valve SP4A-B3).

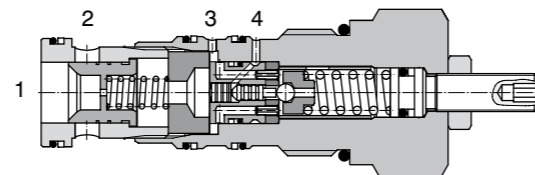
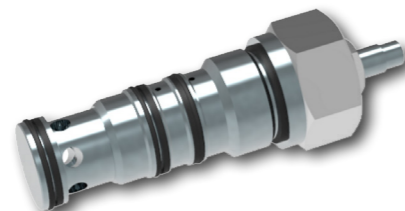
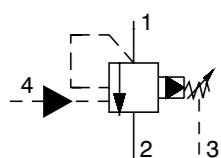


Unloading valves

Pilot operated pressure reducing-relieving valves supplemented by the control stage adjustment using an external pilot. They are intended for specific applications in the circuits with accumulators where the accumulator is used as a pressure energy source for manual override, e.g. for brakes. The accumulator must be kept permanently in a full condition. If the accumulator is full, the valve will open and the fluid will be drawn to the other circuit part or back to the tank. To reduce the high pressure drop across the valve, the control stage is kept in the open position by the pressure signal from the accumulator circuit until the pressure falls below the given value (by about 15%). Afterward, the valve is closed again and the accumulator is pressurized.

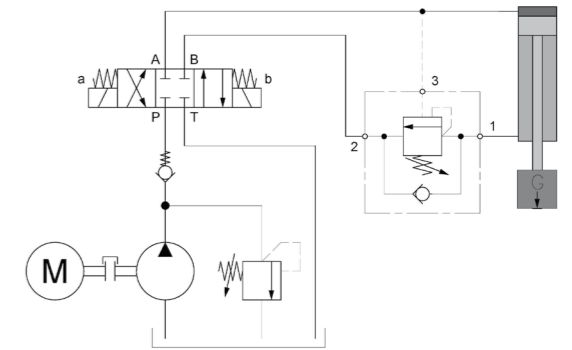


The fluid under pressure from the pump circuit enters the valve through Port 1. Depending on the pressure in the accumulator, this fluid can be drawn to the other circuit part or back to the tank through Port 2. Fluid under pressure from the accumulator circuit is brought into the valve through Port 4. This fluid acts on the auxiliary piston which keeps the control stage open mechanically in the specified pressure range inside the accumulator (100% to 85% of the pressure adjusted by the valve). The fluid is drained from the control stage through Port 3. Therefore, the adjustment of the valve cracking pressure is independent of pressure changes in Port 2. (Example: valve SUD-6A)

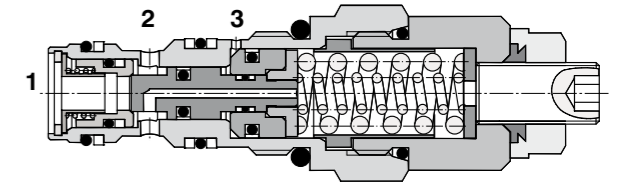
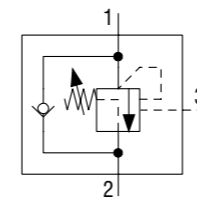


3.1.4. Overcenter valves

These pressure valves are designed for the controlled lowering of a load if the load acts negatively, i.e. in the direction of the actuator movement. The negatively acting force accelerates the actuator movement (piston in the cylinder or shaft rotation of hydraulic motor). It could lead to a loss of control over the system and consequently to an accident. The valves are designed as directly operated pressure relief valves with a bypass check valve and the valve opening using an external pressure signal taken from the input branch of the actuator. The valve provides the controlled load lowering, load positioning when the system stops and blocking the actuator movements, if there is a pipe burst. The valves are mounted directly onto the actuator or in its close proximity. The valves are offered in various design options.



During the lowering of the load on cylinder piston rod, there is the influence of gravity leading to an acceleration of the piston movement. This decreases the pressure in the space above the piston cylinder. At the same time, the pressure drops in the valve inlet 3. The pressure in this port controls the opening of the valve cone and interconnection of cylinder outlet and return line to the tank. The pilot pressure drop (3) causes the poppet to move in the closing direction and so to a reduction of flow rate from the cylinder's rod-side chamber back to the tank. This slows down the piston movement. If the supply line breaks, the system pressure will drop, the valve will close and piston movement will be stopped. During the reverse movement of the cylinder piston, the fluid flows through the built-in bypass check valve (Example: valve SOP5A-Q3).

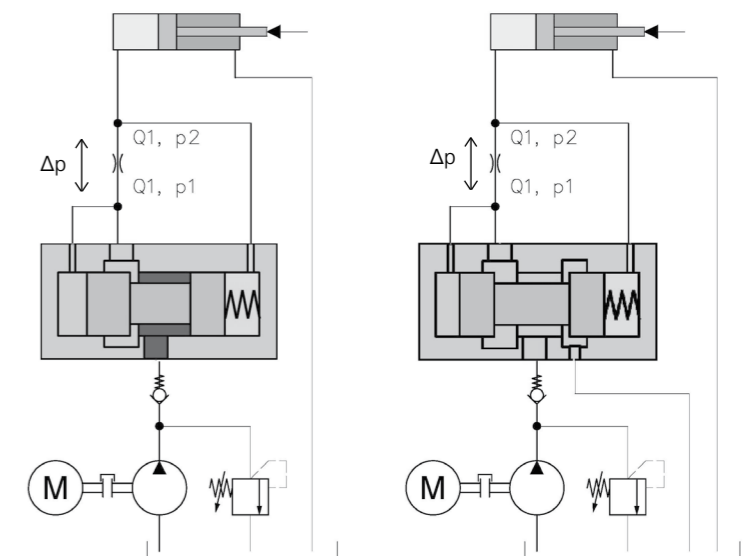


3.1.5. Flow restrictor valves

They are intended for actuator speed control, i.e. shift speed of a cylinder piston or the rotational speed of a hydraulic motor. The throttle valve changes only the cross-sectional flow area. In order to stabilize the actuator speed, independently of the pump supply and external forces on the actuator, the valve must be equipped with a compensation for the pressure difference. For 2-way pressure compensation, the valve inlet pressure is controlled based on the outlet pressure by throttling the flow. For 3-way pressure compensation, the regulation is achieved by draining the fluid portion back to the tank. The pressure difference of the valves determines the pressure generated by the compensator spring. For valves with pressure compensator, the flow rate through the valve can be adjusted either by the change of cross-sectional flow area or by pressure difference adjustment using the spring preload.

$$Q = S \cdot \mu \cdot \sqrt{\frac{2 \cdot \Delta p}{\rho}} \quad \Delta p = p_1 - p_2 = \text{const.}$$

- Q ... flow rate of the valve
- S ... cross-sectional flow area
- μ ... hydraulic coefficient dependent on the type of fluid flow
- Δp ... pressure difference (inlet pressure – outlet pressure)
- ρ ... working fluid density dependent on temperature

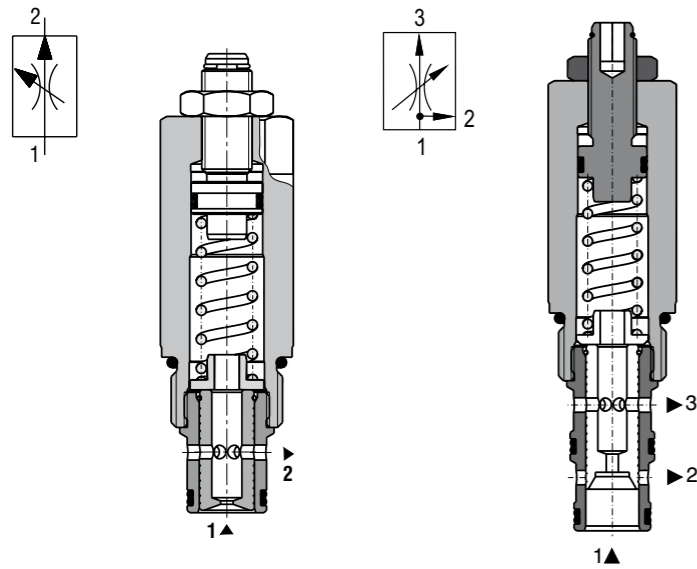


2-way pressure compensator

3-way pressure compensator

The pressure compensators stabilize the pressure difference and flow rate behind the valve independently of the inlet and outlet pressures of the valve.

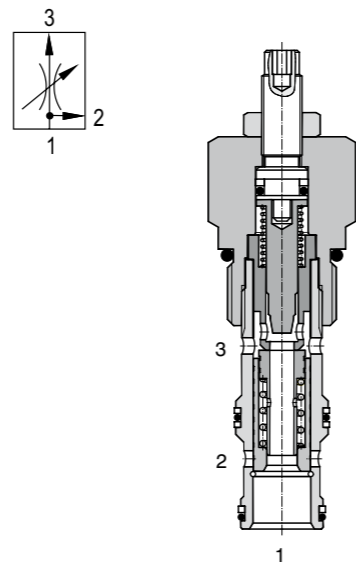
Built-in valves for flow control with 2-way (SF22A-B2) and 3-way (SF32A-B3) pressure compensator



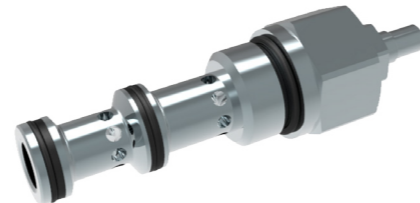
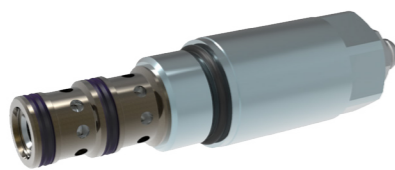
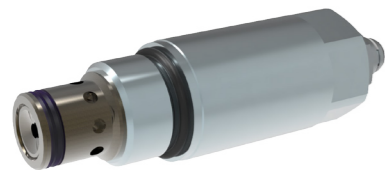
SF22A-B2

SF32A-B3

Built-in valve SF32A-K3 designed for flow control using a 3-way pressure compensator and the cross-sectional flow area control.



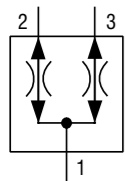
SF32A-K3



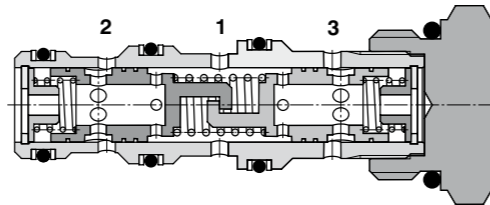
Flow divider valves

Divider valves are one way to divide fluid flow from the pump to more actuators at specified rate, independently of their different loads. Accuracy of division is generally between 2% and 10%. If the actuators are hydraulic cylinders, it is recommended to use cylinders with larger piston diameter, where the specified inaccuracy results only a small difference in stroke. These built-in valves contain a steel sleeve in which two spools of 2-way pressure compensators can shift. These spools are loosely coupled in a mechanical manner and they mutually affect their positions.

The flow divider and combiner valve with two loosely connected spools (in a mechanical manner) of pressure compensators. The fluid enters Port 1 radially. Ports 2 and 3 are outlets toward the actuators.



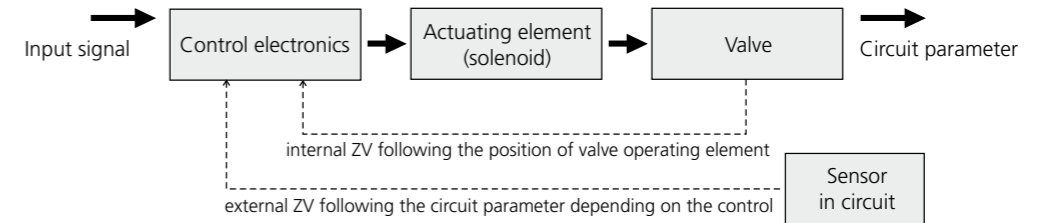
SFD2F-B4



3.1.6. Proportional valves

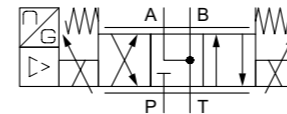
Unlike conventional valves, they adjust the specified parameter in the whole range of values. Precise adjustment requires also improved design of the valves, therefore the price of proportional valves is higher. The control electronics are an integral part. They are either part of the valve ("on board") or a control card is placed in an appropriate electric cabinet. The electronics are powered by 12 or 24 VDC. Modern valves are controlled by pulse width modulation signal (PWM). There are 3 types of the control:

- › without feedback
- › with internal feedback - with a spool position sensor
- › with external feedback - with the sensor signal of controlled parameter in the circuit



Proportional directional valves

These valves are used to fine adjust flow rate. Furthermore, versions with two solenoids may be used to change flow direction. The valves are manufactured in sizes Dn 04, Dn 06 and Dn 10. Each size has two or three flow rates depending on the shape of the metering edges on the spool. For load-independent flow control, it is necessary to stabilize the pressure difference on the directional control valve using the pressure compensator. The valve parameters are defined for a pressure drop of 10 bar. The older versions of proportional directional valves use analog electronics in an open loop configuration. Updated versions use digital electronics and feedbacks.

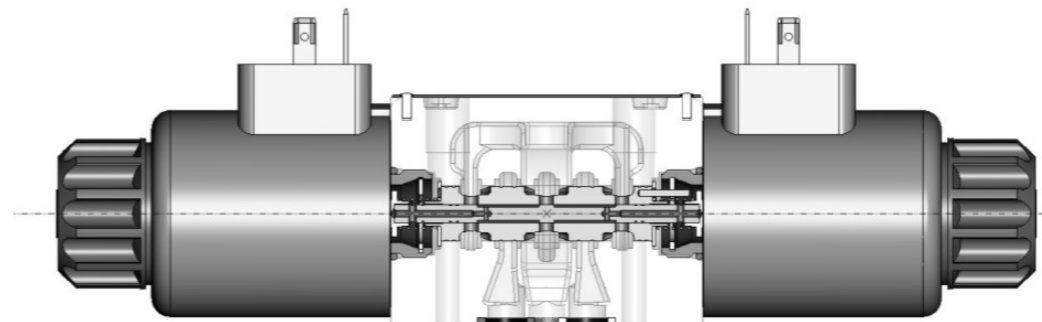


PRM7-04



PRM7-10

Proportional directional control valves of sizes Dn 06 and Dn 10, controlled by a digital electronic unit, capable of working with internal and external feedback or their combination.

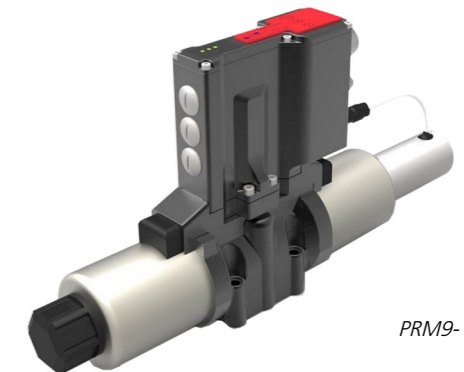


PRM8-06

The pilot operated directional valve PRM-8 of size Dn 06 is characterized by high performance (350 bar, 130 l/min). Its control spool is operated by the solenoids and the main spool is operated hydraulically.



PRM9-06

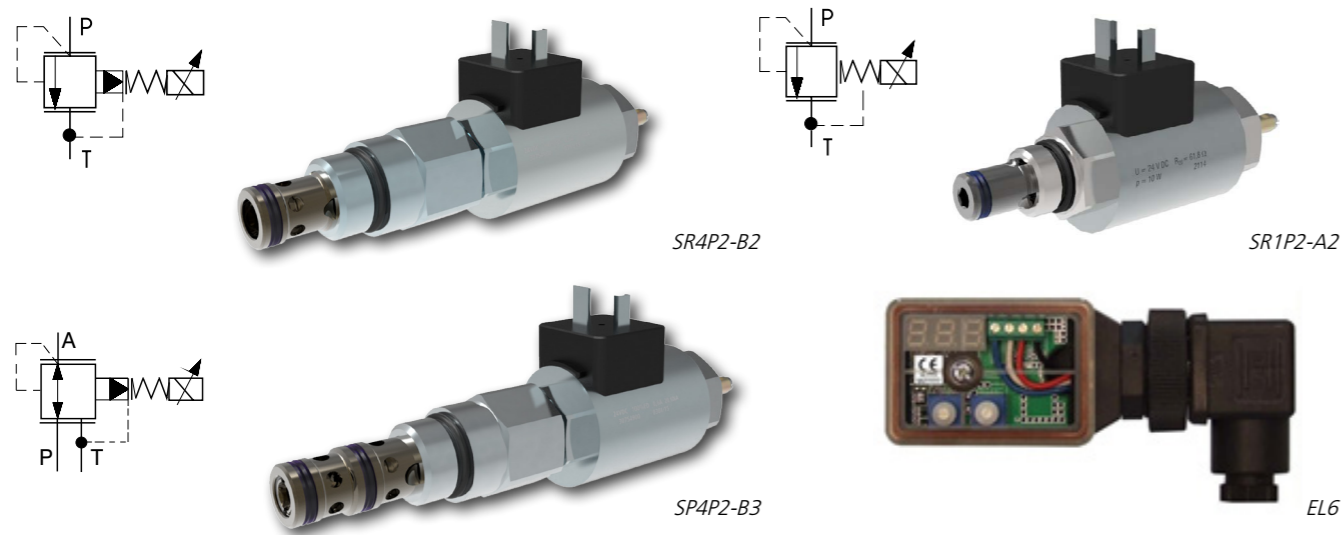


PRM9-10

The proportional directional valve PRM 9 (sizes Dn 06 and Dn 10) is a modern proportional valve with hydraulic parameters optimized by mathematical-physical models, good dynamics and an intelligent electronic control unit capable of communication via CAN bus.

Proportional pressure valves

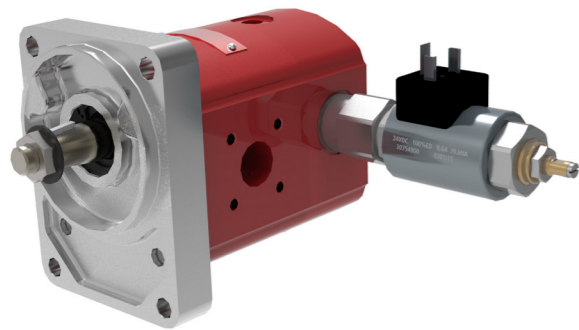
This type of pressure relief valve serves to fine adjust the maximum pressure in the circuit. Pressure reducing-relieving valves on the other hand are intended for the fine pressure adjustment after the valve - directly on the actuator. The proportional pressure valves allow remote pressure control by electrical signal. It is recommended to use the digital control electronics in the form of DIN connector (EL 6).



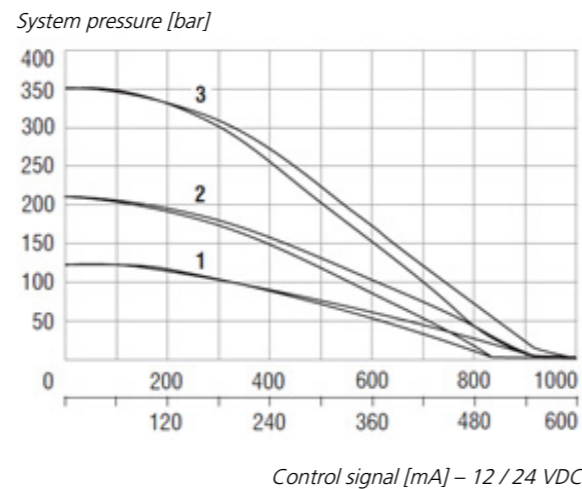
The pilot operated pressure proportional valve with 7/8-14 UNF thread, 2-way pressure relief valve SR4P2-B2 and 3-way pressure reducing-relieving valve are applicable for pressures up to 350 bar and a flow rate up to 60 l/min. Both valves have the same control stage fitted with 3/4-16 UNF thread, usable as a directly operated pressure relief valve with flow rate up to 1.5 l/min. The miniature external electronics EL 6 in the form of DIN connector is used to control the valves.

i To reach reliable and stable function, the valve must be vented properly using a screw placed at the end of the solenoid actuating system.

⚡ Remember that the spring force is replaced by the solenoid force. No pressure is produced in the circuit when the solenoid is switched off. This is functionally different from the valves operated mechanically by the spring. For applications with the reverse function as a necessity, the proportional pressure valves with inverted flow characteristics were developed - the higher the control signal, the lower the pressure.

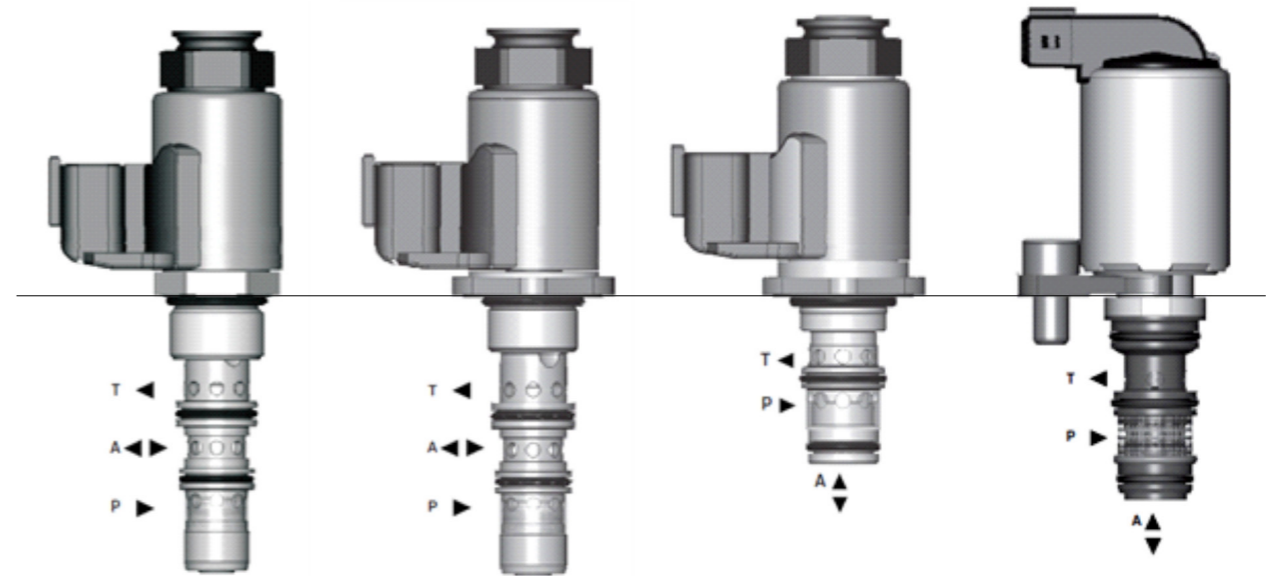


The hydraulic drive and the rotation speed control of a cooler fan (Fan Drive) together with a valve SRN4P1-B2 with the negative characteristic to achieve the optimal constant temperature of the combustion engine.



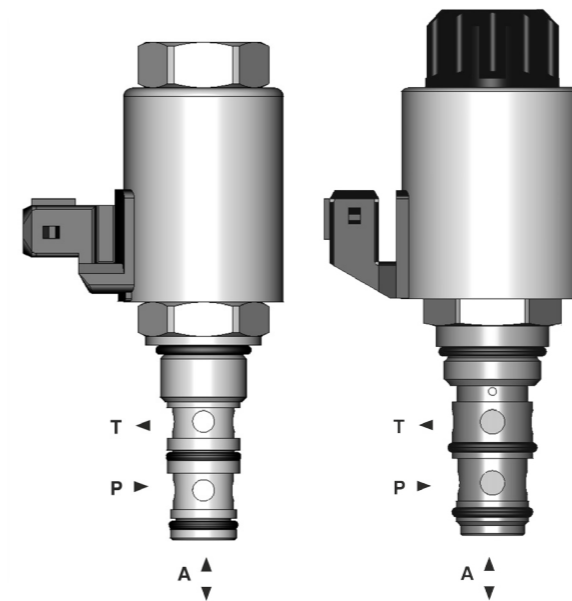
Low-pressure proportional pressure reducing valves

The built-in valves with an inlet pressure of up to 50 bar are specially designed for mobile applications where the system pressure varies between 20 and 30 bar. Pilot operated and directly operated versions are available. Pressure reducing-relieving valves in the slip-in version are in particular used for the control of gearboxes and clutches of mobile equipment. To cover the broadest range of applications, two types of valves with different port arrangements were developed - the first one with Port A in the axial direction and the second one with Port A in the radial direction located in the middle of the housing. The proven built-in valves PVRM of sizes Dn 06 and Dn 10 with metric thread belong to this group.



Pilot operated reducing-relieving valve SP4P1-B4 with 7/8-14 UNF thread and valve PP4P1-Z3 in the slip-in version. Radial direction of Port A.

Pilot operated reducing-relieving valve SP4P1-ZA3 and directly operated Slip-in valve PP2P3-W3. Axial direction of Port A.



Directly operated reducing-relieving valves PVRM1-063 and PVRM3-10 with a metric connecting thread.



Typical block for mobile equipments

3.1.7. Explosion-proof valves

These valves possess the ATEX certification acc. to the directives 2014/34/EU and the IECEx certification. As the basic type of protection, the coil is embedded in the insulating material (m) with a high protection level (Mb, Gb, Db) for normal operation and estimated potential failures. Depending on the solenoid power and ambient temperature, the surface temperature is achieved in the following classes: T4 (max. 135°C), T5 (max. 100°C) and T6 (max. 85°C).

Application areas of valves:

I. Mines with an explosive atmosphere of mine gas consisting mainly of methane

Group M2	The equipment remains switched off after the explosion.
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II. Explosive atmosphere of vapors and gases (chemical, petrochemical and gas industries, etc.)

Group IIB	Ethylene is a typical example of such gas.
Group IIA	Methane is a typical example of such gas.

III. Explosive atmosphere of dust and particulate matter (mills, lime works, textile industry, etc.)

Group IIIC	Conductive dust ($R \leq 10^3 \Omega m$)
Group IIIB	Non-conductive dust
Group IIIA	Particulate matter (e.g. fibers)



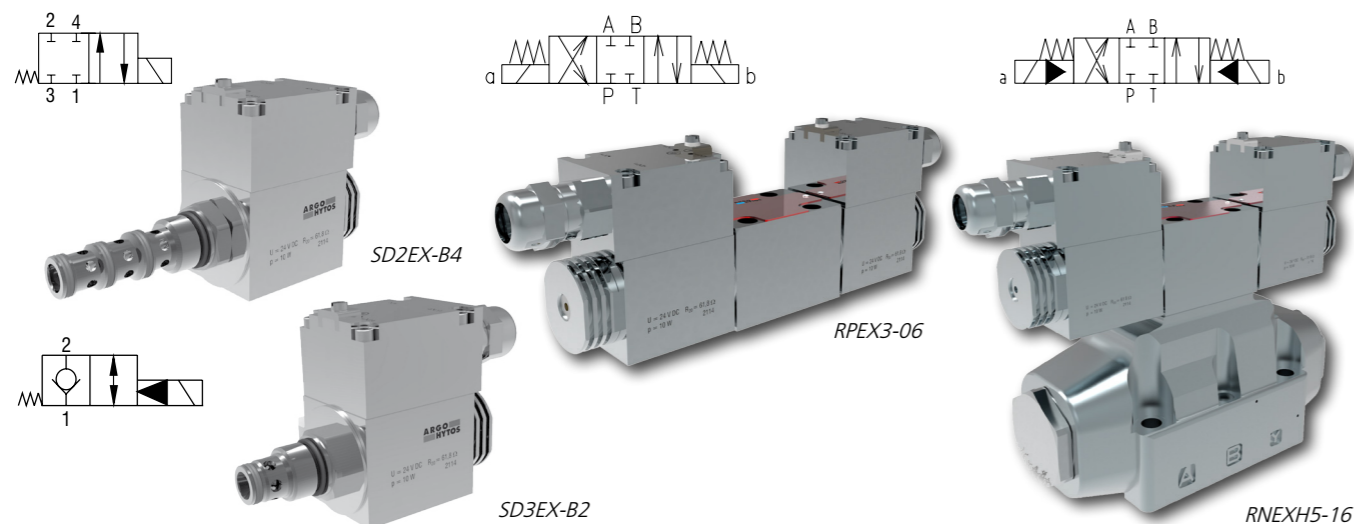
Valves powered with alternating voltage are provided with a built-in rectifier embedded in the insulating material. Therefore, these valves can be delivered only with mounted supply cable of normal length 3 m or 8 m.



If the ATEX solenoid is used separately without the hydraulic part of the valve, the solenoid surface temperature will increase above the specified value due to reduction of the heat transfer surface area. The elevated surface temperature is one of the sources of explosion.

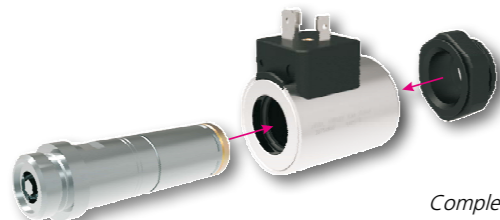
The following valves are available in the ATEX version:

4/3, 4/2 directional control valve with housing - size Dn 06	RPEX3-06
4/2, 3/2, 2/2 built-in spool type valve with 7/8-14 UNF thread	SD2EX-B2, SD2EX-B3, SD2EX-B4
2/2 built-in poppet type valve, pilot operated, with 7/8-14 UNF thread	SD3EX-B2
3/2 poppet-type valve, direct-acting, with 3/4-16 UNF thread	SD1EX-A3
4/3, 4/2 directional valve with pilot valve ATEX	RNEXH1-10, RNEXH5-16, RNEXH4-25



3.2. Actuating solenoids

They are used for electrically operated valves. The solenoid consists of two basic separable parts. A magnetic field acting on the armature of the actuating system is created by an electric current passing through the coil of the excitation system. The armature movement is transmitted by the pin to the spool or the cone of the valve. The first advantage of this design solution is that the connector may be positioned as desired by turning the excitation system around the longitudinal axis of the actuating system. The second advantage is the easy replacement of the excitation system after loosening the nut without a need to dismount the hydraulic section.



Complete solenoid consisting of actuating system, excitation system and tightening nut

Sizes of coils

Number in the coil designation corresponds to outer diameter of the control system and inner diameter of the coil.

Coil designation	Basic application areas
C14	valves of size Dn 03
C19	valves of size Dn 04 and built-in valves with 3/4-16 UNF thread
C20	valves of size Dn 06, reduced coil power (8W)
C22	valves of size Dn 04 and cartridge valves with 7/8-14 UNF thread
C31	valves of size Dn 10

Energizing the solenoid coils

The coils are powered with DC current. Magnetic flux excited by the coil is defined by Hopkinson's law:

$$\Phi [Wb] = \frac{U_M}{R_M} = \frac{I \cdot n}{L^{-1}} \left[\frac{Az}{H^{-1}} \right]$$

- Φ - magnetic flux [Wb]
- U_M - magnetomotive force [AT]
- R_M - magnetic resistance [H⁻¹]
- I - electric current [A]
- n - number of coil turns
- L - coil inductance [H]



The solenoid nominal power depends on electrical supply and winding temperature. It is important to maintain the specified values of the power supply (Un ± 10%) and the limit temperature for the working fluid and the surroundings. The coil resistance increases with higher temperature and the current passing through the coil decreases. Solenoid power and hydraulic power of the valve decrease acc. to Hopkinson's law. Copper wire of the coil winding belongs to the temperature class 200 (insulation temperature index ≤ 200°C).

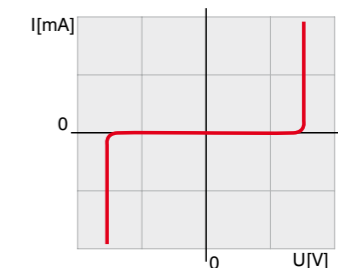
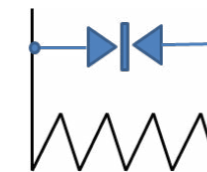


The coils used with AC power supply are fitted with the rectifier placed in the connector or plug connector.

Quenching diode (transient-voltage-suppression diode)

It is a semiconductor element connected between the outlets of the coil winding, which protects the electronics against any damage caused by peak voltage. This dangerous voltage is created by the induction during the magnetic flux change according to Lenz's law, i.e. when an inductive load (coil) is connected / disconnected in the circuit.

$$U_i = - \frac{\Delta\Phi}{\Delta t} = -L \frac{\Delta I}{\Delta t}$$



When the threshold voltage is exceeded, the quenching diode will open and the energy of overvoltage is converted to thermal energy.

Connectors

The basic connectors used for coils are the following:

- › Connector DIN EN 175301-803-A (IP 65)
- › Connector AMP JUNIOR TIMER (IP 67)
- › Connector DEUTSCH DT04-2P (IP 67)
- › Wire box
- › Loose conductors

Manual override of valves

In case of power blackout or failure, it may be to manually shift the operating element in the valve to reach a safe position of the actuated mechanism.

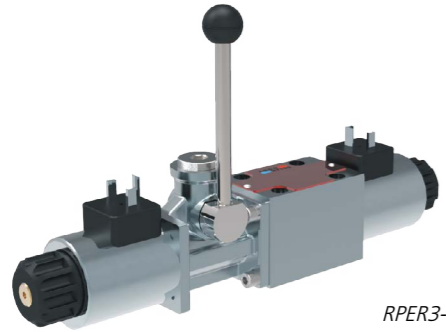


The valves feature manual override, which is, however, only operable if the pressure in Port T does not exceed 25 bar.



Basic versions of the manual override using pin or push button placed in the protective rubber sleeve.

Directional control valves operated by solenoid with spool manual override using hand lever



These special directional control valves are intended for applications requiring manual override that is usable up to a maximum allowable pressure in port T of 100 bar. The hand lever doesn't affect performance or functionality of the solenoid operated valve.

3.3. Manifolds

Manifolds are hydraulic equipment parts used for interconnection of individual circuit parts. In particular, they allow creating various control functions by providing interfaces for valves that may be placed and fixed on their surface areas.

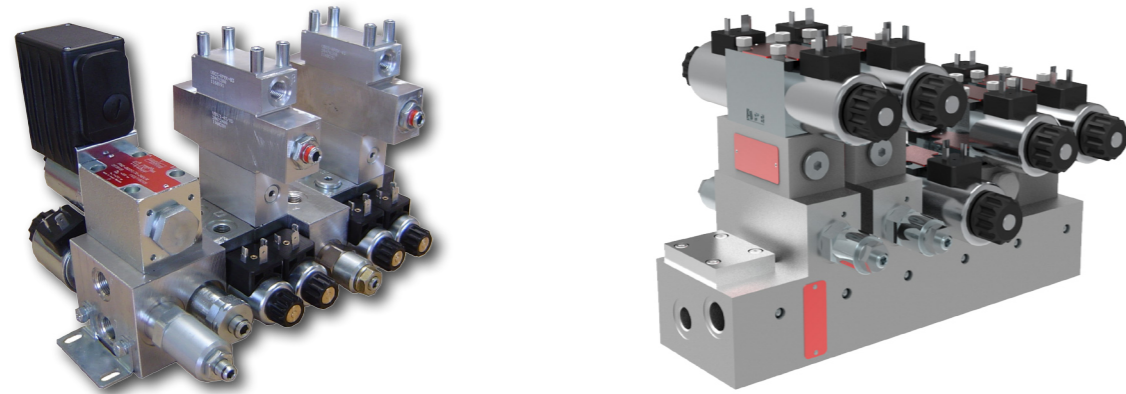


Material of manifolds

Manifolds made from aluminum alloy can be generally used up to 250 bar. The gray cast iron manifolds - up to 350 bar, the steel manifolds - up to 420 bar. The maximum allowable operating pressure must be verified for each individual type in the relevant product catalog.

Standard and custom-made manifolds

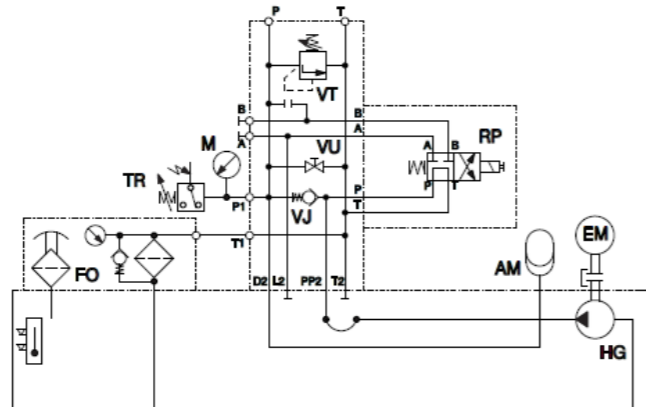
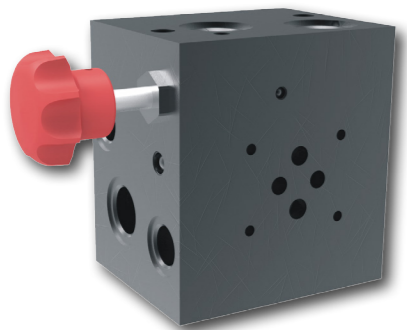
The manufactured manifolds can be divided into two groups. The standard products given in the catalog constitute the first group. For example: subplates, manifolds and modular plates for built-in valves, etc. The interesting solutions are the modular assembly blocks a high design flexibility, whether the modular valve assembly RPEK1-03B of size Dn 03 or the subplates designed for higher sizes (Dn 04, 06, 10).



The modular assembly block based on the bankable directional control valves RPEK1-03 of size Dn 03 and the in-line manifold with 6 sections, fitted with the valves of size Dn 06.

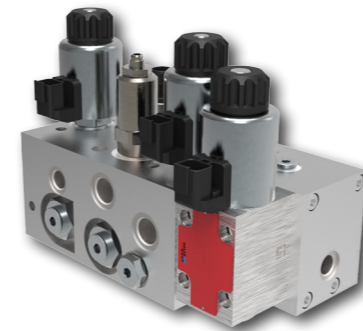
Multifunctional base plate ZB 06

is intended for power pack assemblies. It allows several different basic circuit connections with the pump mounted on the tank cover or placed in the tank. It can be used for the circuit with one accumulator, two pumps or a control pump. Moreover, the side surface allows the connection of other valves with a housing or valves built into modular plates. The in-line manifold PD together with other valves can be connected to the top surface.



The connection schematic of the switch-mode hydraulic power packs connected using the base plate ZB 06.

Manifolds for specific applications constitute the second group. Gray iron castings and aluminum alloy castings are used at higher quantities.



Special manifold for gearbox control developed in cooperation with a customer.

Screw-in cartridge cavity manufacturing tools



For the proper functionality of the built-in valves, the cavities allowing their screw-in mounting are of great importance. Their function depends both on observing the dimensions and correct cavity geometry. These requirements can be met technologically only when using special custom-made form tools made from high-speed steel. An overview of the tools for cavity machining can be found in the catalog SMT 0019.

3.4. Hydraulic power packs

These systems are complete hydraulic drives to which the customer may connect their actuators, e.g. hydraulic cylinders or hydraulic motors. The power packs are developed and modified according to the customers' needs to satisfy their requirements in full. The manufactured power packs are divided into three basic design groups – SMA, SPA and SA. Each group has its specific use.

		Nominal power [kW]	Tank volume [dm ³]	Max. pressure [bar]	Flow rate [dm ³ min ⁻¹]	
SMA	The SMA power packs are characterized by a small installation space, high variability of shapes, types and designs. They are used both for stationary and mobile applications. They are fitted with gear pumps.	0.12 - 3	1.5 - 40	250	0.3 - 17	
SPA	The SPA power packs are used in particular to drive lifting equipment in a small installation space. The submersible motor works in the fluid placed in the tank. The power packs are equipped with gear pumps and possess the added advantage of reduced noise.	0.55 - 3	7 - 30	250	2.2 - 17	
SA	The SA power packs are big hydraulic drives used for stationary applications. They offer enough space for other types of pumps, e.g. axial piston pumps, filtration systems, mounting of various sensors and creating sophisticated circuits by means of vertical and horizontal stacking assembly.	0.55 - 7.5	10 - 250	250	0.5 - 50	

Useful formulas for calculations

a) Pump

Required motor output power for specified hydraulic power	Torque on the pump shaft transmitted by clutch
$P_1[kW] = \frac{Q[dm^3 \cdot min^{-1}] \cdot \Delta p[bar]}{600 \cdot \eta_c}$	$M_k[Nm] = \frac{V_G[cm^3] \cdot \Delta p[bar]}{20\pi}$
Pump rotation speed necessary to deliver the specified flow	Flow delivered by pump at specified motor rotation speed
$n_1[min^{-1}] = \frac{Q[l/min] \cdot 1000}{V_G[cm^3] \cdot \eta_Q}$	$Q[dm^3 \cdot min^{-1}] = \frac{V_G[cm^3] \cdot n_1[min^{-1}] \cdot \eta_Q}{1000}$
<p>P_1 [kW] – motor output power n_1 [min⁻¹] – rotation speed of motor or pump M_{k1} [Nm] – torque on the shaft of motor or pump V_G [cm³] – geometric displacement volume of pump</p>	<p>Q [dm³min⁻¹] – flow delivered by pump Δp [bar] – pressure difference on pump (outlet pressure – inlet pressure) η_c – overall pump efficiency (specified by the manufacturer) η_Q – flow efficiency of pump (specified by the manufacturer)</p>

b) Hydraulic motor

Torque on hydraulic motor shaft at specified pressure difference	Rotation speed of hydraulic motor at specified delivered flow
$M_{k2}[Nm] = \frac{V_M[cm^3] \cdot \Delta p[bar] \cdot \eta_{CM}}{20\pi}$	$n_1[min^{-1}] = \frac{Q[dm^3 \cdot min^{-1}] \cdot 1000}{V_G[cm^3] \cdot \eta_Q}$
Output power on hydraulic motor shaft	Required flow delivered for specified rotation speed of hydraulic motor
$P_2[kW] = \frac{M_{k2}[Nm] \cdot n_2[min^{-1}]}{9549}$	$Q[dm^3 \cdot min^{-1}] = \frac{V_M[cm^3] \cdot n_2[min^{-1}]}{1000 \cdot \eta_{QM}}$
<p>P_2 [kW] – output power on hydraulic motor shaft n_2 [min⁻¹] – rotation speed of hydraulic motor shaft M_{k2} [Nm] – torque of hydraulic motor shaft V_M [cm³] – geometric volume (maximum usable flow) of hydraulic motor</p>	<p>Q [dm³min⁻¹] – flow delivered to hydraulic motor Δp [bar] – pressure drop on hydraulic motor (inlet pressure - outlet pressure) η_{CM} - overall efficiency of hydraulic motor (specified by the manufacturer) η_{QM} – flow efficiency of hydraulic motor (specified by the manufacturer)</p>

c) Hydraulic cylinders

Force acting on piston rod at specified pressure difference on cylinder	Speed of piston rod at specified inlet flow rate
$F_1[N] = 10 \cdot (p_1[bar] \cdot S_1[cm^2] - p_2[bar] \cdot S_2[cm^2]) \cdot \eta_{pV}$	$v_1[ms^{-1}] = \frac{Q_1[dm^3 \cdot min^{-1}]}{6 \cdot S_1[cm^2]} \cdot \eta_{QV}$
Output power on cylinder piston rod	Required flow delivered for specified speed of piston rod
$P_2[kW] = \frac{F_2[N] \cdot v_1[ms^{-1}]}{1000}$	$Q_1[l/min] = \frac{6 \cdot S_1[cm^2] \cdot v_1[ms^{-1}]}{\eta_{QV}}$
<p>F_1 [N] – force on cylinder piston rod p_1 [bar] – inlet pressure p_2 [bar] – outlet pressure S_1 [cm²] – piston effective area S_2 [cm²] – piston effective area on rod side</p>	<p>Q_1 [dm³min⁻¹] – flow entering cylinder v_1 [ms⁻¹] – speed of piston movement η_{pV} – pressure efficiency of hydraulic cylinder η_{QV} – volumetric efficiency of hydraulic cylinder η_{cV} – overall efficiency of cylinder = $\eta_{pV} \cdot \eta_{QV}$</p>



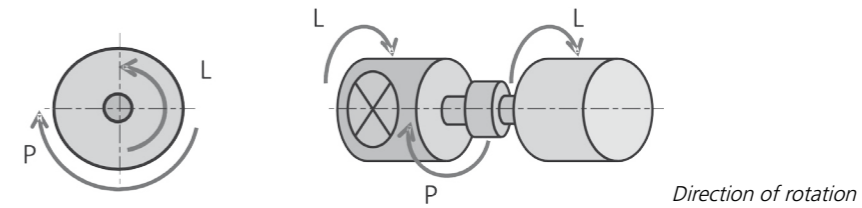
Basic principles for operation of hydraulic power packs

- › Keep enough working fluid in the tank.
- › Use only recommended types of hydraulic fluid meeting the demands on cleanliness and wear rate.
- › Maintain the recommended temperature of the working fluid.
- › Do not exceed the maximum permitted operation period for the power pack. There is an increased risk of damage especially for DC motors that usually work in different duty types than continuously running duty S1.
- › Observe the marked direction of rotation for rotating machines, such as electric motors or pumps.



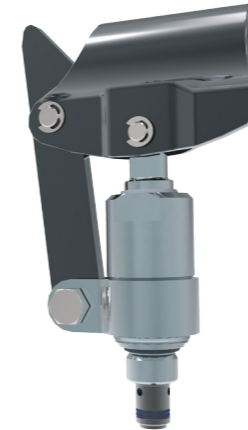
Agreed designation of the direction of rotation:

If we face the shaft of the rotating machine, the clockwise rotation is right-handed.



Accessories

Apart from the complete products, we offer construction subgroups and accessories such as studs for stacking assembly of modular plates, indicators of filter insert clogging, fluid level gauges, plugs, oil dipsticks, piston hand pumps or pressure switches of various types and designs.



Hand pump RCA serves as emergency source of fluid under pressure.



Digital pressure sensor TSE2-D for system pressure indication and switching at reaching two adjustable pressure values

4. Packaging of products

The valves are normally packed into PE pouches using vacuum sealing. The valves with housing are fitted with a plastic transport plate. Undamaged plates can be returned to the manufacturer. The outlets of hydraulic blocks and power packs are protected by the plastic plugs. All products are packaged with respect to the product type, means of transportation and customer's location to avoid corrosion, mechanical damage and contamination of the products. Various packaging procedures can be applied at the customer's request. All used packaging materials are recyclable and eco-friendly.

5. Spare parts and accessories

Supplied spare parts can be chosen from catalog No. 8010. Built-in directional valves and poppet type valves are delivered without coils. The coils must be ordered separately acc. to the catalog No. 8007. Valves with housing and proportional valves are delivered with complete solenoids.

Connecting material, such as connecting bolts or studs must be ordered separately. Studs and nuts used for vertical stacking assembly are listed in the catalog No. 0020.

6. Installation



Mounting position

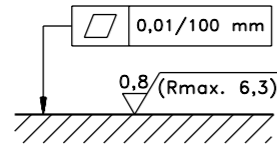
The valve mounting position is usually arbitrary if is not stated otherwise in the catalog. If shocks and vibrations occur during operation, we recommend that the direction of disturbance be not identical to the direction of spool / poppet movement to avoid any effect on their positions.

For hydraulic power packs, the position is determined by the tank orientation.

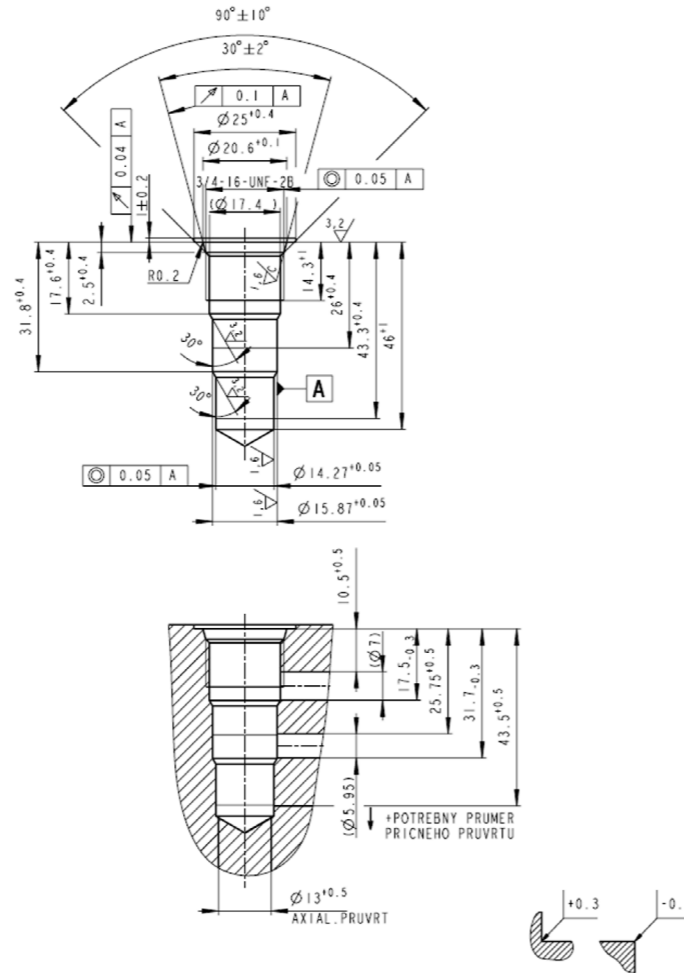
Mounting surfaces and cavities

The mounting surfaces of valves with housing described in ISO 4401 and cavity for the built-in valves are given in the catalog No. 0019. The form tools for manufacturing the cavities are also included in the catalog. For proper functionality of the built-in valve, it is necessary to maintain dimensions, roundness and concentricity of internal cavity diameters and connecting threads. Furthermore, the common axis must maintain its perpendicularity to the front bearing surface.

The tolerable surface roughness inside the cavity is $R_a=1.6$. When machining the bearing surfaces for sealing rings, it is necessary to keep the specified surface roughness $R_a=0.8 / R_{MAX}=6.3$ and flatness $0.01 / 100$ mm.



Required surface quality of the counterpart



7. Classification of ARGO-HYTOS products into groups according to level of danger

- Actuating solenoids of the valves and control electronic units of the proportional valves produce an electromagnetic field. They are the specified products for conformity assessment in accordance with:
 - The Government Regulation No. 117/2016 Coll. The government regulation on conformity assessment of products in terms of electro-magnetic compatibility, when placed on the market
 - Directive 2014/30/EU of the European Parliament and of the Council of 26 February 2014 on the harmonization of the laws of the Member States relating to electromagnetic compatibility

The technical documentation was prepared, the product conformity was assessed, the declaration of conformity was issued and the products were marked with the CE making.
- Actuating solenoids with supply voltage higher than 50 or 75 VDC are the specified products for conformity assessment in accordance with:
 - The Government Regulation No. 118/2016 Coll. The government regulation on conformity assessment of electrical equipment designed for use within certain voltage limits delivered to the market
 - Directive 2014/35/EU of the European Parliament and of the Council of 26 February 2014 on the harmonization of the laws of the Member States relating to the making available on the market of electrical equipment design for use within certain voltage limits.

The technical documentation was prepared, the product conformity was assessed, the declaration of conformity was issued and the products were marked with the CE making.
- The power packs are partly completed machinery in accordance with:
 - The government regulation on technical requirements for machinery (§1 letter g, definition §2 letter g)
 - Directive 2006/42/EC of the European Parliament and of the Council of 17 May 2006 on machinery, and amending Directive 95/16/EC (recast) (Article 1 "Scope" – g "partly completed machinery", Article 2 "Definitions" – g)

The technical documentation was prepared, the product conformity was assessed, the declaration of conformity was issued and the products were marked with the CE making. The partly completed machinery is not marked with the CE marking. The partly completed machinery must not be put into service until the final machinery into which it is to be incorporated has been declared in conformity.
- The safety components are the specified products in accordance with:
 - The Czech Government Regulation No. 176/2008 Coll. on technical requirements for machinery (§1 letter c, definition §2 letter c)
 - Directive 2006/42/EC of the European Parliament and of the Council of 17. May 2006 on machinery, and amending Directive 95/16/EC (recast) (Article 1 "Scope" – c "safety components", Article 2 "Definitions" – c)

The technical documentation and instructions were prepared, the product conformity was assessed, the declaration of conformity was issued and the products were marked with the CE making.
- The hydraulic power packs or blocks can contain hydraulic accumulators and pressure relief valves which are specified in accordance with:
 - The Government Regulation No. 219/2016 Coll. The government regulation on conformity assessment of pressure equipment when made available on the market
 - Directive 2014/68/EU of the European Parliament and of the Council of 15 May 2014 on the harmonization of the laws of the Member States relating to the making available on the market of pressure equipment

The manufacturer's data report is attached to the accumulator. Among other things, this report contains the product documentation, functional safety calculations, pressure test results and the declaration of conformity. The pressure equipment is subject to regular inspection tests.
- The hydraulic components designed for use in potentially explosive atmospheres are the specified products in accordance with:
 - The Government Regulation No. 116/2016 Coll. The government regulation on conformity assessment of equipment and safety systems designed for use in potentially explosive atmospheres when made available on the market
 - Directive 2014/34/EU of the European Parliament and of the Council of 26 February 2014 on the harmonization of the laws of the Member States relating to equipment and protective systems intended for use in potentially explosive atmospheres

The technical documentation and instructions were prepared, the product conformity was assessed, the declaration of conformity was issued and the products were marked with the CE making.
- The hydraulic power packs and block are generally the components designed for the assembly of hydraulic circuits and they are not the specified products for conformity assessment. Subject to the general safety principles for mounting, handling and operation of hydraulic equipment.
- Please note that the machinery manufactured by customers is subject to other legal regulations according to their field of application. For example:
 - The Czech Government Decree No. 9/2002 Coll. on the product technical requirements related to the noise emission
 - Directive 2000/14/EC of the European Parliament and of the Council of 8. May 2000 on the approximation of the laws of the Member States relating to the noise emission in the environment by equipment for use outdoors



- The products are intended for the assembly of hydraulic circuits for stationary and mobile equipment.
- Assembly, installation, commissioning and adjustment of pieces of hydraulic equipment or their parts may only be performed by trained staff with an appropriate qualification.
- When mounting the hydraulic equipment, use only clean components. Do not allow impurities to ingress from the surrounding environment. Avoid formation of secondary pollution using only undamaged parts which correspond to the applicable drawings.
- When handling a hydraulic circuit or its parts, the circuit must be disconnected from the power supply and without pressure (including the accumulator). Special care should be taken to avoid any damage of circuit parts or personal injury due to a fall of equipment. Very heavy products (such as power packs or manifolds) are provided with handling accessories - lifting eye bolts. Follow the instructions (if any) for the product installation containing guidelines for handling and the method of product attachment.
- Individual circuit parts must be tightened using the recommended torques. The loose parts are the spots of working fluid leakage. The excessive tightening can cause damage to parts or their deformation. It will be reflected by malfunctioning or loss of functionality.
- Mineral oils specified in the product catalog may be used as the working fluid. To use other fluids, first consult with ARGO-HYTOS. Using aqueous solutions as the working fluid is impossible.
- Mineral oil is a fluid harmful to the environment. Prevent leakage of the working fluid. Check the circuit tightness after installation. If there is leakage of working fluid, it will be necessary to dispose of it ecologically including contaminated objects, bulk materials and earths.
- Dispose the old working fluid in an eco-friendly manner.
- In the case of contamination of people by the working fluid, the contaminated clothing must be removed immediately and skin must be washed with common skin tolerant detergents. In case of any allergic skin reaction caused by the working fluid, eye irritation or fluid ingestion, seek medical assistance immediately!
- Keep the surroundings of equipment clean. There is a danger of slipping, falling or otherwise injury of people.
- Viscosity of the working fluid must not exceed the range given in the product catalog. Especially when starting the equipment at low temperatures, viscosity increases to a critical value. It can lead to malfunction of the circuit. In this case, it is necessary to heat the fluid to an acceptable temperature before switching on the equipment.
- The electrical parts of the circuit (electric motors, switches, sensors, actuating solenoids, control electronics, etc.) must comply with all applicable legal regulations and technical standards. They must be connected to the power supply in the manner specified in the product catalog. The electrical parameters of the source must be respected. The electrical connections may only be performed by a persons with an appropriate qualification. Before working on the electrical installation, the electrical equipment must be disconnected from the power supply and without pressure (including the accumulator).
- The electrical installations must be executed such that no electrical parts may be damaged mechanically due to the machinery's functions. The insulating material of the conductors must be resistant to chemical actions of the working fluid. If there is any damage to the conductors, plug connectors or other parts of electrical equipment, the equipment must be immediately disconnected from the power supply and the damaged part replaced.
- Ambient and working fluid temperatures must not exceed the values specified in the product catalog. High temperature leads to a decrease of the power on the actuating solenoids due to resistance increase of the coil winding. High temperature also harms the applied seals irreversibly. Don't touch the circuit parts at higher temperature of the working fluid. The surface of the components is gradually heated up to the fluid temperature and there is a risk of burns. Irreversible transformation of energy loss to heat leads to heating the surface of the solenoids. When placing the hydraulic circuit and its components in an enclosed space without air circulation, it is necessary to check the maximum ambient temperature and the working fluid temperature and make sure there is no overheating. If the circuit cannot be cooled enough through heat transfer by natural convection and radiation, a cooling unit of adequate cooling capacity must be put into the circuit.
- Products must be protected from the effects of excessive heat and electrical discharges, mechanical damage, excessive vibrations and shocks, from the effects of aggressive chemical substances and highly corrosive environment.
- While the circuit is loaded with pressure, it is forbidden to disconnect or dismount its parts. There is a risk of ejection of a loose part owing to fluid pressure and massive fluid leakage.
- Although the circuit parts are designed with a sufficient resistance to internal overpressure of the working fluid, the maximum pressure value of individual parts of the circuit must not exceed the limits specified in the product catalog. The pressure peaks occur due to the dynamic changes of pressure and flow rate during circuit operation. These peaks can exceed the maximum static pressure many times. Exceeding the maximum allowable pressure can cause the loss of functionality and the circuit destruction.
- Mineral oils are flammable fluids of Class III. The principles of fire prevention must be followed for fluid storage, handling and filling to the circuit. When installing a heating element into the tank together with the working fluid, overheating of the fluid and ignition of vapors must be avoided. Input power of the heating element should not exceed 1 W/cm² to prevent carbonization of oil on the housing surface.
- Keep the recommended cleanliness of the working fluid as specified in the product catalog using high quality filtration. The fluid cleanliness significantly affects the wear of mechanical components and their functions, in particular pilot operated and poppet type valves. The hydraulic circuit must be protected against the ingress of hard particles such as quartz or abrasive materials causing hard wear and the loss of functionality in a short time.
- Hydraulic equipment may be operated only by authorized staff after having been sufficiently acquainted with the features and operation of the equipment, is aware of possible risks, knowledgeable about preventive measures and the required operations when critical situations occur. If there is any damage to the circuit parts or malfunction, the circuit must be immediately disconnected from the power supply and pressure source. Then contact authorized service. Any improper handling of hydraulic equipment is prohibited.

The valves of ARGO-HYTOS are designed and manufactured in accordance with the standard EN ISO 13849-1:2008, Annex C, paragraph C. 3, with respect to "fundamental" and "proven" safety principles.

The following MTTF_d values follow from this approach for our products:

- valves → 150 years
- valves with external pilot → 75 years, e.g. directional control valves NG16 and NG25 with the pilot valve

Specific MTTF_d values for particular applications:

Apart from this, the component can be considered different from the standard EN ISO 13849-1, Annex C. This approach is based on the calculation of the specific MTTF_d value for particular application.

As a basis for the calculation (see formula), it is necessary to know the following values:

- B_{10d} (mean number of cycles to a dangerous failure of 10% of components)
- n_{op} (mean number of cycles per year)
- d_{op} (mean time of operation expressed in days per year)
- h_{op} (mean time of operation expressed in hours per day)
- t_{cycle} (mean time between two successive cycles of component, e.g. valve switching on, expressed in seconds per one cycle)

$$MTTF_d = \frac{B_{10d}}{0,1 \times n_{op}}$$

$$n_{op} = \frac{d_{op} \times h_{op} \times 3600}{t_{cyklus}}$$

MTTF is an abbreviation for „mean time to failure“. For the assessment according to EN ISO 13849-1, only failures leading to a dangerous situation are taken into account.

This value is a theoretical parameter expressing the probability of component failure (not of the whole assembly) which leads to a dangerous situation in the course of the component service life. The assembly service life is always shorter due to the interconnection of several components.

MTTF value can be derived from the frequency of failures. The frequencies of failures are as follows:

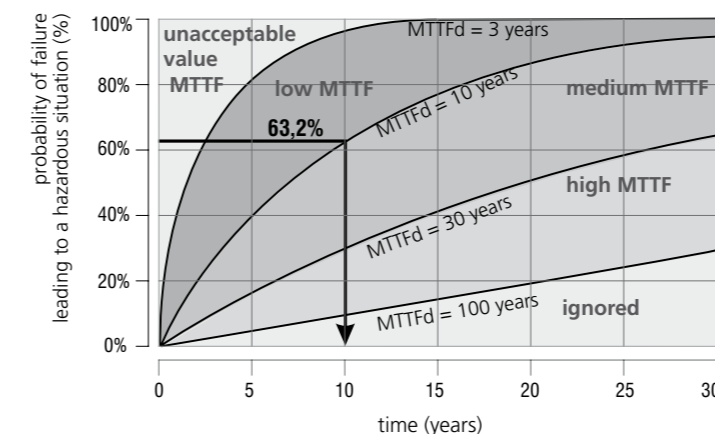
- B₁₀ value for electromechanical and pneumatic components. In this case, service life depends on the switching frequency. B₁₀ value indicates the number of switching cycles before the failure of 10% of parts.
- B_{10d} value indicates the number of switchings before a dangerous failure of 10% of parts occurs. If the B_{10d} value is not available, the calculation B_{10d} = 2 × B₁₀ can be accepted as a simplification.
- For the electronic components, the frequency of failures is expressed by the value of lambda (λ). The frequency of failures is often expressed as FIT (Failures In Time). One FIT means one failure in 10⁹ hours.

The standard EN ISO 13849-1 summarizes MTTF_d values into the following areas:

Designation	Range
Low	3 to 10 years
Medium	10 to 30 years
High	30 to 100 years

Mean time to failure (expressed in years) leading to a dangerous situation (MTTF_d) can be calculated from data on the parts.

Graph:



The example indicated in the graph: time - 10 / MTTF_d value - 10 years → probability of failure leading to a dangerous situation - 63.2%

10. Applied materials

The products are made of common engineering materials, such as low-carbon steel, carbon steel and alloy steel, gray cast iron, brass and AlMgSi alloys. The coil windings are made of enameled copper wire and plastic parts are made of polyamide. The seals are also made of common materials, such as NBR, HNBR, VITONU, PUR or silicone. Surface treatment performed by zinc-coating doesn't include hexavalent chromium Cr+6.

Materials originating from illegal sources are not processed.

The applied manufacturing, mounting and testing procedures do not have any detrimental effect on the health of workers and the environment.

Compliance with the applicable legal regulations, standards and regulations relating to safety at work, fire protection, hygiene, environmental protection and defending workers' rights is checked by the national supervisory bodies.

The applied materials and processes meet the requirements of the following legal regulations:

- › Regulation (EC) No. 1907/2006 of the European Parliament and of the Council concerning the registration, evaluation, authorization and restriction of chemicals (REACH)
- › Directive 2011/65/EU of the European Parliament and of the Council on the restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS)
- › Law H.R. USA No. 4173 (Dodd-Frank) - Sec. 1502 about conflict minerals originating from illegal sources

Original documents:

- › Regulation (EC) No. 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorization and Restriction of Chemicals (REACH), establishing a European Chemicals Agency, amending Directive 1999/45/EC and repealing Council Regulation (EEC) No. 793/93 and Commission Regulation (EC) No. 1488/94 as well as Council Directive 76/769/EEC and Commission Directives 91/155/EEC, 93/67/EEC, 93/105/EC and 2000/21/EC.
- › Directive 2011/65/EU of the European Parliament and of the Council of 8 June 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS)
- › Dodd-Frank Wall Street Reform and Consumer Protection (U.S. Act, HR 4173) - § 1502 "Conflict Minerals", article (4A)

11. Validity of catalogs

All technical data given in the product catalogs serve only descriptive purposes and cannot be interpreted as legally or contractually guaranteed product properties.

We recommend using our website www.argo-hytos.com where continuously updated versions of the catalogs are available.

Content

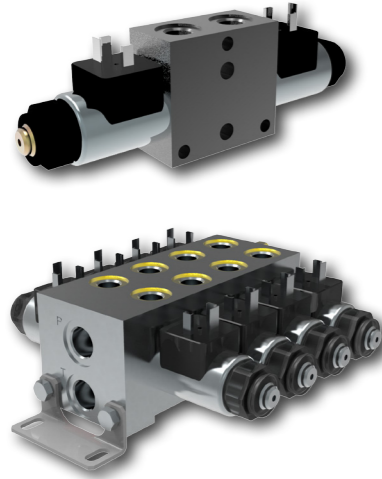
Symbol Example	Flow l/min (GPM)	Pressure bar (PSI)	Type Code	Cartridge	Size 03	Size 04; D02	Size 06; D03	Size 10; D05	Size 16; D07	Size 25; D08	Line Mounted	Page	Data Sheet
4/2 and 4/3 Solenoid Operated Directional Control Valves													
	20 (5)	250 (3600)	RPEK1-03		X							40	HA 4027
	20 (5)	320 (4600)	RPE2-04			X						44	HA 4012
	30 (8)	250 (3600)	RPEL1-04			X						48	HA 4037
	30 (8)	320 (4600)	RPE3-04			X						52	HA 4014
	50 (13)	250 (3600)	RPEL1-06				X					56	HA 4056
	80 (21)	350 (5100)	RPE3-06				X					60	HA 4010
	80 (21)	350 (5100)	RPER3-06				X					64	HA 4026
	80 (21)	350 (5100)	RPEA3-06				X					66	HA 4029
	80 (21)	350 (5100)	RPEW4-06				X					70	HA 4035
	140 (37)	350 (5100)	RPE4-10					X				74	HA 4039
140 (37)	350 (5100)	RPEW4-10					X				78	HA 4044	
4/2 and 4/3 Directional Control Valves, Internally and Externally Pilot Operated													
	150 (40)	420 (6100)	RNEH1-10					X				82	HA 4075
	300 (79)	320 (4600)	RNEH5-16						X			86	HA 4023
	600 (159)	320 (4600)	RNEH4-25							X		90	HA 4024
4/2 and 4/3 Directional Control Valves, Manually Operated													
	30 (8)	320 (4600)	RPR3-04		X							94	HA 4018
	80 (21)	350 (5100)	RPR3-06			X						96	HA 4004
	140 (37)	350 (5100)	RPR1-10				X					98	HA 4084
4/2 and 4/3 Hydraulic Operated Directional Control Valves													
	80 (21)	350 (5100)	RPH2-06				X					102	HA 4005
	80 (21)	350 (5100)	RPH3-06				X					104	HA 4006
4/2 Directional Control Valves, Roller Cam Operated													
	80 (21)	350 (5100)	RPK1-06				X					106	HA 4038
2/2 Directional Valves, Solenoid Operated, Spool Type, Screw-In Style													
	30 (8)	350 (5100)	SD2E-A2	X	(X)					(X)		108	HA 4040
	60 (16)	350 (5100)	SD2E-B2	X		(X)				(X)		110	HA 4060
3/2 Directional Valves, Solenoid Operated, Spool Type, Screw and Slip-In Style													
	30 (8)	80 (1200)	PD2E	X							(X)	112	HA 4050
	30 (8)	350 (5100)	SD2E-A3	X	(X)						(X)	114	HA 4041
	60 (16)	350 (5100)	SD2E-B3	X		(X)					(X)	116	HA 4061

Symbol Example	Flow l/min (GPM)	Pressure bar (PSI)	Type Code	Cartridge	Size 04; D02	Size 06; D03	Size 10; D05	Line Mounted	Page	Data Sheet
4/2 Directional Valves, Solenoid Operated, Spool Type, Screw-In Style										
	30 (8)	350 (5100)	SD2E-A4	X	(X)			(X)	118	HA 4042
	60 (16)	350 (5100)	SD2E-B4	X		(X)		(X)	120	HA 4062
2/2 Directional Valves, Solenoid Operated, Poppet Type, Screw-In and Modular Style										
	63 (13)	250 (3600)	ROE3-06S2	X					122	HA 4022
	25 (7)	250 (3600)	ROE3-062S2/M		X	X		X	124	HA 4072
	30 (8)	420 (6100)	SD3E-A2	X	(X)			(X)	128	HA 4043
	75 (20)	420 (6100)	SD3E-B2	X		(X)		(X)	130	HA 4063
2/2 Directional Valves, Solenoid Operated, Poppet Type, Blocking, Screw-In and Modular Style										
	25 (7)	250 (3600)	ROE3-042S5(S6)	X					132	HA 4055
	25 (7)	250 (3600)	ROE3-042S5(S6)/M		X	X		X	134	HA 4073
	30 (8)	350 (5100)	SD1E-A2	X	(X)			(X)	138	HA 4070
3/2 Directional Valves, Solenoid Operated, Poppet Type, Blocking, Screw-In Style										
	30 (8)	350 (5100)	SD1E-A3	X	(X)			(X)	140	HA 4071
2/2 Directional Valves, Manually Operated, Screw-In Style										
	35 (9)	320 (4600)	ROR3-062	X					142	HA 4025
	20 (5)	250 (3600)	SD1M-A2/L	X	(X)			(X)	144	HA 4051
3/3 Directional Valves, Hydraulically Operated, Screw-In Style										
	40 (11)	320 (4600)	SD2H-LA3	X				(X)	146	HA 4080

4/2 and 4/3 Directional Control Valve, Solenoid Operated, Bankable

RPEK1-03

Size 03 • Q_{max} 20 l/min (5 GPM) • p_{max} 250 bar (3600 PSI)

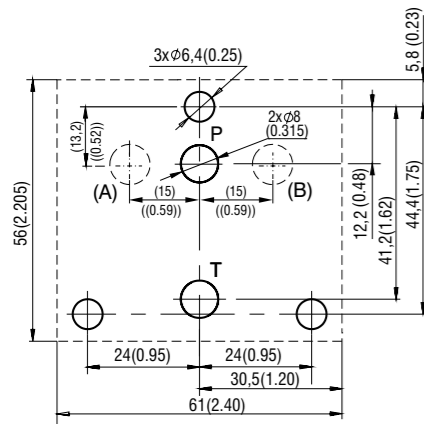


Technical Features

- › Direct acting, directional control valve with bankable mounting interface
- › Designed to be assembled in series or parallel, mounting up to 8 body modules
- › High transmitted hydraulic power up to 250 bar, optimized design to minimize the pressure drop
- › Housing with three chambers for production cost savings
- › The valve is available with interchangeable DC solenoids
- › Wide range of solenoid electrical terminal versions available
- › Wide range of interchangeable spools and manual overrides available
- › Suitable for compact applications in the mobile and mini-power pack industries
- › Space and cost saving! With optional end valves
- › No need for bar manifold to construct complex circuit assemblies from stock
- › In the standard version, the valve housing is phosphated and steel parts are zinc-coated for 240 h protection acc. to ISO 9227
- › Enhanced surface protection for mobile sector up to 520h salt spray acc to ISO 9227 available

Technical Data

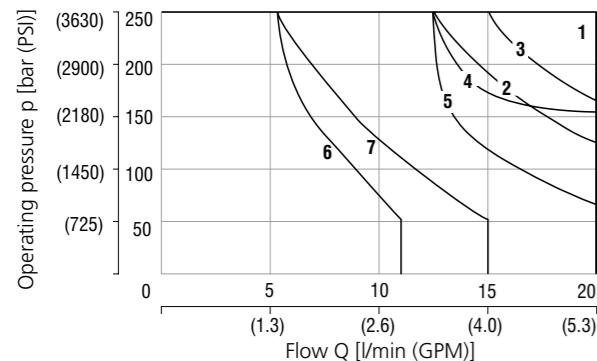
Valve size	03	
Max. flow	l/min (GPM)	20 (5.3)
Max. operating pressure at port P, A, B	bar (PSI)	250 (3630)
Max. operating pressure at port T	bar (PSI)	210 (3050)
Fluid temperature range (NBR)	°C (°F)	-30 ... +80 (-22 ... +176)
Fluid temperature range (FPM)	°C (°F)	-20 ... +80 (-4 ... +176)
Ambient temperature range	°C (°F)	-30 ... +50 (-22 ... +122)
Supply voltage tolerance	%	DC: ±10
Max. switching frequency	1/h	15 000
Switching time at v=32 mm ² /s (156 SUS)	ON	ms 30 ... 50
	OFF	ms 30 ... 50
Mass	- valve with 1 solenoid	kg (lbs) 0.90 (1.98)
	- valve with 2 solenoids	1.05 (2.32)
Data Sheet		Type
General information	GI_0060	Products and operating conditions
Coil types / connectors	C_8007 / K_8008	C14B*/K*
Mounting interface	SMT_0019	Size 03
Spare parts	SP_8010	



Characteristics measured at v = 32 mm²/s (156 SUS)

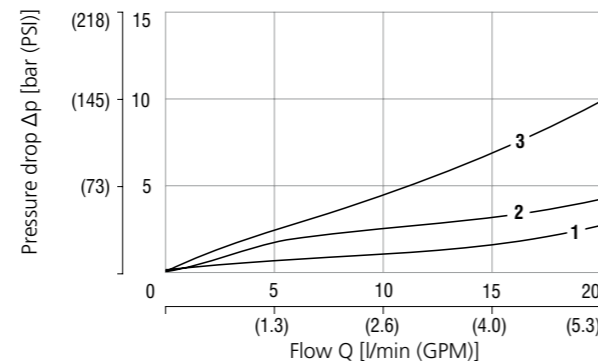
Operating limits

Operating limits for maximum hydraulic power at rated temperature and supplied with voltage equal to 90 % of the nominal value



Spool symbol	
Z11, Z51, R11, P11	1
C11, C51, X11	2
H11, Y11, H51	3
C11, Y11, Y51	4
R21	5
A51, Y82	6
Z81	7

Pressure drop related to flow rate



Spool symbol	P-A	P-B	A-T	B-T	P-T
Z11, Y11, P11	1	1	1	1	
R11, R21, X11	2	2	2	2	
Y51, Z51		1	1		
C11	3	3	3	3	2
H11, H51	1	1	1	1	2
C51				3	2
A51	2	2			
X11	2	2	2	2	
Y82	2	2	1	3	
Z81			1	2	

For operating limits under conditions other than shown consult our technical department. Admissible operating limits may be considerably lower with only one direction of flow (A or B plugged or without flow).

Ordering Code

RPEK1-03 [] [] [] / [] [] [] [] [] [] [] - []

4/2 and 4/3 directional control valve, solenoid operated, bankable

Valve size
thread A, B - G1/4 **G**
thread A, B SAE6 - 9/16-18UNF **S**
stackable **O**

Type of connection
thread A, B - G1/4 **G**
thread A, B SAE6 - 9/16-18UNF **S**
stackable **O**

Number of valve positions
two positions **2**
three positions **3**

Spool symbols
see the table of "Spool Symbols"

Rated supply voltage of solenoids (at the coil terminal)
12 V DC / 1.83 A **01200**
24 V DC / 0.92 A **02400**

Connector
EN 175301-803-A **E1**
E1 with quenching diode **E2**
AMP Junior Timer - axial direction (2 pins; male) **E3A**
E3A with quenching diode **E4A**
Deutsch DT04-2P - axial direction (2 pins; male) **E12A**
E12A with quenching diode **E13A**

Surface treatment
standard
A zinc-coated (ZnCr-3), ISO 9227 (240 h)
B zinc-coated (ZnNi), ISO 9227 (520 h)

Seals
NBR
V FPM (Viton)

Model
No designation standard, P, T through ports, without ports A1, B1
P1 P, T through ports, A1, B1 side ports, all ports sealed
P2 P, T through ports, A1, B1 side ports inverted (not sealed)
Z1 end valve, one side P, T sealed ports
Z2 end valve, one side P, T ports inverted (not sealed)
Z3 end valve, one side P, T ports, A1, B1 side ports, all ports not sealed
Z4 end valve, one side P, T, A1, B1 side ports inverted, all ports not sealed

Manual override
standard
N2 protected with rubber boot
N5 socket head screw

- For directional valves with two solenoids, one solenoid must be de-energized before the other solenoid can be energized.
- For other solenoid voltages see data sheet C_8007.
- The solenoid operated valves are delivered without connectors. For connectors version see data sheet K_8008.
- The orifice to the P port can be ordered separately, see data sheet SP_8010.
- Besides the shown, commonly used valve versions other special models are available. Contact our technical support for their identification, feasibility and operating limits.

Spool Symbols

Type	Symbol	Interposition	Type	Symbol	Interposition	Type	Symbol	Interposition
Z11			R11			H51		
C11			R21			Z51		
H11			A51			Z11		
P11			Y51			X11		
Y11			C51			C11		
Y82			Z81			Y11		

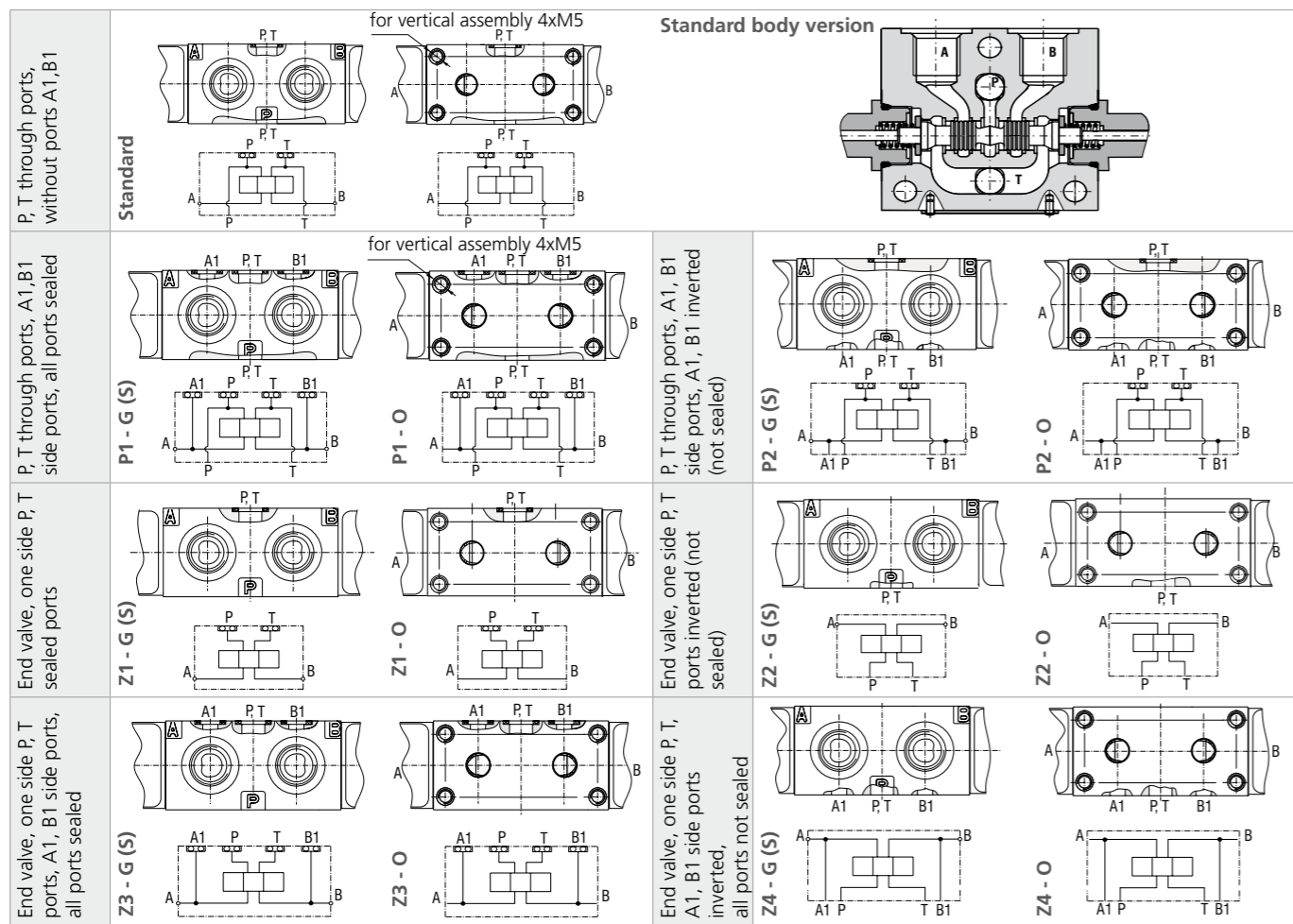
Solenoid Coil in millimeters (inches)

E1, E2 - Protection degree IP65	E3A, E4A - Protection degree IP67	E12A, E13A - Protection degree IP67 / IP69	The indicated IP protection level is only reached with a properly mounted connector.

Manual Override in millimeters (inches)

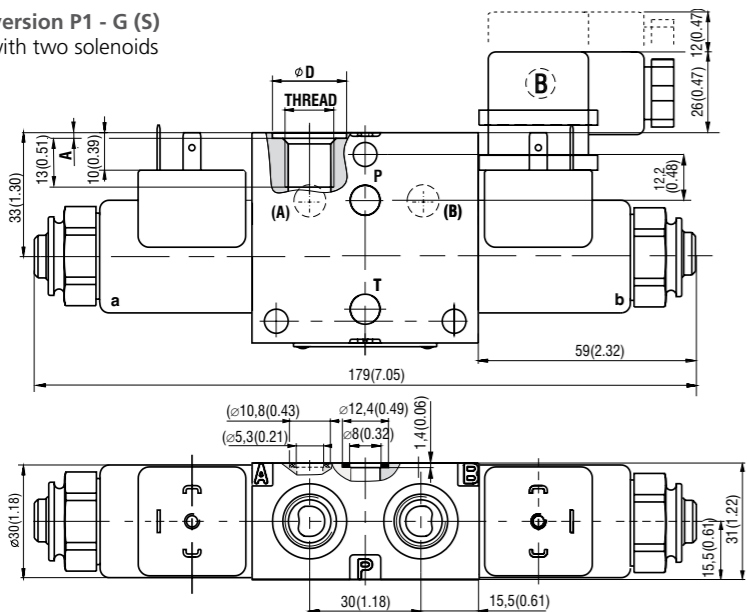
No designation - standard	N2- protected with rubber boot	N5 - socket head screw 3	In case of solenoid malfunction or power failure, the spool of the valve can be shifted by manual override as long as the pressure in port T does not exceed 25 bar (363 PSI). For alternative manual overrides contact our technical support.

Design Forms G (S), O in millimeters (inches)

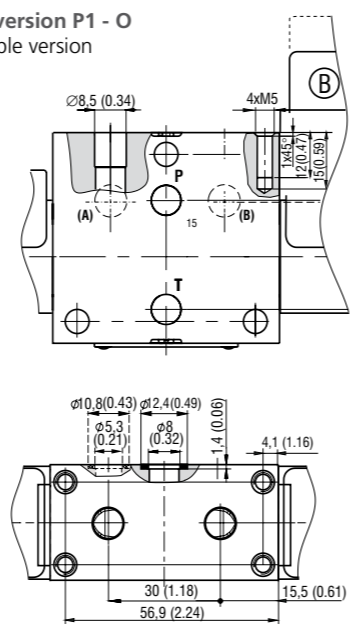


Dimensions in millimeters (inches)

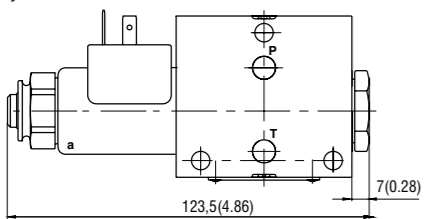
Body version P1 - G (S)
Valve with two solenoids



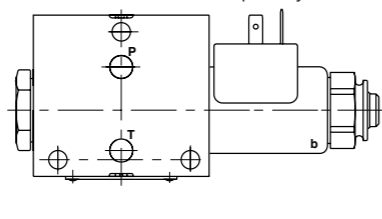
Body version P1 - O
Stackable version



Valve with one solenoid „a”
Spool symbols R11, R21, Y51, C51, Z51



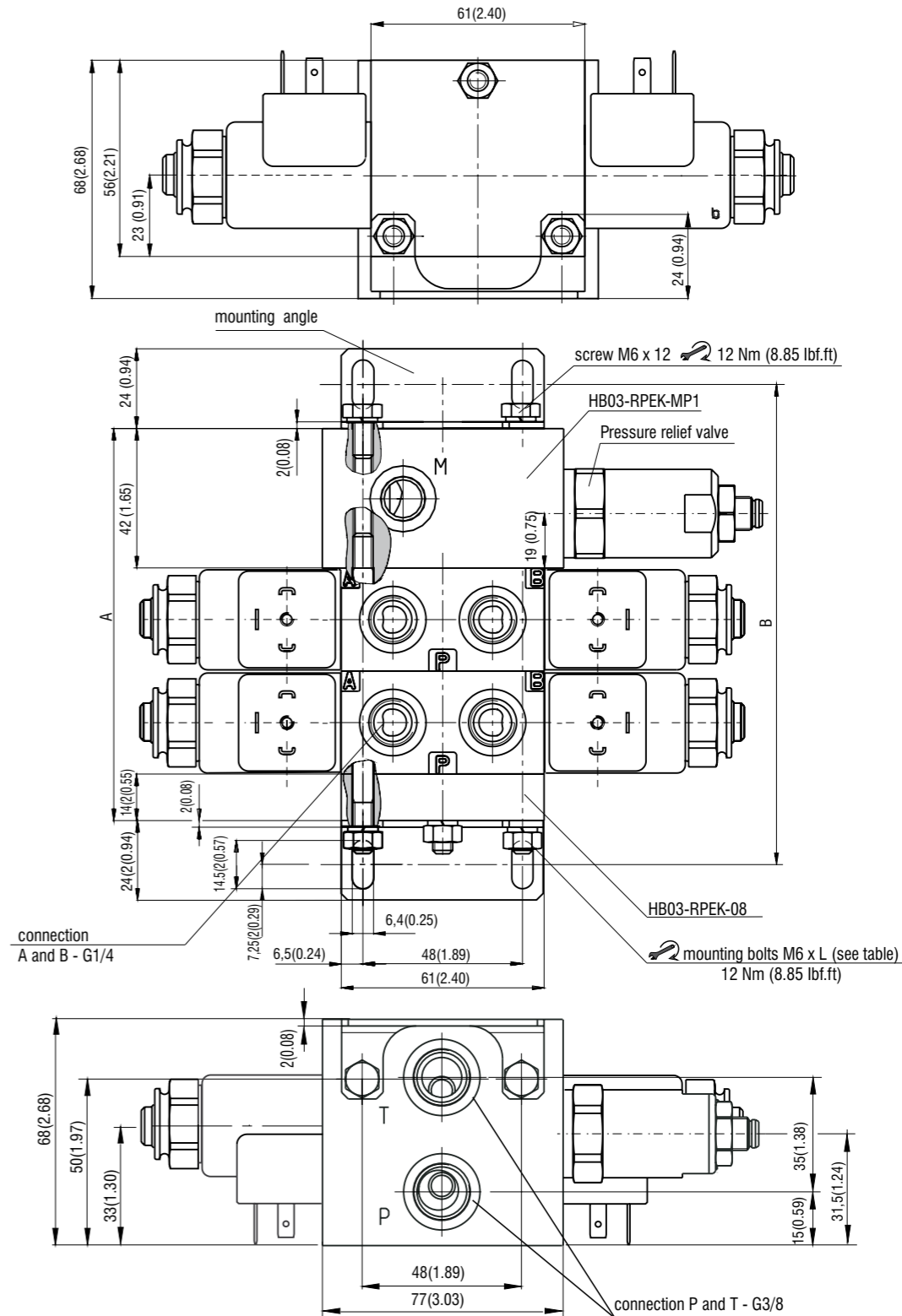
Valve with one solenoid „b”
Spool symbols H11



	G	S
THREAD	G1/4	SAE6-9/16-18UNF
∅ D [mm]	20,9H13	25+0.5
∅ D [in]	0.823	0.984+0.02
A [mm (in)]	1 (0.039)	0.5 (0.020)

Block Assembly in millimeters (inches)

VERSION - valve with inlet block and pressure relief valve see datasheet 4057 - RPEK1-03/B

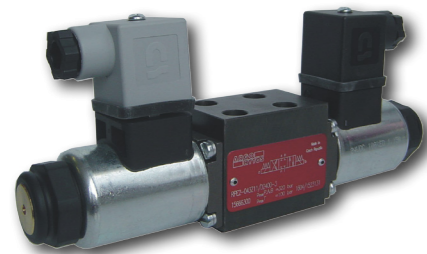


Dimensions mm (inches)								
Number of sections	1	2	3	4	5	6	7	8
Dimension A	87 (3.43)	118 (4.65)	149 (5.87)	180 (7.09)	211 (8.31)	242 (9.53)	273 (10.75)	304 (11.97)
Dimension B	114 (4.49)	145 (5.71)	176 (6.93)	207 (8.15)	238 (9.37)	269 (10.59)	300 (11.81)	331 (13.03)
Dimension L	60 (2.36)	100 (3.94)	133 (5.24)	163 (6.42)	194 (7.64)	224 (8.82)	256 (10.08)	287 (11.30)

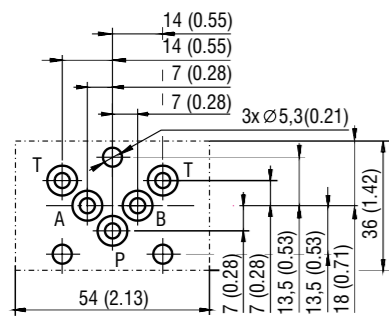
4/2 and 4/3 Directional Control Valve, Solenoid Operated

RPE2-04

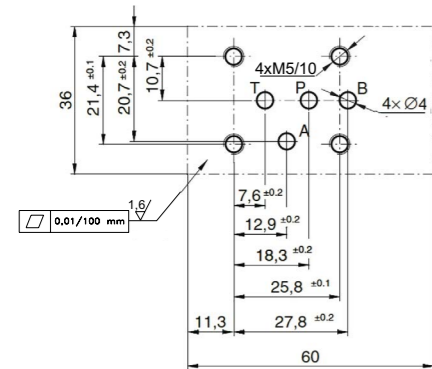
Size 04 (D02) • Q_{max} 20 l/min (5 GPM) • p_{max} 320 bar (4600 PSI)



2 - (former CETOP-RP 121H)



3 - ISO 4401-AA-02-4-A (DIN 24340-A4)



Technical Features

- Direct acting, directional control valve with subplate mounting surface acc. to (CETOP-RP 121H) and ISO 4401-AA-02-4-A (DIN 24340-A4)
- High transmitted hydraulic power up to 320 bar with optimized design to minimize the flow pressure drop
- Three chamber housing design for production cost saving
- The valve is available with interchangeable DC solenoids, also with AC power supply, using a built-in rectifier bridge
- Solenoid electrical terminal option acc. to EN 175301-803-A
- Wide range of interchangeable spools available
- The coil is fastened to the core tube with a retaining nut, and can be rotated by 360°, to suit the available space.
- In the standard version, the valve housing is phosphated and steel parts zinc-coated for 240 h salt spray protection acc. to ISO 9227
- Enhanced surface protection for mobile sector available (ISO 9227, 520 h salt spray)

Technical Data

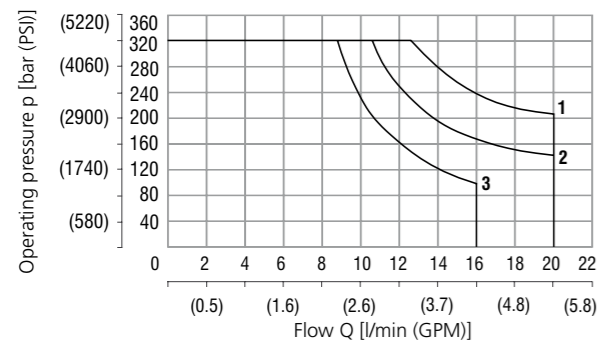
Valve size	04 (D02)		
Max. flow	20 (5.3)		
Max. operating pressure at port P, A, B	bar (PSI)	320 (4600)	
Max. operating pressure at port T	bar (PSI)	100 (1450)	
Fluid temperature range (NBR)	°C (°F)	-30 ... +80 (-22 ... +176)	
Fluid temperature range (FPM)	°C (°F)	-20 ... +80 (-4 ... +176)	
Ambient temperature range	°C (°F)	-30 ... +50 (-22 ... +122)	
Supply voltage tolerance	%	AC: ±10 DC: ±10	
Max. switching frequency	1/h	15 000	
Switching time at $v=32$ mm ² /s (156 SUS)	ON	ms	30 ... 50
	OFF	ms	AC: 70 ... 100 DC: 30 ... 50
Mass	- valve with 1 solenoid	kg (lbs)	1.1 (2.43)
	- valve with 2 solenoids	kg (lbs)	1.5 (3.31)

	Datasheet	Type
General information	GI_0060	Products and operating conditions
Coil types / connectors	C_8007 / K_8008	C19B* / K*
Mounting interface	SMT_0019	2 - (Former CETOP-RP 121H) / 3 - ISO 4401-AA-02-4-A (DIN 24340-A4)
Spare parts	SP_8010	

Characteristics measured at $v = 32$ mm²/s (156 SUS)

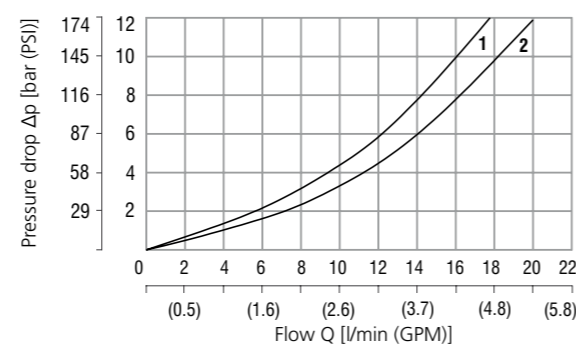
Operating limits

Operating limits for maximum hydraulic power at rated temperature and supply voltage equal to 90% nominal.



Spool symbol	Spool symbol
1	R11, R21, X11, J75
2	Z11, Z51, H11, P11, P51, Y11, Y51, B11
3	C11, C51, L21, A51, Z71, Z81, J15

Pressure drop related to flow rate



For all Functional Symbols	
P → T	1
P → A	2
P → B	2
A → T	2
B → T	2

For operating limits under conditions and flow directions other than shown contact our technical support.

Ordering Code

RPE2-04 [] [] / [] [] [] [] - [] [] []

4/2 and 4/3 directional control valve, solenoid operated

Valve size

Number of valve positions
two positions: 2
three positions: 3

Spool symbols
see the table "Spool Symbols"

Rated supply voltage of solenoids (at the coil terminal)

12 V DC / 2.45 A	01200
24 V DC / 1.15 A	02400
27 V DC / 0.89 A	02700
115 V DC / 0.24 A / 50 (60) Hz	11550
230 V AC / 0.12 A / 50 (60) Hz	23050

Surface treatment

No designation: housing phosphated, steel parts zinc-coated (ZnCr-3), ISO 9227 (240 h)

A: zinc-coated (ZnCr-3), ISO 9227 (240 h)

B: zinc-coated (ZnNi), ISO 9227 (520 h)

Mounting surface

2: acc. to former CETOP-RP 121H

3: acc. to former ISO 4401-AA-02-4-A (DIN 24340-A4)

Seals
NBR

Manual override
standard

Connector
EN 175301-803-A
E1 with quenching diode

- For directional valves with two solenoids, one solenoid must be de-energized before the other solenoid can be charged.
- If the pressure exceeds 100 bar with spool types A51 or J75, port T should be connected directly to the tank.
- For other solenoid voltage supply options see data sheet C_8007.
- The solenoid operated valves are delivered without connectors. For available connectors see data sheet K_8008.
- The orifice to the P port can be ordered separately, see data sheet SP_8010.
- Mounting bolts M5 x 35 DIN 912-10.9 or studs must be ordered separately. Tightening torque is 5 Nm (3.7 lbf.ft).
- Besides the shown, commonly used valve versions other special models are available. Contact our technical support for their identification, feasibility and operating limits.

Spool Symbols

Type	Symbol	Interposition	Type	Symbol	Interposition	Type	Symbol	Interposition
Z11			R11			C51		
C11			A51			R21		
H11			P51			X11		
P11			Y51			Z11		
Y11			Z51			C11		
L21			Z71			J15		
B11			Z81			J75		

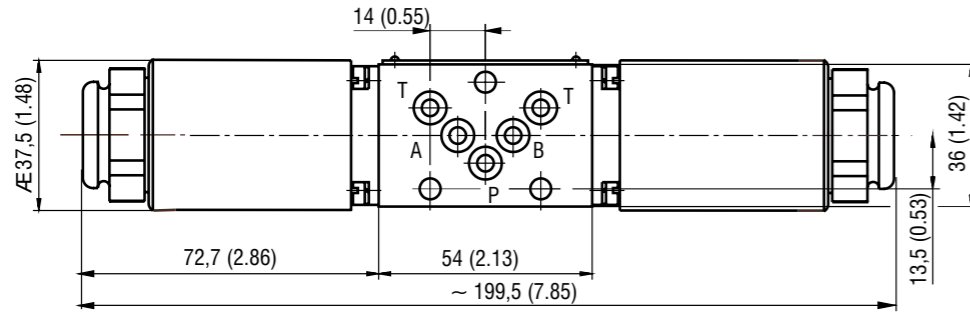
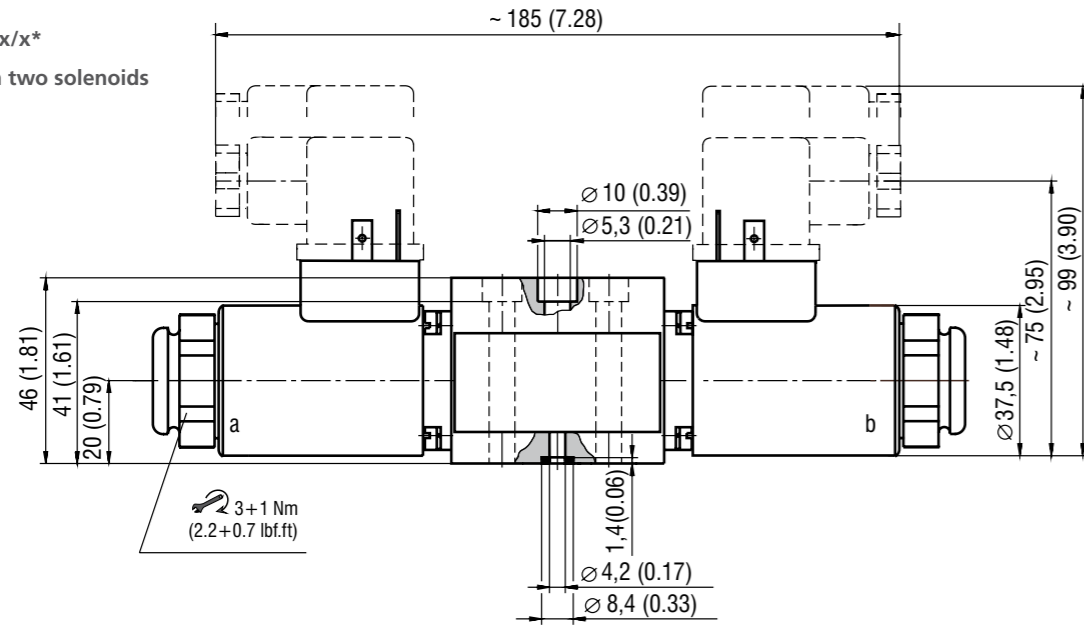
Manual Override in millimeters (inches)

No designation - standard

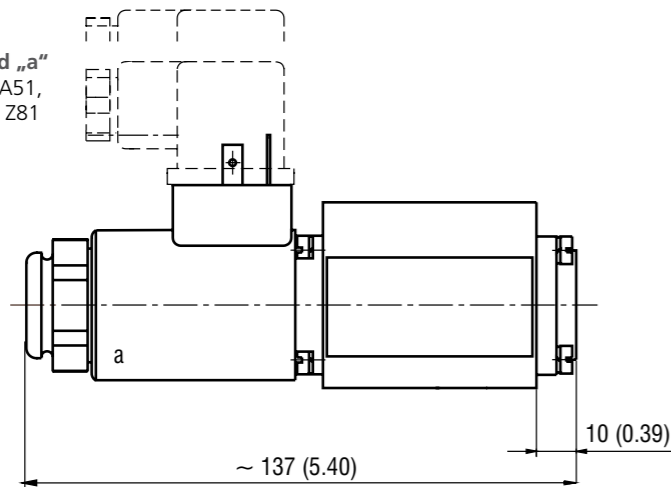
In case of solenoid malfunction or power failure, the spool of the valve can be shifted by manual override as long as the pressure in port T does not exceed 25 bar (363 PSI). For alternative manual overrides contact our technical support.

Installation dimensions 2 (former Norm CETOP-RP 121H)

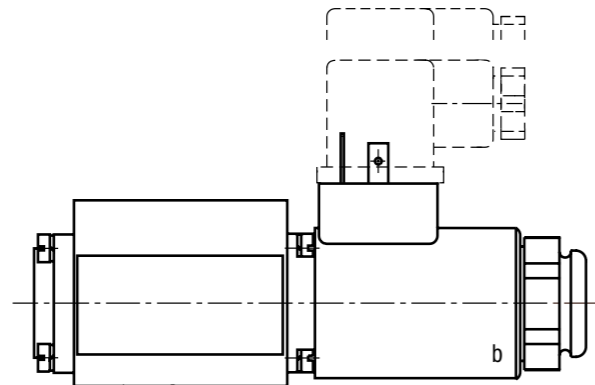
RPE2-043xx/x*
Valve with two solenoids



RPE2-042xx/x*
Valve with one solenoid „a”
Spool symbols R11, R21, A51,
P51, Y51, Z51, C51, Z71, Z81

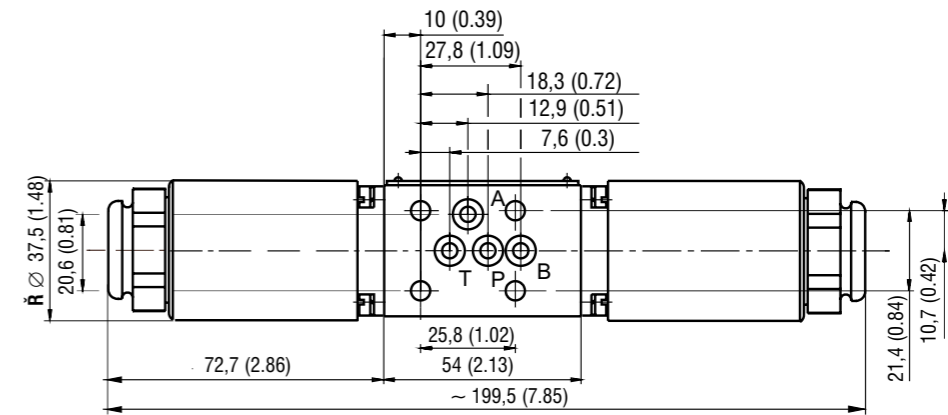
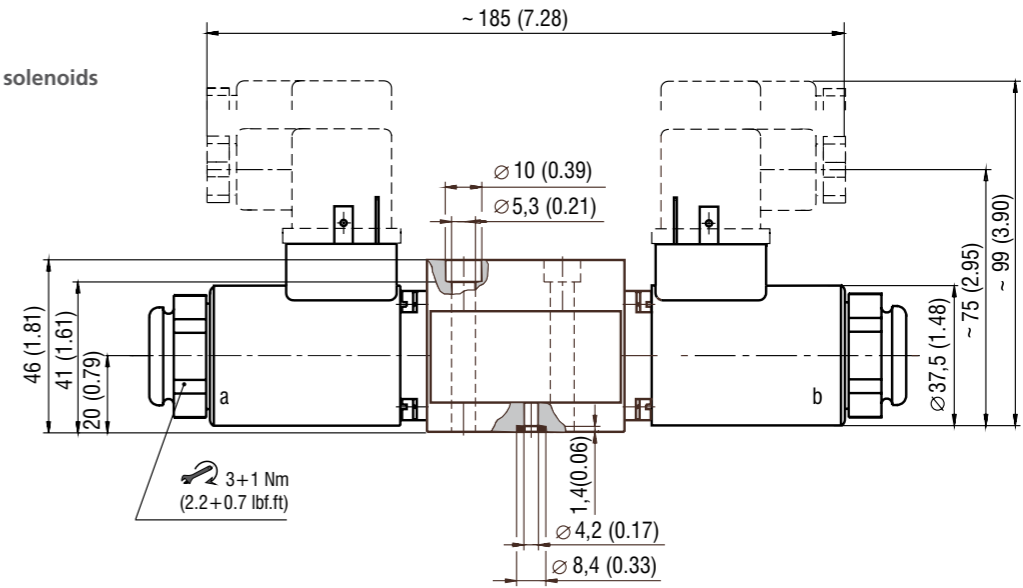


RPE2-042xx/x*
Valve with one solenoid „b”
Spool symbols X11, Z11, C11

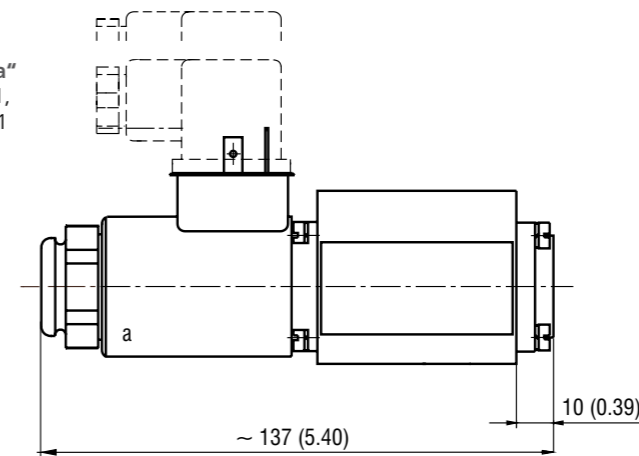


Installation dimensions 3 (former Norm to DIN 24340-A4)

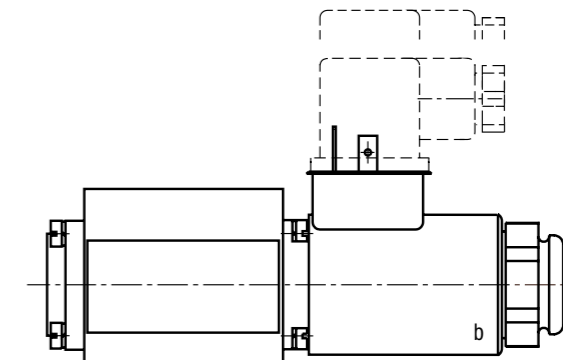
RPE2-043xx/x*
Valve with two solenoids



RPE2-042xx/x*
Valve with one solenoid „a”
Spool symbols R11, R21, A51,
P51, Y51, Z51, C51, Z71, Z81



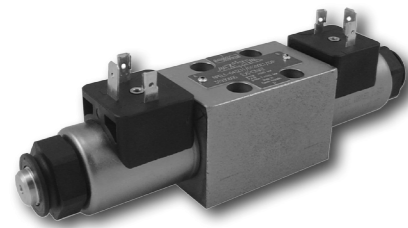
RPE2-042xx/x*
Valve with one solenoid „b”
Spool symbols X11, Z11, C11



4/2 and 4/3 Directional Control Valve, Solenoid Operated, Lightline

RPEL1-04

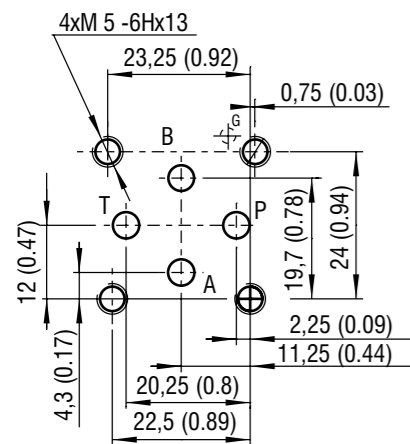
Size 04 (D02) • Q_{max} 30 l/min (8 GPM) • p_{max} 250 bar (3600 PSI)



Technical Features

- › Direct acting, directional control valve with subplate mounting surface acc. to ISO 4401, DIN 24340 (CETOP 02)
- › Compact design with reduced solenoid dimensions
- › Three chamber housing design for production cost saving
- › The valve is available with DC solenoids and a wide range of electrical terminals
- › Solenoid electrical terminal options acc. to EN 175301-803-A, AMP Junior Timer and Deutsch DT04-2P
- › Wide range of interchangeable spools and manual overrides available
- › The coil is fastened to the core tube by a retaining nut, and can be rotated by 360° to suit the available space.
- › In the standard version, the valve housing is phosphated and steel parts zinc-coated for 240 h salt spray protection acc. to ISO 9227
- › Enhanced surface protection for mobile sector available (ISO 9227, 520 h salt spray)

ISO 4401-02-01-0-05



Ports P, A, B, T - max Ø4.5 mm (0.18 in)

Technical Data

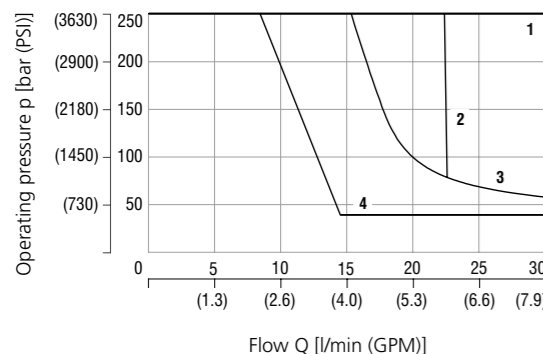
Valve size	04 (D02)	
Max. flow	l/min (GPM)	30 (8)
Max. operating pressure at ports P, A, B	bar (PSI)	250 (3630)
Max. operating pressure at port T	bar (PSI)	100 (1450)
Fluid temperature range (NBR)	°C (°F)	-30 ... +80 (-22 ... +176)
Fluid temperature range (FPM)	°C (°F)	-20 ... +80 (-4 ... +176)
Ambient temperature range	°C (°F)	-30 ... +50 (-22 ... +122)
Supply voltage tolerance	%	DC: ±10
Max. switching frequency	1/h	10 000
Switching time at v=32 mm ² /s (156 SUS)	ON	ms
	OFF	ms
Mass	- valve with 1 solenoid	kg (lbs)
	- valve with 2 solenoids	0.75 (1.65) 0.9 (1.98)

	Datasheet	Type
General information	GI_0060	Products and operating conditions
Coil types / connectors	C_8007 / K_8008	C14B*/K*
Mounting interface	SMT_0019	Size 04
Spare parts	SP_8010	

Characteristics measured at v = 32 mm²/s (156 SUS)

Operating limits

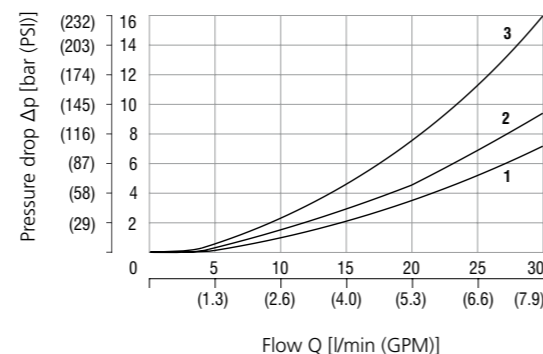
Operating limits for maximum hydraulic power at rated temperature and supply voltage equal to 90% nominal.



Spool symbol	
Z11, Z51, H11, H51	1
R11, X11	2
Y11, Y51	3
C11, C51	4

For operating limits under conditions and flow directions other than shown contact our technical support.

Pressure drop related to flow rate



Spool symbol	P-A	P-B	A-T	B-T	P-T
Z11, Y11	1	1	1	1	
R11, X11	2	2	2	2	
Z51, H51, Y51		1	1		
C11	3	3	3	3	2
C51	3			3	2
H11	1	1	1	1	2

Ordering Code

RPEL1-04 [] [] / [] [] [] [] - []

4/2 and 4/3 directional control valve, solenoid operated, Lightline

Valve size

Number of valve positions
two positions 2
three positions 3

Spool symbols
see the table "Spool Symbols"

Rated supply voltage of solenoids (at the coil terminal)
12 V DC / 1.83 A 01200
24 V DC / 0.92 A 02400

Surface treatment
housing phosphated, steel parts zinc-coated (ZnCr-3), ISO 9227 (240 h)
A zinc-coated (ZnCr-3), ISO 9227 (240 h)
B zinc-coated (ZnNi), ISO 9227 (520 h)

Seals
NBR
FPM (Viton)

Manual override
standard rubber boot protected
socket head screw

Connector
EN 175301-803-A
E1 with quenching diode
AMP Junior Timer - axial direction (2 pins; male)
E3A with quenching diode
E12A with quenching diode
E13A with quenching diode

No designation
A
B

No designation
V

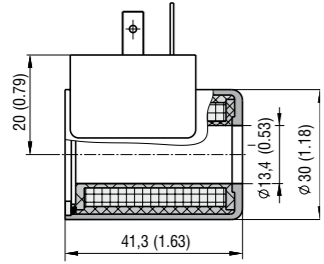
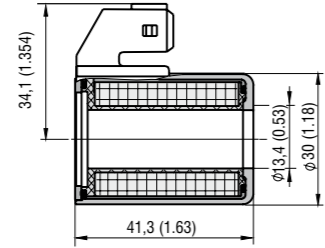
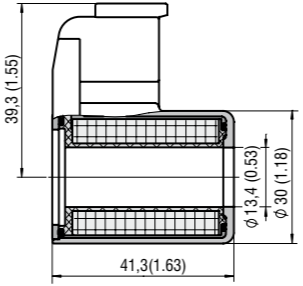
No designation
N2
N5

- For directional valves with two solenoids, one solenoid must be de-energized before the other solenoid can be charged.
- For other solenoid voltage supply options see data sheet C_8007.
- The solenoid operated valves are delivered without connectors. For available connectors see data sheet K_8008.
- The orifice to the P port can be ordered separately, see data sheet SP_8010.
- Mounting bolts M5 x 35 DIN 912-10.9 or studs must be ordered separately. Tightening torque is 5 Nm (3.7 lbf.ft).
- Besides the shown, commonly used valve versions other special models are available. Contact our technical support for their identification, feasibility and operating limits.

Spool Symbols

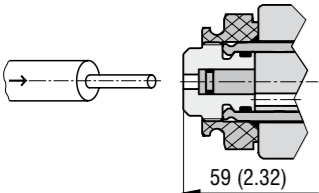
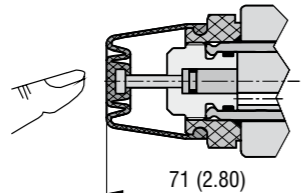
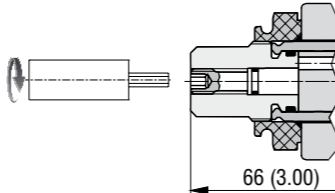
Type	Symbol	Interposition	Type	Symbol	Interposition
Z11			Z51		
C11			H51		
H11			Z11		
Y11			X11		
R11			C11		
Y51			H11		
C51			Y11		

Solenoid Coil in millimeters (inches)

E1 - connector EN 175301-803-A E2 - E1 with quenching diode Protection degree IP65	E3A - AMP Junior Timer (2-pins; male) E4A - E3A with quenching diode Protection degree IP67	E12A - connector Deutsch DT04-2P (2-pins; male) E13A - E12A with quenching diode Protection degree IP67 / IP69K
		

The indicated IP protection level is only achieved if the connector is properly mounted.

Manual Override in millimeters (inches)

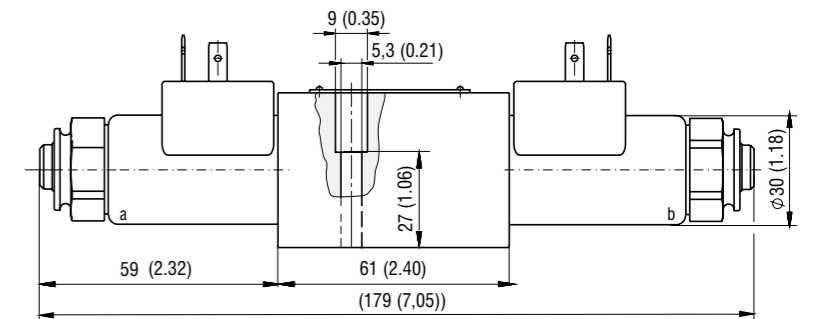
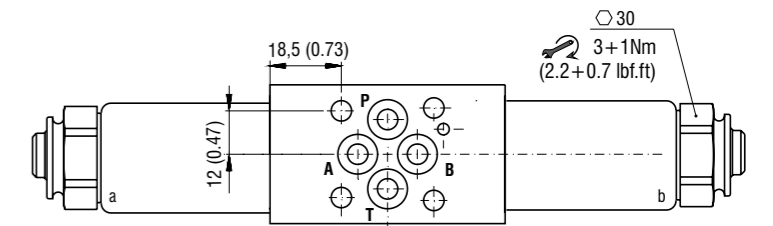
No designation - standard	Designation N2 - protected with rubber boot	Designation N5 - socket head screw 3
		

In case of solenoid malfunction or power failure, the spool of the valve can be shifted by manual override as long as the pressure in port T does not exceed 25 bar (363 PSI). For alternative manual overrides contact our technical support.

Valve Dimension in millimeters (inches)

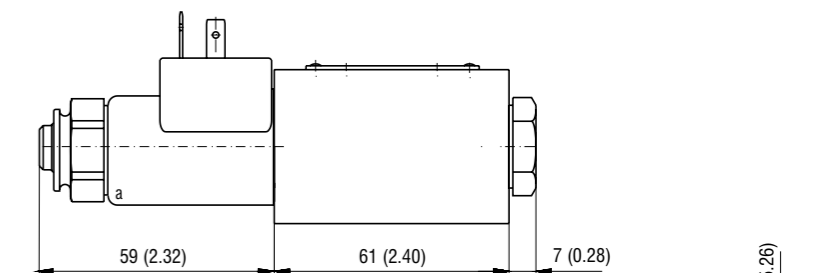
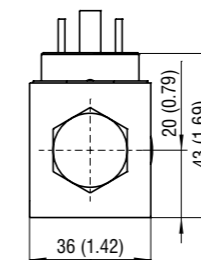
RPEL1-043x/xE1*

Valve with two solenoids
Spool symbols
Z11, C11, H11, Y11



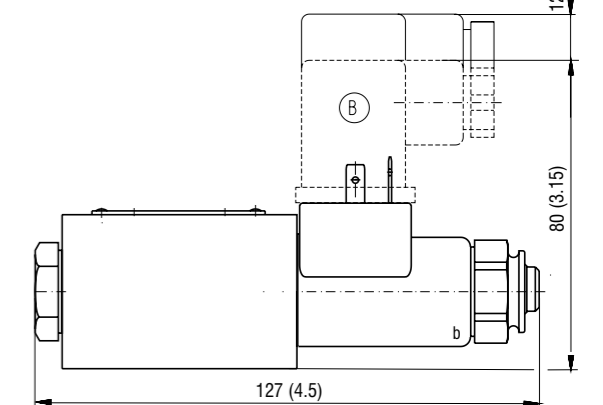
RPEL1-042x/xE1*

Valve with one solenoid „a”
Spool symbols
R11, Y51, C51, Z51, H51



RPEL1-062x/xE1*

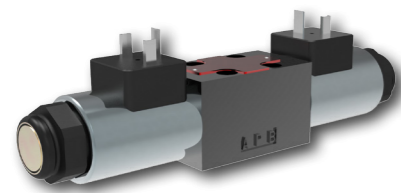
Valve with one solenoid „b”
Spool symbols
Z11, X11, C11, H11, Y11



4/2 and 4/3 Directional Control Valve, Solenoid Operated

RPE3-04

Size 04 (D02) • Q_{max} 30 l/min (8 GPM) • p_{max} 320 bar (4600 PSI)



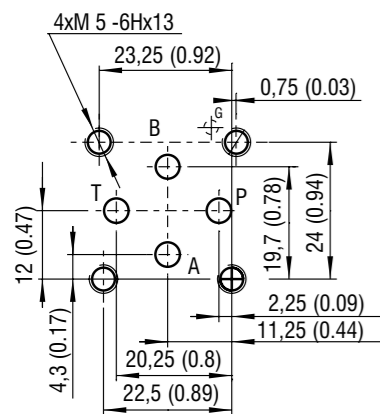
Technical Features

- Direct acting, directional control valve with subplate mounting interface acc. to ISO 4401, DIN 24340 (CETOP 02)
- High transmitted hydraulic power up to 320 bar with optimized design to minimize pressure drop
- Three chamber housing design for production cost saving
- The valve is available with interchangeable DC solenoids, also for AC power supply using a built-in rectifier bridge
- Wide range of solenoid electrical terminal versions available
- CSA Certificate upon request
- The coil is fastened to the core tube with a retaining nut and can be rotated by 360° to suit the available space
- In the standard version, the valve housing is phosphated and steel parts zinc-coated for 240 h salt spray protection acc. to ISO 9227
- Enhanced surface protection for mobile sector available (ISO 9227, 520 h salt spray)

Technical Data

Valve size	04 (D02)		
Max. flow	l/min (GPM)	30 (8)	
Max. operating pressure at ports P, A, B	bar (PSI)	320 (4640)	
Max. operating pressure at port T	bar (PSI)	210 (3050)	
Fluid temperature range (NBR)	°C (°F)	-30 ... +80 (-22 ... +176)	
Fluid temperature range (FPM)	°C (°F)	-20 ... +80 (-4 ... +176)	
Ambient temperature range	°C (°F)	-30 ... +50 (-22 ... +122)	
Supply voltage tolerance	%	AC: ±10 DC: ±10	
Max. switching frequency	1/h	15 000	
Switching time at v=32 mm ² /s (156 SUS)	ON	ms	30 ... 50
	OFF	ms	AC: 70 ... 100 DC: 30 ... 50
Mass	- valve with 1 solenoid	kg (lbs)	0.9 (1.98)
	- valve with 2 solenoids	kg (lbs)	1.3 (2.75)
Datasheet	Type		
General information	GI_0060	Products and operating conditions	
Coil types / connectors	C_8007 / K_8008	C19B* / K*	
Mounting interface / tolerances	SMT_0019	Size 04	
Spare parts	SP_8010		
Subplates	SP_0002	DP*-04	

ISO 4401-02-01-0-05

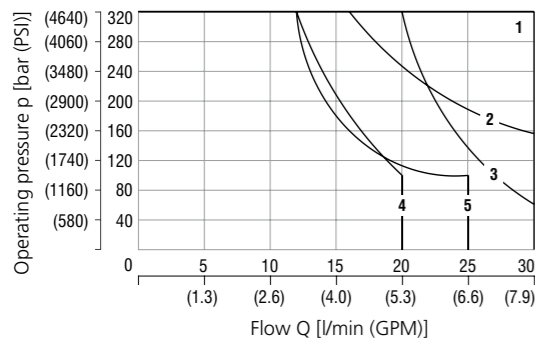


Ports P, A, B, T - max Ø4.5 mm (0.18 in)

Characteristics measured at v = 32 mm²/s (156 SUS)

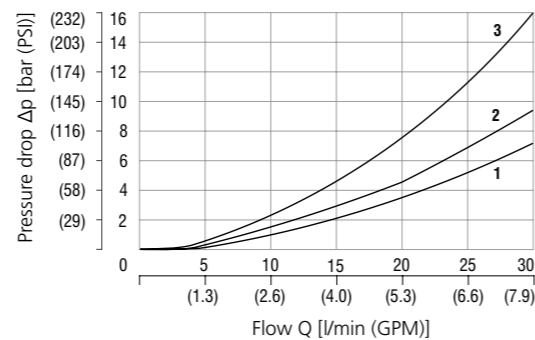
Operating limits

Operating limits for maximum hydraulic power at rated temperature and supply voltage equal to 90% nominal.



Spool symbol	1	2	3	4	5
Z11, Z51, H11, P11, P51, Y11, Y51, B11, R11, X11, J15					
C11, C51					
R21					
L21, A51, J75					
Y71					

Pressure drop related to flow rate



Spool symbol	P-A	P-B	A-T	B-T	P-T
Z11, P11, Y11, L21, B11	1	1	1	1	
R11, R21, X11, J15	2	2	2	2	
A51, J75	1	1			
P51, Y51, Z51		1	1		

For operating limits under conditions and flow directions other than shown contact our technical support.

Ordering Code

RPE3 - 04 [] [] / [] [] [] [] - [] [] [] []

4/2 and 4/3 directional control valve, solenoid operated

Valve size

Number of valve positions
two positions: 2
three positions: 3

Spool symbols
see the table "Spool Symbols"

Rated supply voltage of solenoids
(at the coil terminal)

12 V DC / 2.45 A	01200
24 V DC / 1.15 A	02400
27 V DC / 0.89 A	02700
205 V DC / 0.12 A	20500
24 V AC / 1.31 A / 50 (60) Hz	02450
120 V AC / 0.22 A / 50 (60) Hz	12060
230 V AC / 0.12 A / 50 (60) Hz	23050

CSA upon request

CSA Certified standard CSA marking

Surface treatment
housing phosphated, steel parts
zinc-coated (ZnCr-3), ISO 9227 (240 h)
zinc-coated (ZnCr-3), ISO 9227 (240 h)
zinc-coated (ZnNi), ISO 9227 (520 h)

Seals
NBR
FPM (Viton)

Manual override
standard
rubber boot protected
hand screw
socket head screw

Connector
EN 175301-803-A
E1 with quenching diode
AMP Junior Timer - radial direction
E3 with quenching diode
AMP Junior Timer - axial direction (2 pins; male)
E3A with quenching diode
EN 175301-803-A with integrated rectifier
Loose conductors (two insulated wires)
E8 with quenching diode
Deutsch DT04-2P - axial direction (2 pins; male)
E12A with quenching diode

- For directional valves with two solenoids, one solenoid must be de-energized before the other solenoid can be charged.
- For AC voltage supply use coils with connector type E5.
- For other solenoid voltage supply options see data sheet C_8007.
- The solenoid operated valves are delivered without connectors. For available connectors see data sheet K_8008.
- The orifice to the P port can be ordered separately, see data sheet SP_8010.
- Mounting bolts M5 x 35 DIN 912-10.9 or studs must be ordered separately. Tightening torque is 5 Nm (3.7 lbf.ft).
- Besides the shown, commonly used valve versions other special models are available. Contact our technical support for their identification, feasibility and operating limits.

Spool Symbols

Type	Symbol	Interposition	Type	Symbol	Interposition	Type	Symbol	Interposition
Z11			Y71			Z51		
C11			R11			X11		
H11			R21			C11		
P11			A51			H11		
Y11			P51			J15		
L21			Y51			J75		
B11			C51					

Solenoid Coil in millimeters (inches)

E1 - EN 175301-803-A E2 - E1 with quenching diode Protection degree IP65	E3 - AMP Junior Timer - radial direction E4 - E3 with quenching diode Protection degree IP67	E3A - AMP Junior Timer - axial direction E4A - E3A with quenching diode Protection degree IP67	E5 - EN 175301-803-A and integrated rectifier Protection degree IP65
E8 - Loose conductors (two insulated cables) E9 - (E8 with quenching diode) Protection degree IP65	E12A - Deutsch DT04-2P E13A - E12A with quenching diode Protection degree IP67 / IP69K		

The indicated IP protection level is only achieved if the connector is properly mounted.

Manual Override in millimeters (inches)

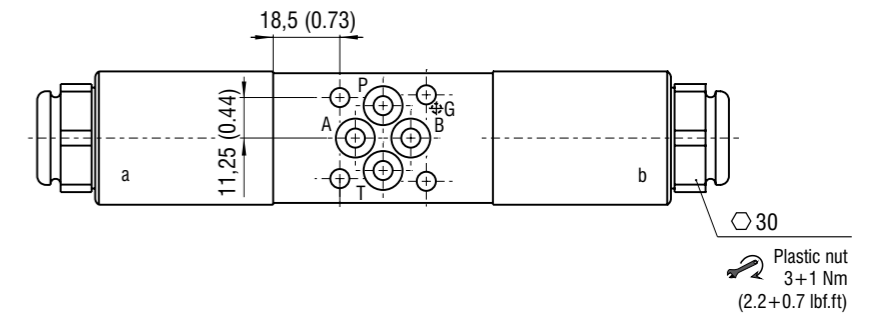
No designation - standard	Designation N2 - rubber boot protected	Designation N4 - hand screw	Designation N5 - socket head screw, size 3

In case of solenoid malfunction or power failure, the spool of the valve can be shifted by manual override as long as the pressure in port T does not exceed 25 bar (363 PSI). For alternative manual overrides contact our technical support.

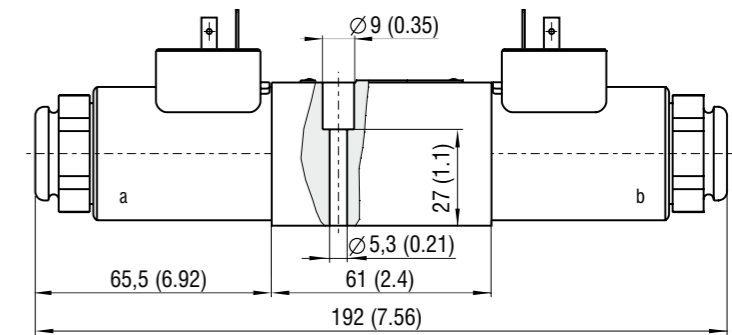
Dimensions in millimeters (inches)

RPE3-043*/*E1*

Valve with two solenoids
Spool symbols Z11, C11, H11,
P11, Y11, L21, B11, Y71

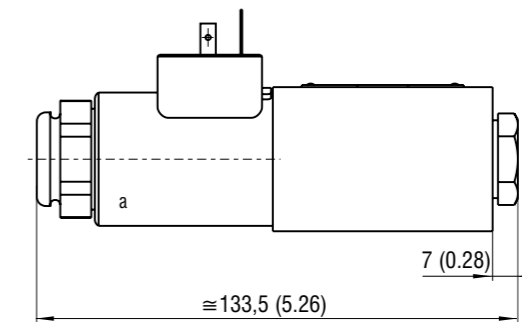
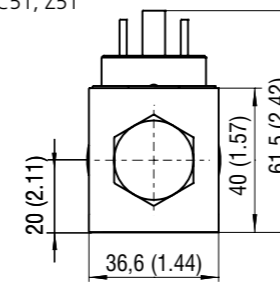


Plastic nut
3+1 Nm
(2.2+0.7 lbf.ft)



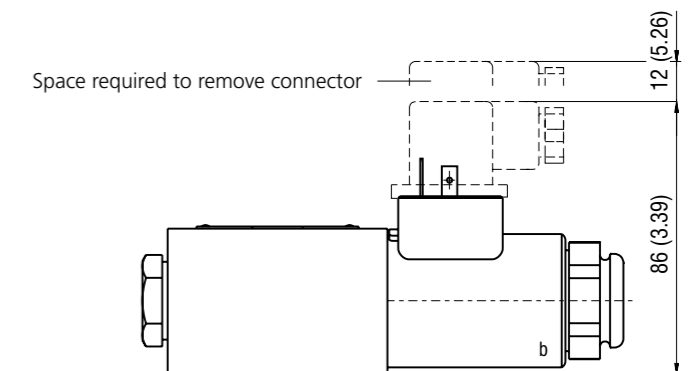
RPE3-042*/*E1*

Valve with one solenoid „a“
Spool symbols R11, R21,
A51, P51, Y51, C51, Z51



RPE3-042*/*E1*

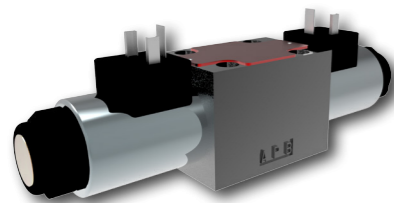
Valve with one solenoid „b“
Spool symbols Z11, X11, C11, H11



4/2 and 4/3 Directional Control Valve, Solenoid Operated, Lightline

RPEL1-06

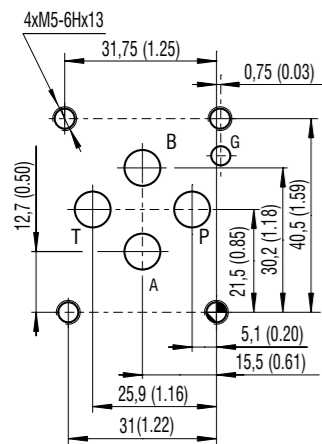
Size 06 (D03) • Q_{max} 50 l/min (13 GPM) • p_{max} 250 bar (3600 PSI)



Technical Features

- > Direct acting directional control valve with subplate mounting interface acc. to ISO 4401, DIN 24340 (CETOP 03)
- > Compact design with reduced solenoid dimensions
- > Three chamber housing design for production cost saving
- > The valve is available with DC solenoids and wide range of electrical terminals
- > The coil, fastened to the core tube with a retaining nut, can be rotated by 360° to suit the available space
- > Wide range of interchangeable spools and manual overrides available
- > In the standard version, the valve housing is phosphated and steel parts zinc-coated for 240 h salt spray protection acc. to ISO 9227
- > Enhanced surface protection for mobile sector available (ISO 9227, 520 h salt spray)

ISO 4401-03-02-0-05



Ports P, A, B, T - max Ø7.5 mm (0.29 in)

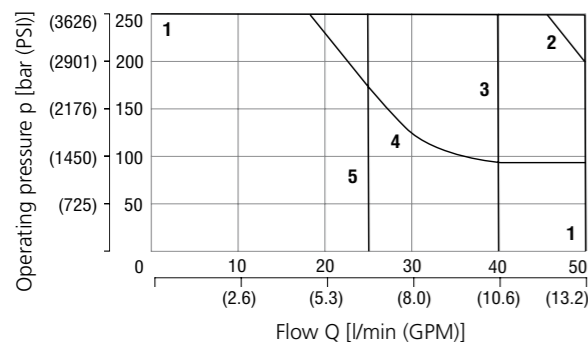
Technical Data

Valve size	06 (D03)	
Max. flow	l/min (GPM)	50 (13.2)
Max. operating pressure at ports P, A, B	bar (PSI)	250 (3630)
Max. operating pressure at port T	bar (PSI)	100 (1450)
Fluid temperature range (NBR)	°C (°F)	-30 ... +80 (-22 ... +176)
Fluid temperature range (FPM)	°C (°F)	-20 ... +80 (-4 ... +176)
Ambient temperature range	°C (°F)	-30 ... +50 (-22 ... +122)
Supply voltage tolerance	%	DC: ±10
Max. switching frequency	1/h	10 000
Switching time at v=32 mm ² /s (156 SUS)	ON	ms
	OFF	ms
Weight	- valve with 1 solenoid	kg (lbs)
	- valve with 2 solenoids	kg (lbs)
		1.3 (2.9)
		1.6 (3.5)
Datasheet		
		Type
General information	GI_0060	Products and operating conditions
Coil types / connectors	C_8007 / K_8008	C19B*/K*
Mounting interface	SMT_0019	Size 06
Spare parts	SP_8010	
Subplates	SP_0002	DP*-06

Characteristics measured at v = 32 mm²/s (156 SUS)

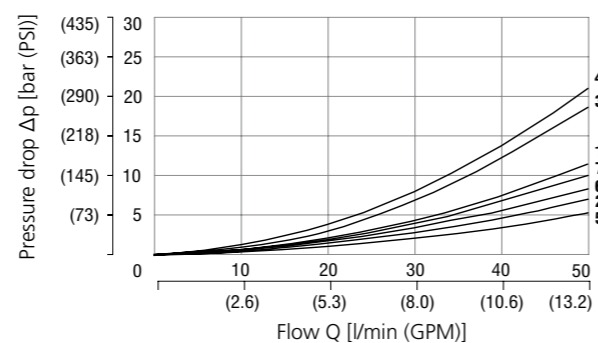
Operating limits

Operating limits for maximum hydraulic power at rated temperature and supply voltage equal to 90% nominal.



Spool symbol	
1	H11, H51, R11, X11
2	Z11, Z51
3	Y11, Y51
4	C11, C51
5	L21

Pressure drop related to flow rate



	P-A	P-B	A-T	B-T	P-T		P-A	P-B	A-T	B-T	P-T
Z11	1	1	1	1		X11	3	2	2	3	
C11	4	4	4	4	7	Z51		1	1		
H11	5	5	5	5		C51	4			4	7
Y11	6	6	5	5		H51		5	5		
L21	5	6	5	6	4	Y51		6	5		
R11	2	3	3	2							

For operating limits under conditions and flow directions other than shown contact our technical support.

Ordering Code

RPEL1-06 [] [] / [] [] [] [] - []

4/2 and 4/3 directional control valve, solenoid operated, Lightline

Valve size

Number of valve positions
two positions 2
three positions 3

Spool symbols
see the table "Spool Symbols"

Rated supply voltage of solenoids (at the coil terminal)

12 V DC / 2.45 A	01200
14 V DC / 1.70 A	01400
24 V DC / 1.15 A	02400
27 V DC / 0.89 A	02700
48 V DC / 0.55 A	04800

Surface treatment

No designation	housing phosphated, steel parts zinc-coated (ZnCr-3), ISO 9227 (240 h)
A	zinc-coated (ZnCr-3), ISO 9227 (240 h)
B	zinc-coated (ZnNi), ISO 9227 (520 h)

Seals

No designation	NBR
V	FPM (Viton)

Manual override

No designation	standard
M2	rubber boot protected

Connector

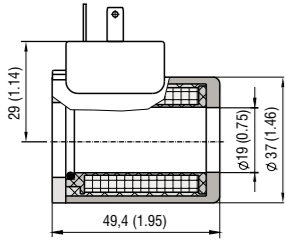
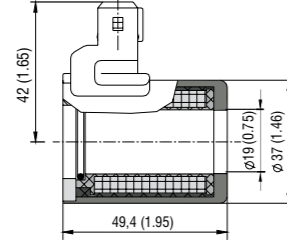
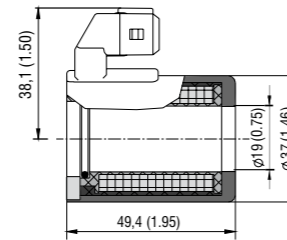
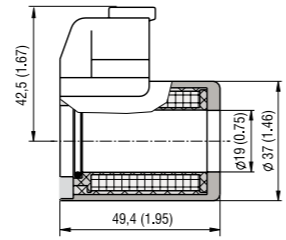
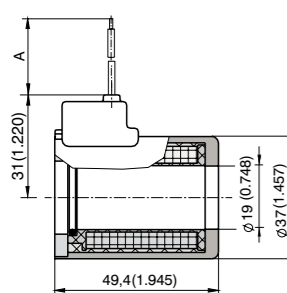
E1	EN 175301-803-A
E2	E1 with quenching diode
E3	AMP Junior Timer - radial direction
E4	E3 with quenching diode
E3A	AMP Junior Timer - axial direction (2 pins; male)
E4A	E3A with quenching diode
E8	loose conductors (two insulated wires)
E9	E8 with quenching diode
E12A	Deutsch DT04-2P - axial direction (2 pins; male)
E13A	E12A with quenching diode

- For directional valves with two solenoids, one solenoid must be de-energized before the other solenoid can be charged.
- For AC voltage supply use coils with connector type E5.
- For other solenoid voltage supply options see data sheet C_8007.
- The solenoid operated valves are delivered without connectors. For available connectors see data sheet K_8008.
- The orifice to the P port can be ordered separately, see data sheet SP_8010.
- Mounting bolts M5 x 45 DIN 912-10.9 or studs must be ordered separately. Tightening torque is 8.9 Nm (6.56 lbf.ft).
- Besides the shown, commonly used valve versions other special models are available. Contact our technical support for their identification, feasibility and operating limits.

Spool Symbols

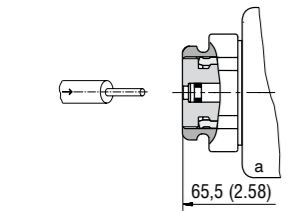
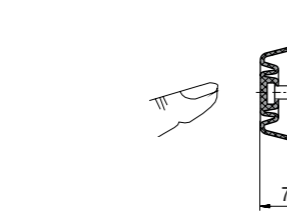
Type	Symbol	Interposition	Type	Symbol	Interposition
Z11			Z51		
C11			H51		
H11			Z11		
Y11			X11		
L21			C11		
R11			H11		
Y51			Y11		
C51					

Solenoid Coil in millimeters (inches)

E1 - EN 175301-803-A E2 - E1 with quenching diode Protection degree IP65	E3 - AMP Junior Timer - radial direction E4 - E3 with quenching diode Protection degree IP67	E3A - AMP Junior Timer - axial direction E4A - E3A with quenching diode Protection degree IP67	E12A - Deutsch DT04-2P - axial direction E13A - E12A with quenching diode Protection degree IP67 / IP69K
			
E8 - Loose conductors (two insulated wires) E9 - (E8 with quenching diode) Protection degree IP65			
			
		Note: A = Standard 300 mm (11.81 in), other lengths on demand	

The indicated IP protection level is only achieved if the connector is properly mounted.

Manual Override in millimeters (inches)

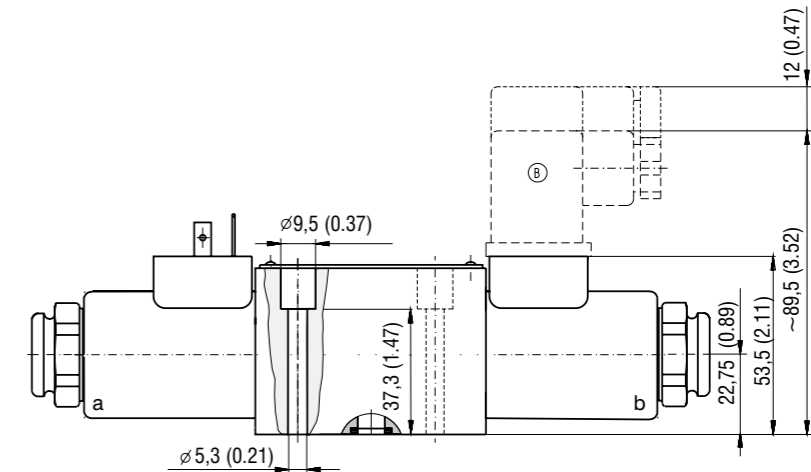
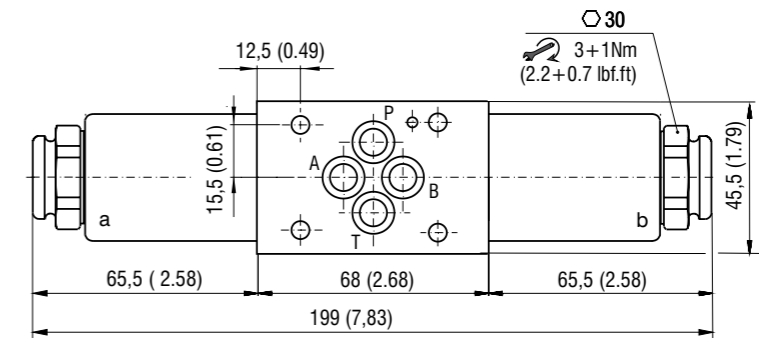
No designation - standard	Designation M2 - rubber boot protected
	

In case of solenoid malfunction or power failure, the spool of the valve can be shifted by manual override as long as the pressure in port T does not exceed 25 bar (363 PSI). For alternative manual overrides contact our technical support.

Valve Dimension in millimeters (inches)

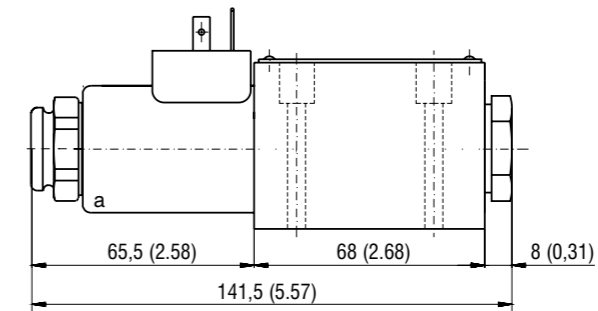
RPEL1-063x/xE1*

Valve with two solenoids
Spool symbols
Z11, C11, H11, Y11, L21



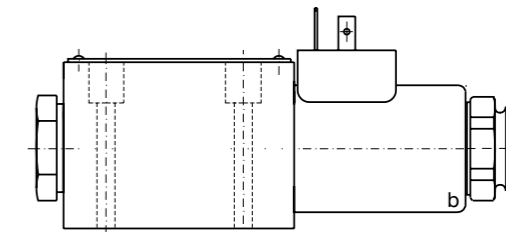
RPEL1-062x/xE1*

Valve with one solenoid „a“
Spool symbols
R11, Y51, C51, Z51, H51



RPEL1-062x/xE1*

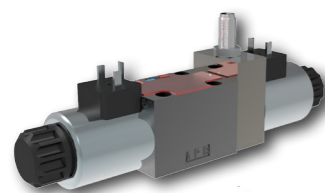
Valve with one solenoid „b“
Spool symbols
Z11, X11, C11, H11, Y11



4/2 and 4/3 Directional Control Valve, Solenoid Operated

RPE3-06

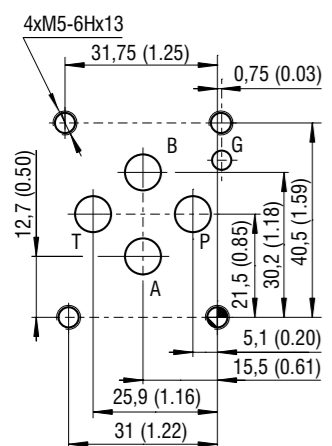
Size 06 (D03) • Q_{max} 80 l/min (21 GPM) • p_{max} 350 bar (5100 PSI)



Technical Features

- Direct acting, directional control valve with subplate mounting interface acc. to ISO 4401, DIN 24340 (CETOP 03)
- High transmitted hydraulic power up to 350 bar with optimized design to minimize pressure drop
- Five chamber housing design with reduced hydraulic power dependence on fluid viscosity
- The valve is available with interchangeable DC solenoids, also for AC power supply using a built-in rectifier bridge
- Wide range of solenoid electrical terminal versions available
- Wide range of interchangeable spools and manual overrides available
- CSA Certificate upon request
- Inductive contactless Normally Open and Normally Closed spool position sensor option
- Soft-shift spool speed control option
- The coil is fastened to the core tube with a retaining nut and can be rotated by 360° to suit the available space
- In the standard version, the valve housing is phosphated and steel parts zinc-coated for 240 h salt spray protection acc. to ISO 9227
- Enhanced surface protection for mobile sector available (ISO 9227, 520 h salt spray)

ISO 4401-03-02-0-05



Ports P, A, B, T - max Ø7.5 mm (0.29 in)

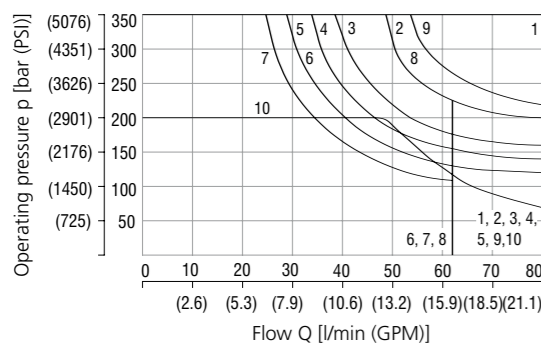
Technical Data

Valve size	06 (D03)	
Max. flow	l/min (GPM)	80 (21.1)
Max. operating pressure at ports P, A, B	bar (PSI)	standard 350 (5080)
Max. operating pressure at port T	bar (PSI)	320 (4640) acc. to CSA
Fluid temperature range (NBR)	°C (°F)	210 (3050), 50 (730) for monitoring S1, S4
Fluid temperature range (FPM)	°C (°F)	-30 ... +80 (-22 ... +176)
Ambient temperature range	°C (°F)	-20 ... +80 (-4 ... +176)
Supply voltage tolerance	%	-30 ... +50 (-22 ... +122)
Max. switching frequency	1/h	AC: ±10 DC: ±10
Switching time at v=32 mm ² /s (156 SUS)	ON ms	15 000
	OFF ms	AC: 30 ... 40 DC: 30 ... 50
Mass - valve with 1 solenoid	kg (lbs)	AC: 30 ... 70 DC: 10 ... 50
- valve with 2 solenoids		1.6 (3.52)
		2.2(4.85)
General information	Datasheet	Type
Coil types / connectors	GI_0060	Products and operating conditions
Mounting interface	C_8007 / K_8008	
Spare parts	SMT_0019	C22B* / K*
	SP_8010	Size 06

Characteristics measured at v = 32 mm²/s (156 SUS)

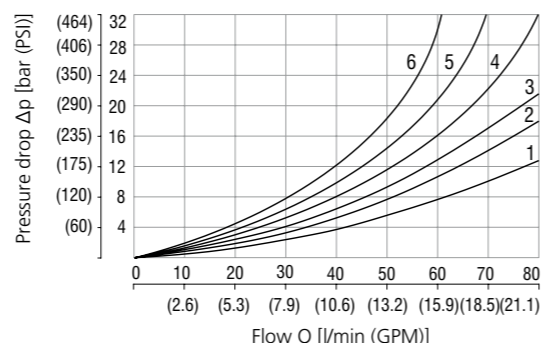
Operating limits

Operating limits for maximum hydraulic power at rated temperature and supply voltage equal to 90% nominal.



1	Z11	5	F11	7	Z91
6	C11	3	R11	5	R31
5	H11	4	R21	5	H51
1	P11	5	A51	7	F51
2	Y11	1	P51	3	X11
5	L21	2	Y51	7	K11
8	B11	6	C51	7	N11
6	Y41	1	Z51	10	X25
1	Z21	7	Z71	1	J15
5	C41	7	Z81	9	J75

Pressure drop related to flow rate



	P-A	P-B	A-T	B-T	P-T		P-A	P-B	A-T	B-T	P-T
Z11,L21,B11,R11	2	2	3	3		P51	1	3			
R21,X11,N11,J15						Y51	2	2			
C11	5	5	5	6	3	C51	2		3	4	
H11	2	2	2	3	3	Z71	3	3			
P11	1	1	3	3		Z81			3	3	
Y11	2	2	2	2		Z91	3			3	3
Y41	3	3	3	3		R31	2			3	
Z21,Z51,H51		2	3			F51		2	3		
C41	4	4			5	K11		2	3		
F11	1	2		3	3	X25	3	3	3		
A51,J75	2	2									

For operating limits under conditions and flow directions other than shown contact our technical support. Admissible operating limits may be considerably lower with only one direction of flow (A or B plugged, or without flow.)

Ordering Code

RPE3 - 06

4/2 and 4/3 directional control valve, solenoid operated

Valve size: 06

Number of spool positions: two positions (2), three positions (3)

Spool symbols: see the table "Spool Symbols"

Rated supply voltage of solenoids (at the coil terminals):
 12 V DC / 2.72 A (01200)
 24 V DC / 1.29 A (02400)
 27 V DC / 1.07 A (02700)
 205 V DC / 0.15 A (20500)
 24 V AC / 1.56 A / 50 (60 Hz) (02450)
 120 V AC / 0.26 A / 60 Hz (12060)
 230 V AC / 0.15 A / 50 (60) Hz (23050)

CSA upon request - only for 320 bar (4640 PSI)

Connector:
 EN 175301-803-A (E1)
 E1 with quenching diode (E2)
 AMP Junior Timer - axial direction (2 pins; male) (E3A)
 E3A with quenching diode (E4A)
 EN 175301-803-A with integrated rectifier (E5)
 Loose conductors (two insulated wires) (E8)
 E8 with quenching diode (E9)
 Deutsch DT04-2P - axial direction (2 pins; male) (E12A)
 E12A with quenching diode (E13A)

CSA Certified standard CSA marking

Surface treatment: standard, zinc-coated (ZnCr-3), ISO 9227 (240 h), zinc-coated (ZnNi), ISO 9227 (520 h)

Spool monitoring: without sensors, normally-open sensor, 50 bar (730 PSI) (S1), normally-open sensor, 210 bar (3050 PSI) (S2), normally-closed sensor, 50 bar (730 PSI) (S4)

Seals: NBR, FPM (Viton)

Soft-shift spool speed control: without soft-shift control, orifice Ø 0.7 mm (0.03 inch) in solenoid (T1)

Manual override: standard, cap nut covered (N1), rubber boot protected (N2), detent assembly (N3), hand screw (N4), socket head screw (N5), without manual override (N9)

- For other solenoid voltage supply options see data sheet C_8007.
 - The solenoid operated valves are delivered without connectors. For available connectors see data sheet K_8008.
 - The orifice to the P port can be ordered separately, see data sheet SP_8010.
 - Mounting bolts M5 x 45 DIN 912-10.9 or studs must be ordered separately. Tightening torque is 8.9 Nm (6.56 lbf.ft).
 - Besides the shown, commonly used valve versions other special models are available. Contact our technical support for their identification, feasibility and operating limits.

Spool Symbols

Type	Symbol	Interposition	Type	Symbol	Interposition	Type	Symbol	Interposition
Z11			R11			Z11		
C11			R21			X11		
H11			A51			C11		
P11			P51			H11		
Y11			Y51			K11		
L21			C51			N11		
B11			Z51			F11		
Y41			Z71			X25		
Z21			Z81			J15		
C41			Z91			J75		
F11			R31					
			H51					
			F51					

Solenoid Coil in millimeters (inches)

E1, E2	E3A, E4A	E5	E8, E9	E12A, E13A
Protection degree IP65	Protection degree IP67	Protection degree IP65	Protection degree IP65	Protection IP67 / 69K
			Note: A = Standard 300 mm, (11.8 in) other lengths on demand	

The indicated IP protection level is only achieved if the connector is properly mounted.

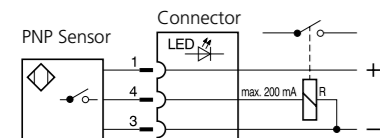
Manual Override in millimeters (inches)

No designation - standard	Designation N1 - cap nut covered	Designation N2 - rubber boot protected	Designation N3 - detent assembly	Designation N4 - hand screw	Designation N5 - socket head screw, size 3	Designation N9 - without manual override

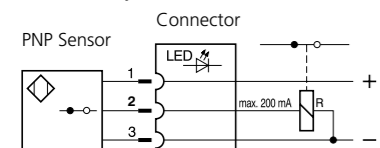
In case of solenoid malfunction or power failure, the spool of the valve can be shifted by manual override as long as the pressure in port T does not exceed 25 bar (363 PSI). For alternative manual overrides contact our technical support.

Spool Position Sensor

S1, S2 - Circuit diagram for the normally - OPEN sensor



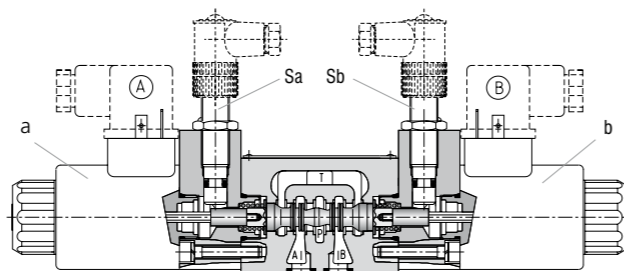
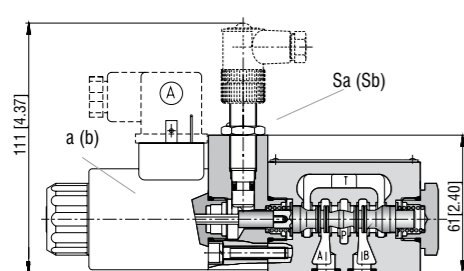
S4 - Circuit diagram of the normally - CLOSED sensor



Technical Data of the Sensor		S1, S4	S2
Rated power supply voltage	V	24 DC	
Power supply voltage range	V	10 ... 30 DC	
Rated current	mA	200	
Sensor enclosure protection (EN 60529)		IP 67	
Max. operating pressure	bar (PSI)	50 (725)	210 (3046)
Switching frequency	Hz	1000	
Ambient temperature range	°C (°F)	-25 ... +80 (-13 ... +176)	
Technical Data of the Connector			
Power supply voltage range	V	10 ... 30 DC	
Ambient temperature range	°C (°F)	-25 ... +80 (-13 ... +176)	
Indicator		yellow LED	

Signal of solenoid	Two-Position Directional Control Valve			
	① a(b)	③ Sa(Sb)	LED	
Signal of sensor	S1, S2	S4	S1, S2	S4
0	1	0	ON	OFF
1	0	1	OFF	ON

Signal of solenoid	Three-Position Directional Control Valve					
	① a(b)		③ Sa(Sb)		LED	
Signal of sensor	a	b	Sa	Sb	Sa - LED	Sb - LED
0	0	1	1	0	ON	ON
1	0	0	1	1	OFF	ON



Spool Speed Control in millimeters (inches)

Designation T1	Important:
	This directional valve provides the means to control spool soft shifting by an orifice situated in the solenoid armature. To ensure the proper function of the valve, unobstructed venting of the solenoid is required through the bleeding plug (1). The plugs are accessible after removing the rubber boot (2) from the solenoid cap nut (3).
Switching time ON and OFF	300 ... 800 ms
The switching times shown are valid for viscosity $\nu = 32 \text{ mm}^2/\text{s}$ (156 SUS) and nominal voltage. They depend on working pressure and flow rate of the directional control valve.	

Dimensions in millimeters (inches)

Valve with two solenoids

RPE3-063*/E1*

RPE3-063*/E1*S

Valve with one solenoid „a“

Spool symbols R11, R21, A51, P51, Y51, Z51, C51, R31, Z71, Z81, Z91, H51, F51, X25

Valve with one solenoid „b“

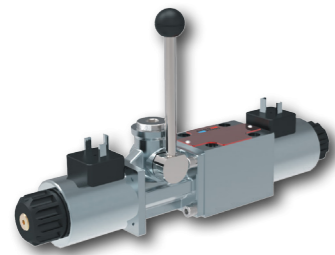
Spool symbols X11, Z11, C11, H11, K11, N11, F11

Mounting screws 8.9 Nm (7 lbf.ft)
M5 x 45 DIN 912-10.9

Auxiliary Lever Override for Solenoid Operated Valves

RPER3-06

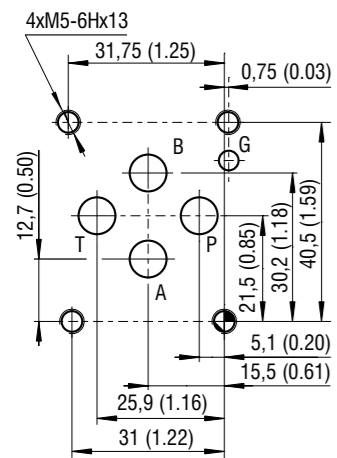
Size 06 (D03) • Q_{max} 80 l/min (21 GPM) • p_{max} 350 bar (5100 PSI)



Technical Features

- Auxiliary lever overrides for ON-OFF solenoid valves of the type RPE3-06 (Datasheet No. 4010) with Size 06 and mounting interface acc. to ISO 4401, DIN 24340 (CETOP 03)
- Auxiliary lever operators allow the valve to be operated when electrical system is de-energized, e.g. emergency operation, electrical failures, maintenance activities
- For proportional valves please consult our technical department for their identification and feasibility
- Manual lever and actuating element can be rotated in 90° increments for flexible installation
- When the valve is electrically operated the hand lever remains stopped in its neutral position
- The lever override does not affect the performances of the base valve
- In the standard version, the valve housings are phosphated and the steel parts are zinc-coated for 240 h salt spray protection acc. to ISO 9227
- Enhanced surface protection for mobile sector available (ISO 9227, 520 h salt spray)

ISO 4401-03-02-0-05



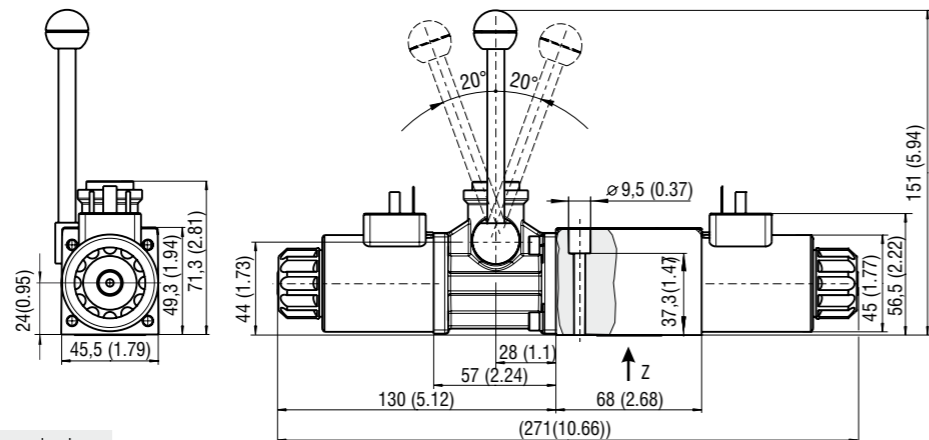
Ports P, A, B, T max Ø 7.5 mm (0.29 in)

Technical Data

Valve size	06 (D03)	
Max. operating pressure at port P, A,B	bar (PSI) 350 (5080)	
Max. operating pressure at port T	bar (PSI) 100 (1450)	
Fluid temperature range (NBR)	°C (°F) -30 ... +80 (-22 ... +176)	
Fluid temperature range (FPM)	°C (°F) -20 ... +80 (-4 ... +176)	
Service life	cycles 10 ⁵	
Rated power supply voltage	% AC: ±10 DC: ±10	
Max. switching frequency	1/h 10 000	
Lever characteristics		
Total stroke angle	deg ±20	
Working stroke angle	deg ±12 to 20	
Operating force	N (lbf) 40 (29.5)	
Lever device mass	kg (lbs) 0.59 (1.3)	
General information		
Data Sheet	GI_0060 Type	
Coil types / connectors	C_8007 / K_8008 Products and operating conditions	
Mounting interface / tolerances	SMT_0019 C22B* / K*	
Spare parts	SP_8010 Size 06	

Dimensions in millimeters (inches)

RPER3-063 */ A19

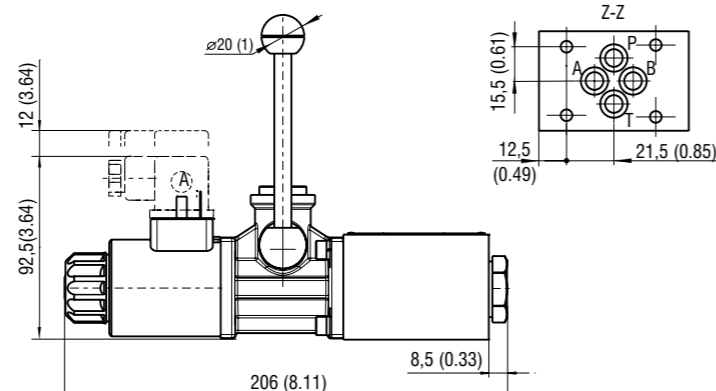


The lever operator should never be used when any solenoid is energized.

RPER3-062 */ A19

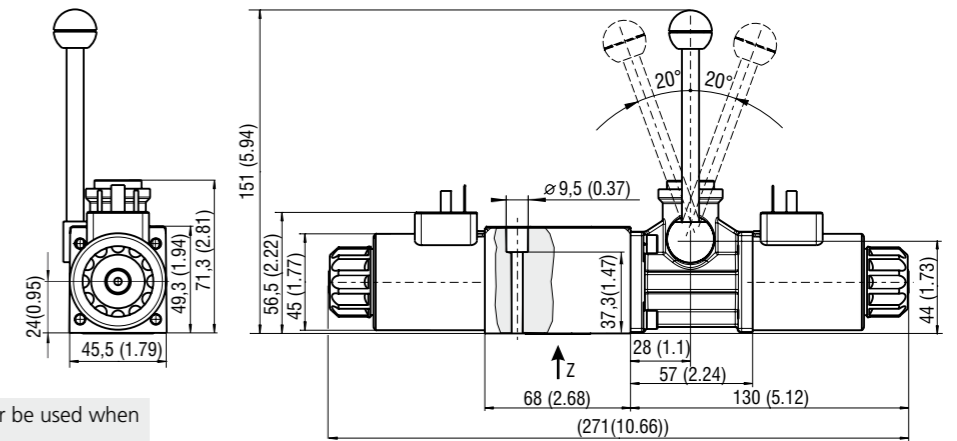
Manual lever and actuating section is shown in the standard supplied position which is the most frequently used. Both elements can be rotated to various positions 90° apart. For other positions of lever and actuating section consult our technical department for their identification.

Mounting screws 8.9 Nm (6.56 lbf.ft)
M5 x 45 DIN 912-10.9



Dimensions in millimeters (inches)

RPER3-063 */ B19

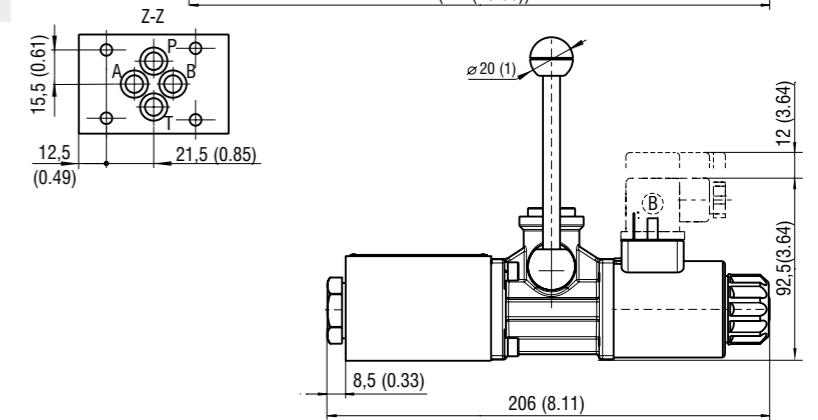


The lever operator should never be used when any solenoid is energized.

RPER3-062 */ B19

Manual lever and actuating section is shown in the standard supplied position which is the most frequently used. Both elements can be rotated to various positions 90° apart. For other positions of lever and actuating section consult our technical department for their identification.

Mounting screws 8.9 Nm (6.56 lbf.ft)
M5 x 45 DIN 912-10.9



Ordering Code

RPER3-06	□	□	/	□	□	□	/	□	□	-	□	-	□
4/2 and 4/3 directional control valve, solenoid operated with lever override													
Valve size													
Number of valve positions	two												
	three												
Spool symbols	see the table Spool symbols on Datasheet RPE3-06 (4010)												
Rated supply voltage of solenoids (at the coil terminals)	12 V DC / 2.72 A												01200
	24 V DC / 1.29 A												02400
	27 V DC / 1.07 A												02700
	205 V DC / 0.15 A												20500
	24 V AC / 1.56 A / 50 (60) Hz												02450
	120 V AC / 0.26 A / 60 Hz												12060
	230 V AC / 0.15 A / 50 (60) Hz												23050
Surface treatment	No des. body phosphated, steel parts zinc-coated (ZnCr-3), ISO 9227 (240 h)												
	A zinc-coated (ZnCr-3), ISO 9227 (240 h)												
	B zinc-coated (ZnNi), ISO 9227 (520 h)												
Lever override length	No designation standard 102 mm												
Manual lever and position of override actuating section	A19 standard, lever on side A, upward												
	B19 standard, lever on side B, upward												
Seals	No designation NBR												
	V FPM (Viton)												
Manual override at actuator system	No designation standard												
Connector	E1 EN 175301-803-A												
	E2 E1 with quenching diode												
	E3A AMP Junior Timer - axial direction (2 pins; male)												
	E4A E3A with quenching diode												
	E5 EN 175301-803-A with integrated rectifier												
	E8 loose conductors (two insulated wires)												
	E9 E8 with quenching diode												
	E12A Deutsch DT04-2P - axial direction (2 pins; male)												
	E13A E12A with quenching diode												

For directional valves with two solenoids, one solenoid must be de-energized before the other solenoid can be charged. For AC voltage supply use coils with connector type E5. For other solenoid voltage supply options see data sheet C_8007. The solenoid operated valves are delivered without connectors. For available connectors see data sheet K_8008. The orifice to the P port can be ordered separately, see data sheet SP_8010. Mounting bolts M5 x 45 DIN 912-10.9 or studs must be ordered separately.

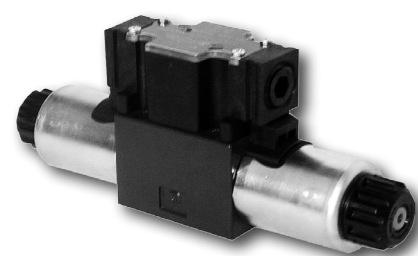
Tightening torque is 8.9 Nm (6.56 lbf.ft) Besides the shown, commonly used valve versions other special models are available. Contact our technical support for their identification, feasibility and operating limits.

For operating limits and pressure drop refer to Datasheet No. 4010 of the base valve RPE3-06.

4/2 and 4/3 Directional Control Valve, Solenoid Operated, 8 Watt

RPEA3-06

Size 06 (D03) • Q_{max} 80 l/min (21 GPM) • p_{max} 350 bar (5100 PSI)

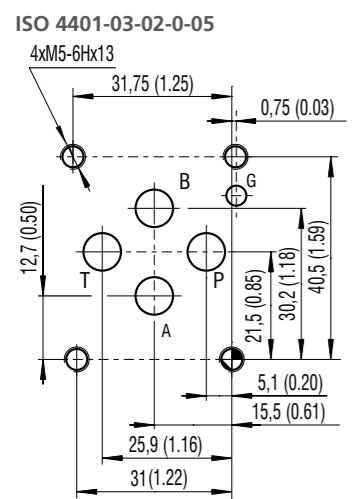


Technical Features

- Direct acting directional control valve with subplate mounting interface acc. to ISO 4401, DIN 24340 (CETOP 03)
- Low power/current (8 W / <0.35 A) solenoid allows direct connection to a PLC or a bus node
- High transmitted hydraulic power up to 350 bar with optimized design to minimize pressure drop
- Five chamber housing with reduced hydraulic power dependence on fluid viscosity
- Solenoid electrical terminal (as per EN 175301-803) and wire box version with 5-Pin M12x1 connection as per IEC 61076-2-101 (code D)
- The valve is available with interchangeable DC solenoids
- Wide range of interchangeable spools and manual overrides available
- Soft-shift spool speed control option
- Optional shift position indicators (raised arrows) installed on the terminal plate
- In the standard version, the valve housing is phosphated and steel parts zinc-coated for 240 h salt spray protection acc. to ISO 9227
- Enhanced surface protection for mobile sector available (ISO 9227, 520 h salt spray)

Technical Data

Valve size	06 (D03)		
Max. flow	l/min (GPM)	80 (21.1)	
Max. operating pressure at ports P, A, B	bar (PSI)	350 (5080)	
Max. operating pressure at port T	bar (PSI)	210 (3050)	
Fluid temperature range (NBR)	°C (°F)	-30 ... +80 (-22 ... +176)	
Fluid temperature range (FPM)	°C (°F)	-20 ... +80 (-4 ... +176)	
Ambient temperature range	°C (°F)	-30 ... +50 (-22 ... +122)	
Supply voltage tolerance	%	DC: ±10	
Max. switching frequency	1/h	15 000	
Enclosure type acc. to EN 60529		IP65	
Switching time at v=32 mm ² /s (156 SUS)	ON	ms	30 ... 50
	OFF	ms	10 ... 50
Mass	- valve with 1 solenoid	kg (lbs)	1.3 (2.8)
	- valve with 2 solenoids		1.9 (4.2)
	Datasheet	Type	
General information	GI_0060	Products and operating conditions	
Coil types / connectors	C_8007 / K_8008	C22* / K*	
Mounting interface	SMT_0019	Size 06	
Spare parts	SP_8010		

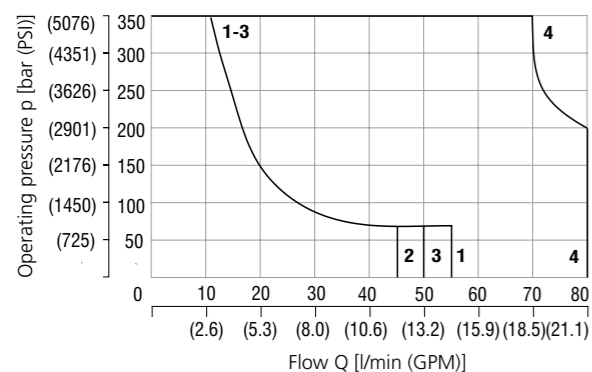


Ports P, A, B, T - max Ø7.5 mm (0.29 in)

Characteristics measured at v = 32 mm²/s (156 SUS)

Operating limits

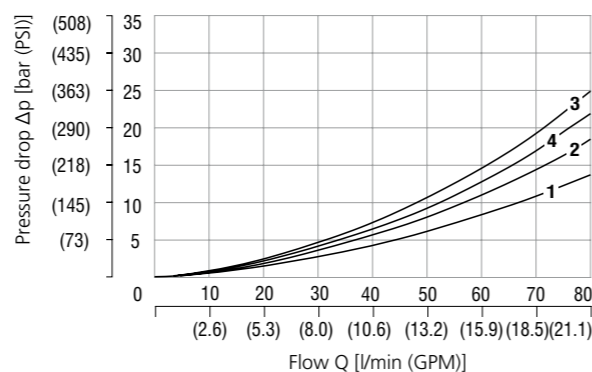
Operating limits for maximum hydraulic power at rated temperature and supply voltage equal to 90% nominal.



Z11, Y11, Z51, Y51	1
R11, X11	2
C11, C51	3
P11, P51	4

For operating limits under conditions and flow directions other than shown contact our technical support. Admissible operating limits may be considerably lower with only one direction of flow (A or B plugged, or without flow.)

Pressure drop related to flow rate



	P-A	P-B	A-T	B-T	P-T		P-A	P-B	A-T	B-T	P-T
Z11	2	2	2	2		Z51	2	2			
C11	2	2	2	2	3	C51	2		2	3	
P11	2	2	4	4		P51	1	1			
Y11	2	2	1			Y51	2	4			
R11, X11	2	2	4	2							

Ordering Code

RPEA3-06 [] [] / [] [] [] [] [] [] [] [] - [] [] [] []

4/2 and 4/3 directional control valve, solenoid operated, 8 watt

Valve size

Number of spool positions
two positions 2
three positions 3

Spool symbols
see the table "Spool Symbols"

Rated supply voltage of solenoids
24 V DC / 0.33 A 02400

Connector
EN 175301-803-A E1
Wire box (plug-in coil), DC version EW1K

Wire box version EW1K supply connector
5-Pin connector M12x1 as per IEC 61076-2-101 (code D) 63
mounted on A-side (B-side plugged)
5-Pin connector M12x1 as per IEC 61076-2-101 (code D) 64
mounted on B-side (A-side plugged)
63 with LED diode 65
64 with LED diode 66

No designation U CSA Certified standard CSA marking

No des. housing phosphated, steel parts
A zinc-coated (ZnCr-3), ISO 9227 (240 h)
B zinc-coated (ZnNi), ISO 9227 (520 h)

Surface treatment

Spool symbol - solenoid identification standards
No designation ISO 4401
AN* ANSI-B93.9
*see comment at spool symbol section

No designation V Seals NBR FPM (Viton)

No designation T1 **Soft-shift spool speed control** without soft shift control orifice Ø 0.7 mm (0.03 inch) in actuator

No designation **Manual override** standard
N1 cap nut covered
N2 rubber boot protected
N3 detent assembly
N4 hand screw
N5 socket head screw
N9 without manual override

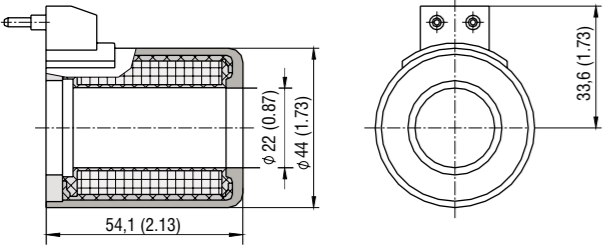
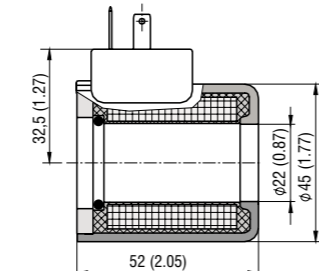
- For directional valves with two solenoids, one solenoid must be de-energized before the other solenoid can be charged.
- The orifice to the P port can be ordered separately, see data sheet SP_8010.
- Mounting bolts M5 x 45 DIN 912-10.9 or studs must be ordered separately. Tightening torque is 8.9 Nm (6.56 lbf.ft).
- Besides the shown, commonly used valve versions other special models are available. Contact our technical support for their identification, feasibility and operating limits.

Spool Symbols

Type	Symbol	Interposition	Type	Symbol	Interposition
Z11			C51		
C11			Z51		
P11			Z11		
Y11			X11		
R11			C11		
P51			Y11		
Y51			P11		

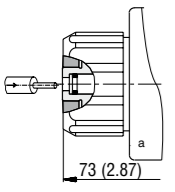
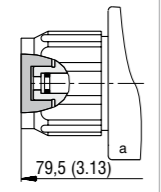
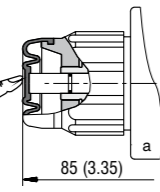
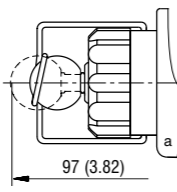
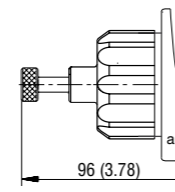
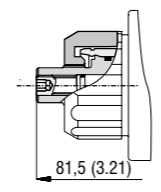
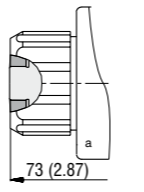
Note: Contrary to the European Norm, the US Standard ANSI-B93.9 states that the energized solenoid routing oil flow to port A be marked with „a“ and the energized solenoid routing oil flow to port B be marked with „b“. This rule is valid independently of the solenoid lay-out.

Solenoid Coil in millimeters (inches)

EW1 - Solenoid coil with terminals for wire box electrical connector Protection degree IP65	E1 - Connector EN 175301-803-A Protection degree IP65
	

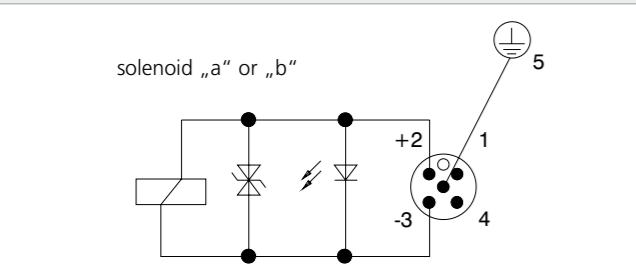
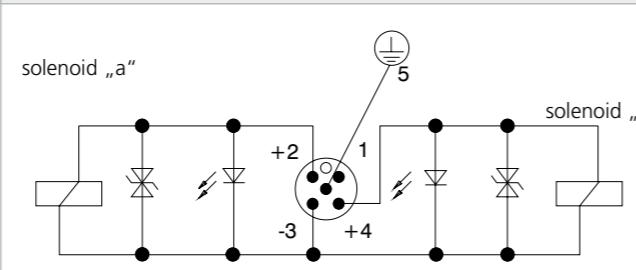
The indicated IP protection level is only achieved if the connector is properly mounted.

Manual Override in millimeters (inches)

No designation - standard	Designation N1 - cap nut covered	Designation N2 - rubber boot protected	Designation N3 - detent assembly	Designation N4 - hand screw	Designation N5 - socket head screw, size 3	Designation N9 - without manual override
						
73 (2.87)	79.5 (3.13)	85 (3.35)	97 (3.82)	96 (3.78)	81.5 (3.21)	73 (2.87)

In case of solenoid malfunction or power failure, the spool of the valve can be shifted by manual override as long as the pressure in port T does not exceed 25 bar (363 PSI). For alternative manual overrides contact our technical support.

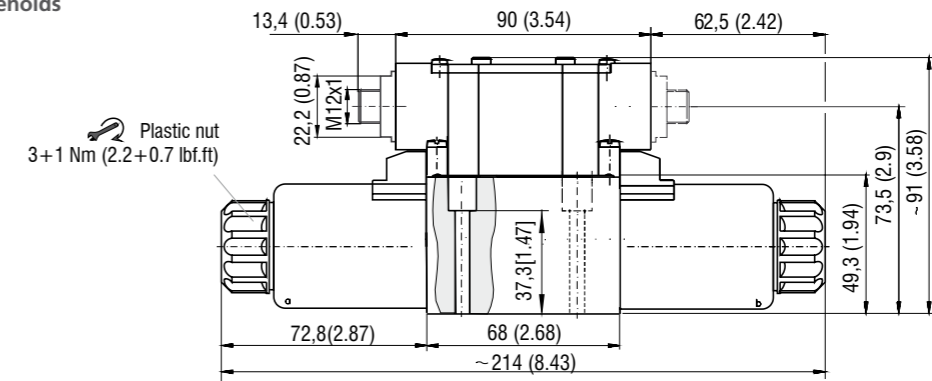
Connector - 5-Pin M12x1 (IEC 61076-2-101)

Pinout Valve with 1 magnet	Pinout Valve with 2 magnets
	

Note:
On valves with solenoid identification according to US Standard ANSI-B93.9 wiring will be different from above: on valves with one (1) solenoid Pin 2 is always driving solenoid „a” and Pin 4 solenoid „b”. This is independent from the actual physical location of the solenoid.

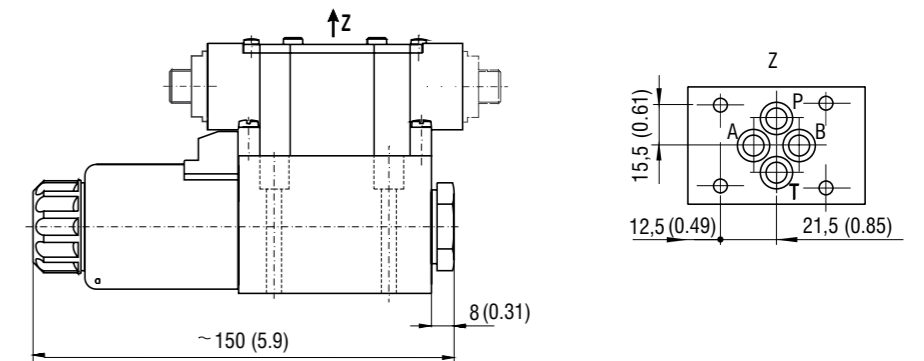
Dimensions in millimeters (inches)

Valve with two solenoids EW1



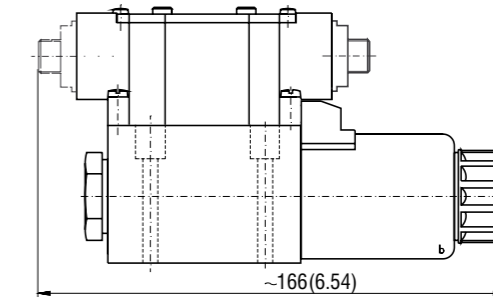
Valve with one solenoid „a”

Spool symbols R11, P51, Y51, Z51, C51

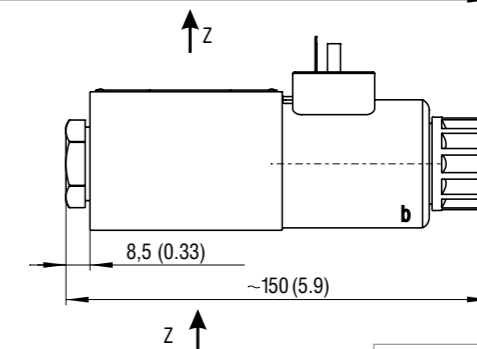
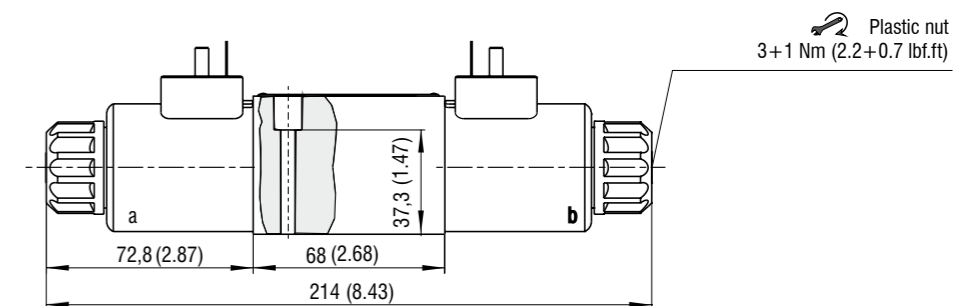
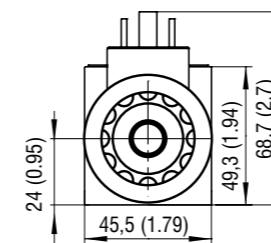


Valve with one solenoid „b”

Spool symbols X11, Z11, C11, Y11, P11



Valve with two solenoids E1

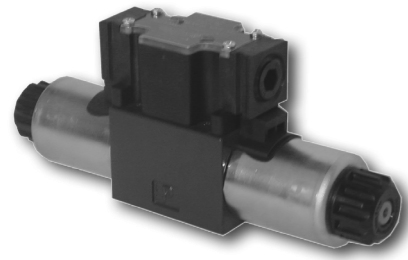


Mounting screws 8.9 Nm (7 lbf.ft)
M5 x 45 DIN 912-10.9

4/2 and 4/3 Directional Control Valve, Solenoid Operated, Wire Box

RPEW4-06

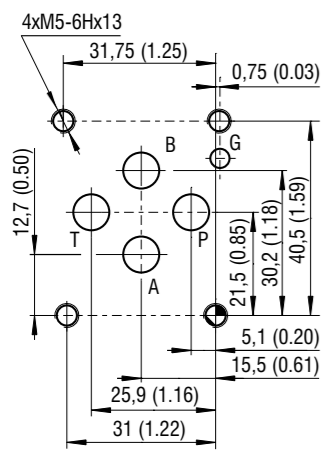
Size 06 (D03) • Q_{max} 80 l/min (21 GPM) • p_{max} 350 bar (5100 PSI)



Technical Features

- Direct acting directional control valve with subplate mounting interface acc. to ISO 4401, DIN 24340 (CETOP 03)
- High transmitted hydraulic power up to 350 bar with optimized design to minimize pressure drop
- Five chamber housing design with reduced hydraulic power dependence on fluid viscosity
- Wire box for solenoid electrical connection with cable gland [1/2" NPT]
- Optional 3-pin or 5-pin connector acc. to ANSI/B93.55M
- Type for AC power supply with a rectifier bridge built in the wire box
- Wide range of interchangeable spools and manual overrides available
- CSA Certificate upon request ☞
- Soft-shift spool speed control option
- Optional shift position indicators (raised arrows) installed on the terminal plate
- In the standard version, the valve housing is phosphated and steel parts zinc-coated for 240 h salt spray protection acc. to ISO 9227
- Enhanced surface protection for mobile sector available (ISO 9227, 520 h salt spray)

ISO 4401-03-02-0-05



Ports P, A, B, T - max Ø7.5 mm (0.29 in)

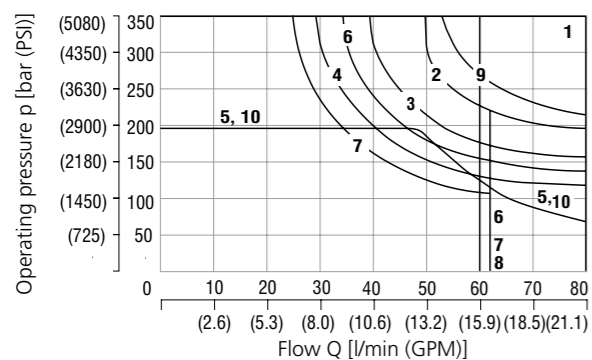
Technical Data

Valve size	06 (D03)	
Max. flow	80 (21.1) l/min (GPM)	
Max. operating pressure at ports P, A, B	350 (5080) 320 (4640) for CSA bar (PSI)	
Max. operating pressure at port T	210 (3050) bar (PSI)	
Fluid temperature range (NBR)	-30 ... +80 (-22 ... +176) °C (°F)	
Fluid temperature range (FPM)	-20 ... +80 (-4 ... +176) °C (°F)	
Ambient temperature range	-30 ... +50 (-22 ... +122) °C (°F)	
Supply voltage tolerance	AC: ±10 DC: ±10 %	
Max. switching frequency	15 000 1/h	
Enclosure type acc. to EN 60529	IP 65	
Switching time at v=32 mm ² /s (156 SUS)	ON	ms AC: 30 ... 40 DC: 30 ... 50
	OFF	ms AC: 30 ... 70 DC: 10 ... 50
Mass	- valve with 1 solenoid	1.3 (2.8) kg (lbs)
	- valve with 2 solenoids	1.9 (4.2) kg (lbs)
	Datasheet	Type
General information	GI_0060	Products and operating conditions
Coil types	C_8007	C22B*
Mounting interface	SMT_0019	Size 06
Spare parts	SP_8010	

Characteristics measured at v = 32 mm²/s (156 SUS)

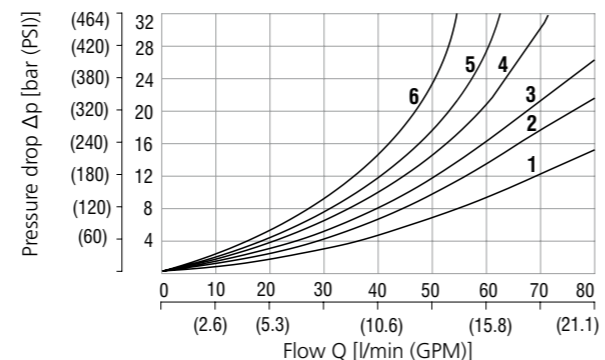
Operating limits

Operating limits for maximum hydraulic power at rated temperature and supply voltage equal to 90% nominal.



1	Z11	1	Z21	6	C51
6	C11	9	J75	1	Z51
3	H11	5	F11	7	H51
1	P11	3	R11	7	F51
2	Y11	4	R21	3	X11
5	L21	5	A51	7	N11
8	B11	1	P51	10	X25
1	J15	2	Y51		

Pressure drop related to flow rate



Z11, L21, B11, R11, R21, X11, N11, J15	P-A	P-B	A-T	B-T	P-T	P-A	P-B	A-T	B-T	P-T
	2	2	3	3		P51	1	3		
C11	5	5	5	6	3	Y51	2	2		
H11	2	2	2	3	3	C51 2			3	4
P11	1	1	3	3		C51 2			3	4
A51, J75	2	2				F11 1	2		3	3
Z21, Z51, H51, F51	2	3				Y11 2	2	2	2	

For operating limits under conditions and flow directions other than shown contact our technical support. Admissible operating limits may be considerably lower with only one direction of flow (A or B plugged, or without flow.)

Ordering Code

RPEW4 - 06 [] / [] [] [] [] [] [] [] [] [] []

4/2 and 4/3 directional control valve, solenoid operated, wire box

Valve size
No designation

Number of valve positions
two positions: 2
three positions: 3

Spool symbols
see the table "Spool symbols"

Rated supply voltage of solenoid
(at the wire box terminal)
12 V DC / 2.72 A ☞ 01200
24 V DC / 1.29 A ☞ 02400
120 V AC / 0.26 A, 60 Hz* ☞ 12060
*DC coils with rectifier in wire box

Connector for wire box
DC solenoid (DC-rectified) EW1
DC solenoid with quenching diode EW2

Wire box power supply
DC power supply K
AC power supply (rectifier in wire box) R

Seals
NBR
FPM (Viton)

Soft-shift spool speed control
No designation T1 without soft-shift control orifice Ø 0.7 mm (0.03 inch) in solenoid

Manual override
standard
N1 cap nut covered
N2 rubber boot protected
N3 detent assembly
N4 hand screw
N5 socket head screw
N9 without manual override

Surface treatment
standard
A zinc-coated (ZnCr-3), ISO 9227 (240 h)
B zinc-coated (ZnNi), ISO 9227 (520 h)

CSA Certified standard
No designation U
CSA marking

Wire box version, supply connector

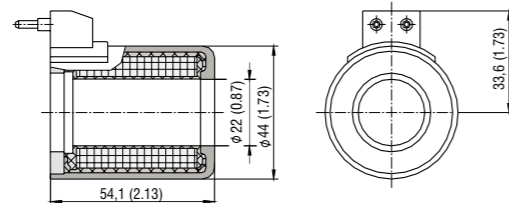
without connector, 1/2 NPT thread at both ends (either side can be used for wiring, remove cover-plug accordingly)	50
50 with LED (B side plugged, A side with feed-through plug)	51
3-pin connector (ANSI/B93.55M) mounted on A-side (B-side plugged, only for single solenoid valves)	52
3-pin connector (ANSI/B93.55M) mounted on B-side (A-side plugged, only for single solenoid valves)	53
52 with LED	54
53 with LED	55
5-pin connector (ANSI/B93.55M) mounted on A-side (B-side plugged, only for double solenoid valves)	56
5-pin connector (ANSI/B93.55M) mounted on B-side (A-side plugged, only for double solenoid valves)	57
56 with LED	58
57 with LED	59

- For directional valves with two solenoids, one solenoid must be de-energized before the other solenoid can be charged.
- The orifice to the P port can be ordered separately, see data sheet SP_8010.
- Mounting bolts M5 x 45 DIN 912-10.9 or studs must be ordered separately. Tightening torque is 8.9 Nm (6.56 lbf.ft).
- Besides the shown, commonly used valve versions other special models are available. Contact our technical support for their identification, feasibility and operating limits.

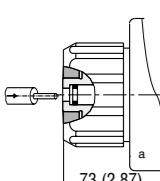
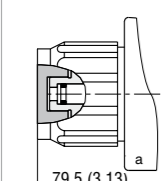
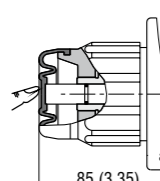
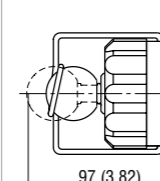
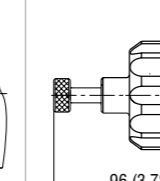
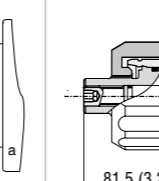
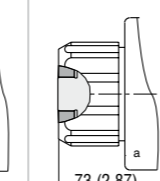
Spool Symbols

Type	Symbol	Interposition	Type	Symbol	Interposition	Type	Symbol	Interposition
Z11			R11			Z11		
C11			R21			X11		
H11			A51			C11		
P11			P51			H11		
Y11			X25			N11		
L21			Y51			F11		
B11			C51			J15		
Z21			Z51			J75		
F11			H51					
			F51					

Solenoid Coil for Wire Box in millimeters (inches)

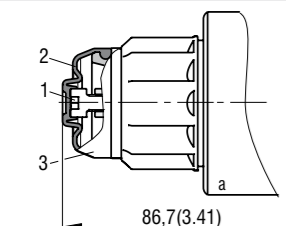
EW1 - Plug-In Coil	
EW2 - EW1 with quenching diode	
Protection degree IP65	

Manual Override in millimeters (inches)

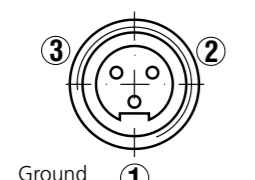
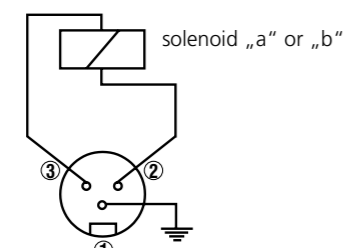
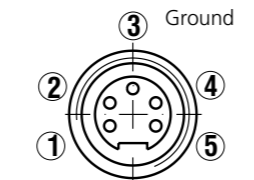
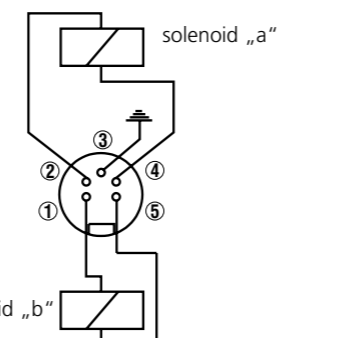
No designation - standard	Designation N1 - cap nut covered	Designation N2 - rubber boot protected	Designation N3 - detent assembly	Designation N4 - hand screw	Designation N5 - socket head screw, size 3	Designation N9 - without manual override
						
73 (2.87)	79.5 (3.13)	85 (3.35)	97 (3.82)	96 (3.78)	81.5 (3.21)	73 (2.87)

In case of solenoid malfunction or power failure, the spool of the valve can be shifted by manual override as long as the pressure in port T does not exceed 25 bar (363 PSI). For alternative manual overrides contact our technical support.

Spool Speed Control Orifice in millimeters (inches)

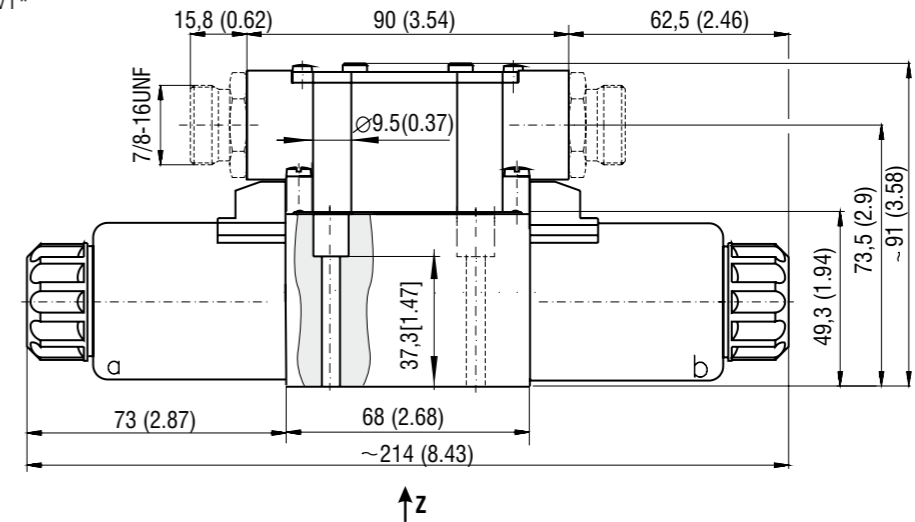
Designation T1	Important:
	<p>This directional valve provides the means to control spool soft shifting by an orifice situated in the solenoid armature. To ensure the proper function of the valve, unobstructed venting of the solenoid is required through the bleeding plug (1). The plugs are accessible after removing the rubber boot (2) from the solenoid cap nut (3).</p>
Switching time ON and OFF	300 ... 800 ms
The switching times shown are valid for viscosity $\nu = 32 \text{ mm}^2/\text{s}$ (156 SUS) and nominal voltage. They depend on working pressure and flow rate of the directional control valve.	

Connector - US - Standard - ANSI/B93.55M

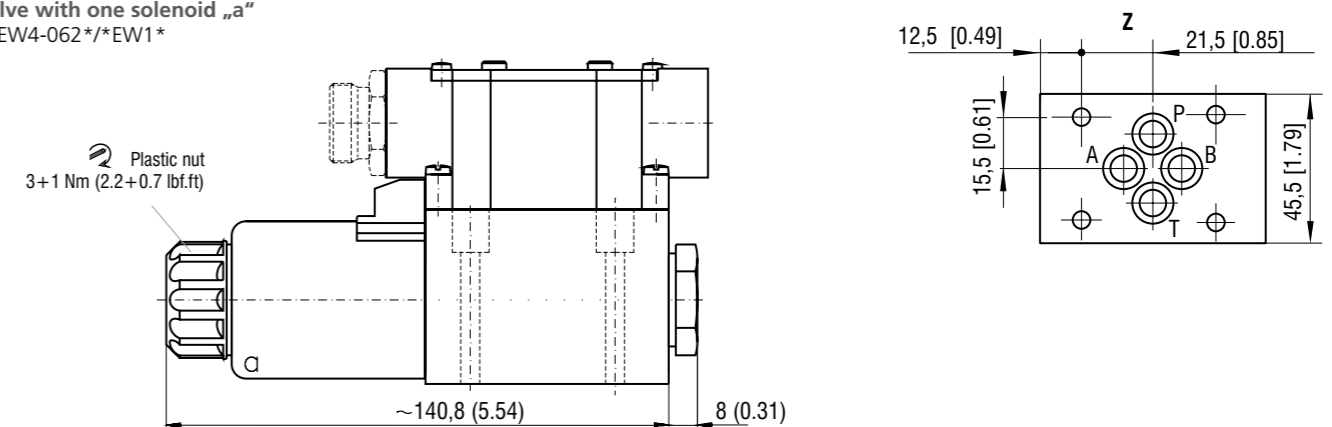
Pinout - 3-pin connector	Pinout - 5-pin connector
<p>1 - green 2 - black 3 - white</p>  <p>Ground ①</p> 	<p>1 - white 2 - red 3 - green 4 - orange 5 - black</p>  <p>Ground ③</p> 

Dimensions in millimeters (inches)

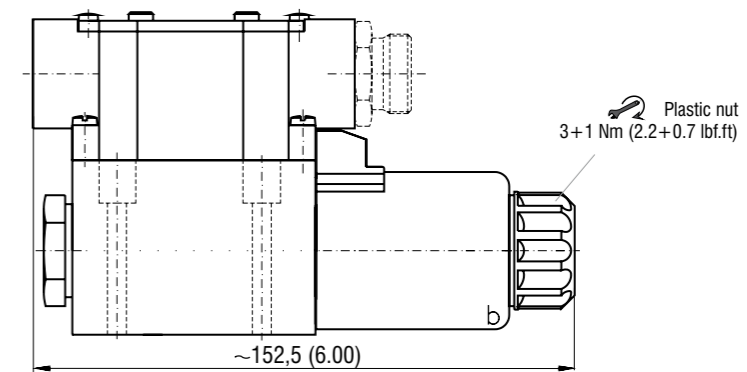
Valve with two solenoids
RPEW4-063*/*EW1*



Valve with one solenoid „a”
RPEW4-062*/*EW1*



Valve with one solenoid „b”
Spool symbols X11, Z11, C11, H11, N11, F11
RPEW4-062*/*EW1*



Mounting screws  8.9 Nm (7 lbf.ft)
M5 x 45 DIN 912-10.9

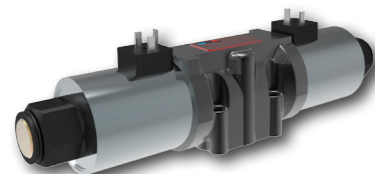
4/2 and 4/3 Directional Control Valve, Solenoid Operated

RPE4-10

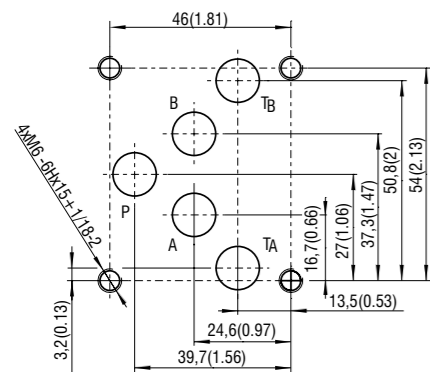
Size 10 (D05) • Q_{max} 140 l/min (37 GPM) • p_{max} 350 bar (5100 PSI)

Technical Features

- > Direct acting directional control valve with subplate mounting interface acc. to ISO 4401, DIN 24340 (CETOP 05)
- > High transmitted hydraulic power up to 350 bar with optimized design to minimize pressure drop
- > Five chamber housing design with reduced hydraulic power dependence on fluid viscosity
- > The valve is available with interchangeable DC solenoids, also for AC power supply using a built-in rectifier bridge
- > Wide range of solenoid electrical terminal versions available
- > Wide range of interchangeable spools and manual overrides available
- > CSA Certificate upon request
- > Inductive contactless Normally Open and Normally Closed spool position sensor option
- > Soft-shift spool speed control option
- > The coil is fastened to the core tube with a retaining nut and can be rotated by 360° to suit the available space.
- > In the standard version, the valve housing is phosphated and steel parts zinc-coated for 240 h salt spray protection acc. to ISO 9227
- > Enhanced surface protection for mobile sector available (ISO 9227, 520 h salt spray)



ISO 4401-05-04-0-05



Ports P, A, B, T - max Ø11.2 mm (0.44 in)

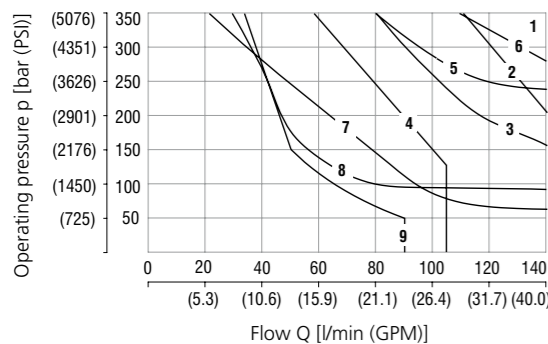
Technical Data

Valve size		10 (D05)	
Max. flow	l/min (GPM)	140 (37)	
Max. operating pressure at ports P, A, B	bar (PSI)	standard 350 (5080)	
Max. operating pressure at port T	bar (PSI)	210 (3050), 50 (730), for version S1, S4	
Fluid temperature range (NBR)	°C (°F)	-30 ... +80 (-22 ... +176)	
Fluid temperature range (FPM)	°C (°F)	-20 ... +80 (-4 ... +176)	
Ambient temperature range	°C (°F)	-30 ... +50 (-22 ... +122)	
Supply voltage tolerance	%	AC: ±10	DC: ±10
Max. switching frequency	1/h	15 000	
Switching time at $v=32$ mm ² /s (156 SUS)	ON	AC: 30 ... 40	DC: 30 ... 40
	OFF	AC: 30 ... 70	DC: 10 ... 50
Enclosure type acc. to EN 60529		IP65 / IP67 (see Dimensions, page 3)	
Mass	- valve with 1 solenoid	kg (lbs)	3.9 (8.60)
	- valve with 2 solenoids		5.4 (11.90)
Datasheet	Type		
General information		GI_0060	Products and operating conditions
Coil types / connectors		C_8007 / K_8008	C31* / K*
Mounting interface		SMT_0019	Size 10
Spare parts		SP_8010	

Characteristics measured at $v = 32$ mm²/s (156 SUS)

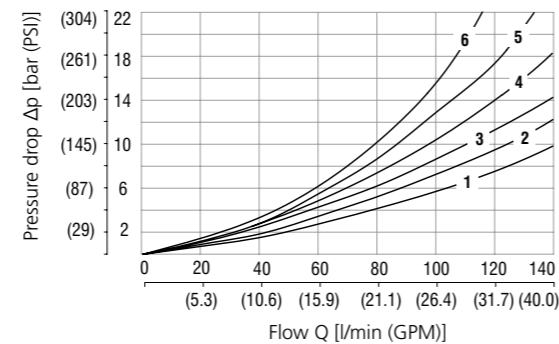
Operating limits

Operating limits for maximum hydraulic power at rated temperature and supply voltage equal to 90% nominal.



Z11, Z51, H11, H51, P11, P51	1	J15, J75	6
R11, X11, R21	2	L21	7
C11, C51	3	A51	8
B11, B51	4	C21	9
Y11, Y51	5		

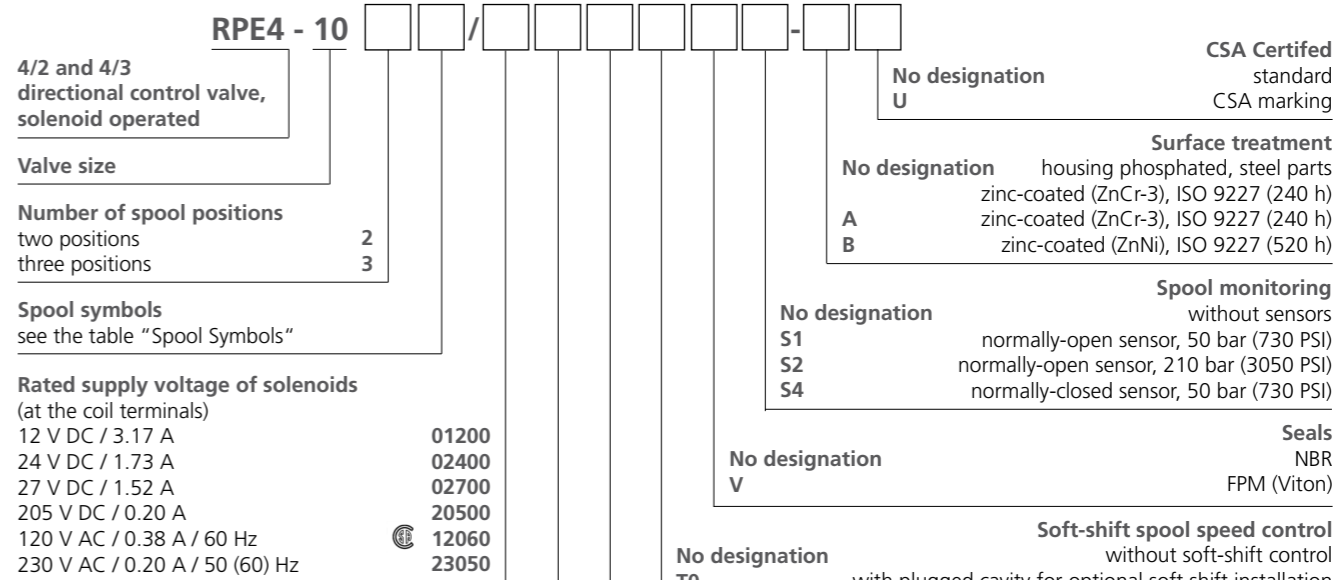
Pressure drop related to flow rate



	P-A	P-B	A-T	B-T	P-T		P-A	P-B	A-T	B-T	P-T	
Z11, P11, Y11, R11, X11, B11	1	1	2	2			C11	4	3	4	5	1
Z51, Y51, B51		1	2				C51	4		5	1	
H11	1	1	2	2	1		L21	1	1	1	2	2
H51		1	2		1		R21	1	1	1	3	
P51		1	2				J15	1	1	2	3	
J75, A51	1	1					C21	6	6	6	6	4

For operating limits under conditions and flow directions other than shown contact our technical support. Admissible operating limits may be considerably lower with only one direction of flow (A or B plugged, or without flow.)

Ordering Code



Connector

- For directional valves with two solenoids, one solenoid must be de-energized before the other solenoid can be charged.
- For AC voltage supply use coils with connector type E5.
- For other solenoid voltage supply options see data sheet C_8007.

Spool Symbols

Type	Symbol	Interposition	Type	Symbol	Interposition
Z11			P51		
C11			Y51		
H11			C51		
P11			Z51		
Y11			B51		
L21			H51		
B11			X11		
C21			C11		
R11			H11		
R21			J15		
A51			J75		

Type of Solenoid Coil in millimeters (inches)

E1, E2 Protection degree IP65	E3, E4 Protection degree IP65	E5 Protection degree IP65	E8, E9 Protection degree IP65	E12A, E13A Protection IP67 / 69K

The indicated IP protection level is only achieved if the connector is properly mounted.

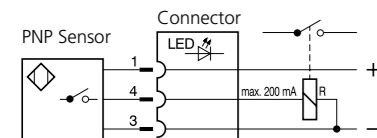
Manual Override in millimeters (inches)

No designation - standard	Designation N1 - cap nut covered	Designation N2 - rubber boot protected	Designation N4 - hand screw	Designation N5 - socket head screw size 3	Designation N9 - without manual override

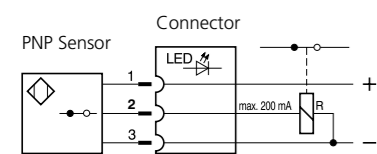
In case of solenoid malfunction or power failure, the spool of the valve can be shifted by manual override as long as the pressure in port T does not exceed 25 bar (363 PSI). For alternative manual overrides contact our technical support.

Spool Position Sensor

S1, S2 - Circuit diagram of the normally - OPEN sensor



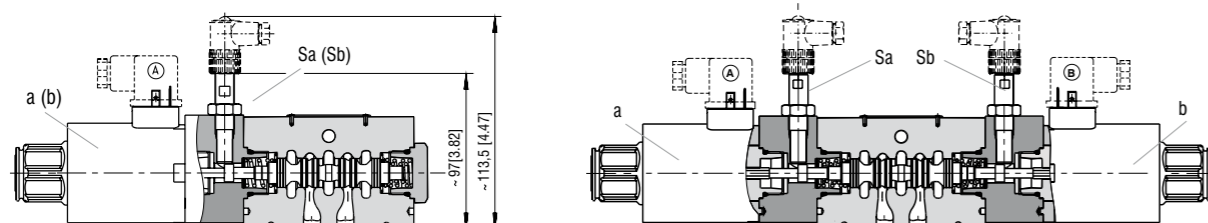
S4 - Circuit diagram of the normally - CLOSED sensor



Technical Data of the Sensor		S1, S4	S2
Rated power supply voltage	V	24 DC	
Power supply voltage range	V	10 ... 30 DC	
Rated current	mA	200	
Sensor enclosure protection (EN 60529)		IP67	
Max. operating pressure	bar (PSI)	50 (725)	210 (3046)
Switching frequency	Hz	1000	
Ambient temperature range	°C (°F)	-25 ... +80 (-13 ... +176)	
Technical Data of the Connector			
Power supply voltage range	V	10 ... 30 DC	
Ambient temperature range	°C (°F)	-25 ... +80 (-13 ... +176)	
Indicator		yellow LED	

Signal of solenoid ① ③	Two-Position Directional Control Valve			
	①a(b)	③Sa(Sb)	LED	
	S1, S2	S4	S1, S2	S4
0	1	0	ON	OFF
1	0	1	OFF	ON

Signal of solenoid ① ③	Three-Position Directional Control Valve					
	①a(b)	③Sa(Sb)	LED			
	a	b	Sa	Sb	Sa	Sb
0	0	1	1	0	0	0
1	0	0	1	1	0	0



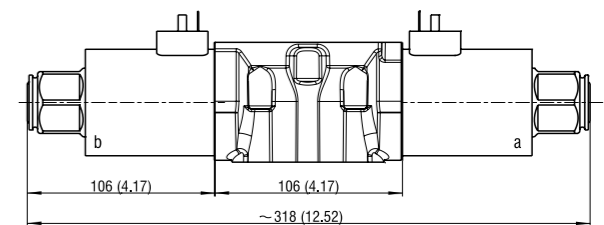
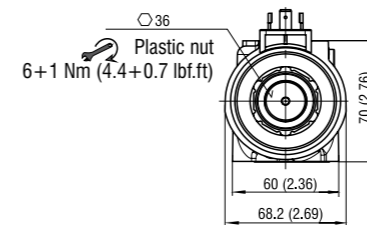
Spool Speed Control in millimeters (inches)

Designation T0 - Plug VSTI M10x1	Designation T2 - Orifice Ø 0.6 (0.02)	Designation T3 - Needle valve
Plugged cavity for optional soft-shift control devices installation (T2, T3)	Switching time ON and OFF	The orifice extends the valve shifting time. The needle valve allows continuous adjustment of the shifting time.
		120 ... 350 ms 30 ... 2000 ms

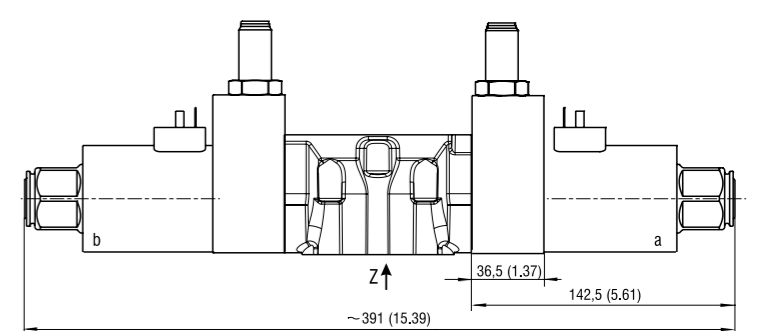
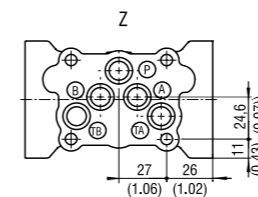
Dimensions in millimeters (inches)

Valve with two solenoids

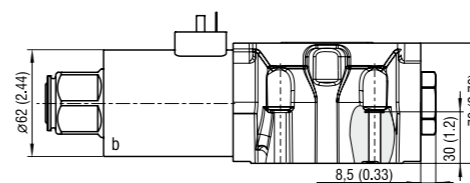
RPE4-103*/E1



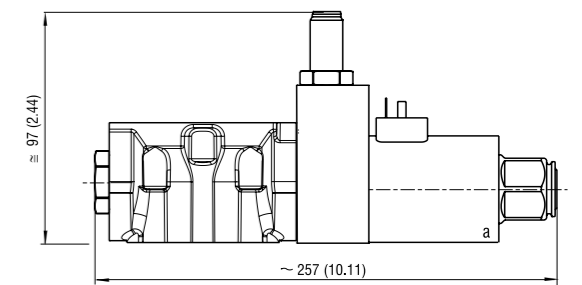
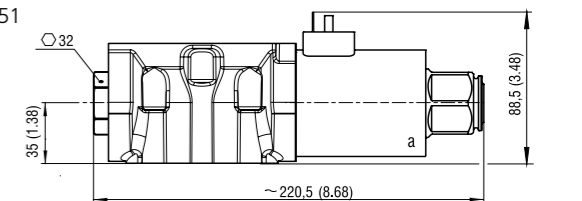
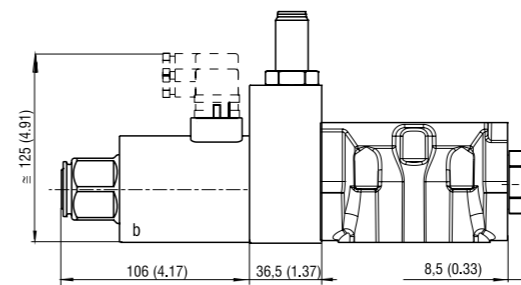
RPE4-103*/E1*S



Valve with one solenoid „b“
Spool symbols X11, C11, H11



RPE4-102*/E1*S

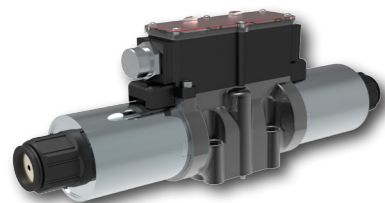


Mounting screws 14 Nm (10.3 lbf.ft)
M6 x 40 DIN 912-10.9

4/2 and 4/3 Directional Control Valve, Solenoid Operated, Wire Box

RPEW4-10

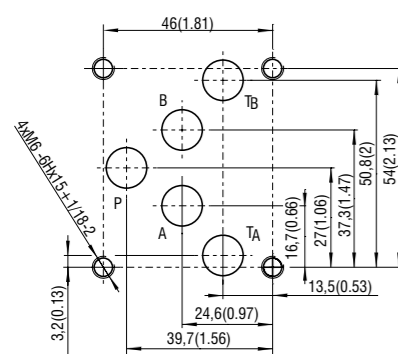
Size 10 (D05) • Q_{max} 140 l/min (37 GPM) • p_{max} 350 bar (5100 PSI)



Technical Features

- Direct acting directional control valve with subplate mounting surface acc. to ISO 4401, DIN 24340 (CETOP 05)
- High transmitted hydraulic power up to 350 bar with optimized design to minimize pressure drop
- Five chamber housing design with reduced hydraulic power dependence on fluid viscosity
- Wire box for solenoid electrical connection with cable gland [1/2" NPT]
- Optional 3-pin or 5-pin connector acc. to ANSI/B93.55M
- Type for AC power supply with a rectifier bridge built in the wire box
- Wide range of interchangeable spools and manual overrides available
- CSA Certificate upon request ☺
- Soft-shift spool speed control option
- Optional shift position indicators (raised arrows) installed on the terminal plate
- In the standard version, the valve housing is phosphated and steel parts zinc-coated for 240 h salt spray protection acc. to ISO 9227
- Enhanced surface protection for mobile sector available (ISO 9227, 520 h salt spray)

ISO 4401-05-04-0-05



Ports P, A, B, T - max Ø11.2 mm (0.44 in)

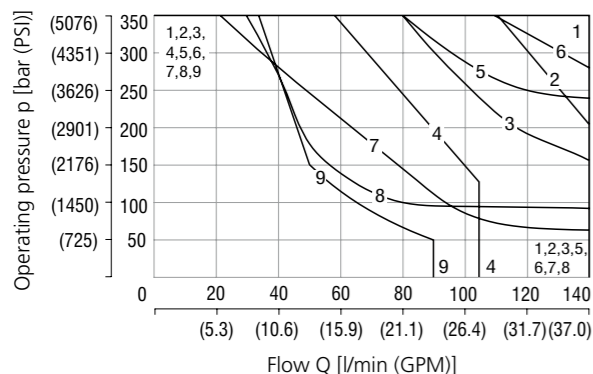
Technical Data

Valve size	10 (D05)	
Max. flow	140 (37)	
Max. operating pressure at ports P, A, B	350 (5080)	
Max. operating pressure at port T	210 (3050)	
Fluid temperature range (NBR)	-30 ... +80 (-22 ... +176)	
Fluid temperature range (FPM)	-20 ... +80 (-4 ... +176)	
Ambient temperature range	-30 ... +50 (-22 ... +122)	
Supply voltage tolerance	AC: ±10	DC: ±10
Max. switching frequency	1/5000	
Enclosure type acc. to EN 60529	IP65	
Switching time at v=32 mm ² /s (156 SUS)	ON	DC: 50 ... 120
	OFF	DC: 30 ... 90
Mass	3.9 (8.6)	
- valve with 1 solenoid	5.4 (11.9)	
- valve with 2 solenoids		
	Datasheet Type	
General information	GI_0060 Products and operating conditions	
Coil types	C_8007 C31K*	
Mounting interface	SMT_0019 Size 10	
Spare parts	SP_8010	

Characteristics measured at v = 32 mm²/s (156 SUS)

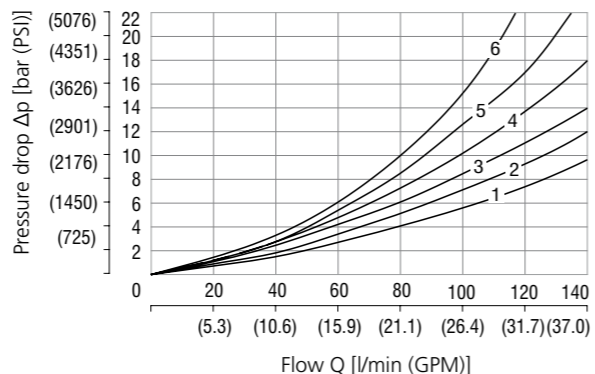
Operating limits

Operating limits for maximum hydraulic power at rated temperature and supply voltage equal to 90% nominal.



1	Z11	5	Y51	7	L21
1	Z51	3	C11	2	R21
1	H11	3	C51	6	J15
1	H51	2	R11	6	J75
1	P11	2	X11	8	A51
1	P51	4	B11	9	C21
5	Y11	4	B51		

Pressure drop related to flow rate



	P-A	P-B	A-T	B-T	P-T		P-A	P-B	A-T	B-T	P-T	
Z11,P11,Y11, R11,X11,B11	1	1	2	2			C11	4	3	4	5	1
Z51,P51,Y51, B51		1	2				C21	6	6	6	6	4
R21	1	1	1	3			C51	4			5	1
J15	1	2	2	3			L21	1	1	1	2	2
J75,A51	1	1					H11	1	1	2	2	1
H51		1	2		1							

For operating limits under conditions and flow directions other than shown contact our technical support. Admissible operating limits may be considerably lower with only one direction of flow (A or B plugged, or without flow.)

Ordering Code

4/2 and 4/3 directional control valve, solenoid operated, wire box

RPEW4 - 10 / / / / / / / - /

- Valve size**: 10
- Number of valve positions**:
 - two positions: 2
 - three positions: 3
- Spool symbols**: see the table "Spool Symbols"
- Rated supply voltage of solenoids (at the wire box terminal)**:
 - 12 V DC / 3.17 A: 01200
 - 24 V DC / 1.73 A: 02400
 - 120 coil V AC / 0.38 A / 60 Hz*: 12060 (☺)
- Connector for wire box**:
 - DC solenoid (DC-rectified): EW1
 - DC solenoid with quenching diode: EW2
- Wire box power supply**:
 - DC power supply: K
 - AC power supply (rectifier in wire box): R

CSA Certified standard CSA marking
No designation U

Surface treatment
No designation: housing phosphated, steel parts zinc-coated (ZnCr-3), ISO 9227 (240 h)
A: zinc-coated (ZnCr-3), ISO 9227 (240 h)
B: zinc-coated (ZnNi), ISO 9227 (520 h)

Seals
No designation: NBR
V: FPM (Viton)

Soft-shift spool speed control
No designation: without soft-shift control
T0: with plugged cavity for optional soft shift installation
T2: orifice Ø0.6 mm (0.02 inch) in T line bridge
T3: adjustable needle valve in T line bridge

Manual override
No designation: standard
N1: cap nut covered
N2: rubber boot protected
N4: hand screw
N5: socket head screw
N9: without manual override

Wire box version, supply connector

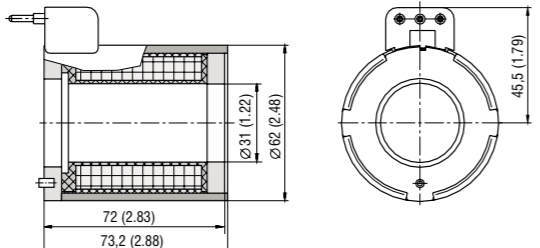
without connector, 1/2 NPT thread at both ends (either side can be used for wiring, remove cover-plug accordingly)	50
50 with LED (B side plugged, A side with feed-through plug)	51
3-pin connector (ANSI/B93.55M) mounted on A-side (B-side plugged, only for single solenoid valves)	52
3-pin connector (ANSI/B93.55M) mounted on B-side (A-side plugged, only for single solenoid valves)	53
52 with LED	54
53 with LED	55
5-pin connector (ANSI/B93.55M) mounted on A-side (B-side plugged, only for double solenoid valves)	56
5-pin connector (ANSI/B93.55M) mounted on B-side (A-side plugged, only for double solenoid valves)	57
56 with LED	58
57 with LED	59

- For directional valves with two solenoids, one solenoid must be de-energized before the other solenoid can be charged.
- The port restrictor plugs can be ordered separately from the spare parts data sheet.
- Mounting bolts M6 x 40 DIN 912-10.9 or studs must be ordered separately. Tightening torque is 14 Nm (10.3 lbf.ft).
- Besides the shown, commonly used valve versions other special models are available. Contact our technical support for their identification, feasibility and operating limits.

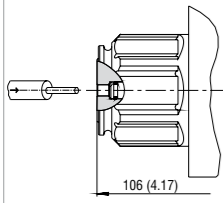
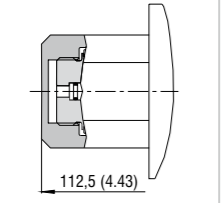
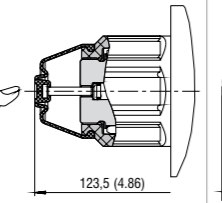
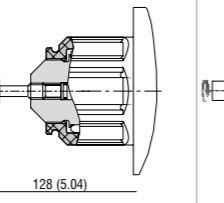
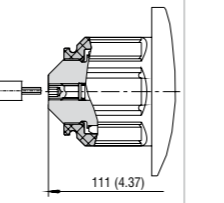
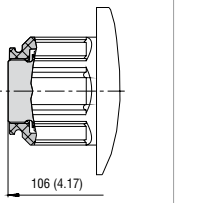
Spool Symbols

Type	Symbol	Interposition	Type	Symbol	Interposition
Z11			P51		
C11			Y51		
H11			C51		
P11			B51		
Y11			Z51		
L21			H51		
B11			X11		
C21			C11		
R11			H11		
R21			J15		
A51			J75		

Solenoid Coil for Wire box in millimeters (inches)

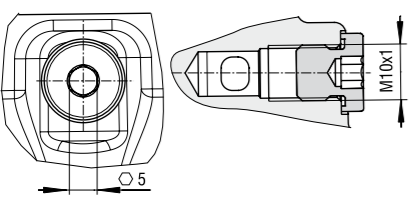
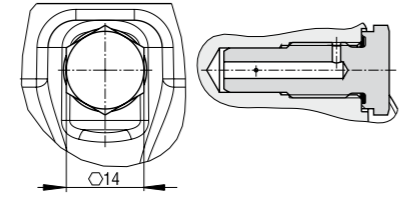
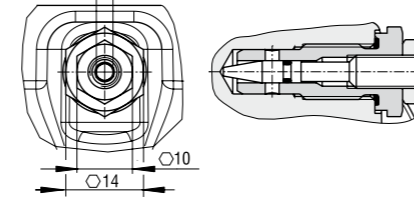
EW1 Protection degree IP65	
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Manual Override in millimeters (inches)

No designation - standard	Designation N1 - cap nut covered	Designation N2 - rubber boot protected	Designation N4 - hand screw	Designation N5 - socket head screw, size 3	Designation N9 - without manual override
					
106 (4.17)	112,5 (4.43)	123,5 (4.86)	128 (5.04)	111 (4.37)	106 (4.17)

In case of solenoid malfunction or power failure, the spool of the valve can be shifted by manual override as long as the pressure in port T does not exceed 25 bar (363 PSI). For alternative manual overrides contact our technical support.

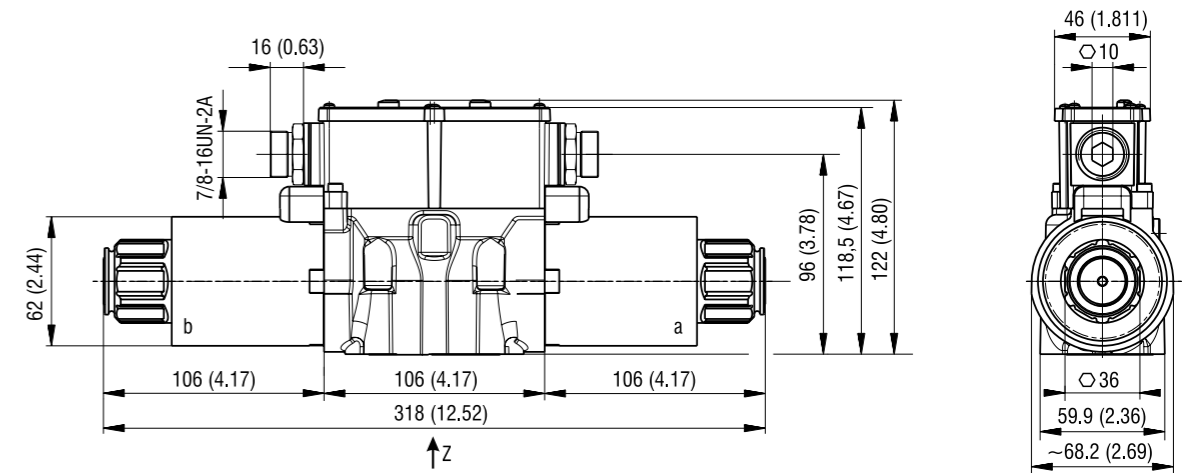
Spool Speed Control in millimeters (inches)

Designation T0 - Plug VST1 M10x1	Designation T2 - Orifice \varnothing 0.6 (0.02)	Designation T3 - Needle valve
		
Plugged cavity for optional soft-shift control devices installation (T2, T3)	Switching time ON and OFF	The orifice extends the valve shifting time.
	120 ... 350 ms	The needle valve allows continuous adjustment of the shifting time.
		30 ... 2000 ms

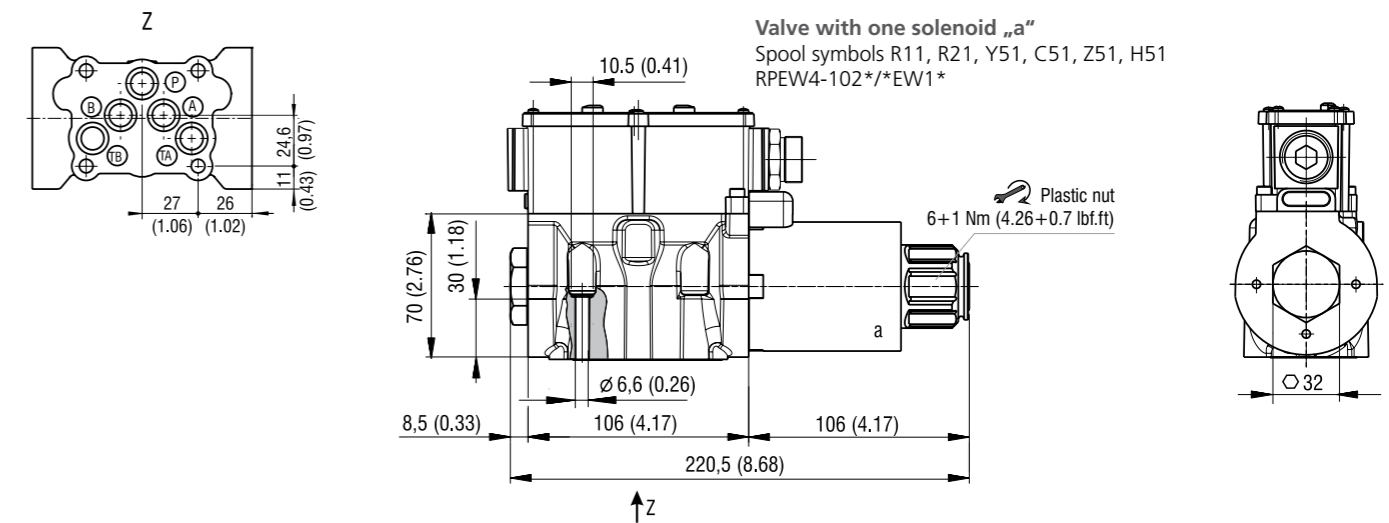
The switching times shown are valid for viscosity $\nu = 32 \text{ mm}^2/\text{s}$ (156 SUS) and nominal voltage. They depend on working pressure and flow rate of the directional control valve.

Dimensions in millimeters (inches)

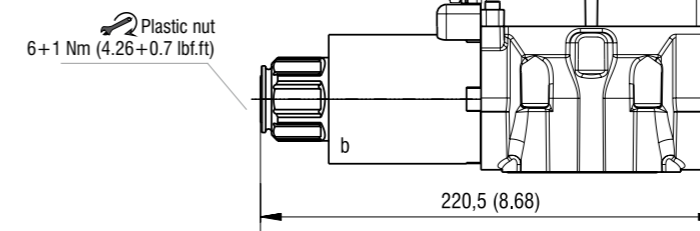
Valve with two solenoids
RPEW4-103*/*EW1*



Valve with one solenoid „a“
Spool symbols R11, R21, Y51, C51, Z51, H51
RPEW4-102*/*EW1*



Valve with one solenoid „b“
Spool symbols C11, H11
RPEW4-102*/*EW1*

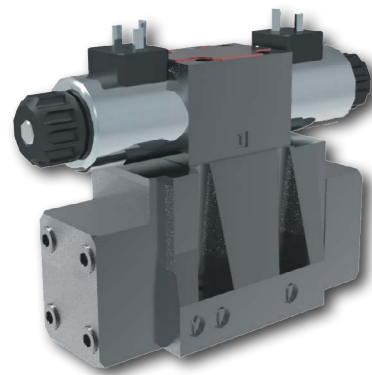


Mounting screws  14 Nm (10.3 lbf.ft)
M6 x 40 DIN 912-10.9

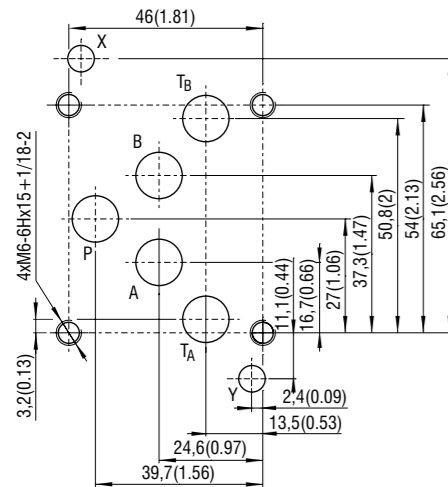
4/2 and 4/3 Directional Control Valve, Pilot Operated

RNEH1-10

Size 10 (D05) • Q_{max} 150 l/min (40 GPM) • p_{max} 320 bar (4600 PSI) / 420 bar (6100 PSI)

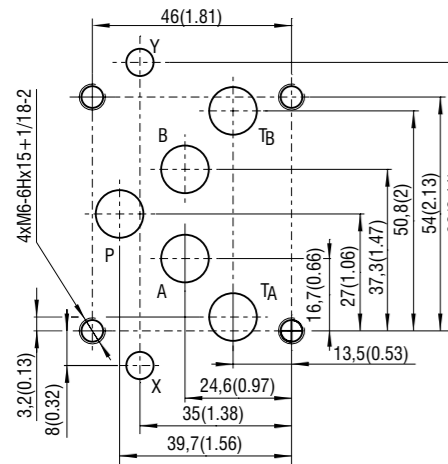


CETOP 4.2-4 P05-320 STANDARD PATTERN



Ports P, A, B, T - max. - Ø11.2 mm (0.44 in)
Ports X, Y - max. - Ø6.3 mm (0.25 in)

ISO 4401-05-05-005 CETOP 4.2-4 R05-320



Ports P, A, B, T - max. - Ø11.2 mm (0.44 in)
Ports X, Y - max. - Ø6.3 mm (0.25 in)

Operating limits

Operating limits for maximum hydraulic power at rated temperature and supplied with voltage equal to 90% of the nominal value

Maximum flow rates in l/min (GPM)	at pressure	
	210 bar (3050 PSI)	320 bar (4640 PSI)
Spool type C11	500 (133)	450 (119)
All other spools	600 (159)	500 (133)

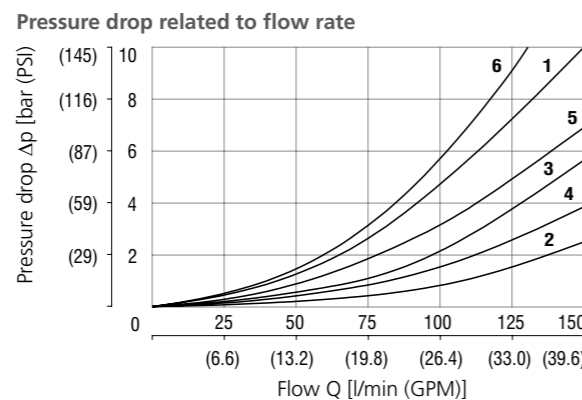
Technical Features

- Directional control valve internally or externally pilot operated with standard mounting interface CETOP 4.2-4 P05-320, optional interface acc. to ISO 4401-05-05-005
- Driven by an ISO 4401-03 (CETOP 03) solenoid operated directional valve (RNEH) or a hydraulic pilot operated directional valve (RNH)
- Electrohydraulic and hydraulic control ports X and Y
- Version for high pressures 420 bar (6090 PSI) available
- High transmitted hydraulic power, optimized design to minimize the pressure drop
- Flexibly changed from internal pilot or drain to external by inserting or removing threaded plugs in the main control valve body
- Wide range of interchangeable spools and valve controls available
- Soft-shift, spool speed, main stroke limiter control options
- In the standard version, the valve housing is phosphated and steel are parts zinc-coated for 240 h protection acc. to ISO 9227
- Enhanced surface protection for mobile sector for up to 520h salt spray acc to ISO 9227

Technical Data

Valve type		RN*1-10	RN*1H-10
Valve size		10 (D05)	
Max. flow	l/min (GPM)	150 (37)	
Max. operating pressure at port P, A, B	bar (PSI)	320 (4640)	420 (6090)
	- at port T (external drain)	210 (3050)	350 (5080)
- at port T (internal drain)		210 (3050)	
Minimum pilot pressure	bar (PSI)	12 (174)	
Maximum pilot pressure	bar (PSI)	210 (3050)*	350 (5080)*
Fluid temperature range (NBR)	°C (°F)	-30 ... +80 (-22 ... +176)	
Fluid temperature range (FPM)	°C (°F)	-20 ... +80 (-4 ... +176)	
Ambient temperature range	°C (°F)	-30 ... +50 (-22 ... +122)	
Supply voltage tolerance	%	AC: ±10	DC: ±10
Max. switching frequency	1/h	10 000	
Enclosure type acc. to EN 60529		IP 65	
Switching time at v=32 mm ² /s (156 SUS)	ON	AC: 45 ... 60	DC: 55 ... 75
	OFF	AC: 60 ... 90	DC: 60 ... 90
Weight	RNH1-10	4.6 (10.1)	
	RNEH1-102	6.4 (14.1)	
	RNEH1-103	7 (15.4)	
Data Sheet		Type	
General information	GI_0060	products and operating conditions	
Mounting interface	SMT_0019	Size 10	
Spare parts	SP_8010		

Characteristics measured at v = 32 mm²/s (156 SUS)



Spool position	P-A	P-B	A-T	B-T	P-T	Spool position	P-A	P-B	A-T	B-T	P-T
Z11 Energized	1	1	2	3		J17, J27	1	1	4	3	
H11 De-energized					6*	R51, R52, X51, X52	1			3	
H11 Energized	5	5	2	4			1	4			
Y11 De-energized			1**	1***							6***
Y11 Energized	1	1	2	4		P11	6	6	3	5	
C11 De-energized					6						
C11 Energized	6	6	3	5							

*A-B blocked **B blocked ***A blocked

Ordering Code

4/2 and 4/3 directional control valve, internally and externally pilot operated

Type of control: electrohydraulically operated (EH), hydraulically operated (H)

Design series: standard 320 bar (1), high pressure 420 bar (1H) (not available for C11 spools)

Valve size and connecting pattern: Standard pattern (10), Pattern ISO 4401-05-05-0-05 (10R)

Number of spool positions: two positions (2), three positions (3)

Spool symbols: see the table spool symbols

Control Options: without additional features (No designation), main spool stroke limiter (C), main spool shifting speed control (D), shifting speed control, with orifice (0.8 mm) in port P of solenoid pilot valve (PF)

Piloting: internal (No designation), not available for spools 3H11, 3C11, 2R52, 2X52, 2J27, internal with installed pressure reducing valve, fixed 30 bar setting (Z), external (E)

Surface treatment: No designation (phosphated body, steel parts for 240h salt spray test (ISO 9227)), B (520 h salt spray test (ISO 9227))

Seals: No designation (NBR), V (FPM (Viton))

Manual override (only for RNEH): No designation (Standard), N1 (protected with retaining nut), N2 (protected with rubber boot)

Solenoid electrical terminals: E1 (EN 175301-803-A), E2 (E1 with quenching diode), E5 (EN 1745301-803-A with integrated rectifier)

Rated supply voltage of solenoids (at the coil terminal): 01200 (12 V DC / 2,72 A), 02400 (24 V DC / 1,29 A), 12060 (120 V AC / 0,35 A / 50 (60) Hz), 23050 (230 V AC / 0,17 A / 50 (60) Hz)

see data sheet RPE3-06 (4010) for other pilot valve options

Drain: No designation (I), external, internal

Installation note:

- Piloting must always be external for all types RNH and for types RNEH with spools H11, C11, R52, X52, J27.
- For directional valves with two solenoids, one solenoid must be without supply voltage charge before the other solenoid can be charged.
- The AC coils correspond to E5 Solenoid electrical terminal.
- Other voltage of solenoids see data sheet HA 8007
- The solenoid operated valves are delivered without connectors.
- Connectors are not supplied. For connectors versions see data sheet HA 8008.
- Configurations with centering and recall springs can be mounted in any position; type J17, J27 valves - without springs and with mechanical retention must be mounted with the longitudinal axis horizontal.
- Other special versions are available. Consult our technical department.

Spool Symbols

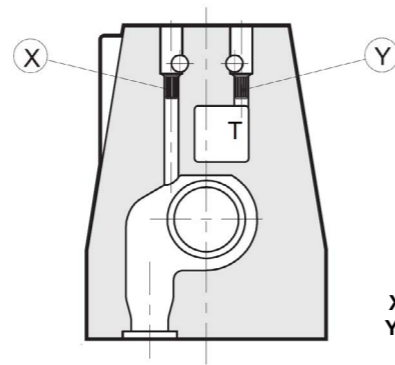
	Three positions with centering spring		Two positions with return spring	
Z11			R51	
H11			R52	
Y11			X51	
C11			X52	
P11			Two positions with mechanical detent on pilot valve	
			J17	
			J27	

Symbols are referred to the solenoid valve RNEH. For the hydraulic control version RNH please see the connection schematic (see page 3)

Pilot and Drain

The RNEH valves are available with pilot and drain, both internal and external. The version with external drain allows for a higher back pressure on the outlet.

Type of valve		Plug assembly	
		X	Y
RNEH1-10**/*	internal pilot and external drain	NO	YES
RNEH1-10**/*I	internal pilot and internal drain	NO	NO
RNEH1-10**/*E	external pilot and external drain	YES	YES
RNEH1-10**/*EI	external pilot and internal drain	YES	NO



X: plug M5x6 for external pilot
Y: plug M5x6 for external drain

Electrical Features

Solenoids

The operating solenoids are DC solenoids. For AC supply, the solenoids are provided with a rectifier integrated in the DIN connector socket as part of the solenoid. The connectors can be turned by 90°. By loosening the nut, the solenoids can be turned or replaced without interfering with any seals of the valve. In case of a solenoid malfunction or power failure, the spool of the valve can be shifted by manual override, provided the pressure in port T does not exceed 25 bar.

For detail information on the pilot valve RPE3-06 refer to data sheet No. 4010.

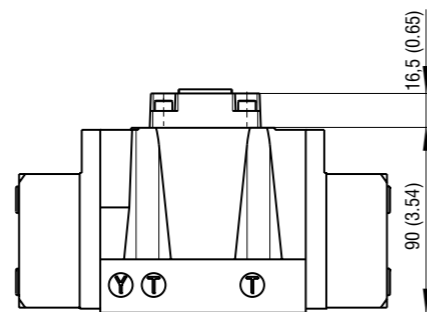
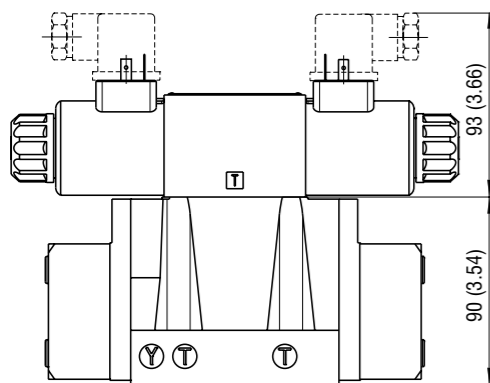
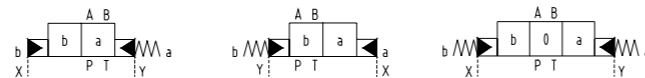
Actuation in millimeters (inches)

Solenoid control: RNEH

The valve is supplied with an RPE3-06 pilot solenoid valve.

Hydraulic control: RNH

The valve is supplied with a cross-connection cover plate. X and Y connections are used for the hydraulic control of the valve.



The minimum piloting pressure can be as low as 5 bar at low flow rates, but with higher flow rates a pressure of 12 bar is needed.

If the valve operates with higher pressures it is necessary to use the version with external pilot and reduced pilot pressure. Otherwise, the valve with internal pilot and a pressure reducing valve with a 30 bar fixed setting can be ordered.

Control Options - Special Features

Control of the main spool shifting speed: D

By placing a 2VS3-06 flow control valve between the pilot solenoid valve and the hydropiloted valve, the pilot flow rate can be controlled and therefore the shifting speed adjusted. Add the letter D to the identification code to request this device.

Pilot pressure reducing valve - 30 bar fixed setting: Z

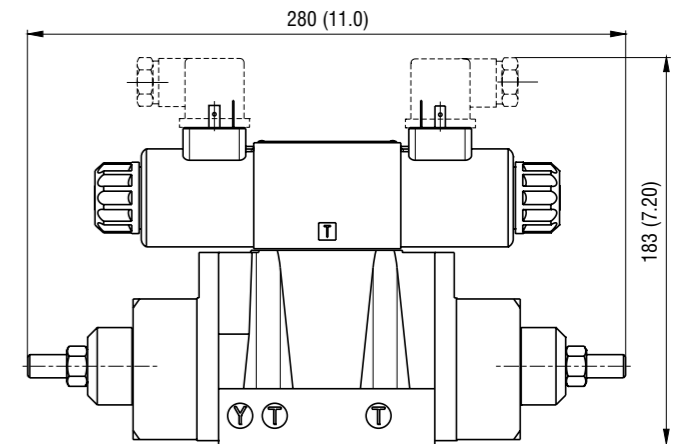
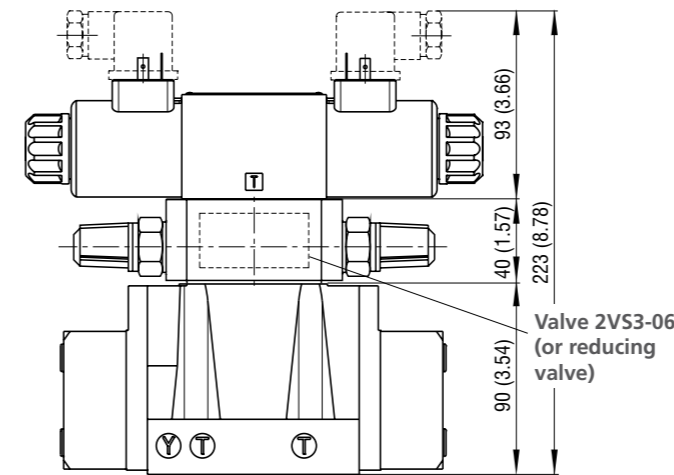
Internal piloting with mounted pressure reducing valve with 30 bar fixed setting. The option Z may be used together with option D.

Control of the main spool stroke: C

Using special side plugs, it is possible to introduce stroke control the piloted valve so as to vary the maximum spool opening clearance. This solution allows the control of the flow rate from the pump to the actuator and from the actuator to the outlet, resulting in double adjustable control of the actuator. Add the letter C to the identification code to request this device.

Shifting speed control: PF

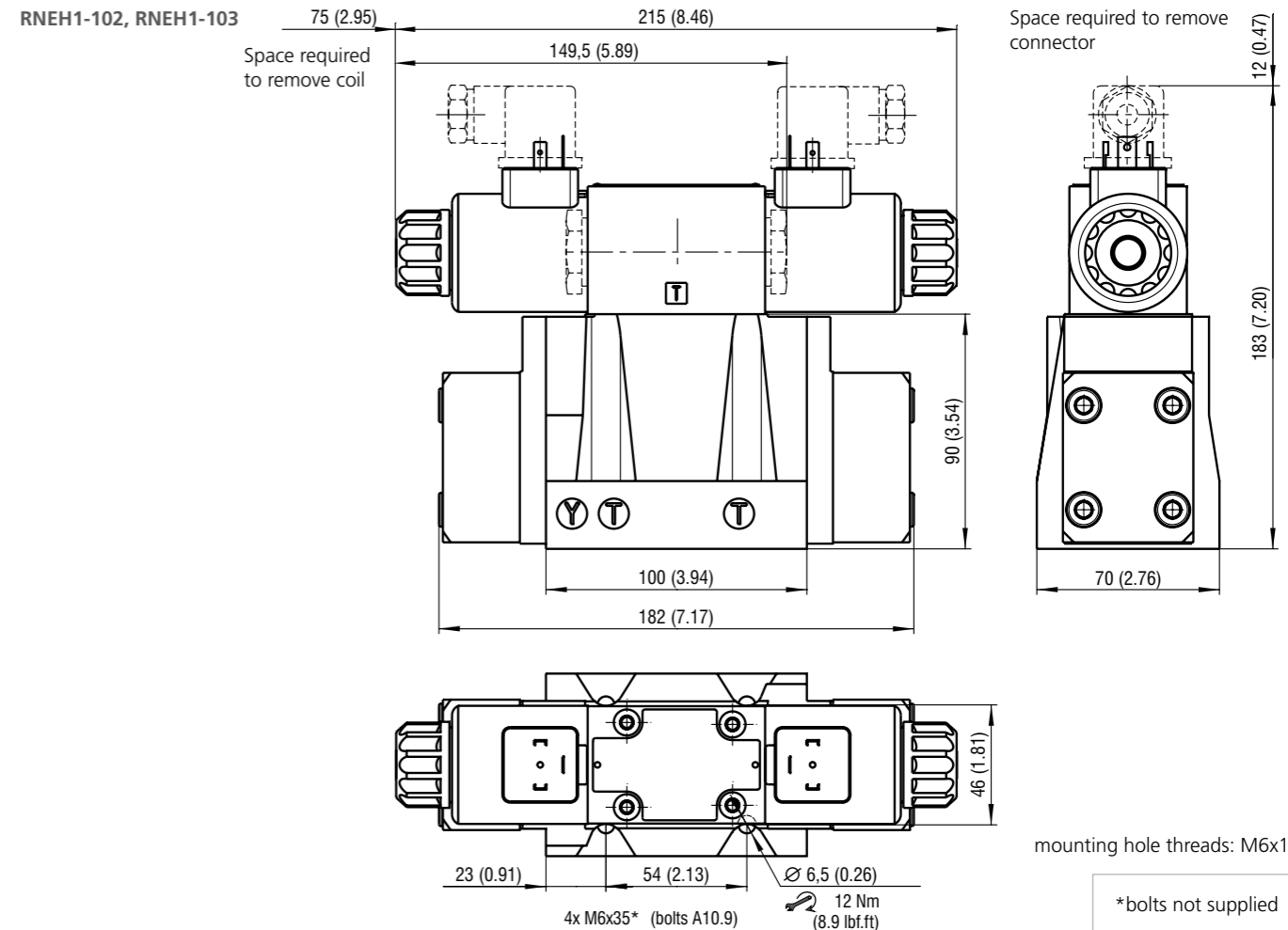
with an orifice (0.8 mm) in port P of the solenoid pilot valve. Add PF to the identification code to request this device



Solenoid operated distributor with pilot valve in the configuration 3H11

It is possible to deliver the solenoid operated distributor with the pilot valve in configuration 3H11 (all the ports at the outlet). This configuration is used with external piloting in order to allow the unloading of the piloting line when the solenoid operated valve is in the rest position. With this option, the piloting is necessarily external.

Dimensions in millimeters (inches)



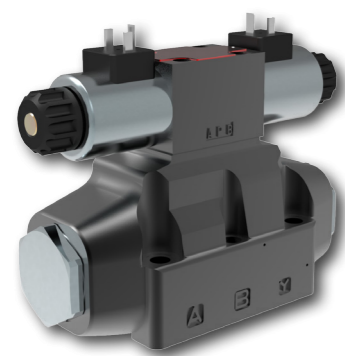
mounting hole threads: M6x10

*bolts not supplied

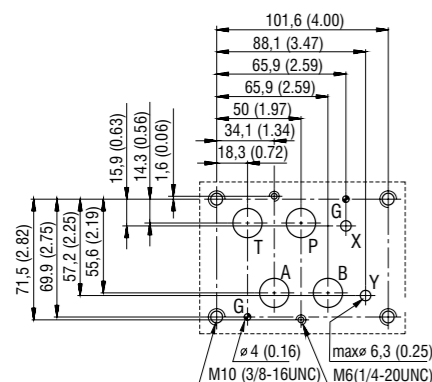
4/2 and 4/3 Directional Control Valve, Pilot Operated

RNEH5-16

Size 16 (D07) • Q_{max} 300 l/min (80 GPM) • p_{max} 350 bar (5100 PSI) / 420 bar (6100 PSI)



ISO 4401-07-07-0-05



Ports P, A, B, T max Ø 17.5 mm (0.69 in)

Technical Features

- Directional control valve, internally or externally pilot operated with mounting interface acc. to ISO 4401, DIN 24340 (CETOP 07)
- Driven by an ISO 4401-03 (CETOP 03) solenoid operated directional valve (RNEH) or a hydraulic pilot operated directional valve (RNH) without pilot valve
- Electrohydraulic and hydraulic control ports X and Y
- Version for high pressures 420 bar (6090 PSI) available
- High transmitted hydraulic power, optimized design to minimize the pressure drop
- Flexibly changed from internal pilot or drain to external by inserting or removing threaded plugs in the main control valve body
- Wide range of interchangeable spools and valve controls available
- Soft-shift, spool speed, main stroke limiter control options
- In the standard version, the valve housing is phosphated and steel are parts zinc-coated for 240 h protection acc. to ISO 9227
- Enhanced surface protection for mobile sector for up to 520 h salt spray acc to ISO 9227 available

Technical Data

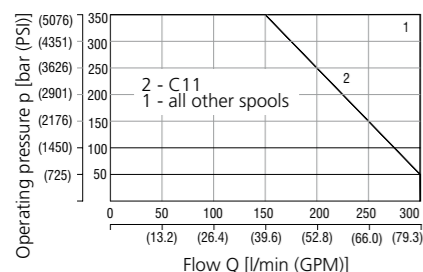
Valve type		RN*5-16	RN*5H-16
Valve size		16 (D07)	
Max. flow	l/min (GPM)	300 (80)	
Max. operating pressure at port P, A, B	bar (PSI)	350 (5080)	420 (6090)
- at port T (external drain)		210 (3050)	350 (5080)
- at port T (internal drain)		210 (3050)	
Minimum pilot pressure	bar (PSI)	12 (174)	
Maximum pilot pressure	bar (PSI)	210 (3050)*	350 (5080)*
Fluid temperature range (NBR)	°C (°F)	-30 ... +80 (-22 ... +176)	
Fluid temperature range (FPM)	°C (°F)	-20 ... +80 (-4 ... +176)	
Ambient temperature range	°C (°F)	-30 ... +50 (-22 ... +122)	
Supply voltage tolerance	%	AC: ±10	DC: ±10
Max. switching frequency	1/h	10 000	
Enclosure type acc. to EN 60529		IP 65	
Switching time	ms	AC: 60 ... 80**	DC: 50 ... 70**
at v=32 mm ² /s (156 SUS)		AC: 60 ... 80**	DC: 60 ... 80**
Mass	kg (lbs)	6.6 (14.6)	8.2 (18.1)
		RNEH5-16	RNEH5-162
		RNEH5-163	RNEH5-163
General information	Data Sheet	Type	
Mounting interface	GI_0060	Products and operating conditions	
Spare parts	SMT_0019	Size 16	
	SP_8010		

* For higher system pressure use option „Z“
** The values indicated refer to a solenoid valve working with a pilot pressure of 100 bar (mineral oil, temperature = 50°C, viscosity = 36 mm²/s, P - A and B - T connected). The energizing and de-energizing times are obtained at the pressure variation which occurs on the lines.

Characteristics measured at v = 32 mm²/s (156 SUS)

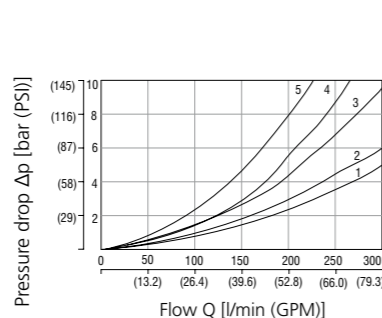
Operating limits

Operating limits for maximum hydraulic power at rated temperature and supplied with voltage equal to 90% of the nominal value



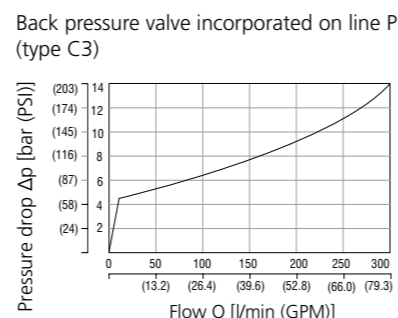
Pressures bar (PSI)	RNEH5 RNEH5H RNH5 RNH5H				
	Min.	Max.			
Pressure in P, A, B ports	350 (5100)	420 (6090)	350 (5100)	420 (6090)	
Piloting pressure (X port and / or Y port)	12 (175)	210 (3050)	350 (5100)	210 (3050)	350 (5100)
Pressure in T line with internal drainage	210 (3050)	210 (3050)	-	-	-
Pressure in T line with external drainage	210 (3050)	350 (5100)	210 (3050)	350 (5100)	

Pressure drop related to flow rate



Spool position	P-A	P-B	A-T	B-T	P-T
Z11	1	1	3	4	
H11	1	1	4	4	
Y11	1	1	4	4	2
C11	2	2	4	5	4
R11, R21	1	1	3	4	
X11, X21	1	1	4	4	
J15, J19	1	1	3	4	

Pressure drop related to flow rate



The curve refers to the pressure drop (body part only) with back pressure valve energized to which the pressure drop of the reference spool must be added.

Ordering Code

4/2 and 4/3 directional control valve, internally and externally pilot operated

Actuation
electrohydraulic EH
hydraulic H

Design series
standard 350 bar 5
high pressure 420 bar 5H
(not available for C11 spools)

Valve size
ISO 4401-07-07-0-05 (CETOP 07)

Number of valve positions
two positions 2
three positions 3

Spool symbols
see the table „Spool Symbols“

Control Options
without additional features No designation
main spool stroke limiter C
main spool shifting speed control D
shifting speed control, with orifice (0.8 mm) PF
in port P of solenoid pilot valve

Piloting
internal No designation
internal with installed pressure reducing valve, fixed 30 bar setting Z
external E

Surface treatment
No designation phosphated body, steel parts
B zinc-coated (ZnCr-3), ISO 9227 (240 h)
zinc-coated (ZnNi), ISO 9227 (520 h)

Seals
No designation NBR
V FPM (Viton)

Manual override (only for RNEH)
No designation standard
N1 protected with retaining nut
N2 protected with rubber boot

Solenoid electrical terminals
E1 EN 175301-803-A
E2 E1 with quenching diode
E5 EN 175301-803-A with integrated rectifier

Rated supply voltage of solenoids (at the coil terminal)
01200 12 V DC / 2.72 A
02400 24 V DC / 1.29 A
12060 120 V AC / 0.35 A / 50 (60) Hz
23050 230 V AC / 0.17 A / 50 (60) Hz

see data sheet RPE3-06 (4010) for other pilot valve options

Check valve incorporated in P-line
No designation if not required
C3 with back pressure check valve

Drain
No designation external
I recommended when the valve is used with back pressure on the outlet internal

Installation Note:

- It is necessary to ensure minimum pilot pressure, therefore either external piloting or option C3 (check valve in P port) must be used for spools which have connection between P and T ports (C11, H11, X21, R21, J19).
- Attention: spools J15, J19 may assume an undefined position without energy supply.
- For directional valves with two solenoids, one solenoid must be de-energized before the other solenoid can be energized.
- The AC coils correspond to E5 solenoid electrical terminal.
- For other solenoid voltages see data sheet HA 8007.
- The solenoid operated valves are delivered without connectors. For connectors see data sheet HA 8008.
- Configurations with centering and recall springs can be mounted in any position; J15, J19 valves - without springs or mechanical retention - must be mounted with the longitudinal axis in the horizontal.
- Other special versions are available. Consult our technical department.

Spool Symbols

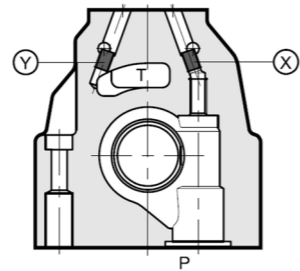
Three positions with centering spring		Two positions with return spring	
Z11		X11	
H11		X21	
Y11		R11	
C11		R21	
Z41		Two positions with mechanical detent on pilot valve	
Z22		J15	
		J19	

Symbols are referred to the solenoid valve RNEH. For the hydraulic control version RNH please see the connection schematic (see page 3)

Pilot and Drain

The RNEH valves are available with pilot and drain, both internal and external. The version with external drain allows for a higher back pressure on the outlet.

Type of valve	Plug assembly		
	X	Y	
RNEH5-16**/**	internal pilot and external drain	NO	YES
RNEH5-16**/**1	internal pilot and internal drain	NO	NO
RNEH5-16**/*E*	external pilot and external drain	YES	YES
RNEH5-16**/*EI	external pilot and internal drain	YES	NO



plug M6x8
X: for external pilot, Y: for external drain

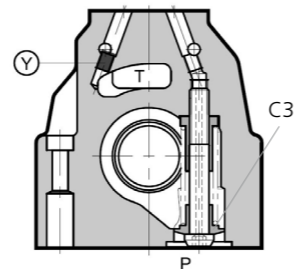
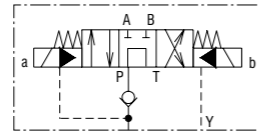
Check Valve Incorporated in Line P

Check valve incorporated in line P: C3

Valves RNEH are available with a back pressure valve incorporated on line P (Type „C3“). This is necessary to obtain the piloting pressure when the control valve (in the rest position) has the line P connected to the port T (spools H11, C11, X21, R21, J19). The cracking pressure is 5 bar with a minimum flow rate of 15 l/min.



In the C3 version the piloting is always internal. The back pressure valve can't be used as a check valve because it doesn't guarantee sealing.



pilot always internal

Y: plug M6x8 for external drain

The back pressure valve can be also delivered separately and it can be easily mounted on line P of the main control valve. Specify the code to order the back pressure valve separately from the spare part data sheet No. 8010.

Electrical Features

Solenoids

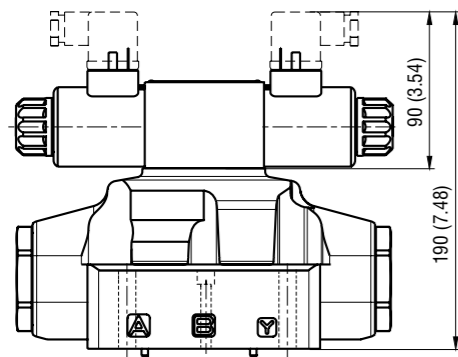
The operating solenoids are DC solenoids. For AC supply, the solenoids are provided with a rectifier integrated in the DIN connector socket as part of the solenoid. The connectors can be turned by 90°. By loosening the nut, the solenoids can be turned or replaced without interfering with any seals of the valve. In case of a solenoid malfunction or power failure, the spool of the valve can be shifted by manual override, provided the pressure in port T does not exceed 25 bar.

For detail information on the pilot valve RPE3-06 refer to data sheet No. 4010.

Actuation in millimeters (inches)

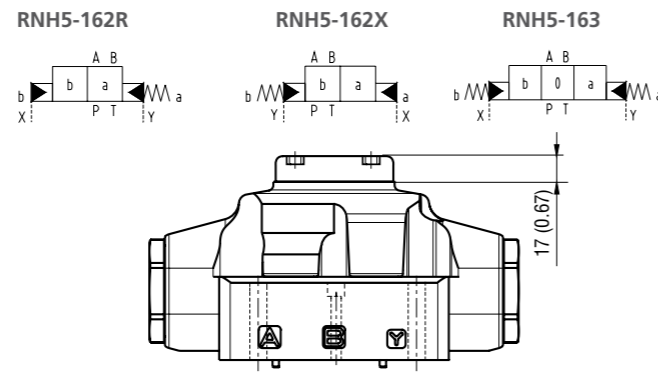
Solenoid control: RNEH

The valve is supplied with an RPE3-06 pilot solenoid valve.



Hydraulic control: RNH

The valve is supplied with a cross-connection cover plate. X and Y connections are used for the hydraulic control of the valve.



The minimum piloting pressure can be as low as 5 bar at low flow rates, but with higher flow rates a pressure of 12 bar is needed.

If the valve operates with higher pressures it is necessary to use the version with external pilot and reduced pilot pressure. Otherwise, the valve with internal pilot and a pressure reducing valve with a 30 bar fixed setting can be ordered.

Control Options - Special Features

Control of the main spool shifting speed: D

By placing a 2V53-06 flow control valve between the pilot solenoid valve and the hydro-piloted valve, the pilot flow rate can be controlled and therefore the shifting speed adjusted. Add the letter D to the identification code to request this device.

Pilot pressure reducing valve - 30 bar fixed setting: Z

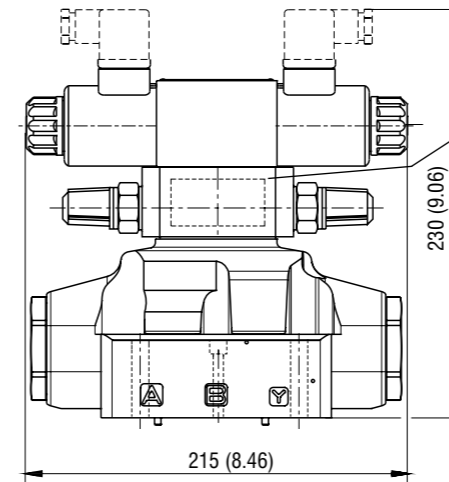
Internal piloting with mounted pressure reducing valve with 30 bar fixed setting. The option Z may be used together with option D.

Control of the main spool stroke: C

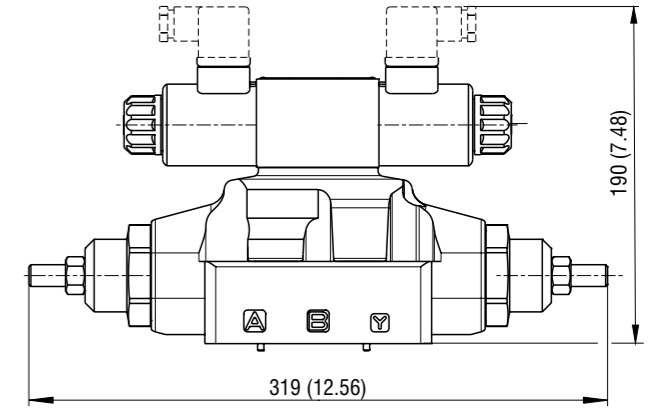
Using special side plugs, it is possible to introduce stroke control the piloted valve so as to vary the maximum spool opening clearance. This solution allows the control of the flow rate from the pump to the actuator and from the actuator to the outlet, resulting in double adjustable control of the actuator. Add the letter C to the identification code to request this device.

Shifting speed control: PF

with an orifice (0.8 mm) in port P of the solenoid pilot valve. Add PF to the identification code to request this device.



Valve 2V53-06 (or reducing valve)

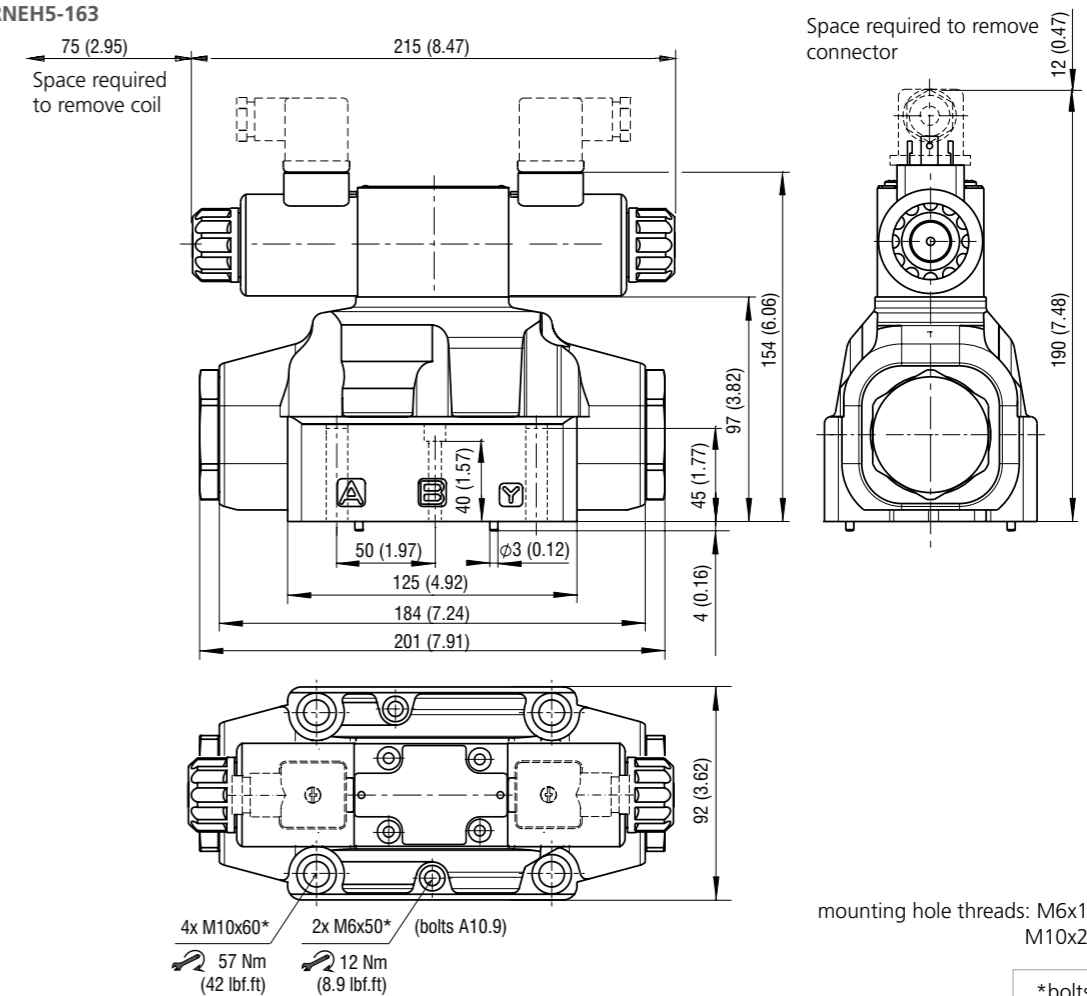


Solenoid operated distributor with pilot valve in the configuration 3H11

It is possible to deliver the solenoid operated distributor with the pilot valve in configuration 3H11 (all the ports at the outlet). This configuration is used with external piloting in order to allow the unloading of the piloting line when the solenoid operated valve is in the rest position. With this option, the piloting is necessarily external.

Dimensions in millimeters (inches)

RNEH5-162, RNEH5-163



4x M10x60* 2x M6x50* (bolts A10.9)
57 Nm (42 lbf.ft) 12 Nm (8.9 lbf.ft)

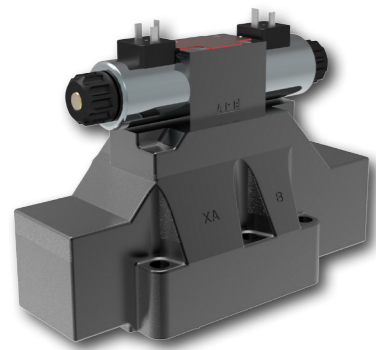
mounting hole threads: M6x12 (1/2-13 UNC)
M10x20 (1/2-13 UNC)

*bolts not supplied

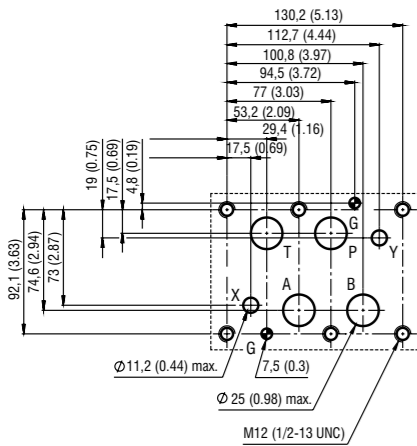
4/2 and 4/3 Directional Control Valve, Pilot Operated

RNEH4-25

Size 25 (D08) • Q_{max} 600 l/min (160 GPM) • p_{max} 320 bar (4600 PSI) / 420 bar (6100 PSI)



ISO 4401-08-08-0-05



Ports P, A, B, T max Ø25 mm (0.98 in)

Technical Features

- Directional control valve, internally or externally pilot operated with mounting interface acc. to ISO 4401, DIN 24340 (CETOP 08)
- Driven by an ISO 4401-03 (CETOP 03) solenoid operated directional valve (RNEH) or a hydraulic pilot operated directional valve (RNH)
- Electrohydraulic and hydraulic control ports X and Y
- Version for high pressures 420 bar (6090 PSI) available
- High transmitted hydraulic power, optimized design to minimize the pressure drop
- Flexibly changed from internal pilot or drain to external by inserting or removing threaded plugs in the main control valve body
- Wide range of interchangeable spools and valve controls available
- Soft-shift, spool speed, main stroke limiter control options
- In the standard version the valve body is phosphated and operating solenoids are zinc coated for 240 h corrosion protection in NSS acc. to ISO 9227
- Enhanced surface protection for mobile sector for up to 520h salt spray acc to ISO 9227

Technical Data

Valve type		RN*4-25	RN*4H-25
Valve size		25 (D08)	
Max. flow	l/min (GPM)	600 (159)	
Max. operating pressure at port P, A, B		320 (4640)	420 (6090)
- at port T (external drain)	bar (PSI)	210 (3050)	350 (5080)
- at port T (internal drain)		210 (3050)	
Minimum pilot pressure	bar (PSI)	12 (174)	
Maximum pilot pressure	bar (PSI)	210 (3050)*	350 (5080)*
Fluid temperature range (NBR)	°C (°F)	-30 ... +80 (-22 ... +176)	
Fluid temperature range (FPM)	°C (°F)	-20 ... +80 (-4 ... +176)	
Ambient temperature range	°C (°F)	-30 ... +50 (-22 ... +122)	
Supply voltage tolerance	%	AC: ±10	DC: ±10
Max. switching frequency	1/h	10 000	
Enclosure type acc. to EN 60529		IP 65	
Switching time at v=32 mm ² /s (156 SUS)	ON / OFF	ms	AC: 45 ... 60 / DC: 55 ... 75
Mass	RNH4-25	13.2 (29.1)	
	RNEH4-252	15 (33.1)	
	RNEH4-253	15.6 (34.4)	
	Data Sheet	Type	
General information	GI_0060	Products and operating conditions	
Mounting interface	SMT_0019	Size 25	
Spare parts	SP_8010		

*For higher system pressure use option „Z“.

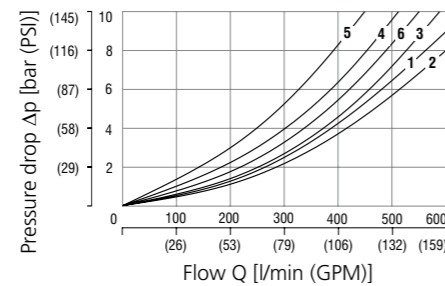
Characteristics measured at v = 32 mm²/s (156 SUS)

Operating limits

Operating limits for maximum hydraulic power at rated temperature and supplied with voltage equal to 90% of the nominal value

Maximum flow rates in l/min (GPM)	at pressure	
	210 bar (3050 PSI)	320 bar (4640 PSI)
Spool type C11	500 (133)	450 (119)
All other spools	600 (159)	500 (133)

Pressure drop related to flow rate

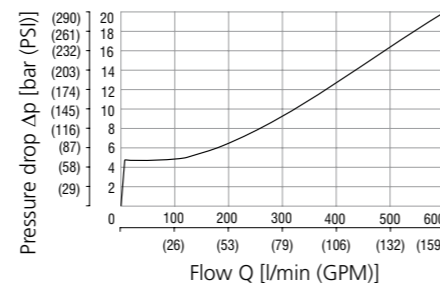


	Spool position	P-A	P-B	A-T	B-T	P-T
Z11, J17, J27	Energized	1	1	2	3	
	De-energized					6*
H11	Energized	5	5	1	2	
	De-energized			4**	4***	
Y11	Energized	1	1	1	2	
	De-energized					6
C11	Energized	6	6	3	4	
	De-energized			1	2	
R51, R52, X51, X52	De-energized			1	2	
	Energized	1	1	2	3	

* A-B blocked ** B blocked *** A blocked

Pressure drop related to flow rate

Back pressure valve incorporated on line P



The curve refers to the pressure drop (body part only) with back pressure valve energized to which the pressure drop of the reference spool must be added.

Ordering Code

4/2 and 4/3 directional control valve, internally and externally pilot operated

Actuation: electrohydraulic (EH), hydraulic (H)

Design series: standard 320 bar (4), high pressure 420 bar (4H)

Valve size: ISO 4401-08-08-0-05 (CETOP 08)

Number of valve positions: two positions (2), three positions (3)

Spool symbols: see the table „Spool Symbols“

Control Options: without additional features (No designation), main spool stroke limiter (C), main spool shifting speed control (D), shifting speed control, with orifice (0.8 mm) in port P of solenoid pilot valve (PF)

Piloting: internal (No designation), not available for spools 3H11, 3C11, 2X52, 2R52, 2J27, if internal pilot is required, choose „internal piloting with check valve C3“ (Z), internal with installed pressure reducing valve (Z), fixed 30 bar setting (E), external (E)

Surface treatment: standard (No designation), zinc-coated (ZnCr-3), ISO 9227 (240 h) (A), zinc-coated (ZnNi), ISO 9227 (520 h) (B)

Seals: NBR (No designation), FPM (Viton) (V)

Manual override (only for RNEH): standard (No designation), protected with retaining nut (N1), protected with rubber boot (N2)

Solenoid electrical terminals: EN 175301-803-A (E1), E1 with quenching diode (E2), EN 175301-803-A with integrated rectifier (E5)

Rated supply voltage of solenoids (at the coil terminal): 12 V DC / 2.72 A (01200), 24 V DC / 1.29 A (02400), 120 V AC / 0.35 A / 50 (60) Hz (12060), 230 V AC / 0.17 A / 50 (60) Hz (23050)

Check valve incorporated in P-line: none (No designation), with back pressure check valve (C3)

Drain: external (No designation), internal (I)

Installation Note:

- It is necessary to ensure minimum pilot pressure, that is why either external piloting or option C3 (check valve in P port) must be used for spools which have connection between P and T ports (H11, C11, R52, X52, J27). In this case, the valve must be externally drained.
- Attention: spools J17, J27 may assume an undefined position without energy supply.
- For directional valves with two solenoids, one solenoid must be de-energized before the other solenoid can be energized.
- The AC coils correspond to E5 solenoid electrical terminal.
- For other solenoid voltages see data sheet HA 8007.
- The solenoid operated valves are delivered without connectors. For connectors see data sheet HA 8008.
- Configurations with centering and recall springs can be mounted in any position; J17, J27 valves - without springs or mechanical retention - must be mounted with the longitudinal axis in the horizontal.
- Other special versions are available. Consult our technical department.

Spool Symbols

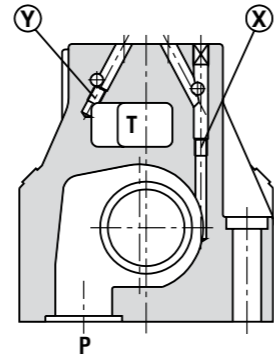
	Three positions with centering spring	Two positions with return spring	
Z11		R51	
H11		R52	
Y11		X51	
C11		X52	
P11		Two positions with mechanical detent on pilot valve	
		J17	
		J27	

Symbols are referred to the solenoid valve RNEH. For the hydraulic control version RPH please see the connection schematic (see page 3)

Pilot and Drain

The RNEH valves are available with pilot and drain, both internal and external. The version with external drain allows for a higher back pressure on the outlet.

Type of valve	Plug assembly		
	X	Y	
RNEH4-25**/**	internal pilot and external drain	NO	YES
RNEH4-25**/**	internal pilot and internal drain	NO	NO
RNEH4-25**/*E*	external pilot and external drain	YES	YES
RNEH4-25**/*EI	external pilot and internal drain	YES	NO

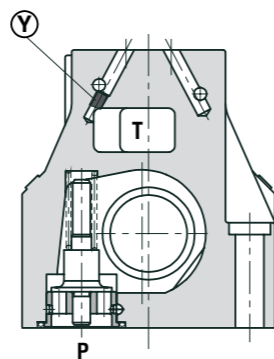
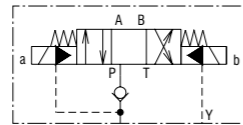


X: plug M6x8 for external pilot
Y: plug M6x8 for external drain

Check Valve incorporated in Line P

Valves RNEH are available with a back pressure valve incorporated on line P (Type „C3“). This is necessary to obtain the piloting pressure when the control valve (in the rest position) has the line P connected to the port T (spools H11, C11, R52, X52, J27). The cracking pressure is 5 bar with a minimum flow rate of 15 l/min.

Add „C3“ to the identification code for this request (see „Ordering Code“ section).



pilot always internal

Y: plug M6x8 for external drain



In the C3 version the piloting is always internal. The back pressure valve can't be used as a check valve because it doesn't guarantee sealing.

The back pressure valve can be also delivered separately and it can be easily mounted on line P of the main control valve. Specify the code to order the back pressure valve separately from the spare part data sheet No. 8010.

Electrical Features

Solenoids

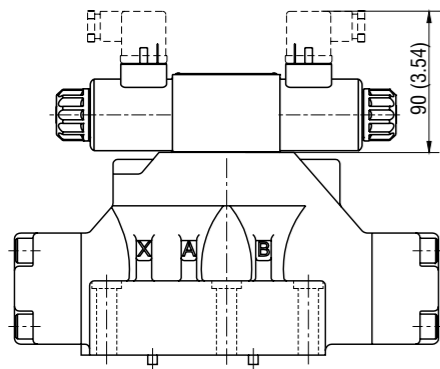
The operating solenoids are DC solenoids. For AC supply, the solenoids are provided with a rectifier integrated in the DIN connector socket as part of the solenoid. The connectors can be turned by 90°. By loosening the nut, the solenoids can be turned or replaced without interfering with any seals of the valve. In case of a solenoid malfunction or power failure, the spool of the valve can be shifted by manual override, provided the pressure in port T does not exceed 25 bar.

For detail information on the pilot valve RPE3-06 refer to data sheet No.4010.

Actuation in millimeters (inches)

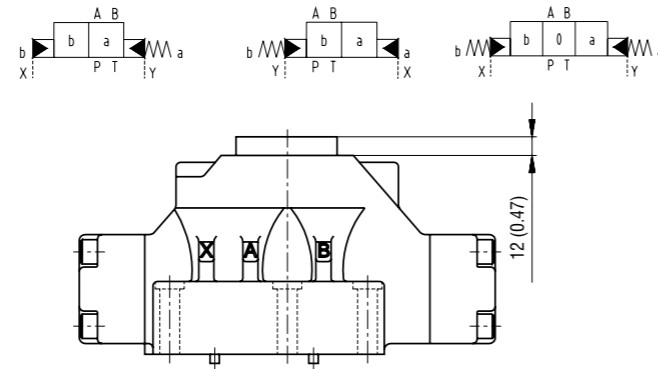
Solenoid control: RNEH

The valve is supplied with an RPE3-06 pilot solenoid valve.



Hydraulic control: RNH

The valve is supplied with a cross-connection cover plate. X and Y connections are used for the hydraulic control of the valve.



The minimum piloting pressure can be as low as 5 bar at low flow rates, but with higher flow rates a pressure of 12 bar is needed.

If the valve operates with higher pressures it is necessary to use the version with external pilot and reduced pilot pressure. Otherwise, the valve with internal pilot and a pressure reducing valve with a 30 bar fixed setting can be ordered.

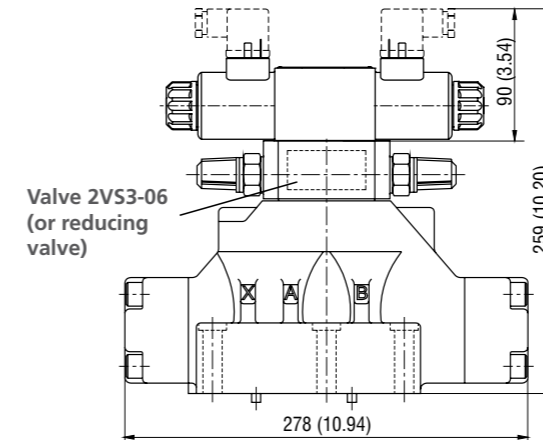
Control Options - Special Features

Control of the main spool shifting speed: D

By placing a 2VS3-06 flow control valve between the pilot solenoid valve and the hydropiloted valve, the pilot flow rate can be controlled and therefore the shifting speed adjusted. Add the letter D to the identification code to request this device.

Pilot pressure reducing valve - 30 bar fixed setting: Z

Internal piloting with mounted pressure reducing valve with 30 bar fixed setting. The option Z may be used together with option D.



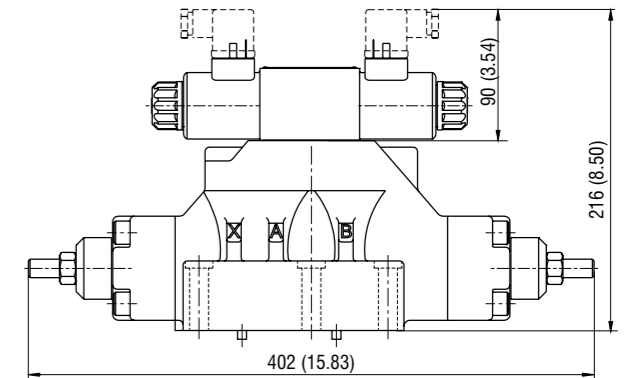
Valve 2VS3-06 (or reducing valve)

Control of the main spool stroke: C

Using special side plugs, it is possible to introduce stroke control the piloted valve so as to vary the maximum spool opening clearance. This solution allows the control of the flow rate from the pump to the actuator and from the actuator to the outlet, resulting in double adjustable control of the actuator. Add the letter C to the identification code to request this device.

Shifting speed control: PF

with an orifice (0.8 mm) in port P of the solenoid pilot valve. Add PF to the identification code to request this device

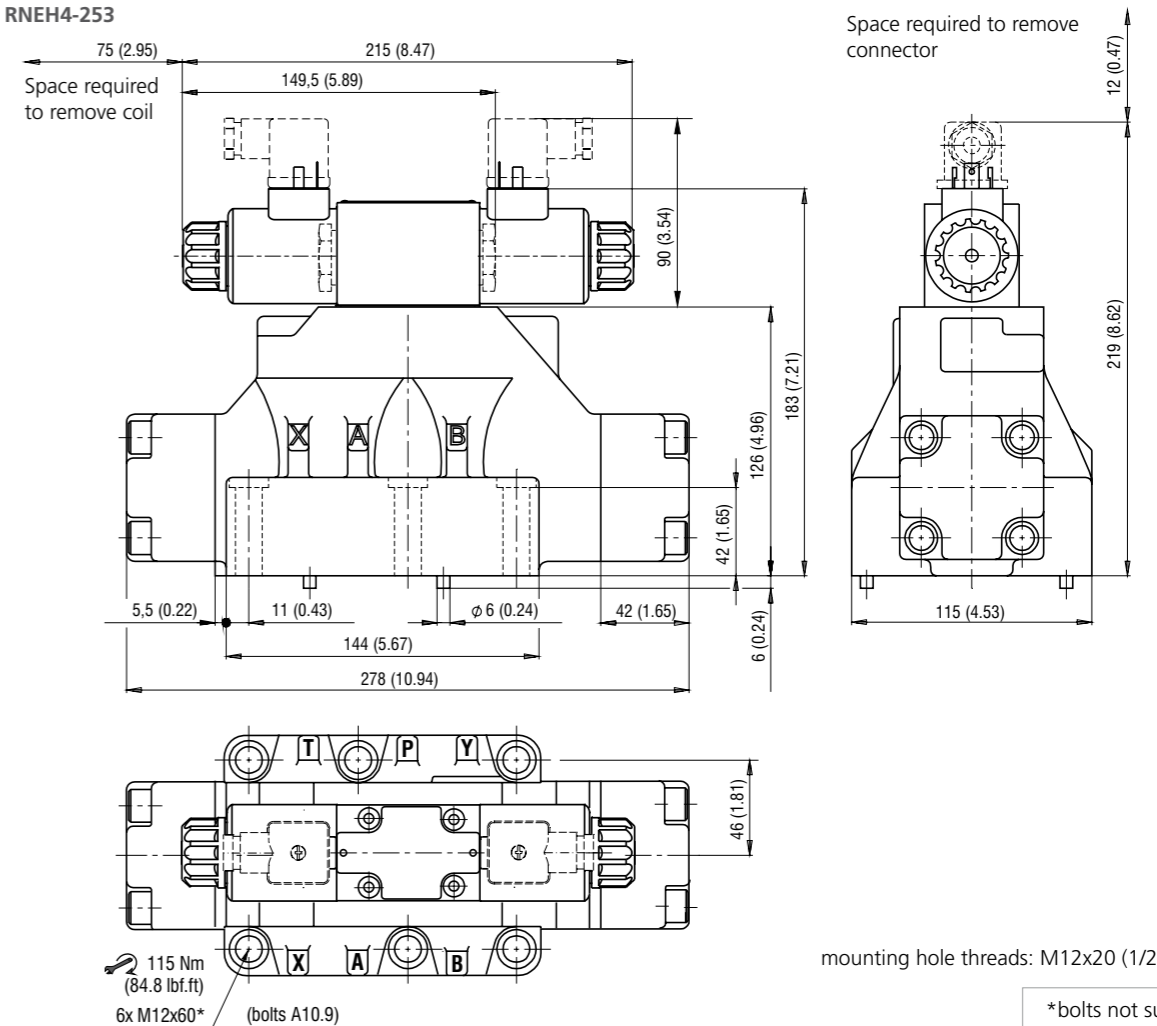


Solenoid operated distributor with pilot valve in configuration 3H11

It is possible to deliver the solenoid operated distributor with the pilot valve in configuration 3H11 (all the ports at the outlet). This configuration is used with external piloting in order to allow the unloading of the piloting line when the solenoid operated valve is in the rest position. With this option, the piloting is necessarily external.

Dimensions in millimeters (inches)

RNEH4-252, RNEH4-253



Space required to remove connector

mounting hole threads: M12x20 (1/2-13 UNC)

*bolts not supplied

4/2 and 4/3 Directional Control Valve, Manually Operated

RPR3-04

Size 04 (D02) • Q_{max} 30 l/min (8 GPM) • p_{max} 320 bar (4600 PSI)



Technical Features

- Direct acting directional control valve with subplate mounting interface acc. to ISO 4401, DIN 24340 (CETOP 02)
- High transmitted hydraulic power up to 320 bar with optimized design to minimize pressure drop
- Three chamber housing design for production cost saving
- Manual lever and actuating section can be rotated in 90° increments for flexible installation
- Wide range of interchangeable spools available
- Springless, detented valves available, valve holds last selected position, available for all spools
- In the standard version, the valve housing is phosphated and steel parts zinc-coated for 240 h salt spray protection acc. to ISO 9227
- Enhanced surface protection for mobile sector available (ISO 9227, 520 h salt spray)

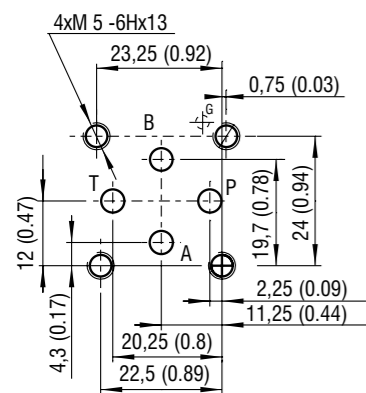
Model Code	Z11	R11	J15
Symbol			

Technical Data

Valve size	04 (D02)	
Max. flow	l/min (GPM)	30 (7.9)
Max. operating pressure at ports P, A, B	bar (PSI)	320 (4640)
Max. operating pressure at port T	bar (PSI)	100 (1450)
Operating force	N (lbf)	< 40 (9)
Fluid temperature range (NBR)	°C (°F)	-30 ... +100 (-22 ... +212)
Fluid temperature range (FPM)	°C (°F)	-20 ... +120 (-4 ... +248)
Service life	cycles	10 ⁶
Weight	kg (lbs)	1 (2.20)

	Datasheet	Type
General information	GI_0060	Products and operating conditions
Mounting interface / tolerances	SMT_0019	Size 04
Spare parts	SP_8010	

ISO 4401-02-01-0-05

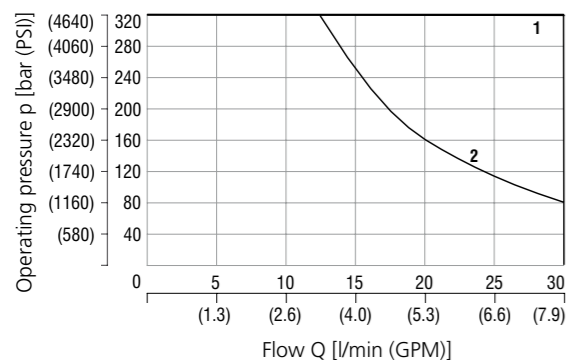


Ports P, A, B, T - max Ø4.5 mm (0.18 in)

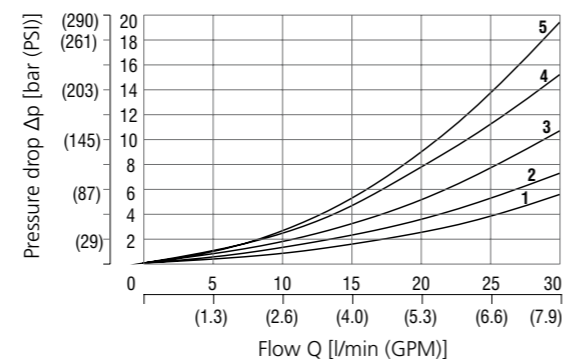
Characteristics measured at v = 32 mm³/s (156 SUS)

Operating limits

Operating limits for maximum hydraulic power and rated lever force.



Pressure drop related to flow rate

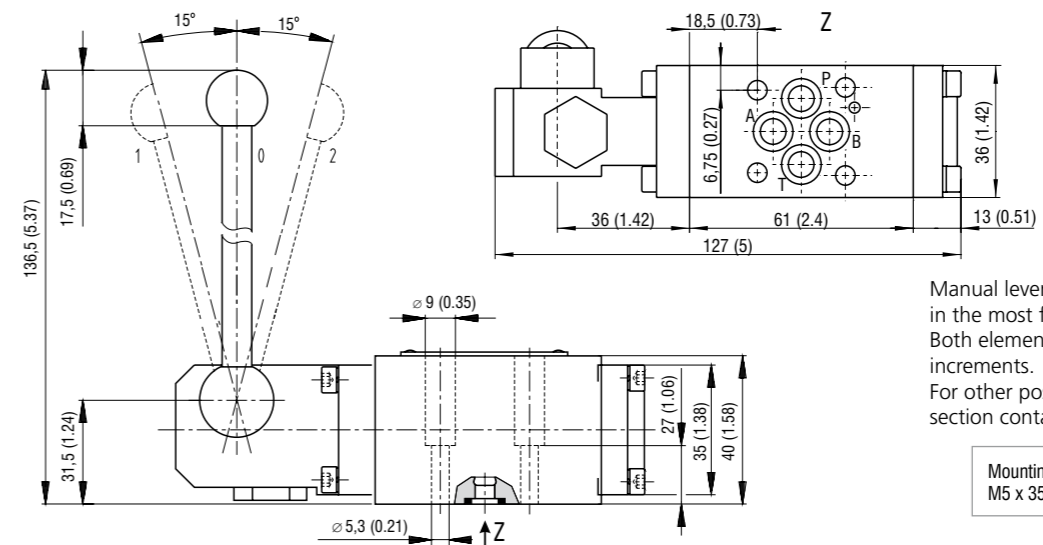


1	Z11	2	L21	1	C15	1	Y35
1	C11	1	Y31	1	H15	1	Y75
1	H11	1	Y71	1	P15	1	J15
1	P11	1	R11	1	Y15	1	J75
1	Y11	1	A51	1	B15	1	R25
1	B11	1	R21	1	L15		
2	L11	1	Z15	1	L25		

	P-A	P-B	A-T	B-T	P-T		P-A	P-B	A-T	B-T	P-T
Z11, Z15	3	2	2	2		B11, B15	3	3	2	1	
C11, C15	5	5	4	4	3	L11, L15	3	2	1	2	4
H11, H15	3	3	2	2	3	L21, L25	2	2	3	3	4
P11, P15	1	1	1	3		Y71, Y75	3	1			
Y11, Y15	3	3	1	1		A51, J75	2	2			
Y31, Y35, R11	3	3	2	2		J15, R21, R25	3	3	2	2	

For operating limits under conditions and flow directions other than shown contact our technical support. Admissible operating limits may be considerably lower with only one direction of flow (A or B plugged, or without flow.)

Dimensions in millimeters (inches)



Manual lever and actuating section are shown in the most frequently used standard position. Both elements can be rotated in 90° increments.

For other positions of lever and actuating section contact our technical support.

Mounting screws 5 Nm (3.69 lbf.ft)
M5 x 35 DIN 912-10.9 - not supplied

Spool Symbols

Type	Symbol	Interposition	Type	Symbol	Interposition	Type	Symbol	Interposition
Z11			Z15			R11		
C11			C15			A51		
H11			H15			R21		
P11			P15			J15		
Y11			Y15			J75		
B11			B15			P55		
L11			L15			R25		
L21			L25			X11		
Y31			Y35					
Y71			Y75					

Ordering Code

RPR3-04 [] / [] - []

4/2 and 4/3 directional control valve, manually operated

Valve size

Number of valve positions
two positions: 2
three positions: 3

Spool symbols
see the table "Spool Symbols"

Surface treatment
No designation: housing phosphated, steel parts zinc-coated (ZnCr-3), ISO 9227 (240 h)
A: zinc-coated (ZnCr-3), ISO 9227 (240 h)
B: zinc-coated (ZnNi), ISO 9227 (520 h)

Seals
No designation: NBR
V: FPM (Viton)

Manual lever and actuating section position
A1: standard, lever on side A, upward

The port restrictor plugs can be ordered separately from the spare parts data sheet HA 8010. Besides the shown, commonly used valve versions other special models are available. Contact our technical support for their identification, feasibility and operating limits.

4/2 and 4/3 Directional Control Valve, Manually Operated

RPR3-06

Size 06 (D03) • Q_{max} 80 l/min (21 GPM) • p_{max} 350 bar (5100 PSI)



Technical Features

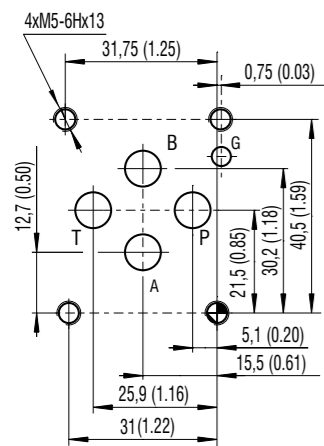
- Direct acting manually operated directional control valve with subplate mounting interface acc. to ISO 4401, DIN 24340 (CETOP 03)
- High transmitted hydraulic power up to 350 bar, optimized design for minimized pressure drop
- Three chamber housing design for production cost saving
- Manual lever and actuation element can be rotated in 90° increments for flexible installation
- Wide range of interchangeable spools available
- Springless, detented valves available, valve holds last selected position, available for all spools
- In the standard version, the valve housing is phosphated and steel parts zinc-coated for 240 h salt spray protection acc. to ISO 9227
- Enhanced surface protection for mobile sector available (ISO 9227, 520 h salt spray)

Model Code	Z11	R11	J15
Symbol			

Technical Data

Valve size	06 (D03)	
Max. flow	l/min (GPM)	80 (21.1)
Max. operating pressure at ports P, A, B	bar (PSI)	350 (5080)
Max. operating pressure at port T	bar (PSI)	100 (1450)
Operating force	N (lbf)	< 50 (11.2)
Fluid temperature range (NBR)	°C (°F)	-30 ... +100 (-22 ... +212)
Fluid temperature range (FPM)	°C (°F)	-20 ... +120 (-4 ... +248)
Service life	cycles	10 ⁶
Mass	kg (lbs)	1.6 (3.53)
General information		Datasheet GI_0060 Products and operating conditions
Mounting interface		SMT_0019 Size 06
Spare parts		SP_8010

ISO 4401-03-02-0-05

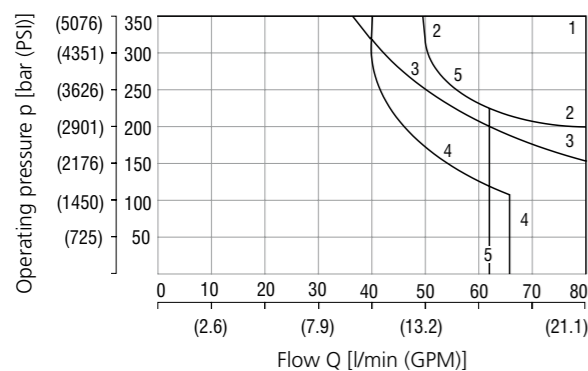


Ports P, A, B, T - max Ø7.5 mm (0.29 in)

Characteristics measured at v = 32 mm³/s (156 SUS)

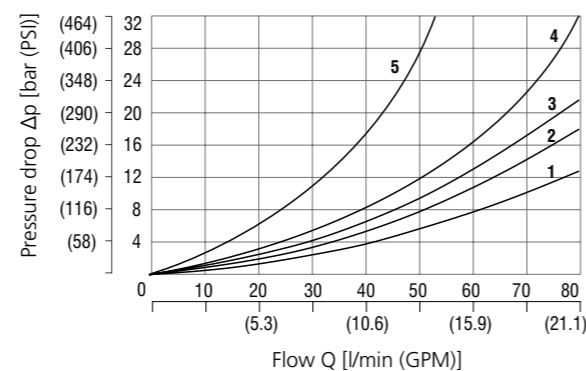
Operating limits

Operating limits for maximum hydraulic power and rated lever force.



A51	3	H15	1	R11	1
B11	5	J15	1	Y11	2
B15	1	J75	1	Y15	1
C11	4	P11	1	Z11	1
C15	1	P15	1	Z15	1
H11	3				

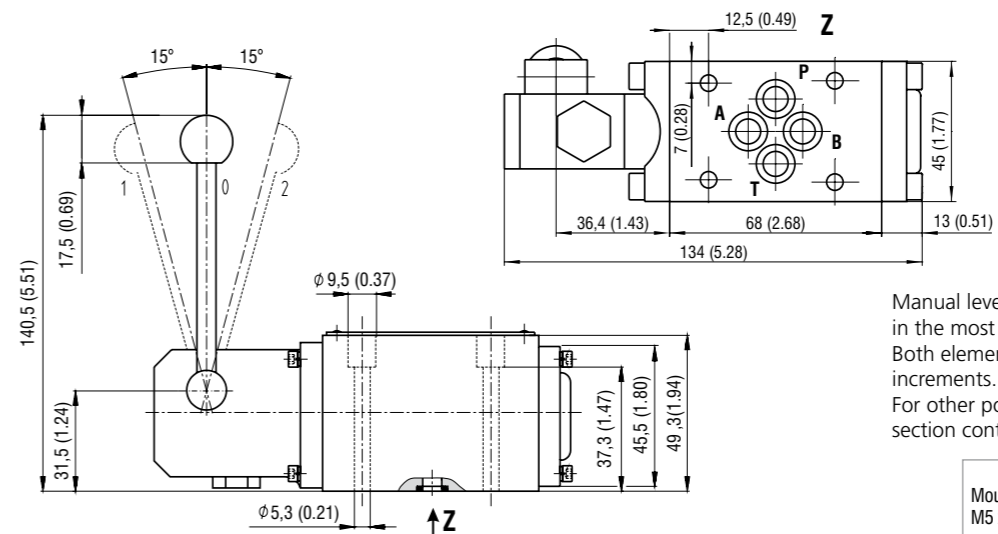
Pressure drop related to flow rate



	P-A	P-B	A-T	B-T	P-T
Z11, Z15, B11, B15R11, J15	2	2	3	3	
C11, C15	3	3	4	3	5
H11, H15	2	2	2	2	3
P11, P15	1	1	3	3	
Y11, Y15	2	2	2	2	
A51, J75	2	2			

For operating limits under conditions and flow directions other than shown contact our technical support. Admissible operating limits may be considerably lower with only one direction of flow (A or B plugged, or without flow.)

Dimension in millimeters (inches)



Manual lever and actuating section are shown in the most frequently used standard position. Both elements can be rotated in 90° increments. For other positions of lever and actuating section contact our technical support.

Mounting screws 8.9 Nm (6.56 lbf.ft)
M5 x 45 DIN 912-10.9 - not supplied

Spool Symbols

Type	Symbol	Interposition	Type	Symbol	Interposition	Type	Symbol	Interposition
Z11			Y14			X21		
C11			Z21			C55		
H11			P11			Z15		
P11			H11			Z55		
Y11			C51			Y55		
B11			Z11			J15		
L21			H51			J75		
Z15			Y11			P55		
C15			R11			R25		
H15			A51			X15		
P15			R21			Y15		
Y15			J19					
B15			X11					

Ordering Code

RPR3-06 [] / [] - []

4/2 and 4/3 directional control valve, manually operated

Valve size []

Number of valve positions
two positions 2
three positions 3

Spool symbols
see the table "Spool Symbols"

Surface treatment
No designation housing phosphated, steel parts zinc-coated (ZnCr-3), ISO 9227 (240 h)
A zinc-coated (ZnCr-3), ISO 9227 (240 h)
B zinc-coated (ZnNi), ISO 9227 (520 h)

Seals
No designation NBR
V FPM (Viton)

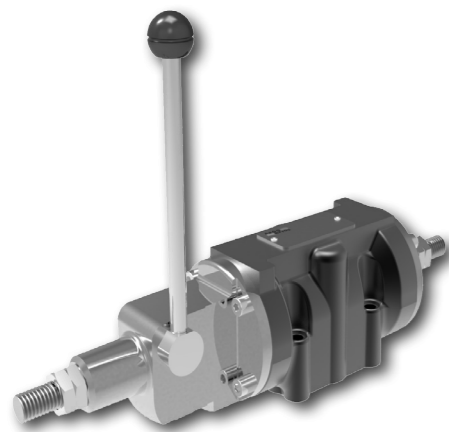
Manual lever and actuating section position
A1 standard, lever on side A, upward

The port restrictor plugs can be ordered separately from the spare parts data sheet HA 8010. Besides the shown, commonly used valve versions other special models are available. Contact our technical support for their identification, feasibility and operating limits.

4/2, 4/3 Directional Control Valve, Manually Operated

RPR1-10

Size 10 (D05) • Q_{max} 140 l/min (37 GPM) • p_{max} 350 bar (5100 PSI)



Technical Features

- Direct acting directional control valve with subplate mounting interface acc. to ISO 4401, DIN 24340 (CETOP 05)
- High transmitted hydraulic power up to 350 bar with optimized design to minimize pressure drops
- Three chamber housing design for production cost saving
- Manual lever and actuation element can be rotated in 90° increments for flexible installation
- Wide range of interchangeable spools available
- Springless, detented valves available, valve holds last selected position, available for all spools
- Spool end position sensing option
- Spool stroke limit option
- In the standard version, the valve housing is phosphated and steel parts zinc-coated for 240 h salt spray protection acc. to ISO 9227
- Enhanced surface protection for mobile sector available (ISO 9227, 520 h salt spray)

Model Code	Z11	Z11 with Sensors	R11	J15
Symbol				

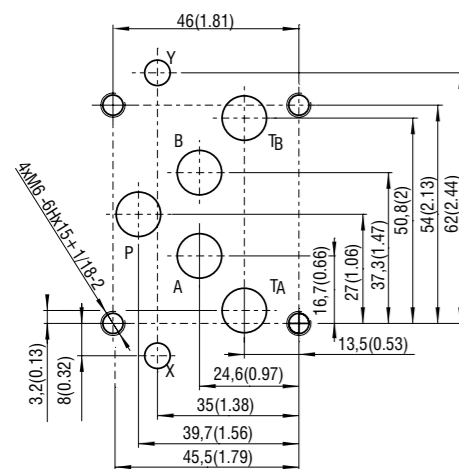
Technical Data

Valve size		10 (D05)
Max. flow	l/min (GPM)	140 (37)
Max. operating pressure at ports P, A, B	bar (PSI)	350 (5080)
Max. operating pressure at port T	bar (PSI)	100 (1450) 50 (725) for versions with sensor
Operating force	N (lbf)	< 40 (9)
Fluid temperature range (NBR)	°C (°F)	-30 ... +100 (-22 ... +212)
Fluid temperature range (FPM)	°C (°F)	-20 ... +120 (-4 ... +248)
Service life	cycles	106
Mass	kg (lbs)	3.4 (7.5)

Technical Data Sensor and Connector		SO, SC
Rated power supply voltage	V	24 DC
Power supply voltage range	V	10 ... 30 DC
Rated current	mA	200
Enclosure type of sensor to EN 60529		IP 67
Switching frequency	Hz	1000
Ambient temperature range	°C (°F)	-25 ... +80 (-13 ... +176)

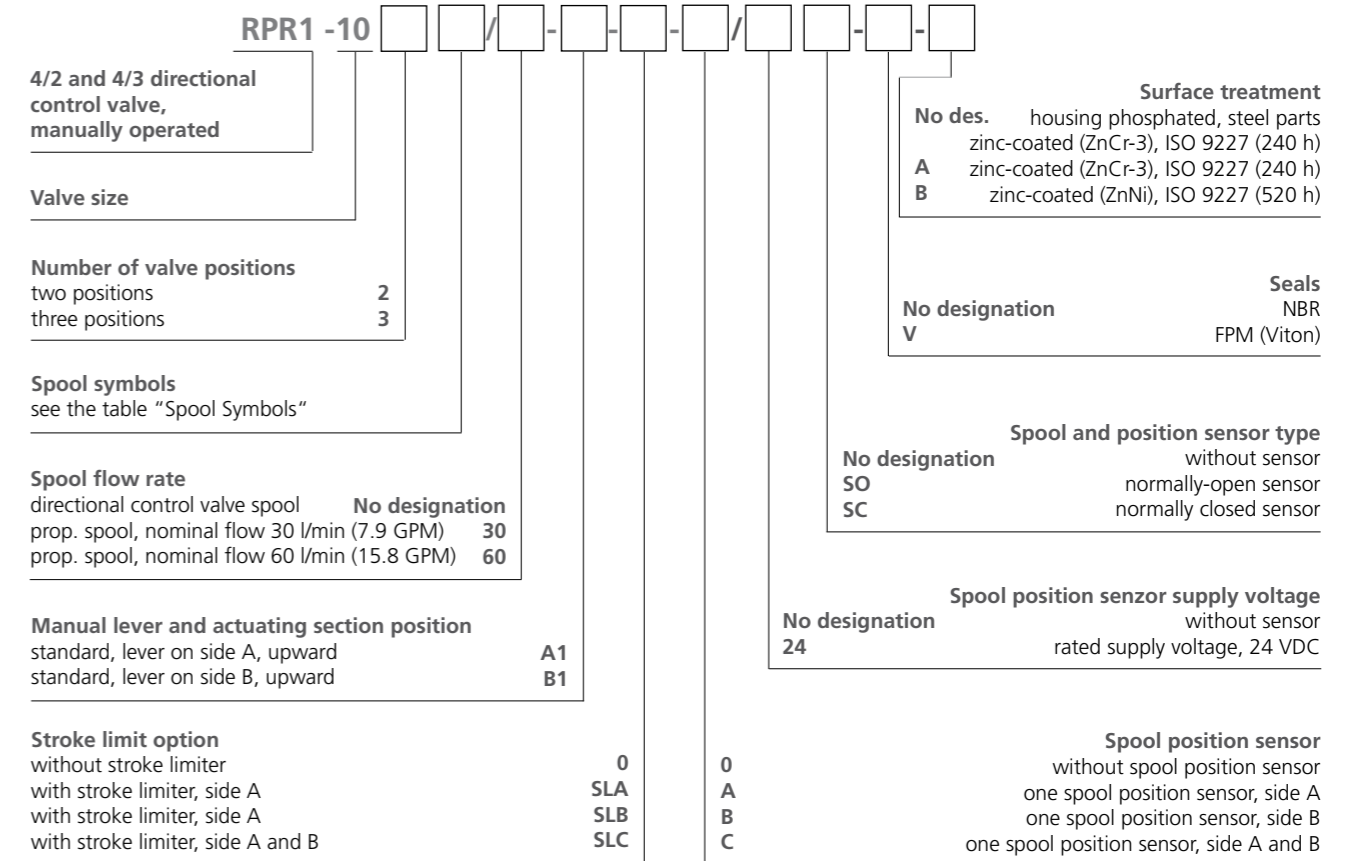
	Datasheet	Type
General information	GI_0060	Products and operating conditions
Mounting interface	SMT_0019	Size 10
Spare parts	SP_8010	

ISO 4401-05-04-0-05



Ports P, A, B, T - max Ø11.2 mm (0.44 in)

Ordering Code



The port restrictor plugs can be ordered separately from the spare parts data sheet SP_8010. Mounting bolts M6 x 40 DIN 912-10.9 or studs must be ordered separately. Tightening torque is 14 Nm (10.3 lbf.ft). Besides the shown, commonly used valve versions other special models are available. Contact our technical support for their identification, feasibility and operating limits.

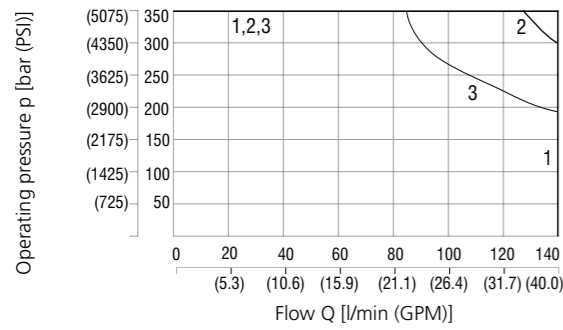
Spool Symbols

Type	Symbol	Interposition	Type	Symbol	Interposition
Z11			P15		
C11			R11		
H11			R21		
P11			Z15		
Y11			J15		
C15			R25		
H15			Y15		
Z11			Y11		

Characteristics measured at $v = 32 \text{ mm}^2/\text{s}$ (156 SUS)

Operating limits (Directional valve)

Operating limits for maximum hydraulic power and rated lever force

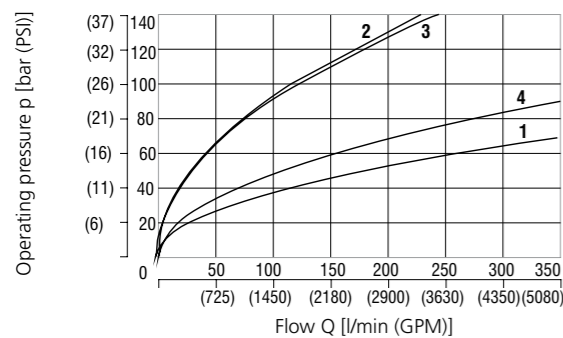


Z11	1	H11	1	For operating limits under conditions and flow directions other than shown contact our technical support. Admissible operating limits may be considerably lower with only one direction of flow (A or B plugged, or without flow.)			
Y11	1	C11	3				
P11	1	R11	2				

Operating limits (Proportional valve)

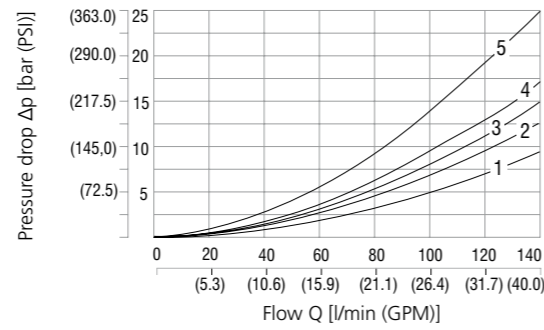
Operating limits for maximum hydraulic power and rated lever force

30 l/min (7.9 GPM)



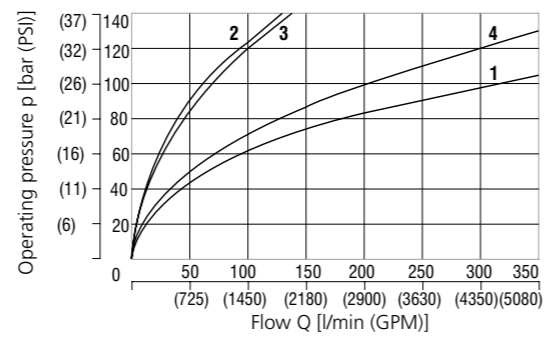
s	50% [2.3mm (0.09in)]	100% [4.6mm (0.18in)]
Z11/30	1	2
Y11/30	3	4

Pressure drop related to flow rate



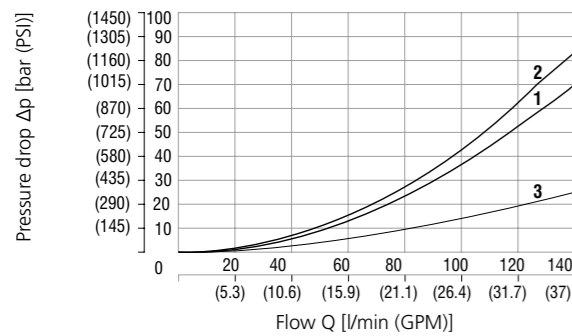
	P-A	P-B	A-T	B-T	P-T		P-A	P-B	A-T	B-T	P-T
Z11	1	1	3	3		H11	1	1	1	1	3
Y11	1	1	2	2		C11	1	1	3	3	5
P11	1	1	3	3		R11	1	1	4	4	

60 l/min (15.8 GPM)



s	50% [2.3mm (0.09in)]	100% [4.6mm (0.18in)]
Z11/60	1	2
Y11/60	3	4

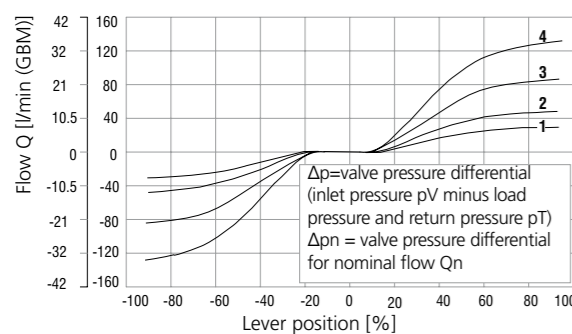
Pressure drop related to flow rate



	P-A	P-B	A-T	B-T
Z11/30	1	1	2	2
Y11/30	1	1	2	2
Z11/60	3	3	3	3
Y11/60	3	3	3	3

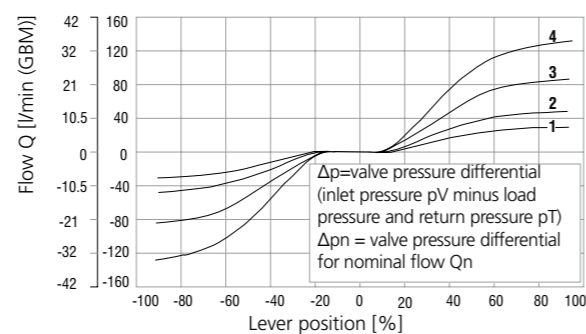
Proportional Valve Actuation Characteristics

Proportional spool flow rate 30 l/min (7.9 GPM)



1	Δpn = 10 bar (145 PSI)	3	Δp = 160 bar (2321 PSI)
2	Δp = 50 bar (725 PSI)	4	Δp = 350 bar (5076 PSI)

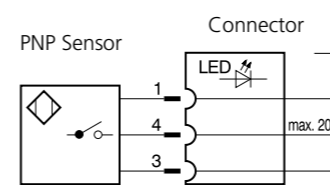
Proportional spool flow rate 60 l/min (15.8 GPM)



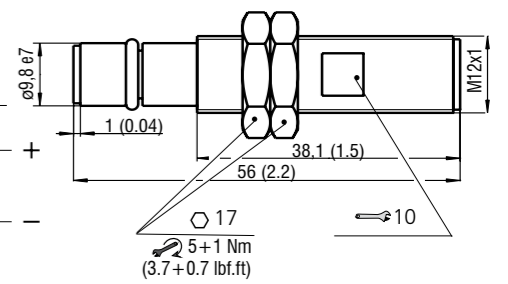
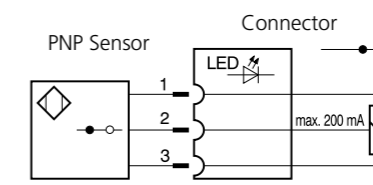
1	Δpn = 10 bar (145 PSI)	3	Δp = 160 bar (2321 PSI)
2	Δp = 50 bar (725 PSI)	4	Δp = 350 bar (5076 PSI)

Technical Data - Sensor in millimeters (inches)

SO Circuit diagram of the normally - OPEN sensor

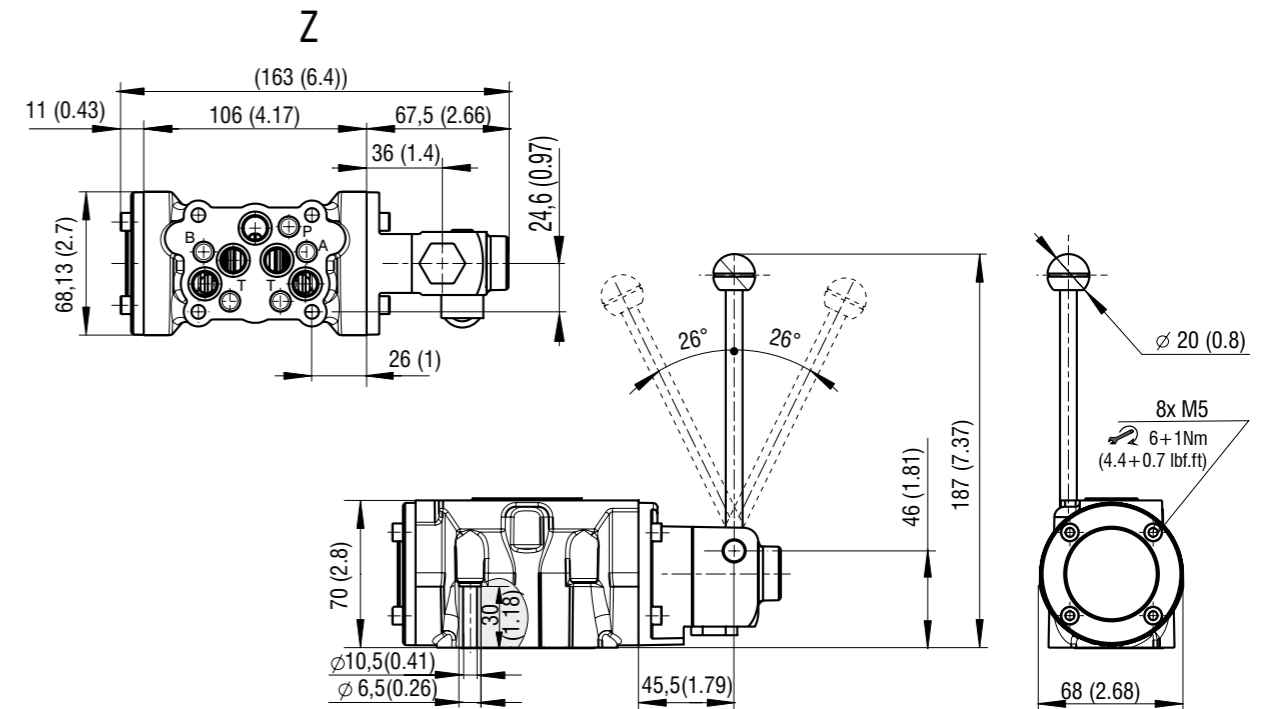


SC Circuit diagram of the normally - CLOSED sensor

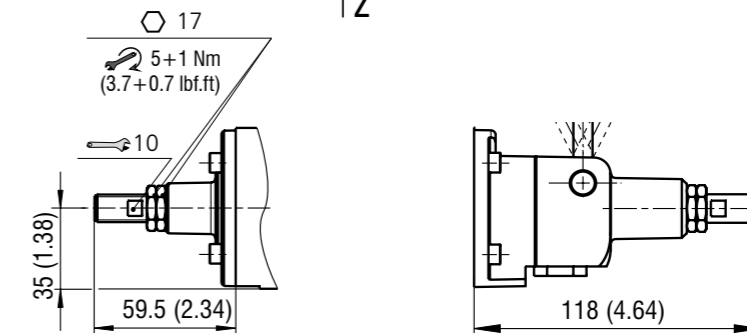


Dimensions in millimeters (inches)

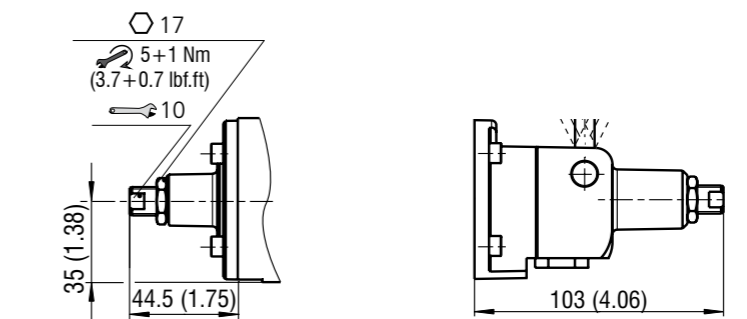
RPR1-10*/A1-0-0 without stroke limiter and position sensor



RPR1-10*/A(B,C) Position sensor



RPR1-10*/SL* Stroke limiter

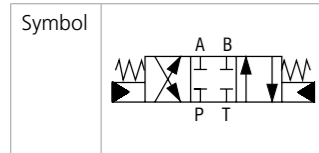
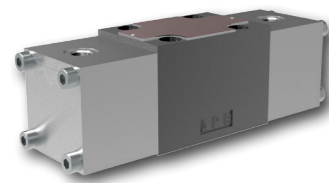


Manual lever and actuating section are shown in the most frequently used standard position. Both elements can be rotated in 90° increments. For other positions of lever and actuating section contact our technical support.

4/2 and 4/3 Directional Control Valve, Hydraulically Operated

RPH2-06

Size 06 (D03) • Q_{max} 80 l/min (21 GPM) • p_{max} 350 bar (5100 PSI)



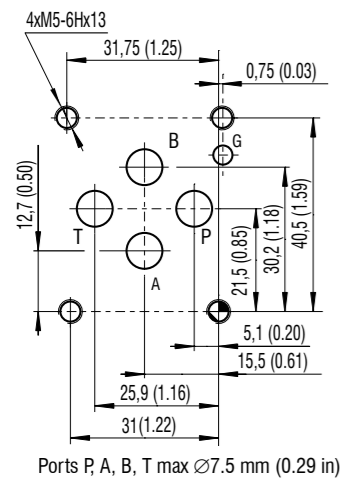
Technical Features

- › Direct acting directional control valve, hydraulically operated with subplate mounting interface acc. to ISO 4401, DIN 24340 (CETOP 03)
- › High transmitted hydraulic power up to 350 bar with optimized design to minimize pressure drop
- › Five chamber housing design with reduced hydraulic power dependence on fluid viscosity
- › Actuating section can be rotated in 90° increments for flexible installation
- › Wide range of interchangeable spools available
- › Connection for hydraulic operation M10x1, G1/8 and 7/16-20 UNF-2B (SAE-4)
- › In the standard version, the valve housing is phosphated and steel parts zinc-coated for 240 h salt spray protection acc. to ISO 9227
- › Enhanced surface protection for mobile sector available (ISO 9227, 520 h salt spray)

Functional Description

These hydraulically operated directional control valves are used mainly to control start, stop and direction of fluid. The valves consist of a housing, a control spool with two centering springs, and the actuating section. The actuating section consists of the hydraulic actuation cylinder. The directional control valves are manufactured as two or three position valves (see table with functional symbols).

ISO 4401-03-02-0-05



Technical Data

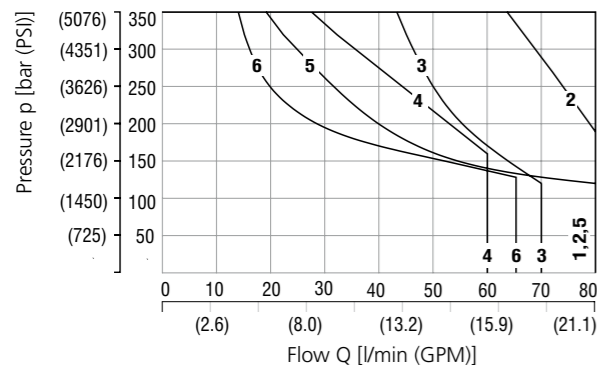
Valve size	06 (D03)	
Max. flow	l/min (GPM)	80 (21.1)
Max. operating pressure P, A, B	bar (PSI)	350 (5080)
Max. operating pressure at port T	bar (PSI)	130 (1890)
Min. pilot pressure	bar (PSI)	30 (440)
Max. pilot pressure	bar (PSI)	160 (2320)
Pilot volume	cm ³ (cu.in)	0.5 (0.03)
Fluid temperature range (NBR)	°C (°F)	-30 ... +100 (-22 ... +212)
Fluid temperature range (FPM)	°C (°F)	-20 ... +120 (-4 ... +248)
Mass	valve with 1 actuator	1.6 (3.53)
	valve with 2 actuators	2.7 (5.70)

	Datasheet	Type
General information	GI_0060	Products and operating conditions
Mounting interface	SMT_0019	Size 06
Spare parts	SP_8010	

Characteristics measured at v = 32 mm²/s (156 SUS)

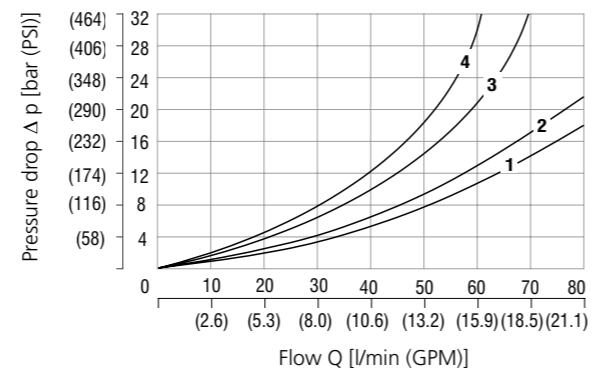
Operating limits

Operating limits for maximum hydraulic power with min. piloting pressure



H11	1	J15	3	C51	1	A51	5
H51	1	R11	4	Z11	2	Y11	6
C11	1	X11	4	Z51	2	Y51	6

Pressure drop related to flow rate

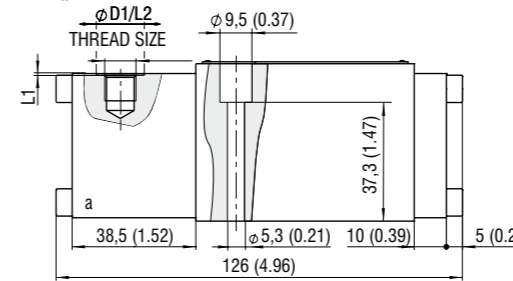


Z11, R11, X11, J15	P-A	P-B	A-T	B-T	P-T	C51	P-A	P-B	A-T	B-T	P-T
	1	1	2	2			3			4	2
C11	3	3	3	4	2	Z51	1	2			
H11, H51	1	1	1	1	2	A51	1	1			
Y11	1	1	1	1		Y51	1	1			

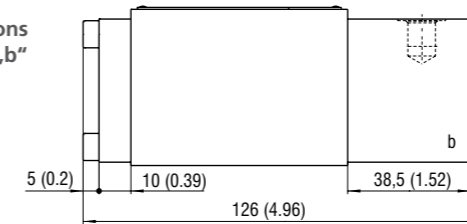
For operating limits under conditions and flow directions other than shown contact our technical support. Admissible operating limits may be considerably lower with only one direction of flow (A or B plugged, or without flow.)

Dimension in millimeters (inches)

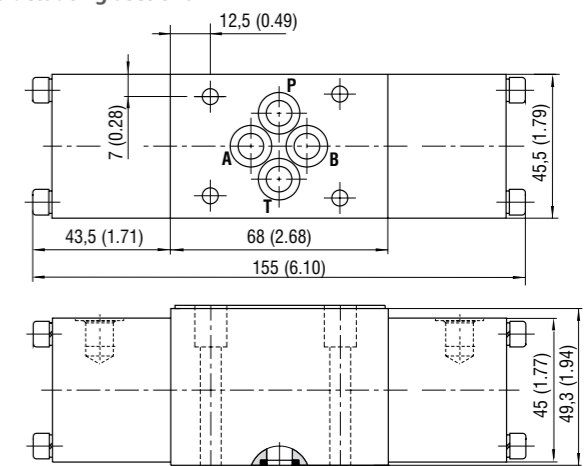
Valve with two positions one actuating section „a”



Valve with two positions one actuating section „b”



Valve with three positions two actuating sections

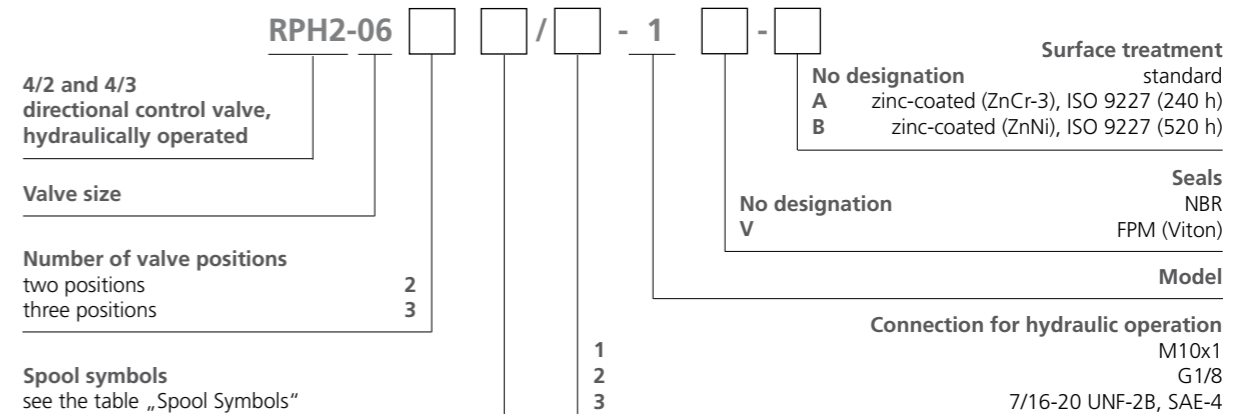


Thread size	\varnothing D1	L1	L2
M10x1, G1/8	15,5 (0.61)	1 (0.04)	8 (0.32)
7/16-20 UNF-2B, SAE-4	21 (0.83)	0,8 (0.03)	14 (0.55)

Spool Symbols

Type	Symbol	Interposition	Type	Symbol	Interposition
Z11			C51		
C11			H51		
H11			Y51		
Y11			Y11		
L21			H11		
R11			X11		
A51			Z11		
Z51			J15		

Ordering Code

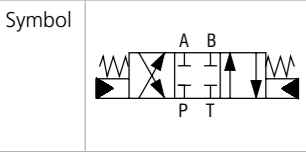


Mounting bolts M5 x 45 DIN 912-10.9 or studs must be orderer separately see Spare Parts data sheet HA 8010. Tightening torque is 8.9 Nm (6.56 lbf.ft). Besides the shown, commonly used valve versions other special models are available. Contact our technical support for their identification, feasibility and operating limits.

4/2 and 4/3 Directional Control Valve, Hydraulically or Pneumatically Operated

RPH3-06

Size 06 (D03) • Q_{max} 80 l/min (21 GPM) • p_{max} 350 bar (5100 PSI)



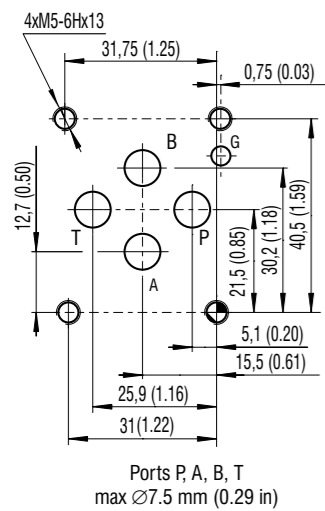
Technical Features

- Direct acting directional control valve, hydraulically or pneumatically operated with subplate mounting interface acc. to ISO 4401, DIN 24340 (CETOP 03)
- High transmitted hydraulic power up to 350 bar with optimized design to minimize pressure drop
- Five chamber housing design with reduced hydraulic power dependence on fluid viscosity
- Minimum pilot pressure 2 bar (29 PSI) for maximum hydraulic power
- Wide range of interchangeable spools available
- Connection for hydraulic operation M10x1, G1/8, G1/4
- In the standard version, the valve housing is phosphated and steel parts zinc-coated for 240 h salt spray protection acc. to ISO 9227
- Enhanced surface protection for mobile sector available (ISO 9227, 520 h salt spray)

Functional Description

These hydraulically or pneumatically operated directional control valves are used mainly to control start, stop and direction of fluid. The valves consist of a housing, a control spool with two centering springs, and the actuating section. The actuating section consists of the hydraulic or pneumatic actuation cylinder. The directional control valves are manufactured as two or three position valves (see table with functional symbols).

ISO 4401-03-02-0-05



Technical Data

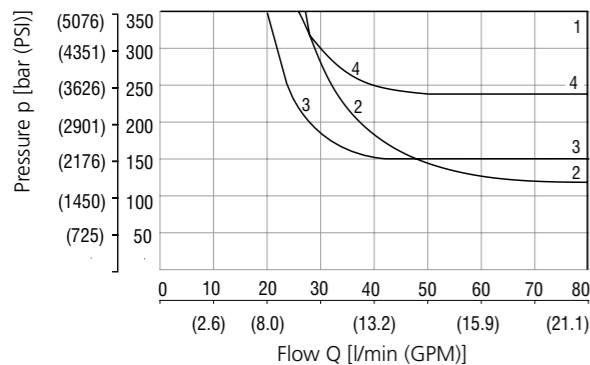
Valve size	06 (D03)	
Max. flow	l/min (GPM)	80 (21.1)
Max. operating pressure P, A, B	bar (PSI)	350 (5080)
Max. operating pressure at port T	bar (PSI)	160 (2320)
Min. pilot pressure	bar (PSI)	2 (30)
Max. pilot pressure	bar (PSI)	25 (360)
Pilot volume	cm ³ (cu.in)	6,2 (0.38)
Fluid temperature range (NBR)	°C (°F)	-30 ... +100 (-22 ... +212)
Fluid temperature range (FPM)	°C (°F)	-20 ... +120 (-4 ... +248)
Mass	valve with 1 actuator	1.8 (3.96)
	valve with 2 actuators	2.5 (5.50)

General information	Datasheet	GI_0060	Type	Products and operating conditions
Mounting interface	SMT_0019		Size 06	
Spare parts	SP_8010			

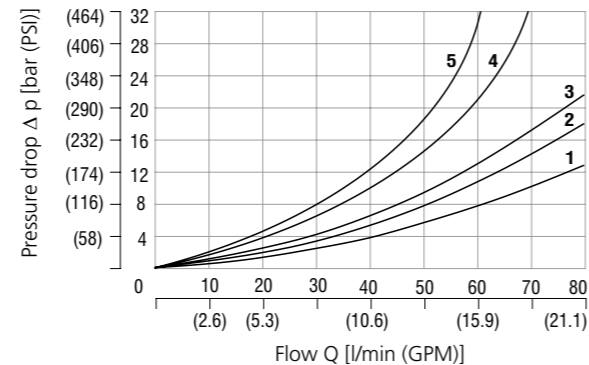
Characteristics measured at v = 32 mm³/s (156 SUS)

Operating limits

Operating limits for maximum hydraulic power with min. piloting pressure



Pressure drop related to flow rate



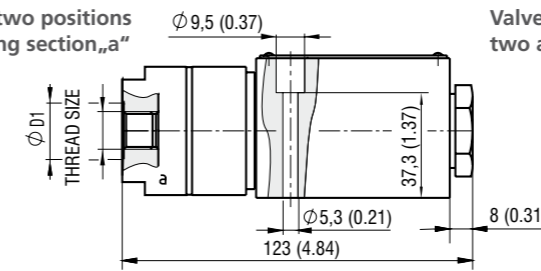
Z11, P11, Y11, B11, R11, A51, P51, X11, J15, J75	1
C11, Y51	2
H11	3
L21	4

	P-A	P-B	A-T	B-T	P-T		P-A	P-B	A-T	B-T	P-T
Z11, L21, B11, R11, X11, J15	2	2	3	3		Y11	2	2	2	2	
C11	4	4	4	5	3	A51, J75	2	2			
H11	2	2	2	2	3	P51		1	3		
P11	1	1	3	3		Y51		2	2		

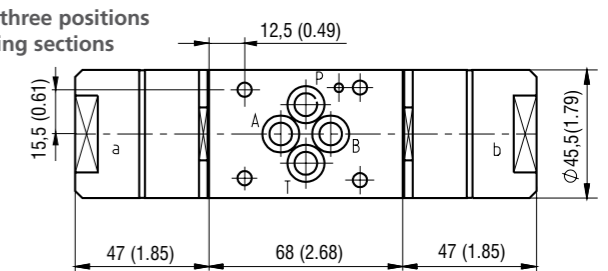
For operating limits under conditions and flow directions other than shown contact our technical support. Admissible operating limits may be considerably lower with only one direction of flow (A or B plugged, or without flow.)

Dimension in millimeters (inches)

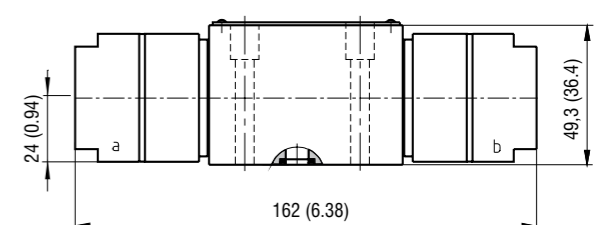
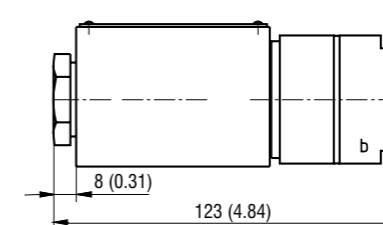
Valve with two positions one actuating section „a“



Valve with three positions two actuating sections



Valve with two positions one actuating section „b“

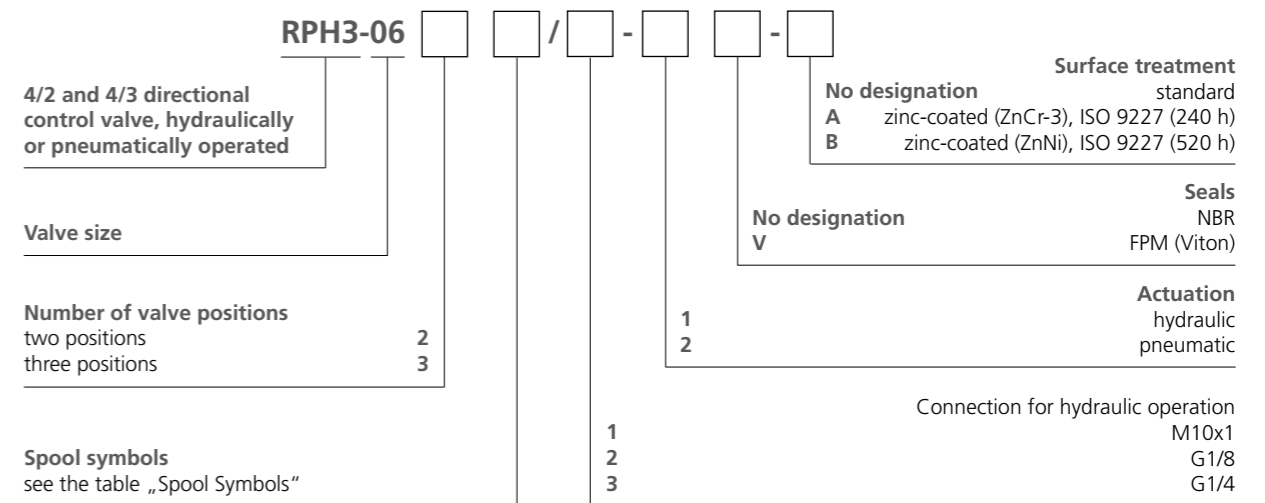


Thread size	Ø D1
M10x1, G1/8	15 (0.59)
G1/4	20 (0.79)

Spool Symbols

Type	Symbol	Interposition	Type	Symbol	Interposition
Z11			R11		
C11			A51		
H11			P51		
P11			Y51		
Y11			X11		
L21			J15		
B11			J75		

Ordering Code

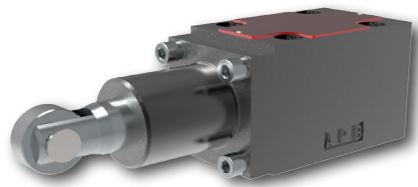


Mounting bolts M5 x 45 DIN 912-10.9 or studs must be ordered separately see Spare Parts data sheet HA 8010. Tightening torque is 8.9 Nm (6.56 lbf.ft). Besides the shown, commonly used valve versions other special models are available. Contact our technical support for their identification, feasibility and operating limits.

4/2 Directional Control Valve, Roller Cam Operated

RPK1-06

Size 06 (D03) • Q_{max} 80 l/min (21 GPM) • p_{max} 350 bar (5100 PSI)

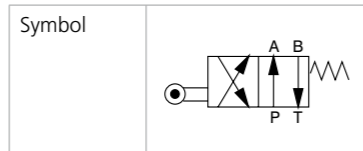


Technical Features

- Direct acting roller cam operated directional control valve with subplate mounting interface acc. to ISO 4401, DIN 24340 (CETOP 03)
- High transmitted hydraulic power up to 350 bar, optimized design for minimized pressure drop
- Five chamber housing design with reduced dependence on fluid viscosity
- Actuation element rotatable in 90° increments
- Wide range of interchangeable spools available
- In the standard version, the valve housing is phosphated and steel parts zinc-coated for 240 h salt spray protection acc. to ISO 9227
- Enhanced surface protection for mobile sector available (ISO 9227, 520 h salt spray)

Functional Description

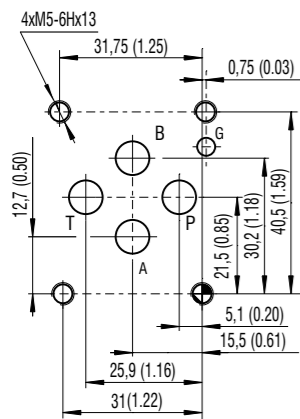
These roller cam operated 4/2 directional control valves are mainly used to control start, stop and direction of fluid. The valves consist of the housing, the spool, an integrated return spring, and the actuation element.



Technical Data

Valve size		06 (D03)
Max. flow	l/min (GPM)	80 (21.1)
Max. operating pressure at ports P, A, B	bar (PSI)	350 (5080)
Max. operating pressure at port T	bar (PSI)	20 (290)
Operating force		see table
Fluid temperature range (NBR)	°C (°F)	-30 ... +100 (-22 ... +212)
Fluid temperature range (FPM)	°C (°F)	-20 ... +120 (-4 ... +248)
Mass	kg (lbs)	1.6 (3.53)
	Datasheet	Type
General information	GI_0060	Products and operating conditions
Mounting interface	SMT_0019	Size 06
Spare parts	SP_8010	

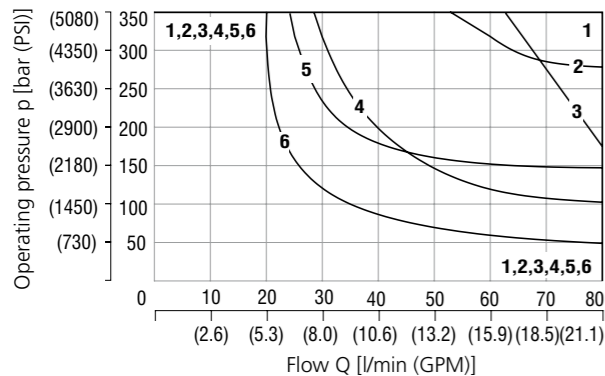
ISO 4401-03-02-0-05



Ports P, A, B, T - max \varnothing 7.5 mm (0.29 in)

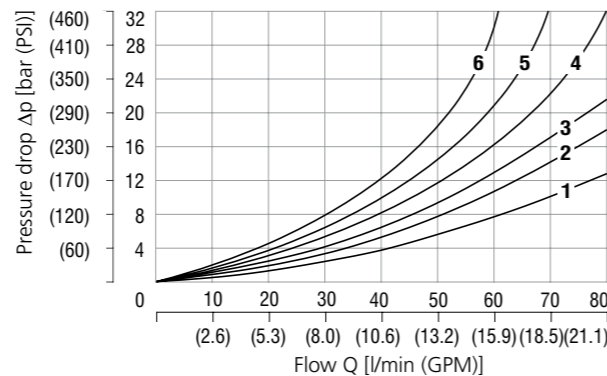
Characteristics measured at $v = 32 \text{ mm}^2/\text{s}$ (156 SUS)

Operating limits



Y11, Y51	1
R11	2
Z11, Z51	3
C11, C51	4
R21	5
H11, H51	6

Pressure drop related to flow rate



	P-A	P-B	A-T	B-T	P-T
Z11, R11, R21, X11	2	2	3	3	
C11	5	5	6	6	3
H11	2	2	2	2	3
A51	2	2			
P51		1	3		
Y51		2	2		
C51	2			3	4
Z51, H51		2	3		

For operating limits under conditions other than shown, contact our technical department. Admissible operating limits may be considerably lower with only one direction of flow (A or B plugged, or without flow.)

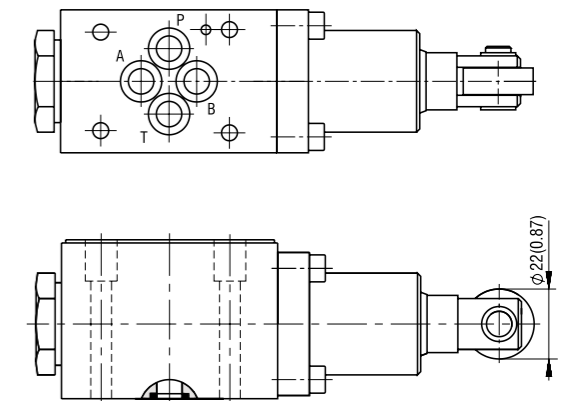
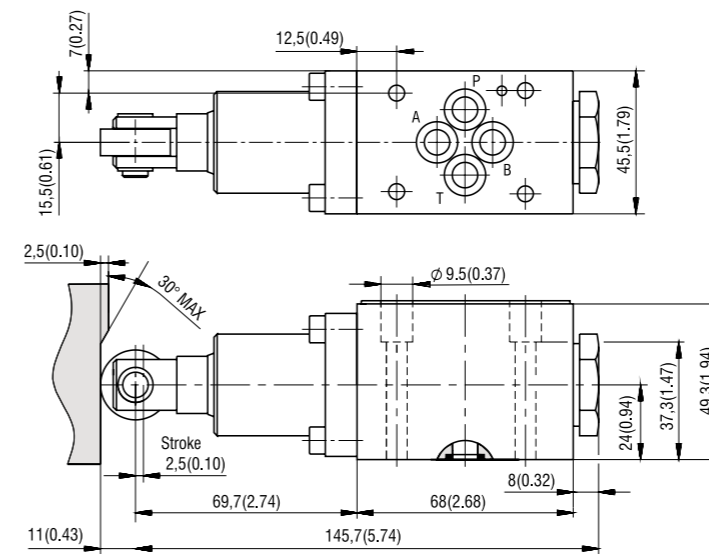
Dimensions in millimeters (inches)

Spool symbols

R11, R21, A51, P51, Y51, C51, Z51, H51

Spool symbols

Z11, X11, C11, H11



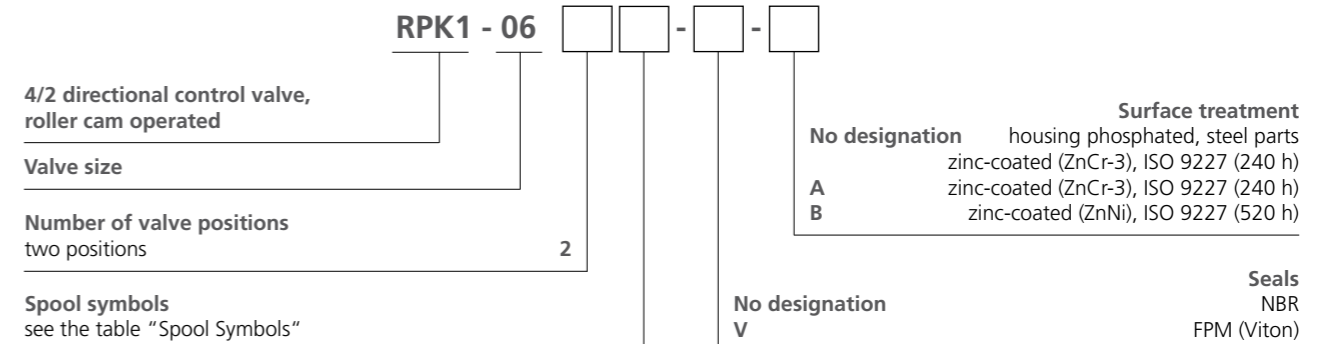
Spool Symbols

Type	Symbol	Interposition	Type	Symbol	Interposition
R11			Z51		
R21			H51		
A51			Z11		
P51			X11		
Y51			C11		
C51			H11		

Operating Force

Operating pressure	Pressure at port T: 0 bar (0 PSI)			Pressure at port T: 20 bar (290 PSI)		
	Start stroke	Working stroke	Max stroke	Start stroke	Working stroke	Max stroke
100 bar (1450 PSI)	35 N (8 lbf)	135 N (30 lbf)	195 N (44 lbf)	60 N (13 lbf)	160 N (36 lbf)	220 N (49 lbf)
200 bar (2900 PSI)	35 N (8 lbf)	135 N (30 lbf)	195 N (44 lbf)	60 N (13 lbf)	160 N (36 lbf)	220 N (49 lbf)
300 bar (4350 PSI)	35 N (8 lbf)	135 N (30 lbf)	195 N (44 lbf)	60 N (13 lbf)	160 N (36 lbf)	220 N (49 lbf)

Ordering Code



The port restrictor plugs can be ordered separately from the spare parts data sheet HA 8010. The port restrictor plugs can be ordered separately in spare parts data sheet. Mounting bolts M5x45 DIN 912-10.9 or studs must be orderer separately. Tightening torque is 8.9 Nm (6.56 lbf.ft).

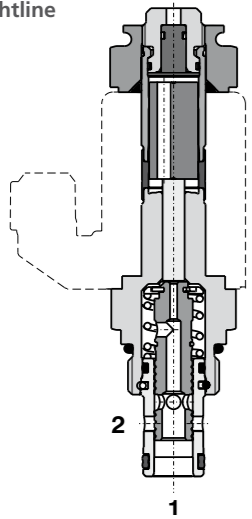
Besides the shown, commonly used valve versions other special models are available. Contact our technical support for their identification, feasibility and operating limits.

2/2 Directional Valve, Solenoid Operated, Spool Type, Direct Acting

SD2E-A2

3/4-16 UNF • Q_{max} 30 l/min (8 GPM) • p_{max} 350 bar (5100 PSI)

Lightline



Technical Features

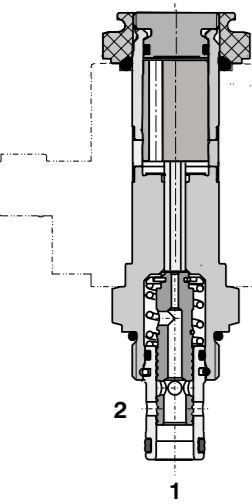
- › Hardened precision parts
- › High flow capacity
- › High transmitted hydraulic power
- › Wide range of manual overrides available
- › All ports may be fully pressurized
- › Variety of optional spools available
- › Coil interchangeability among SD*-A* product line
- › Standard version zinc-coated with surface protection acc. to ISO 9227 (240 h salt spray)

Functional Description

2-way, 2-position high pressure, bi-directional spool valve in the form of a screw-in cartridge. The valve is used mainly to direct flow to actuators.

Model Code	2111	2112
Symbol		

High performance



Technical Data

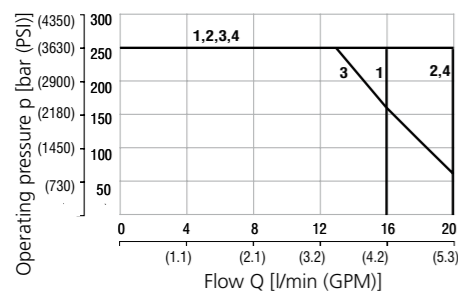
Valve size / Cartridge cavity		3/4-16 UNF-2A / A2	
		Lightline	High performance
Max. flow	l/min (GPM)	20 (5.3)	30 (7.9)
Max. operating pressure	bar (PSI)	250 (3630)	350 (5080)
Fluid temperature range	°C (°F)	-20...60 (-4...140)	-20...80 (-4...176)
Ambient temperature range	°C (°F)	-20...50 (-4...122)	-20...80 (-4...176)
Supply voltage tolerance	%	DC ± 10	AC, DC: ± 15
Max. switching frequency	1/h	15 000	
Mass without coil	kg (lbs)	0.14 (0.31)	0,20 (0.44)

General information		Datasheet	Type
GI_0060		C_8007	Products and operating conditions
Coil types		C_14B*	C_19B*
Valve bodies	In-line mounted	SB_0018	SB-A2*
	Sandwich mounted	SB-04(06)_0028	SB-*A2*
Cavity details / Form tools		SMT_0019	SMT-A2*
Spare parts		SP_8010	

Characteristics measured at $v = 32 \text{ mm}^2/\text{s}$ (156 SUS)

Operating limits - Lightline

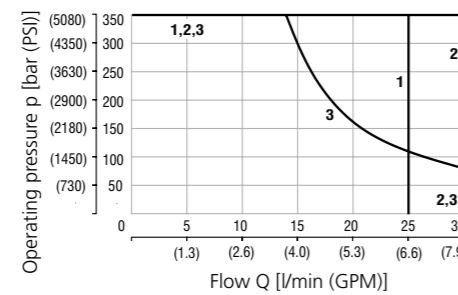
Oil 60 °C (140 °F) / Ambient temperature
50 °C (122 °F) / Voltage U_n -10% (21.6 VDC)



Model	Connection
1	2→1
2	1→2
3	1→2
4	2→1

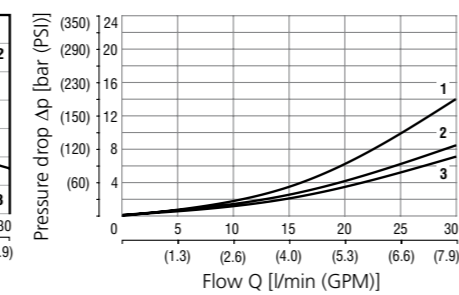
Operating limits - High performance

Oil 80 °C (176 °F) / Ambient temperature
50 °C (122 °F) / Voltage U_n -10% (21.6 VDC)



Model	Connection
1	2→1
2	1→2
2	2→1
3	1→2

Pressure drop related to flow rate
- Lightline, High performance

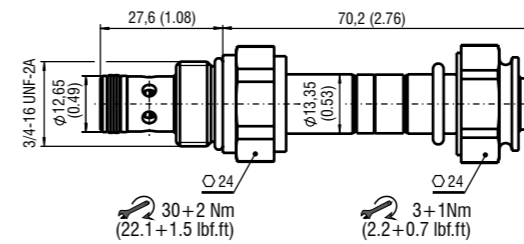


Model	Connection
1	2→1
1	1→2
2	1→2
3	2→1

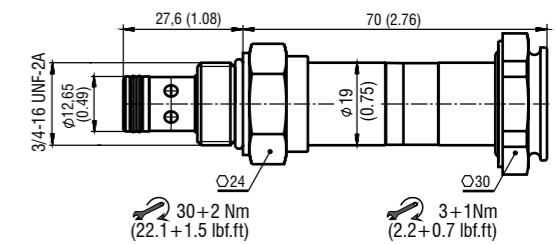
For operating limits under conditions and flow directions other than shown contact our technical support.

Dimensions in millimeters (inches)

Lightline



High performance



Manual Override in millimeters (inches)

No designation - standard	Designation M2 - rubber boot protected	Designation M5 - socket head screw, size 2.5	Designation M9 - without manual override
L ~ 70,2 (2.63) H ~ 70,0 (2.76)	L ~ 81,7 (3.22) H ~ 81,5 (3.21)	L ~ 77,2 (3.04) H ~ 77,6 (3.06)	L ~ 67,2 (2.65) H ~ 70,0 (2.76)

In case of solenoid malfunction or power failure, the spool of the valve can be shifted by manual override as long as the pressure in port T does not exceed 25 bar (363 PSI). For alternative manual overrides contact our technical support.

Ordering Code

SD2E-A2 / [] [] [] [] - []

2/2 directional valve, solenoid operated, spool type, direct acting, 3/4-16 UNF

Lightline High performance L H

Model 2111 2112

Surface treatment
A zinc-coated (ZnCr-3), ISO 9227 (240 h)
B zinc-coated (ZnNi), ISO 9227 (520 h)

Seals
No designation V NBR FPM (Viton)

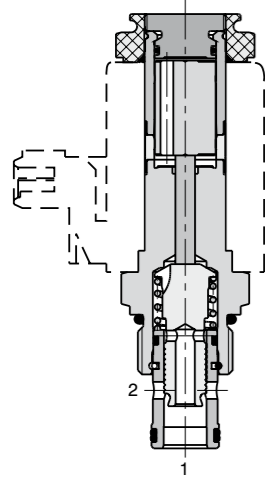
Manual override
No designation M2 M5 M9 standard rubber boot protected socket head screw without manual override

2/2 Directional Valve, Solenoid Operated, Spool Type, Direct Acting

SD2E-B2

7/8-14 UNF • Q_{max} 60 l/min (16 GPM) • p_{max} 350 bar (5100 PSI)

Lightline



Technical Features

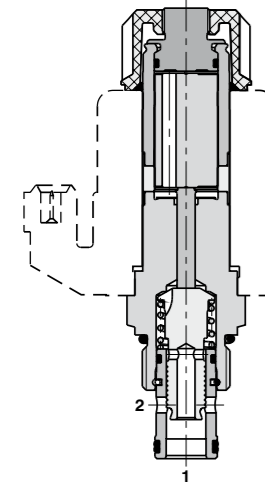
- › Hardened precision parts
- › High flow capacity
- › High transmitted hydraulic power
- › Wide range of manual overrides available
- › All ports may be fully pressurized
- › Variety of optional spools available
- › Coil interchangeability among SD*-B* product line
- › Standard version zinc-coated with surface protection acc. to ISO 9227 (240 h salt spray)

Functional Description

2-way, 2-position high pressure directional spool valve in form of a screw-in cartridge. The valve is used mainly to direct flow to actuators.

Model Code	2111	2112
Symbol		

High performance



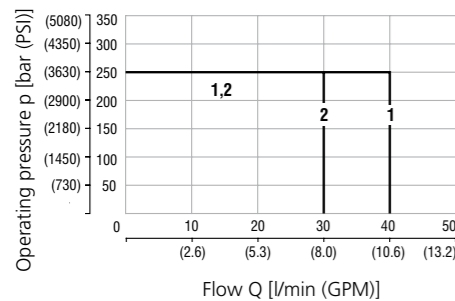
Technical Data

Valve size / Cartridge cavity		7/8-14 UNF-2A / B2	
		Lightline	High performance
Max. flow	l/min (GPM)	50 (13.2)	60 (15.9)
Max. operating pressure	bar (PSI)	250 (3630)	350 (5080)
Fluid temperature range	°C (°F)	-20...60 (-4...140)	-20...80 (-4...176)
Ambient temperature range	°C (°F)	-20...50 (-4...122)	-20...80 (-4...176)
Supply voltage tolerance	%	AC, DC: ± 10	AC, DC: ± 15
Max. switching frequency	1/h	15 000	
Mass without coil	kg (lbs)	0.22 (0.49)	0.29 (0.64)
General information		Type	
Datasheet		Products and operating conditions	
GI_0060		C 19B*	
C_8007		C 22B*	
Coil types			
In-line mounted	SB_0018		SB-B2*
Sandwich mounted	SB-04(06)_0028		SB-*B2*
Valve bodies			
Cavity details / Form tools	SMT_0019		SMT-B2*
Spare parts	SP_8010		

Characteristics measured at v = 32 mm²/s (156 SUS)

Operating limits - Lightline

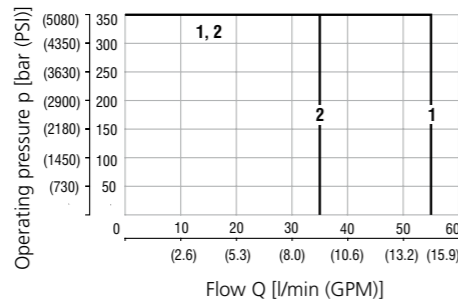
Oil 60 °C (140 °F) / Ambient temperature
50 °C (122 °F) / Voltage U_n -10% (21.6 VDC)



Model	Connection
1	2111
2	2112

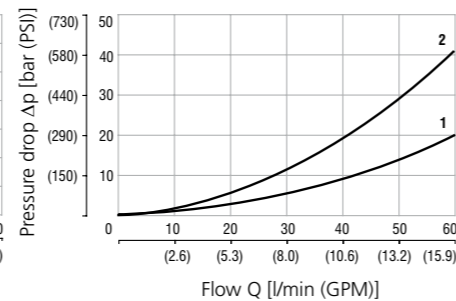
Operating limits - High performance

Oil 80 °C (176 °F) / Ambient temperature
50 °C (122 °F) / Voltage U_n -10% (21.6 VDC)



Model	Connection
1	2111
2	2112

Pressure drop related to flow rate
- Lightline, High performance

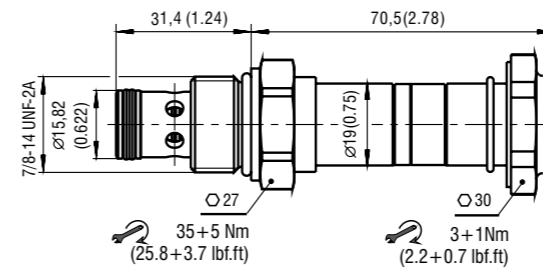


Model	Connection
1	2111
2	2112

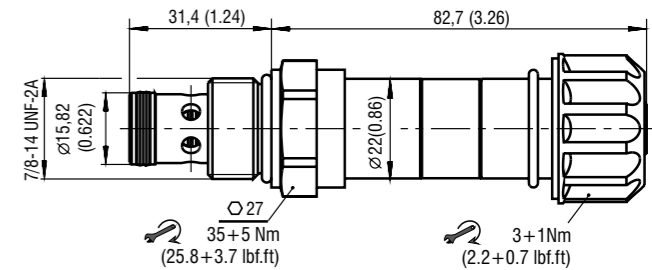
For operating limits under conditions and flow directions other than shown contact our technical support.

Dimensions in millimeters (inches)

Lightline



High performance



Manual Override in millimeters (inches)

No designation - standard	Designation M2 - rubber boot protected	Designation M5 - socket head screw, size 2.5	Designation M9 - without manual override
L ~ 70,5 (2.78) H ~ 82,7 (3.26)	L ~ 82,0 (3.23) H ~ 100,0 (3.94)	L ~ 78,1 (3.07) H ~ 84,8 (3.34)	L ~ 70,5 (2.78) H ~ 82,7 (3.26)

In case of solenoid malfunction or power failure, the spool of the valve can be shifted by manual override as long as the pressure in port T does not exceed 25 bar (363 PSI). For alternative manual overrides contact our technical support.

Ordering Code

SD2E-B2 / [] [] [] [] - []

2/2 directional valve, solenoid operated, spool type, direct acting, 7/8-14 UNF

Lightline High performance L H

Model

2111
2112

Surface treatment

A zinc-coated (ZnCr-3), ISO 9227 (240 h)
B zinc-coated (ZnNi), ISO 9227 (520 h)

Seals

No designation V
NBR
FPM (Viton)

Manual override

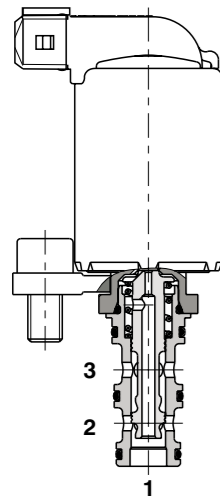
No designation
M2 rubber boot protected
M5 socket head screw
M9 without manual override

3/2 Directional Valve, Solenoid Operated, Spool Type, Direct Acting, Slip-In Style

PD2E1

Size D17/D20 • Q_{max} 30 l/min (8 GPM) • p_{max} 80 bar (1200 PSI)

PD2E1-Y3



Technical Features

- › 3/2 directional valve in an economical design
- › Hardened precision parts
- › High flow capacity
- › Variety of optional spools available
- › Standard version zinc-coated with surface protection acc. to ISO 9227 (240 h salt spray)

Functional Description

3-way, 2-position spool valve in the form of an economically designed slip-in cartridge. Designed for use in specialized low-pressure pilot systems or transmission clutch control.

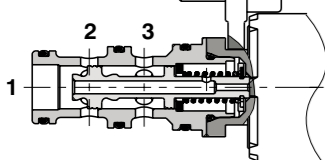
Model Code	2D21	2D26
Symbol		

Technical Data

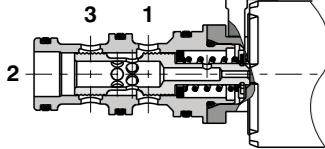
Valve size / Cartridge cavity		D17 / Y3	D20 / X3, W3
Max. flow	l/min (GPM)	30 (7.9)	
Max. operating pressure version Y, X (2, 3), W (3,1)	bar (PSI)	80 (1160)	
Max. operating pressure version Y, X (1), W (2)	bar (PSI)	30 (440)	
Fluid temperature range	°C (°F)	-30...90 (-22...194), +100 (212) short-time	
Ambient temperature range	°C (°F)	-30...90 (-22...194), +100 (212) short-time	
Supply voltage tolerance	%	DC ± 10	
Supply voltage	V	12 DC	24 DC
Quenching diode (E4A, E13)		BZW06-19B	BZW06-33B
Enclosure type acc. to EN 60529		IP67 / IP 69K	
Mass	kg (lbs)	0.2 (0.44)	

Valve	Datasheet	Type		
		PD2E1-Y3	PD2E1-X3	PD2E1-W3
General information	GI_0060	Products and operating conditions		
Valve bodies	In-line mounted SB_0018	SB-Y3-*	SB-W3-*	
Cavity details	SMT_0019	SMT-Y3*	SMT-W3*	
Spare parts	SP_8010			

PD2E1-X3



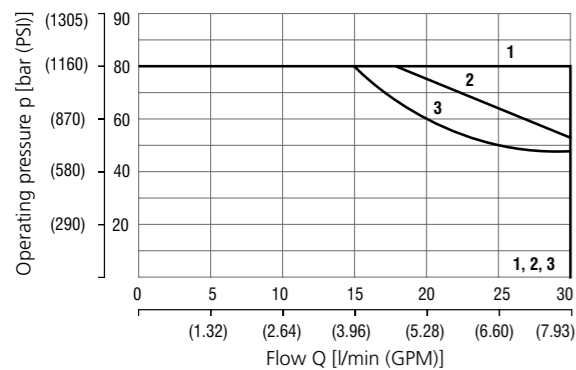
PD2E1-W3



Characteristics measured at v = 32 mm²/s (156 SUS)

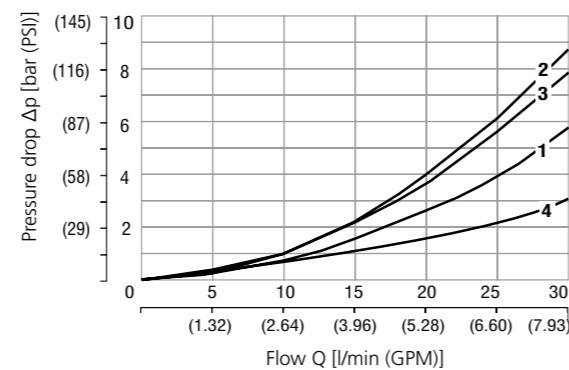
Operating limits

Oil 90 °C (194 °F) / Ambient temperature 90 °C (194 °F) / Voltage U_n ± 15% (21.6 VDC)



	Model	Connection
Y3	1	2→1
	1	3→2
	1	3→2
X3	2	2→1
	2	3→2
W3	3	2→1
	3	3→2

Pressure drop related to flow rate

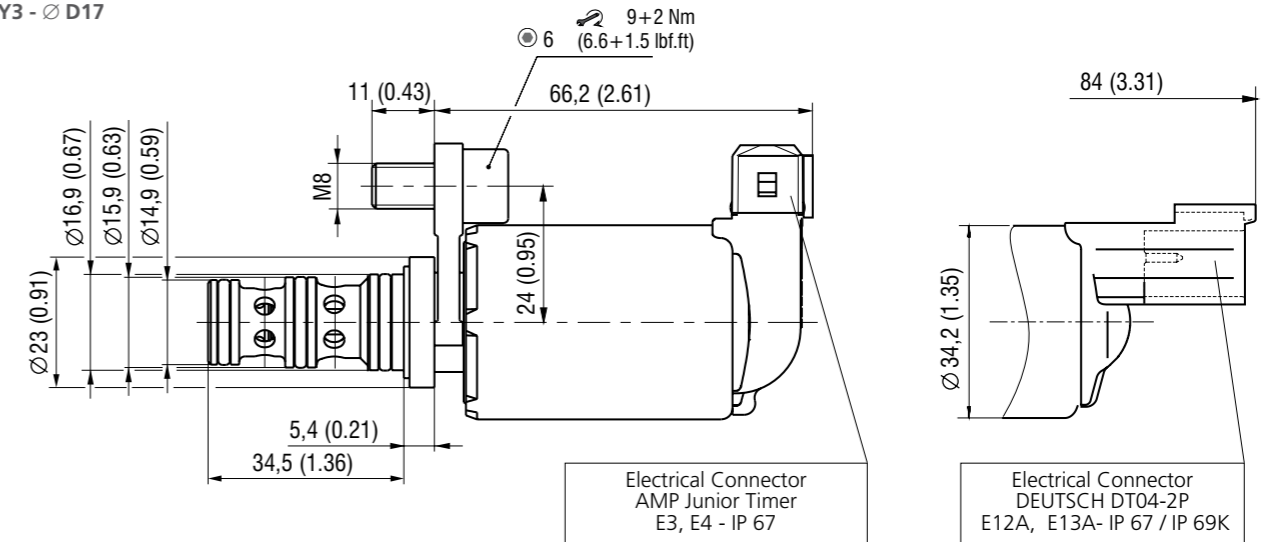


	Model	Connection
Y3	1	2→1
	2	3→2
	3	2→1
X3	4	3→2
	4	2→1
W3	1	2→1
	1	3→2

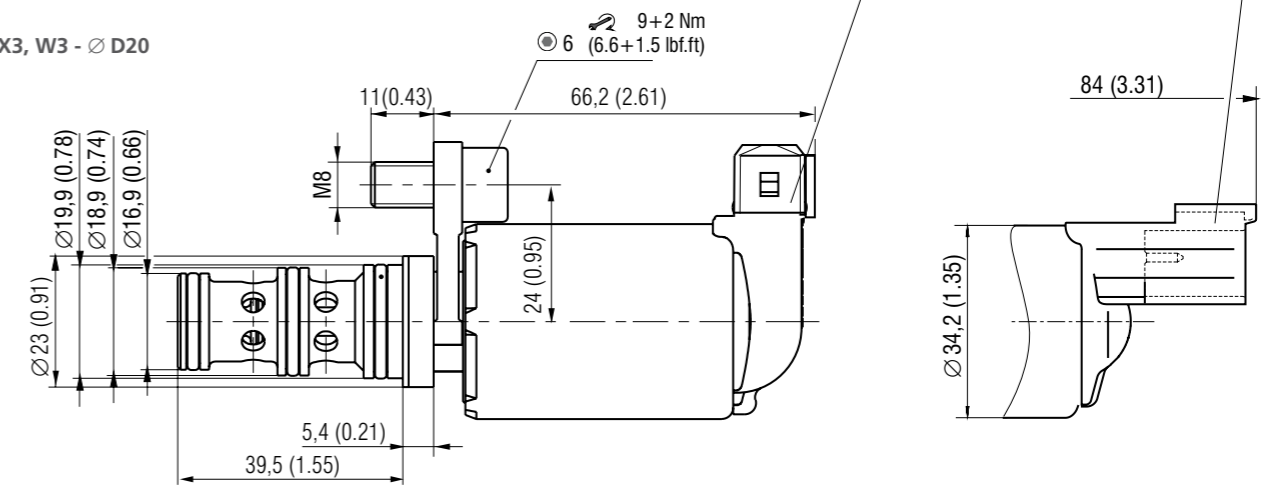
For operating limits under conditions and flow directions other than shown contact our technical support.

Dimensions in millimeters (inches)

Y3 - Ø D17



X3, W3 - Ø D20



Ordering Code

PD2E1 - [] / [] - [] - [] - []

3/2 directional valve, solenoid operated, spool type, direct acting, slip-in style

Valve cavity
D17 Y3
D20 W3
D20 X3

Model
 2D21
 2D26

Surface treatment
A zinc-coated (ZnCr-3), ISO 9227 (240 h)
B zinc-coated (ZnNi), ISO 9227 (520 h)

Seals
V No designation
NBR
FPM (Viton)

Connector
E3 AMP Junior Timer - radial direction (2 pins; male)
E4 E3 with quenching diode
E12A Deutsch DT04-2P - axial direction (2 pins; male)
E13A E12A with quenching diode

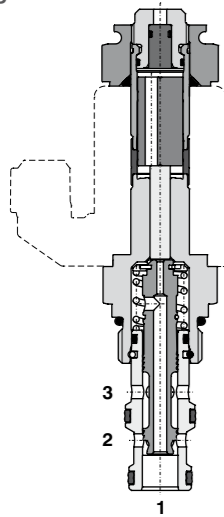
Nominal supply voltage
12 V DC / 1.67 A
24 V DC / 0.84 A

3/2 Directional Valve, Solenoid Operated, Spool Type, Direct Acting

SD2E-A3

3/4-16 UNF • Q_{max} 30 l/min (8 GPM) • p_{max} 350 bar (5100 PSI)

Lightline



Technical Features

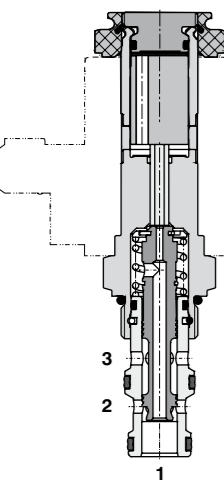
- › Hardened precision parts
- › High flow capacity
- › High transmitted hydraulic power
- › Wide range of manual overrides available
- › All ports may be fully pressurized
- › Variety of optional spools available
- › Coil interchangeability among SD*-A* product line
- › Standard version zinc-coated with surface protection acc. to ISO 9227 (240 h salt spray)

Functional Description

3-way, 2-position high pressure, bi-directional spool valve in the form of a screw-in cartridge. The valve is used mainly to direct flow to actuators.

Model Code	2D21	2D25	2D26	2D27, 2D31
Symbol				

High performance



Technical Data

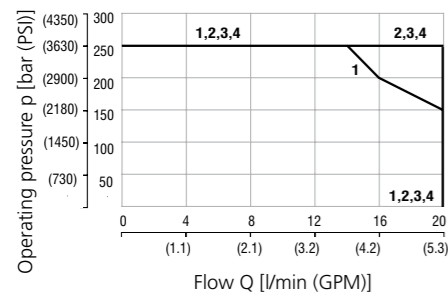
Valve size / Cartridge cavity		3/4-16 UNF-2A / A3	
		Lightline	High performance
Max. flow	l/min (GPM)	20 (5.3)	30 (7.9)
Max. operating pressure	bar (PSI)	250 (3630)	350 (5080)
Fluid temperature range	°C (°F)	-20...60 (-4...140)	-20...80 (-4...176)
Ambient temperature range	°C (°F)	-20...50 (-4...122)	-20...80 (-4...176)
Supply voltage tolerance	%	DC ± 10	AC, DC: ± 15
Max. switching frequency	1/h	15 000	
Mass without coil	kg (lbs)	0.14 (0.31)	0.20 (0.44)

		Datasheet	Type
General information		GI_0060	Products and operating conditions
Coil types		C_8007	C14B* C19B*
Valve bodies	In-line mounted	SB_0018	SB-A3*
	Sandwich mounted	SB-04(06)_0028	SB-*A3*
Cavity details / Form tools		SMT_0019	SMT-A3*
Spare parts		SP_8010	

Characteristics measured at v = 32 mm²/s (156 SUS)

Operating limits - Lightline

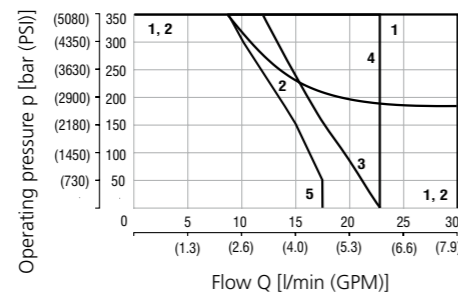
Oil 60 °C (140 °F) / Ambient temperature
50 °C (122 °F) / Voltage U_n -10% (21.6 VDC)



Model	Connection
1	2D26 3→2
2	2D26 2→1
3	2D25 3→2, 2→1
4	2D21 3→2, 2→1

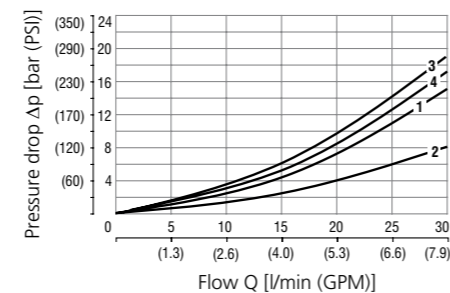
Operating limits - High performance

Oil 80 °C (176 °F) / Ambient temperature
50 °C (122 °F) / Voltage U_n -10% (21.6 VDC)



Model	Connection
1	2D21 3→2, 2→1
1	2D25 3→2, 2→1
1	2D31 3→1
2	2D26 3→2, 2→1
3	2D31 2→1
4	2D27 3→1
5	2D27 2→1

Pressure drop related to flow rate
- Lightline, High performance

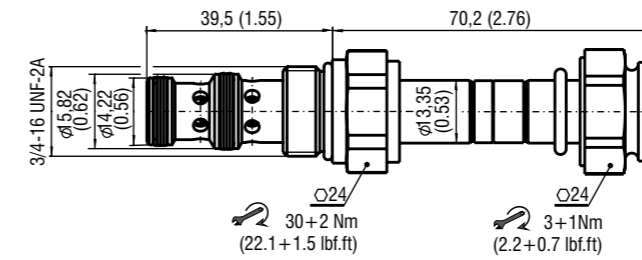


Model	Connection
1	2D21 3→2
1	2D25 3→2
1	2D31 2→1
1	2D27 2→1
2	2D21 2→1
3	2D26 3→2
3	2D27 3→1
4	2D25 2→1
4	2D26 2→1
4	2D31 3→1

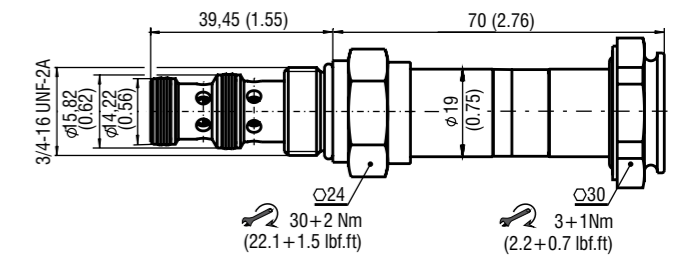
For operating limits under conditions and flow directions other than shown contact our technical support.

Dimensions in millimeters (inches)

Lightline



High performance



Manual Override in millimeters (inches)

No designation - standard	Designation M2 - rubber boot protected	Designation M5 - socket head screw, size 2.5	Designation M9 - without manual override
L ~ 70,2 (2.63) H ~ 70,0 (2.76)	L ~ 81,7 (3.22) H ~ 81,5 (3.21)	L ~ 77,2 (3.04) H ~ 77,6 (3.06)	L ~ 67,2 (2.65) H ~ 70,0 (2.76)

In case of solenoid malfunction or power failure, the spool of the valve can be shifted by manual override as long as the pressure in port T does not exceed 25 bar (363 PSI). For alternative manual overrides contact our technical support.

Ordering Code

SD2E-A3 / [] [] [] [] - []

3/2 directional valve, solenoid operated, spool type, direct acting, 3/4-16 UNF

Lightline High performance L H

Model

2D21
2D25
2D26
2D27 only for H
2D31 only for H

Surface treatment

A zinc-coated (ZnCr-3), ISO 9227 (240 h)
B zinc-coated (ZnNi), ISO 9227 (520 h)

Seals

No designation NBR
V FPM (Viton)

Manual override

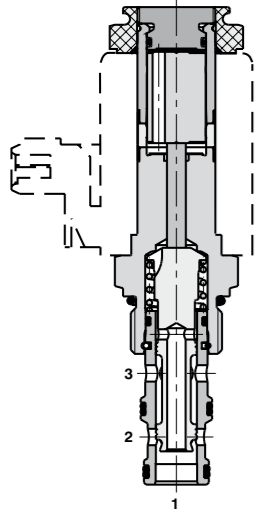
No designation standard
M2 rubber boot protected
M5 socket head screw
M9 without manual override

3/2 Directional Valve, Solenoid Operated, Spool Type, Direct Acting

SD2E-B3

7/8-14 UNF • Q_{max} 60 l/min (16 GPM) • p_{max} 350 bar (5100 PSI)

Lightline



Technical Features

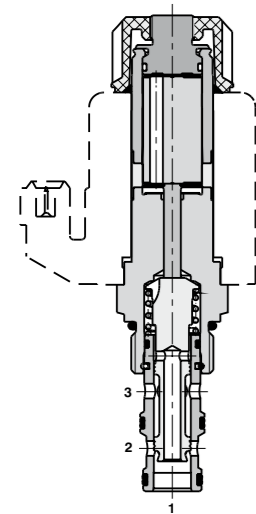
- › Hardened precision parts
- › High flow capacity
- › High transmitted hydraulic power
- › Wide range of manual overrides available
- › All ports may be fully pressurized
- › Variety of optional spools available
- › Coil interchangeability among SD*-B* product line
- › Standard version zinc-coated with surface protection acc. to ISO 9227 (240 h salt spray)

Functional Description

3-way, 2-position high pressure directional spool valve in form of a screw-in cartridge. The valve is used mainly to direct flow to actuators.

Model Code	2D21	2D25	2D26
Symbol			

High performance



Technical Data

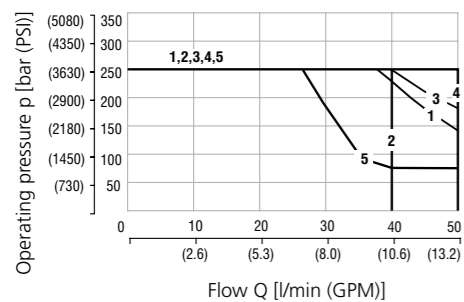
Valve size / Cartridge cavity		7/8-14 UNF-2A / B3	
		Lightline	High performance
Max. flow	l/min (GPM)	50 (13.2)	60 (15.9)
Max. operating pressure	bar (PSI)	250 (3630)	350 (5080)
Fluid temperature range	°C (°F)	-20...60 (-4...140)	-20...80 (-4...176)
Ambient temperature range	°C (°F)	-20...50 (-4...122)	-20...80 (-4...176)
Supply voltage tolerance	%	AC, DC: ± 10	AC, DC: ± 15
Max. switching frequency	1/h	15 000	
Mass without coil	kg (lbs)	0.24 (0.53)	0.31 (0.68)

General information		Datasheet		Type	
GI_0060		C_8007		Products and operating conditions	
C_8007		C_19B*		C_22B*	
SB_0018		SB_04(06)_0028		SB-B3*	
SB_04(06)_0028		SMT_0019		SB-*B3*	
SMT_0019		SP_8010		SMT-B3*	
SP_8010					

Characteristics measured at v = 32 mm²/s (156 SUS)

Operating limits - Lightline

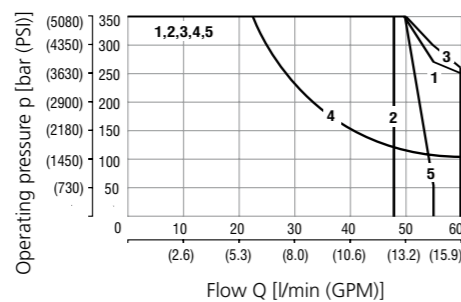
Oil 60 °C (140 °F) / Ambient temperature
50 °C (122 °F) / Voltage U_n -10% (21.6 VDC)



Model	Connection
1	2D21
2	2D21
3	2D25
4	2D25
5	2D26
2	2D26

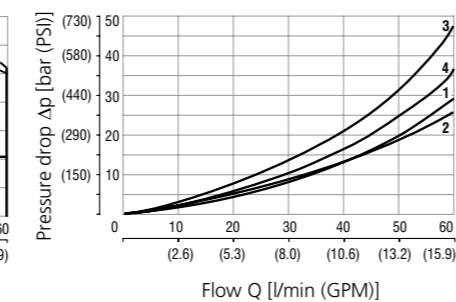
Operating limits - High performance

Oil 80 °C (176 °F) / Ambient temperature
50 °C (122 °F) / Voltage U_n -10% (21.6 VDC)



Model	Connection
1	2D21
2	2D21
3	2D25
4	2D25
5	2D26
2	2D26

Pressure drop related to flow rate
- Lightline, High performance

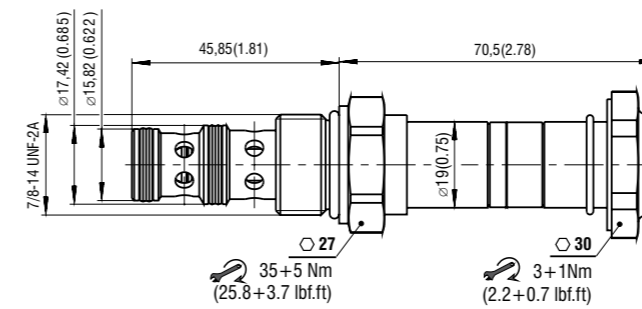


Model	Connection
1	2D21
2	2D21
3	2D25
4	2D25
1	2D26
1	2D26

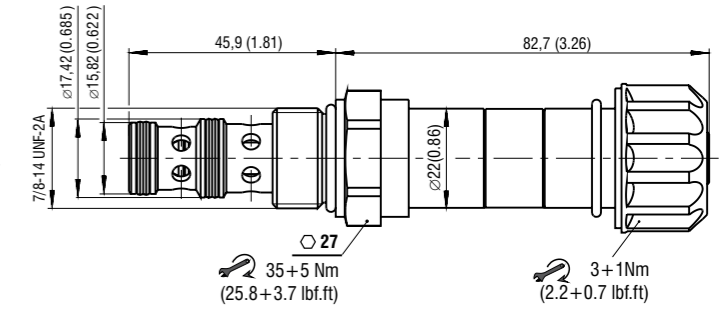
For operating limits under conditions and flow directions other than shown contact our technical support.

Dimensions in millimeters (inches)

Lightline



High performance



Manual Override in millimeters (inches)

No designation - standard	Designation M2 - rubber boot protected	Designation M5 - socket head screw, size 2.5	Designation M9 - without manual override
L ~ 70,5 (2.78) H ~ 82,7 (3.26)	L ~ 82,0 (3.23) H ~ 100,0 (3.94)	L ~ 78,1 (3.07) H ~ 84,8 (3.34)	L ~ 70,5 (2.78) H ~ 82,7 (3.26)

In case of solenoid malfunction or power failure, the spool of the valve can be shifted by manual override as long as the pressure in port T does not exceed 25 bar (363 PSI). For alternative manual overrides contact our technical support.

Ordering Code

SD2E-B3 / [] [] [] [] - []

3/2 directional valve, solenoid operated, spool type, direct acting, 7/8-14 UNF

Lightline High performance L H

Surface treatment
A zinc-coated (ZnCr-3), ISO 9227 (240 h)
B zinc-coated (ZnNi), ISO 9227 (520 h)

Seals
No designation NBR
V FPM (Viton)

Manual override
No designation standard
M2 rubber boot protected
M5 socket head screw
M9 without manual override

Model

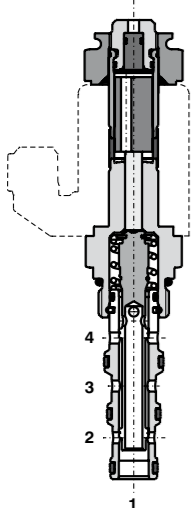
2D21
2D25
2D26

4/2 Directional Valve, Solenoid Operated, Spool Type, Direct Acting

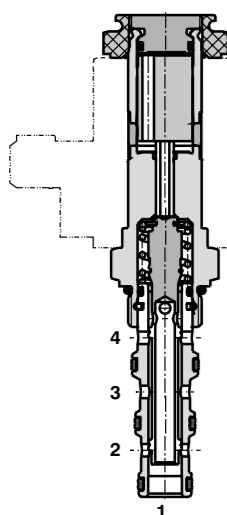
SD2E-A4

3/4-16 UNF • Q_{max} 30 l/min (8 GPM) • p_{max} 350 bar (5100 PSI)

Lightline



High performance

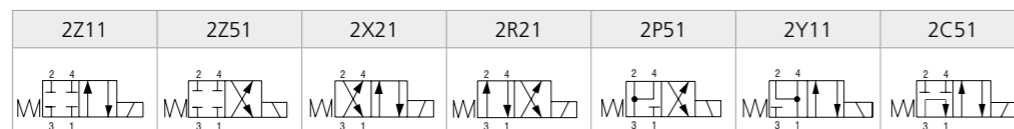


Technical Features

- ▶ Hardened precision parts
- ▶ High flow capacity
- ▶ High transmitted hydraulic power
- ▶ Wide range of manual overrides available
- ▶ All ports may be fully pressurized
- ▶ Variety of optional spools available
- ▶ Coil interchangeability among SD*-A* product line
- ▶ Standard version zinc-coated with surface protection acc. to ISO 9227 (240 h salt spray)

Functional Description

4-way, 2-position high pressure bi-directional spool valve in the form of a screw-in cartridge. The valve is used mainly to direct flow to actuators.



Technical Data

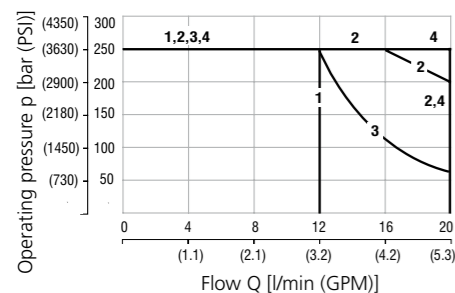
Valve size / Cartridge cavity		3/4-16 UNF-2A / A4	
		Lightline	High performance
Max. flow	l/min (GPM)	20 (5.3)	30 (7.9)
Max. operating pressure	bar (PSI)	250 (3630)	350 (5080)
Fluid temperature range	°C (°F)	-20...60 (-4...140)	-20...80 (-4...176)
Ambient temperature range	°C (°F)	-20...50 (-4...122)	-20...80 (-4...176)
Supply voltage tolerance	%	DC ± 10	AC, DC: ± 15
Max. switching frequency	1/h	15 000	
Mass without coil	kg (lbs)	0.15 (0.33)	0.23 (0.51)

General information		Datasheet	Type
Coil types		C_8007	Products and operating conditions
Valve bodies		In-line mounted SB_0018	C14B* SB-A4*
Cavity details / Form tools		Sandwich mounted SB-04(06)_0028	C19B* SB-*A4*
Spare parts		SMT_0019	SMT-A4*
		SP_8010	

Characteristics measured at v = 32 mm³/s (156 SUS)

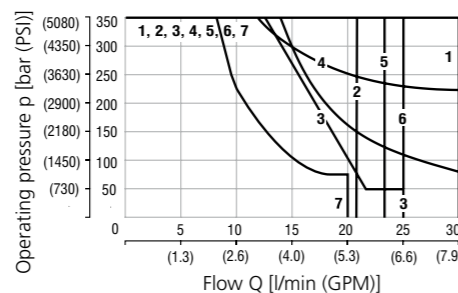
Operating limits - Lightline

Oil 60 °C (140 °F) / Ambient temperature
50 °C (122 °F) / Voltage U_n -10% (21.6 VDC)

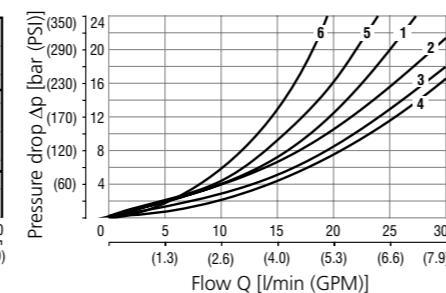


Operating limits - High performance

Oil 80 °C (176 °F) / Ambient temperature
50 °C (122 °F) / Voltage U_n -10% (21.6 VDC)



Pressure drop related to flow rate - Lightline, High performance



Model	Connection
1 2Z11	3→2, 4→1
2 2Z51	3→4, 2→1
3 2R21	3→2, 4→1
4 2R21	3→4, 2→1
4 2P51	3→4, 2→1
4 2X21	3→4, 2→1 3→2, 4→1

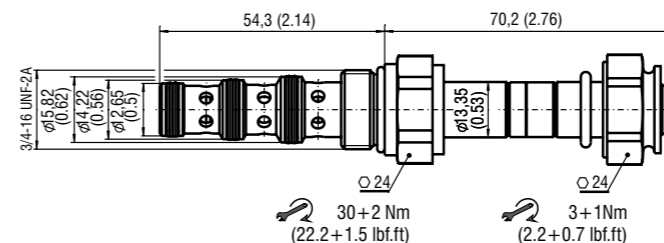
Model	Connection
1 2Z51	3→4, 2→1
2 2Z11	3→2, 4→1
3 2R21	3→2, 4→1
4 2X21	3→4, 2→1
5 2X21	3→2, 4→1
1 2R21	3→4, 2→1
2 2Y11	3→2, 4→1
7 2C51	3→1

Model	Connection	Model	Connection
1 2Z11	4→1	2R21	2→1
2 2Z11	3→2	2Z51	2→1
2 2X21	3→4, 4→1	2R21	3→2
3 2Z51	3→4	2R21	3→4
3 2Y11	3→2, 4→1		
4 2X21	3→2, 2→1	2C51	3→2, 4→1
5 2R21	4→1		
6 2C51	3→1		

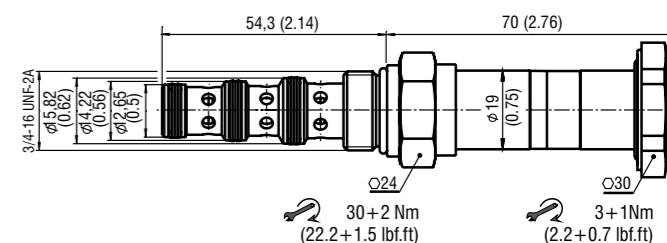
For operating limits under conditions and flow directions other than shown contact our technical support.

Dimensions in millimeters (inches)

Lightline



High performance



Manual Override in millimeters (inches)

No designation - standard	Designation M2 - rubber boot protected	Designation M5 - socket head screw, size 2.5	Designation M9 - without manual override
 L ~ 70,2 (2.63) H ~ 70,0 (2.76)	 L ~ 81,7 (3.22) H ~ 81,5 (3.21)	 L ~ 77,2 (3.04) H ~ 77,6 (3.06)	 L ~ 67,2 (2.65) H ~ 70,0 (2.76)

In case of solenoid malfunction or power failure, the spool of the valve can be shifted by manual override as long as the pressure in port T does not exceed 25 bar (363 PSI). For alternative manual overrides contact our technical support.

Ordering Code

SD2E-A4 / [] [] [] [] - []

4/2 directional valve, solenoid operated, spool type, direct acting, 3/4-16 UNF

Lightline High performance L H

Model

		2Z11
		2Z51
		2X21
		2R21
		only for L 2P51
		only for H 2Y11
		only for H 2C51

Surface treatment

A zinc-coated (ZnCr-3), ISO 9227 (240 h)
B zinc-coated (ZnNi), ISO 9227 (520 h)

Seals

No designation V
NBR
FPM (Viton)

Manual override

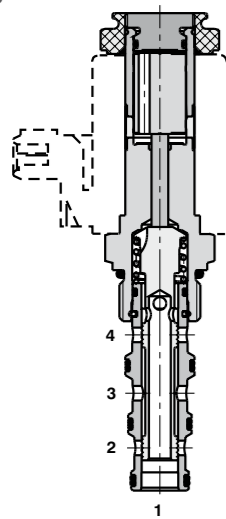
No designation M2 M5 M9
standard
rubber boot protected
socket head screw
without manual override

4/2 Directional Valve, Solenoid Operated, Spool Type, Direct Acting

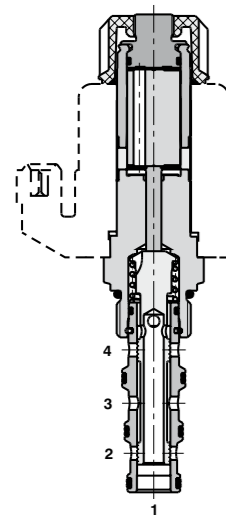
SD2E-B4

7/8-14 UNF • Q_{max} 60 l/min (16 GPM) • p_{max} 350 bar (5100 PSI)

Lightline



High performance



Technical Features

- › Hardened precision parts
- › High flow capacity
- › High transmitted hydraulic power
- › Wide range of manual overrides available
- › All ports may be fully pressurized
- › Variety of optional spools available
- › Coil interchangeability among SD*-B* product line
- › Standard version zinc-coated with surface protection acc. to ISO 9227 (240 h salt spray)

Functional Description

4-way, 2-position high pressure directional spool valve in form of a screw-in cartridge. The valve is used mainly to direct flow to actuators.

Model Code	2Z11	2Z51	2X21
Symbol			

Technical Data

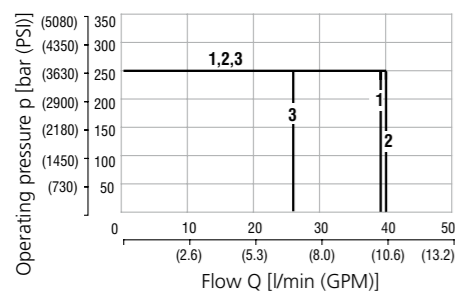
Valve size / Cartridge cavity		7/8-14 UNF-2A / B4	
		Lightline	High performance
Max. flow	l/min (GPM)	50 (13.2)	60 (15.9)
Max. operating pressure	bar (PSI)	250 (3630)	350 (5080)
Fluid temperature range	°C (°F)	-20...60 (-4...140)	-20...80 (-4...176)
Ambient temperature range	°C (°F)	-20...50 (-4...122)	-20...80 (-4...176)
Supply voltage tolerance	%	AC, DC: ± 10	AC, DC: ± 15
Max. switching frequency	1/h	15 000	
Mass without coil	kg (lbs)	0.25 (0.55)	0.32 (0.71)

General information		Datasheet		Type	
		GI_0060	GI_0060	Products and operating conditions	
Coil types		C_8007	C_19B*	C_22B*	
Valve bodies		In-line mounted	SB_0018	SB-B4*	
		Sandwich mounted	SB-04(06)_0028	SB-*B4*	
Cavity details / Form tools		SMT_0019		SMT-B4*	
Spare parts		SP_8010			

Characteristics measured at v = 32 mm/s (156 SUS)

Operating limits - Lightline

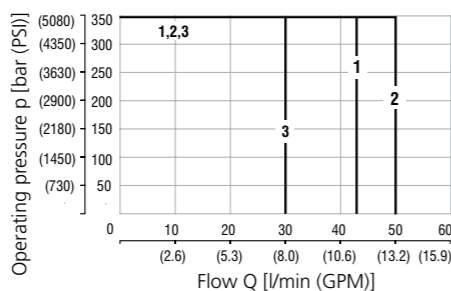
Oil 60 °C (140 °F) / Ambient temperature 50 °C (122 °F) / Voltage U_n -10% (21.6 VDC)



Model	Connection
1 2Z11	3→2, 4→1
2 2Z51	3→4, 2→1
2 2X21	3→4, 2→1
3 2X21	3→2, 4→1

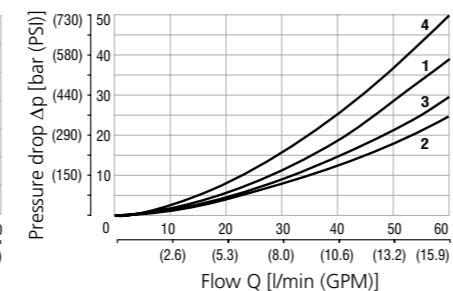
Operating limits - High performance

Oil 80 °C (176 °F) / Ambient temperature 50 °C (122 °F) / Voltage U_n -10% (21.6 VDC)



Model	Connection
1 2Z11	3→2, 4→1
2 2Z51	3→4, 2→1
2 2X21	3→4, 2→1
3 2X21	3→2, 4→1

Pressure drop related to flow rate - Lightline, High performance

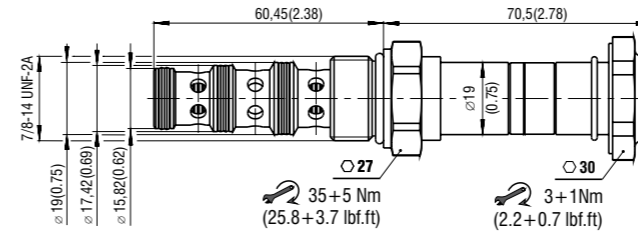


Model	Connection
1 2Z11	3→2
1 2Z11	4→1
3 2Z51 - only for L	3→4
2 2Z51 - only for L	2→1
2 2Z51 - only for H	3→4
3 2Z51 - only for H	2→1
3 2X21	3→2
4 2X21	4→1
3 2X21 Q _{max} 50 l/min	3→4
2 2X21 Q _{max} 40 l/min	2→1

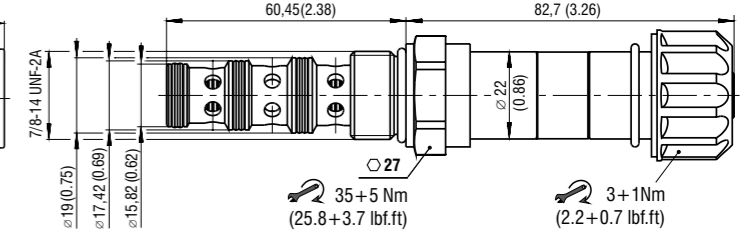
For operating limits under conditions and flow directions other than shown contact our technical support.

Dimensions in millimeters (inches)

Lightline



High performance



Manual Override in millimeters (inches)

No designation - standard	Designation M2 - rubber boot protected	Designation M5 - socket head screw, size 2.5	Designation M9 - without manual override
L ~ 70,5 (2.78) H ~ 82,7 (3.26)	L ~ 82,0 (3.23) H ~ 100,0 (3.94)	L ~ 78,1 (3.07) H ~ 84,8 (3.34)	L ~ 70,5 (2.78) H ~ 82,7 (3.26)

In case of solenoid malfunction or power failure, the spool of the valve can be shifted by manual override as long as the pressure in port T does not exceed 25 bar (363 PSI). For alternative manual overrides contact our technical support.

Ordering Code

SD2E-B4 / [] [] [] [] - []

4/2 directional valve, solenoid operated, spool type, direct acting, 7/8-14 UNF

Lightline High performance L H

Model

2Z11
2Z51
2X21

Surface treatment
A zinc-coated (ZnCr-3), ISO 9227 (240 h)
B zinc-coated (ZnNi), ISO 9227 (520 h)

Seals
NBR
FPM (Viton)

No designation V

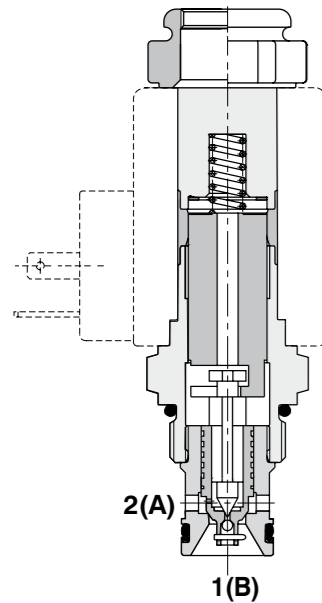
Manual override
standard
M2 rubber boot protected
M5 socket head screw
M9 without manual override

2/2 Directional Valve, Solenoid Operated, Poppet Type, Piloted

ROE3-062S2

M22x1.5 • Q_{max} 63 l/min (17 GPM) • p_{max} 250 bar (3600 PSI)

Normally closed



Technical Features

- › Hardened precision parts
- › High flow capacity and leak-free closing
- › High transmitted hydraulic power
- › Normally closed version
- › All ports may be fully pressurized
- › Coil interchangeability among ROE / RPE3-04 product line
- › Standard version zinc-coated with surface protection acc. to ISO 9227 (240 h salt spray)

Functional Description

2-way, 2-position piloted poppet valve in form of a screw-in cartridge. The valve is used mainly for on-off bi-directional control of flow to actuators with leak-free closing in one direction.

Model Code	S2
Symbol	

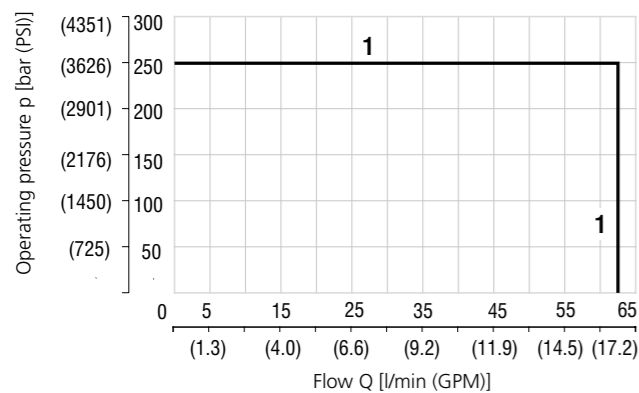
Technical Data

Valve size / Cartridge cavity		M22x1.5 / QG2
Max. flow	l/min (GPM)	63 (16.6)
Max. operating pressure	bar (PSI)	250 (3630)
Fluid temperature range (NBR)	°C (°F)	-30 ... +80 (-22 ... +176)
Fluid temperature range (FPM)	°C (°F)	-20 ... +80 (-4 ... +176)
Ambient temperature	°C (°F)	-20 ... 50 (-4 ... 122)
Supply voltage tolerance	%	AC, DC: ± 10
Max. switching frequency	1/h	15 000
Mass without coil	kg (lbs)	0.20 (0.44)

		Datasheet	Type
General information		GI_0060	Products and operating conditions
Coil types		C_8007	C 19B*
Valve bodies	In line mounted	SB_0018	SB-QG2*
	Sandwich mounted	SB-04 (06)_0028	SB-06-QG2*
Cavity details		SMT_0019	SMT-QG2*
Spare parts		SP_8010	

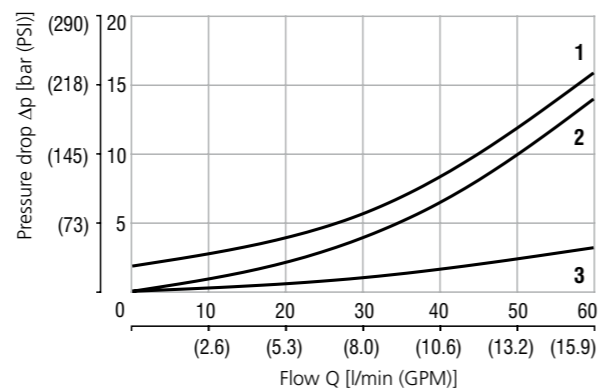
Characteristics measured at v = 32 mm²/s (156 SUS)

Operating limits
Operating limits for maximum hydraulic power at rated temperature and supply voltage equal to 90% nominal.



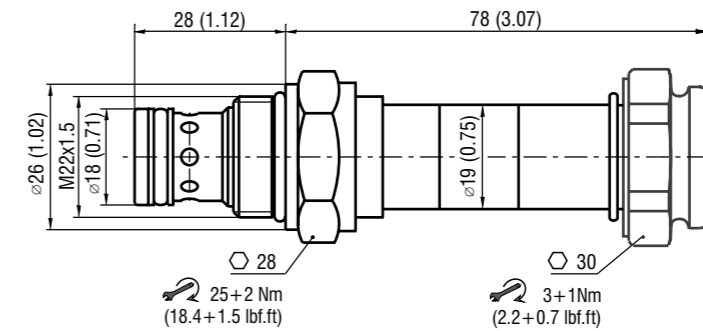
Model	Connection
1 S2	2→1, 1→2

Pressure drop related to flow rate



Model	Connection	Solenoid
1 S2	1→2	OFF
2 S2	2→1	ON
3 S2	1→2	ON

Dimensions in millimeters (inches)

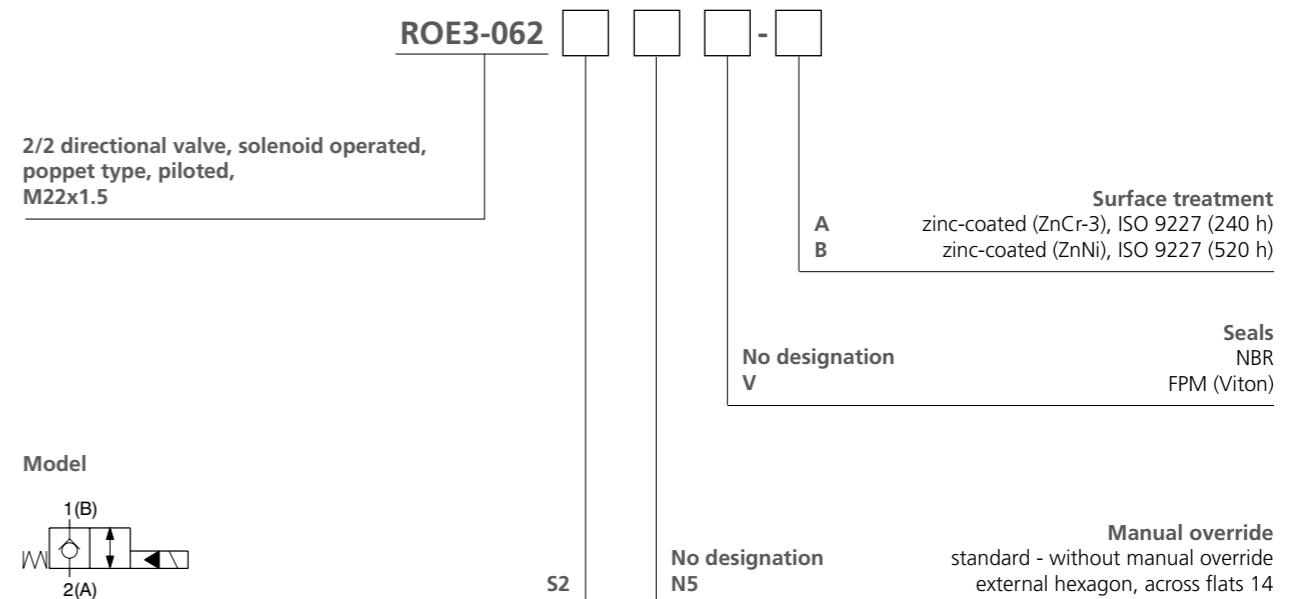


Manual Override in millimeters (inches)

Standard - without manual override	Designation N5 - with external hexagon, across flats 14

In case of solenoid malfunction or power failure, the spool of the valve can be shifted by manual override as long as the pressure in port T does not exceed 25 bar (363 PSI). For alternative manual overrides contact our technical support.

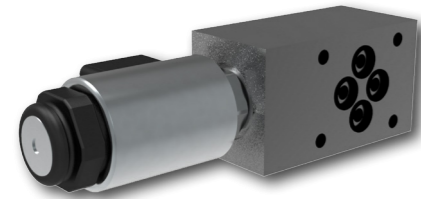
Ordering Code



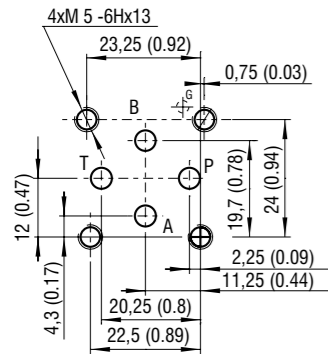
2/2 Directional Valve, Solenoid Operated, Poppet Type, Pilot Operated, Modular

ROE3-062S2/M

Size 04 (D02), 06 (D03) • Q_{max} 60 l/min (16 GPM) • p_{max} 250 bar (3600 PSI)

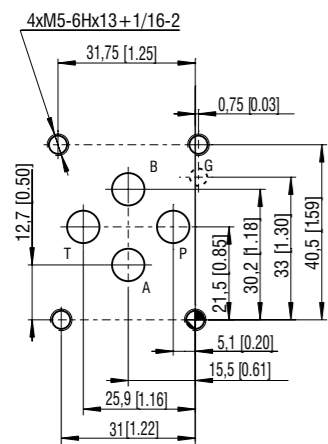


ISO 4401-02-01-0-05



Ports P, A, B, T max Ø 4.5 mm (0.18 in)

ISO 4401-03-02-0-05



Ports P, A, B, Tmax Ø 7.5 mm (0.29 in)

Technical Features

- 2/2 directional valve, solenoid operated, poppet type, blocking, pilot operated with mounting interface acc. to ISO 4401, DIN 24340 (CETOP 02 and 03) or as an in-line device
- Hardened precision parts
- High flow capacity and leak-free closing
- High transmitted hydraulic power
- Normally closed (NC) version
- All ports may be fully pressurized
- Coils interchangeable across ROE / RPE3-04 product line
- In the standard version, the valve is zinc-coated for 240 h protection acc. to ISO 9227 and the valve body is phosphated.

Functional Description

2-way, 2-position high pressure pilot operated poppet valve in the form of a screw-in cartridge. Usable in various subplate and in-line arrangements. The valve is used mainly for ON-OFF bi-directional control of flow from and to actuators with secure leak-free closing in both directions.

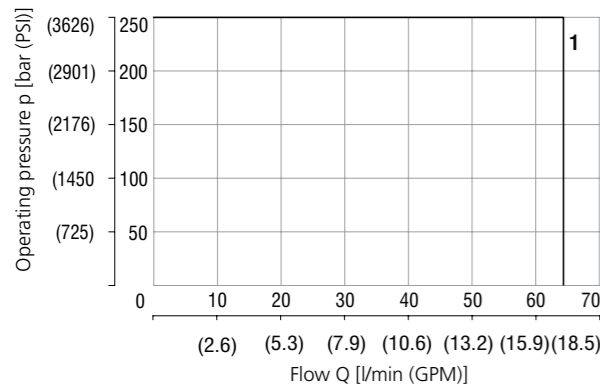
Technical Data

Valve size / Cartridge cavity		04 (02) / QG2	06 (03) / QG2
Max. flow	l/min (GPM)	25 (6.6)	60 (15.9)
Max. operating pressure	bar (PSI)	250 (3630)	
Fluid temperature range (NBR)	°C (°F)	-30 ... +80 (-22 ... +176)	
Fluid temperature range (FPM)	°C (°F)	-20 ... +80 (-4 ... +176)	
Ambient temperature range	°C (°F)	-20 ... +50 (-4 ... +122)	
Supply voltage tolerance	%	AC, DC: ± 10	
Max. switching frequency	1/h	15 000	
Switching time, at v = 32 mm ² /s (156 SUS)	ON	DC 25 ... 35 AC 25 ... 35	DC 30 ... 50 AC 30 ... 110
	OFF	DC 15 ... 25 AC 50 ... 100	DC 80 ... 130 AC 100 ... 150
Mass	- valve with 1 solenoid	Modular 1.2 (2.5)	Modular 1.5 (3.2)
	- valve with 2 solenoids	Modular 1.7 (3.6)	Modular 2.0 (4.3)
		In-line 1.6 (3.5)	
Data Sheet		Type	
General information	GI_0060	Products and operating conditions	
Cavity details	SMT_0019	Size 04, 06	
Spare parts	SP_8010		

Characteristics measured at v = 32 mm²/s (156 SUS)

Operating limits

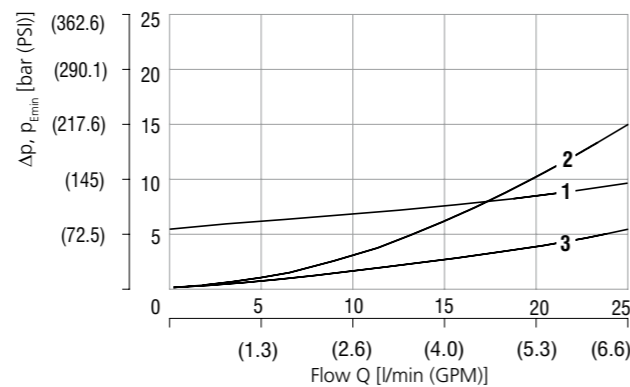
Operating limits for maximum hydraulic power at rated temperature and supplied with voltage equal to 90% of the nominal value



Model	Direction
1 S2	A-B, B-A

Pressure drop related to flow rate

In-line body design R*

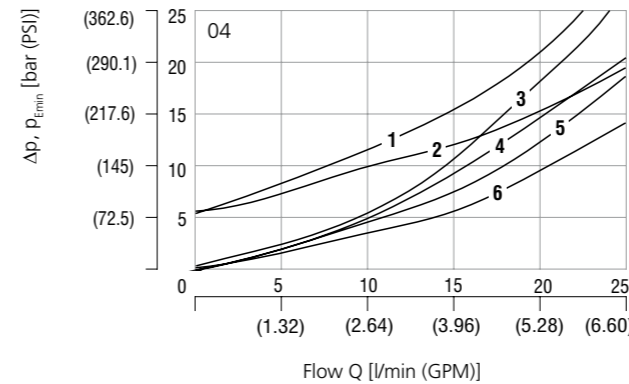


Model	Direction
1 R1, R2, R3, R4	B-A, Solenoid OFF
2 R1, R3, R4	B-A, Solenoid ON
3 R1, R2, R3, R4	A-B, Solenoid ON

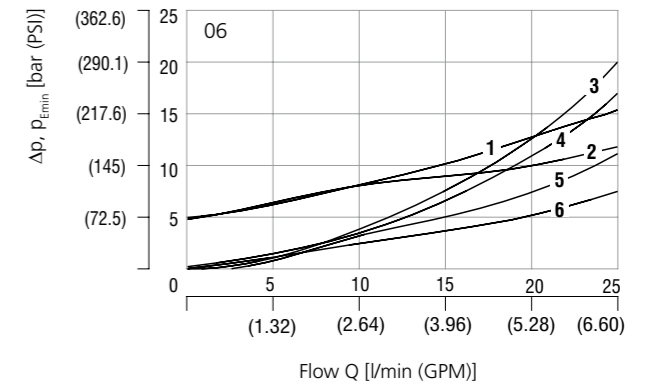
Characteristics measured at v = 32 mm²/s (156 SUS)

Pressure drop related to flow rate

In-line body design M*



	Model	Direction	Solenoid
1	MD04	T-A	OFF
1	MX04	B-A	OFF
2	MA04	A1-A2	OFF
3	MD04	A-T	
4	MA04	A2-A1	
4	MD04	T-A	ON
5	MX04	B-A	ON
6	MA04	A1-A2	ON



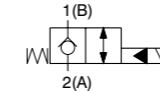
	Model	Direction	Solenoid
1	MD06	T-A	OFF
2	MX06	B-A	OFF
2	MA06	A1-A2	OFF
3	MD06	A-T	
4	MA06	A2-A1	
4	MX06	A-B	
5	MD06	A-T	
6	MA06	A1-A2	ON
6	MX06	B-A	ON

Ordering Code

ROE3-062 S2 / [] / [] / [] / [] - []

2/2 directional valve, solenoid operated, poppet type, blocking, direct acting, modular

normally closed (NC)



Surface treatment
No designation phosphated body, steel parts
A zinc-coated (ZnCr-3), ISO 9227 (240 h)
B zinc-coated (ZnNi), ISO 9227 (520 h)

Seals
No designation NBR
V FPM (Viton)

Manual override
No designation standard - without manual override
N5 with external hexagon 14

Connector
E1 EN 175301-803-A
E2 E1 with quenching diode
E3 AMP Junior Timer - radial direction (2 pins; male)
E4 E3 with quenching diode
E3A AMP Junior Timer - axial direction (2 pins; male)
E4A E3A with quenching diode
E5 EN 175301-803-A with integrated rectifier
E8 loose conductors (two insulated wires)
E9 E8 with quenching diode
E12A Deutsch DT04-2P - axial direction
E13A E12A with quenching diode

Rated supply voltage of solenoids (at the coil terminals)

01200	12 V DC / 2.41 A
01400	14 V DC / 1.66 A
02100	21 V DC / 1.31 A
02400	24 V DC / 1.15 A
02700	27 V DC / 0.89 A
20500	205 V DC / 0.12 A
02450	24 V AC / 1.44 A / 50 (60) Hz
12060	120 V AC / 0.22 A / 50 (60) Hz
23050	230 V AC / 0.12 A / 50 (60) Hz

Model

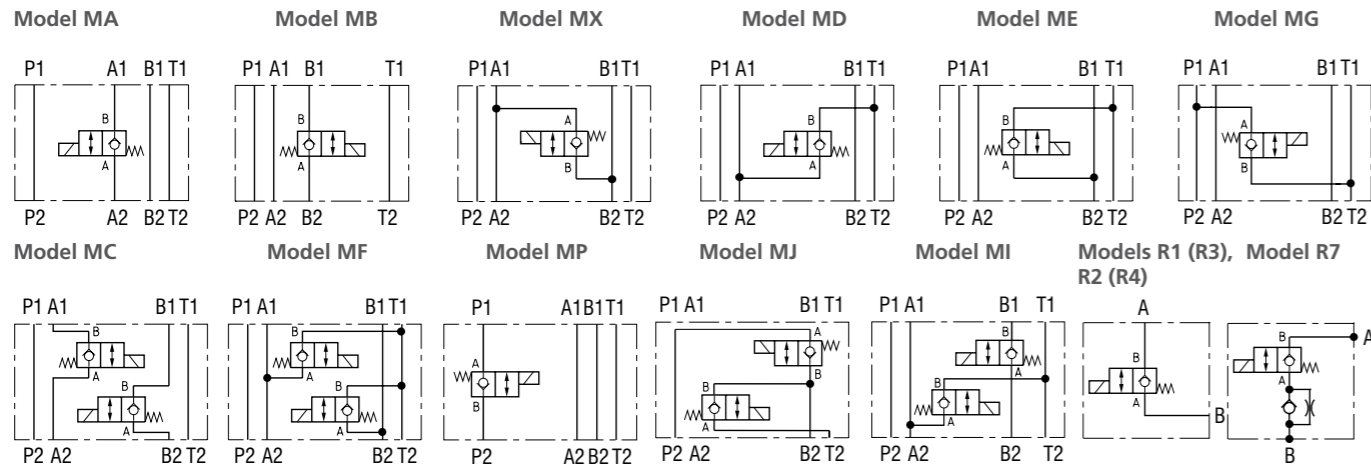
- modular valve, connection A2-A1 MA
- modular valve, connection B2-B1 MB
- modular valve, connection A-B MX
- modular valve, connection A-T MD
- modular valve, connection B-T ME
- modular valve, connection B2-B1, A2-A1 MC
- modular valve, connection B-T, A-T MF
- modular valve, connection P-T MG
- modular valve, connection P2-P1 MP*
- modular valve, connection B2-P2, B2-T2 MJ
- modular valve, connection A-T, B2-B1 MI
- in-line valve, 2 ports, thread G3/8 R1
- in-line valve, 2 ports, thread G1/2 R2
- in-line valve, 2 ports, thread SAE 8, 3/4-16 R3
- in-line valve, 2 ports, thread SAE 10, 7/8-14 R4
- in-line valve, 2 ports, thread SAE 10, 7/8-14 R7

*only available for size 06 (D03)

Modular plate size

- ISO 4401-02-01-0-05, DIN 24340 (CETOP 02), size 04 04
- ISO 4401-03-02-0-05, DIN 24340 (CETOP 03), size 06 06

Functional Symbols



Solenoid Coil in millimeters (inches)

E1 - EN 175301-803-A E2 - E1 with quenching diode Protection degree IP65	E3 - AMP Junior Timer - radial direction E4 - E3 with quenching diode Protection degree IP67	E3A - AMP Junior Timer - axial direction E4A - E3A with quenching diode Protection degree IP67	E5 - EN 175301-803-A and integrated rectifier Protection degree IP65
E8 - Loose conductors (two insulated cables) E9 - (E8 with quenching diode) Protection degree IP65	E12A - Deutsch DT04-2P E13A - E12A with quenching diode Protection degree IP67 / IP69K		

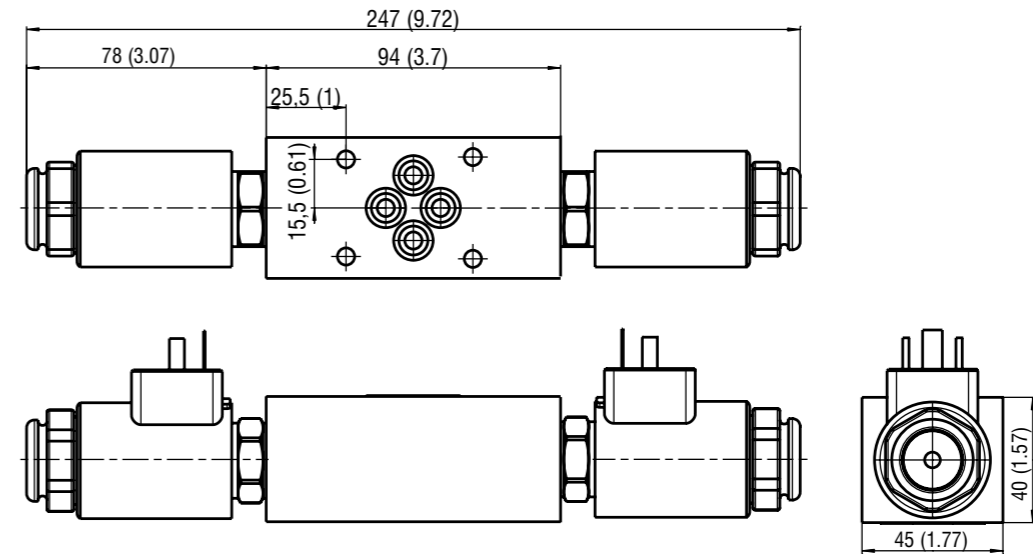
The indicated IP protection level is only reached with a properly mounted connector.

Manual Override in millimeters (inches)

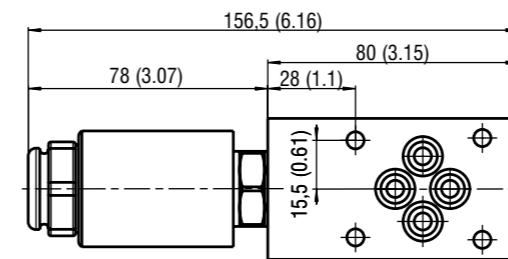
No designation - standard - without manual override	Designation N5 - with external hexagon 14

Dimensions in millimeters (inches)

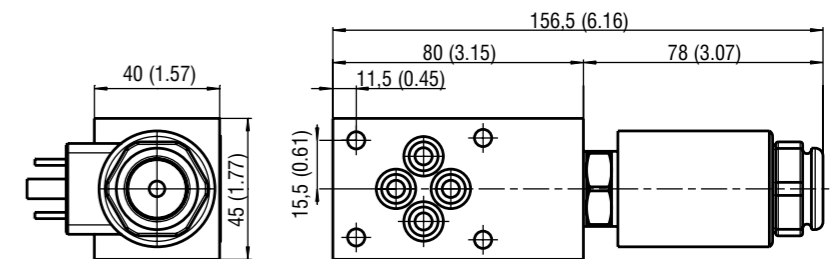
Models MC, MF, MI, MJ



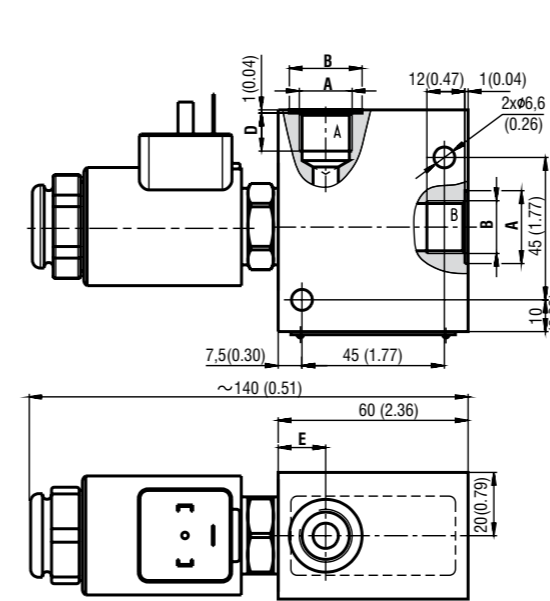
Models MA, MX, MD, MG, MP



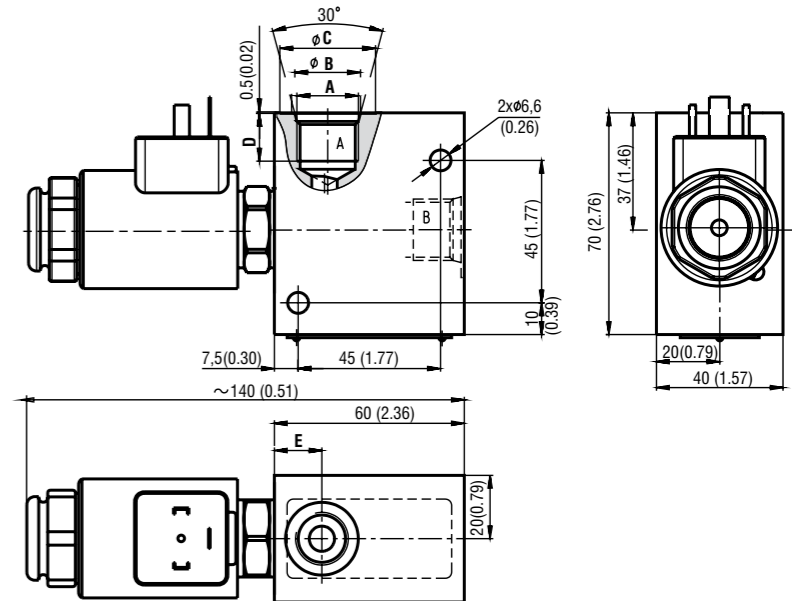
Models MB, ME



Models R1 (R2)



Model R3 (R4)



	A	B	D
R1	G3/8-A	Ø 23	12 (0.47)
R2	G1/2-A	Ø 28	14 (0.55)

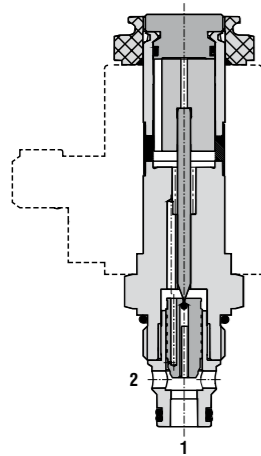
	A	B	C	D	E
R3	3/4-16UNF-2B	Ø 20.6	Ø 30	15 (0.59)	16 (0.61)
R4	7/8-14UNF-2B	Ø 23.9	Ø 34	16.7 (0.66)	18 (0.71)

2/2 Directional Valve, Solenoid Operated, Poppet Type, Piloted

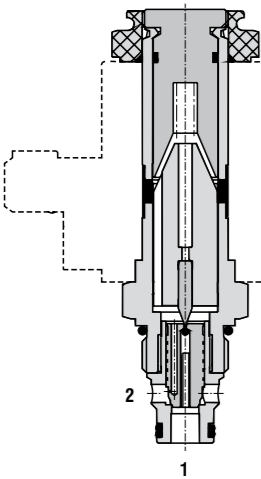
SD3E-A2

3/4-16 UNF • Q_{max} 30 l/min (8 GPM) • p_{max} 420 bar (6100 PSI)

Normally Open



Normally Closed



Technical Features

- › Hardened precision parts
- › High flow capacity and leak-free closing
- › High transmitted hydraulic power up to 420 bar
- › Lightline design 250 bar with reduced solenoid power for production cost saving
- › Normally open and normally closed version
- › Wide range of manual overrides available
- › All ports may be fully pressurized
- › Coil interchangeability among SD*- A* product line
- › Standard version zinc-coated with surface protection acc. to ISO 9227 (240 h salt spray)

Functional Description

2-way, 2-position high pressure, pilot operated poppet valve in form of a screw-in cartridge. The valve is used mainly for on-off bi-directional control of flow to actuators with leak-free closing in one direction.

Model Code	2O2	2L2
Symbol		

Technical Data

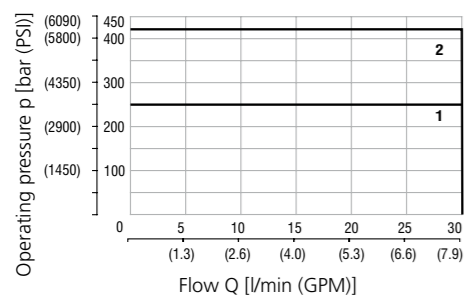
Valve size / Cartridge cavity		3/4-16 UNF-2A / A2	
		Lightline	High performance
Max. flow	l/min (GPM)	30 (7.9)	30 (7.9)
Max. operating pressure	bar (PSI)	250 (3630)	420 (6090)
Fluid temperature range	°C (°F)	-20...60 (-4...140)	-20...80 (-4...176)
Ambient temperature range	°C (°F)	-20...50 (-4...122)	-20...80 (-4...176)
Supply voltage tolerance	%	DC: ± 10	AC, DC: ± 15
Max. switching frequency	1/h	15 000	
Mass without coil	kg (lbs)	0.12 (0.26)	0.20 (0.44)

General information		Datasheet	Type
General information		GI_0060	Products and operating conditions
Coil types		C_8007	C14B* C19B*
Valve bodies	In-line mounted	SB_0018	SB-A2*
	Sandwich mounted	SB-04(06)_0028	SB-*A2*
Cavity details / Form tools		SMT_0019	SMT-A2*
Spare parts		SP_8010	

Characteristics measured at v = 32 mm²/s (156 SUS)

Operating limits - Lightline + High performance

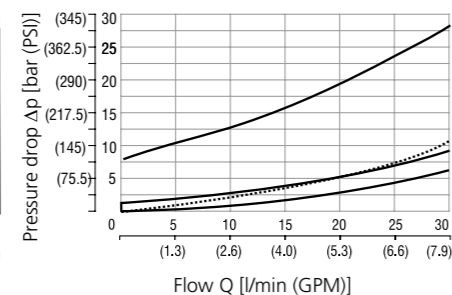
- L - Oil 60 °C (140 °F) / Ambient temperature/ 50 °C (122 °F) / Voltage U_n -10% (21.6 VDC)
- HP - Oil 80 °C (176 °F) Ambient temperature 50 °C (122 °F) / Voltage U_n -10% (21.6 VDC)



Model	Connection
1	L2L2
1	L2O2
2	H2L2
2	H2O2

Pressure drop related to flow rate

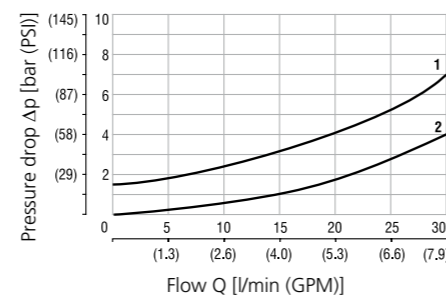
- Lightline



Model	Connection	Solenoid
1	L2L2	1→2
1	L2L2	2→1
1	L2O2	2→1
2	L2L2	1→2
3	L2O2	1→2
4	L2O2	1→2

Pressure drop related to flow rate

- High performance

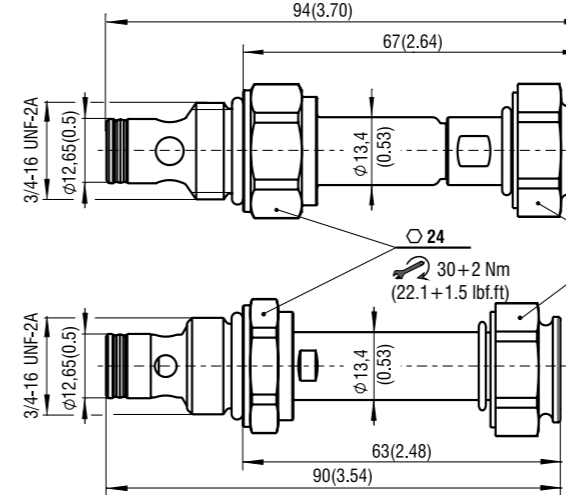


Model	Connection	Solenoid
1	H2L2	1→2
2	H2L2	1→2
2	H2L2	2→1
2	H2O2	1→2
2	H2O2	2→1
2	H2O2	1→2

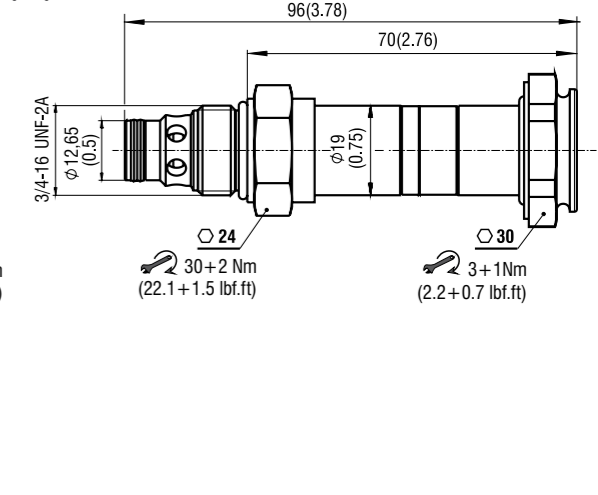
For operating limits under conditions and flow directions other than shown contact our technical support.

Dimensions in millimeters (inches)

Lightline L2



High performance L2 (O2)



O2

Manual Override in millimeters (inches)

No designation - standard for 2O2*	Designation M2 for 2O2 - rubber boot protected *	Designation M5 for 2O2 - socket head screw, size 2.5 *	Designation M9 for 2O2 - without manual override
~ 70.0 (2.76)	~ 81.5 (3.21)	~ 77.6 (3.06)	H ~ 70.0 (2.76) L ~ 90.0 (3.54)
Only for High performance version		Designation M5 for 2L2 - socket head screw, size 2.5	Designation M9 for 2L2 - without manual override
		~ 88.8 (3.50)	H ~ 70.0 (2.76) L ~ 94.0 (3.70)

In case of solenoid malfunction or power failure, the spool of the valve can be shifted by manual override as long as the pressure in port T does not exceed 25 bar (363 PSI). For alternative manual overrides contact our technical support.

Ordering Code

SD3E-A2 / [] [] [] [] - []

2/2 directional valve, solenoid operated, poppet type, piloted, 3/4-16 UNF

Lightline L
High performance H

Model

2O2

2L2

Surface treatment

A zinc-coated (ZnCr-3), ISO 9227 (240 h)
B zinc-coated (ZnNi), ISO 9227 (520 h)*

*Only for High performance version

Seals

No designation NBR
V FPM (Viton)*

*Only for High performance version

Manual override

No designation standard for 2O2*
M2 rubber boot protected*
M5 socket head screw*
M9 without manual override

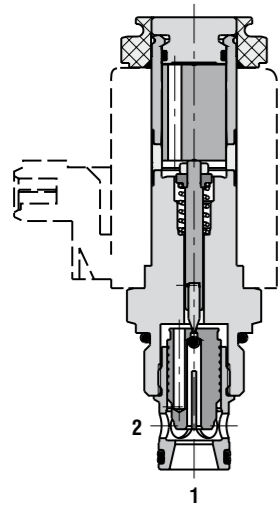
*Only for High performance version

2/2 Directional Valve, Solenoid Operated, Poppet Type, Piloted

SD3E-B2

7/8-14 UNF • Q_{max} 75 l/min (20 GPM) • p_{max} 420 bar (6100 PSI)

Normally Open



Technical Features

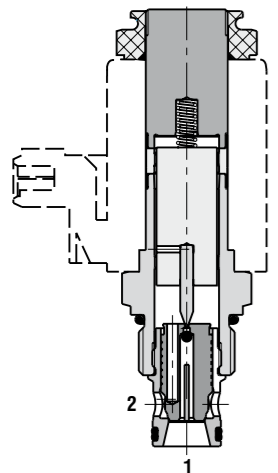
- › Hardened precision parts
- › High flow capacity and leak-free closing
- › High transmitted hydraulic power up to 420 bar
- › Normally open and normally closed version
- › Wide range of manual overrides available
- › All ports may be fully pressurized
- › Coil interchangeability among SD*- B* product line
- › Standard version zinc-coated with surface protection acc. to ISO 9227 (240 h salt spray)

Functional Description

2-way, 2-position high pressure pilot operated poppet valve in form of a screw-in cartridge. The valve is used mainly for on-off bi-directional control of flow to actuators with leak-free closing in one direction.

Model Code	2O2	2L2
Symbol		

Normally Closed



Technical Data

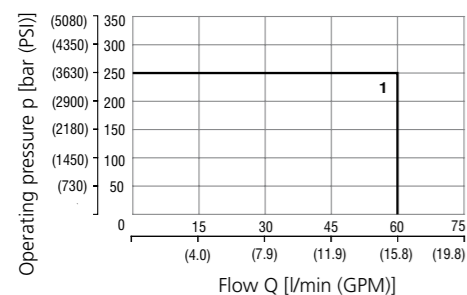
Valve size / Cartridge cavity		7/8-14 UNF-2A / B2	
		Lightline	High performance
Max. flow	l/min (GPM)	60 (13.2)	75 (15.9)
Max. operating pressure	bar (PSI)	250 (3630)	420 (5080)
Fluid temperature range	°C (°F)	-20...60 (-4...140)	-20...80 (-4...176)
Ambient temperature range	°C (°F)	-20...50 (-4...122)	-20...80 (-4...176)
Supply voltage tolerance	%	AC, DC: ± 10	AC, DC: ± 15
Max. switching frequency	1/h	15 000	
Mass without coil	kg (lbs)	0.23 (0.51)	0.30 (0.66)

General information		Type	
Datasheet		Products and operating conditions	
GI_0060		C19B* C22B*	
Coil types	C_8007	C19B* C22B*	
Valve bodies	In-line mounted	SB_0018	SB-B2*
	Sandwich mounted	SB-04(06)_0028	SB-*B2*
Cavity details / Form tools	SMT_0019	SMT-B2*	
Spare parts	SP_8010		

Characteristics measured at $v = 32 \text{ mm}^2/\text{s}$ (156 SUS)

Operating limits - Lightline

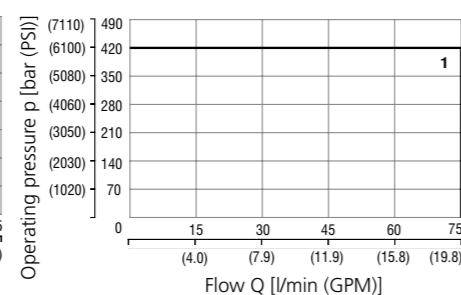
Oil 60 °C (140 °F) / Ambient temperature
50 °C (122 °F) / Voltage U_n -10% (21.6 VDC)



Model	Connection
1 2L2	1→2, 2→1
1 2O2	1→2, 2→1

Operating limits - High performance

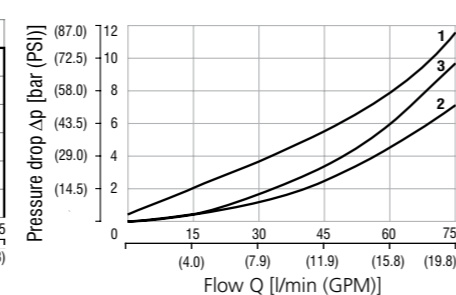
Oil 80 °C (176 °F) / Ambient temperature
50 °C (122 °F) / Voltage U_n -10% (21.6 VDC)



Model	Connection
1 2L2	1→2, 2→1
1 2O2	1→2, 2→1

Pressure drop related to flow rate

- Lightline, High performance

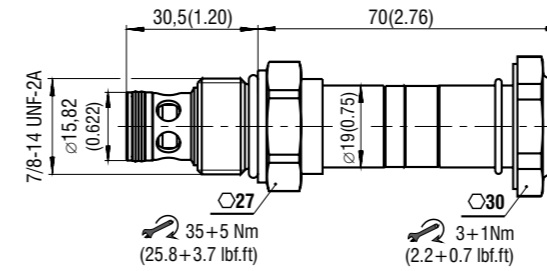


Model	Connection	Solenoid
1 2L2	1→2	off
2 2L2	2→1	on
2 2L2	1→2	on
2 2O2	1→2	off
3 2O2	2→1	off

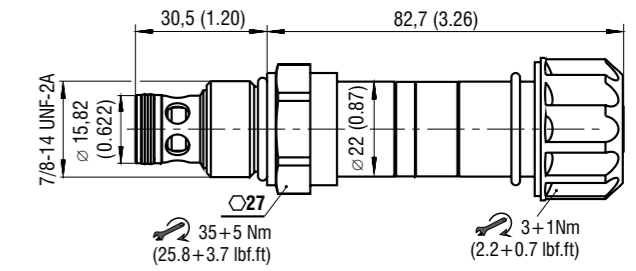
For operating limits under conditions and flow directions other than shown contact our technical support.

Dimensions in millimeters (inches)

Lightline



High performance



Manual Override in millimeters (inches)

No designation - for 2O2 - standard	Designation M2 for 2O2 - rubber boot protected	Designation M5 - for 2O2 - socket head screw, size 2.5	Designation M9 - for 2O2 - without manual override
 L ~ 70,0 (2.76) H ~ 82,7 (3.26)	 L ~ 82,0 (3.23) H ~ 100,0 (3.94)	 L ~ 77,6 (3.06) H ~ 84,8 (3.34)	 L ~ 70,0 (2.76) H ~ 82,7 (3.26)
		Designation M5 - for 2L2 - socket head screw, size 2.5	Designation M9 - for 2L2 - without manual override
		 L ~ 81,8 (3.22) H ~ 93,6 (3.69)	 L ~ 70,0 (2.76) H ~ 82,7 (3.26)

In case of solenoid malfunction or power failure, the spool of the valve can be shifted by manual override as long as the pressure in port T does not exceed 25 bar (363 PSI). For alternative manual overrides contact our technical support.

Ordering Code

SD3E-B2 / [] [] [] [] - []

2/2 directional valve, solenoid operated, poppet type, piloted, 7/8-14 UNF

Lightline
High performance

Model

Surface treatment

A zinc-coated (ZnCr-3), ISO 9227 (240 h)
B zinc-coated (ZnNi), ISO 9227 (520 h)

Seals

NBR
FPM (Viton)

No designation

V

Manual override

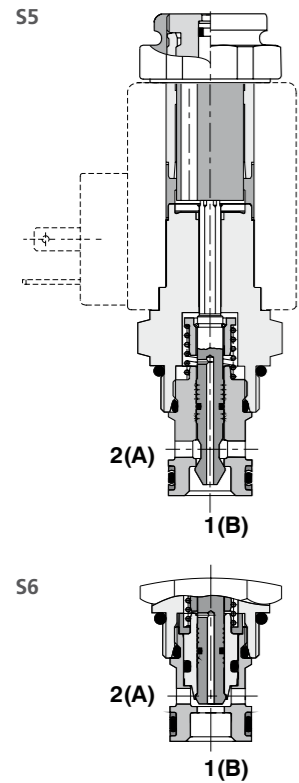
standard for 2O2
rubber boot protected
socket head screw
without manual override

2O2

2L2

2/2 Directional Valve, Solenoid Operated, Poppet Type, Blocking, Direct Acting

ROE3-042S5(S6) M22x1.5 • Q_{max} 25 l/min (7 GPM) • p_{max} 250 bar (3600 PSI)



Technical Features

- › Hardened precision parts
- › High flow capacity and leak-free closing
- › High transmitted hydraulic power
- › Wide range of manual overrides available
- › All ports may be fully pressurized
- › Normally open and normally closed version
- › Coil interchangeability among ROE / RPE3-04 product line
- › Standard version zinc-coated with surface protection acc. to ISO 9227 (240 h salt spray)

Functional Description

2-way, 2-position high pressure, direct acting poppet valve in the form of a screw-in cartridge. The valve is used mainly for ON-OFF bi-directional control of flow to actuators with leak-free closing in both directions.

Model Code	S5	S6
Symbol		

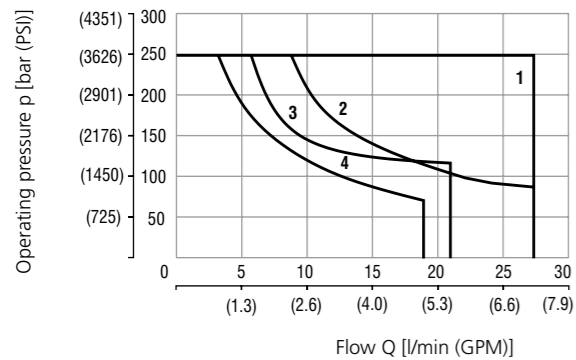
Technical Data

Valve size / Cartridge cavity	M22x1.5 / QG2	
Max. flow	l/min (GPM)	25 (6.6)
Max. operating pressure	bar (PSI)	250 (3630)
Fluid temperature range (NBR)	°C (°F)	-30 ... +80 (-22 ... +176)
Fluid temperature range (FPM)	°C (°F)	-20 ... +80 (-4 ... +176)
Ambient temperature	°C (°F)	-20 ... 50 (-4 ... 122)
Supply voltage tolerance	%	AC, DC: ± 10
Max. switching frequency	1/h	15 000
Mass without coil	kg (lbs)	0.2 (0.44)

	Datasheet	Type
General information	GI_0060	Products and operating conditions
Coil types	C_8007	C 19B*
Valve bodies	In-line mounted	SB_0018
	Sandwich mounted	SB-04 (06)_0028
Cavity details	SMT_0019	SMT-QG2*
Spare parts	SP_8010	

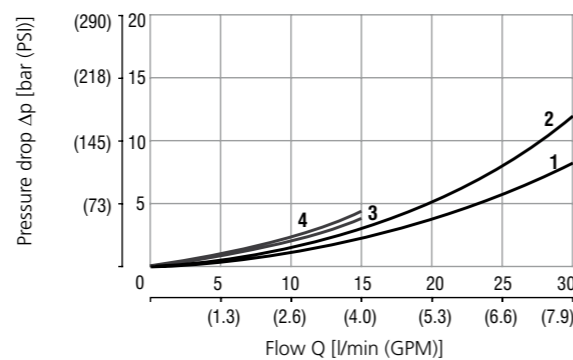
Characteristics measured at v = 32 mm²/s (156 SUS)

Operating limits
Operating limits for maximum hydraulic power at rated temperature and supply voltage equal to 90% nominal.



	Model	Connection
1	S5	2→1
2	S5	1→2
3	S6	2→1*
4	S6	1→2*

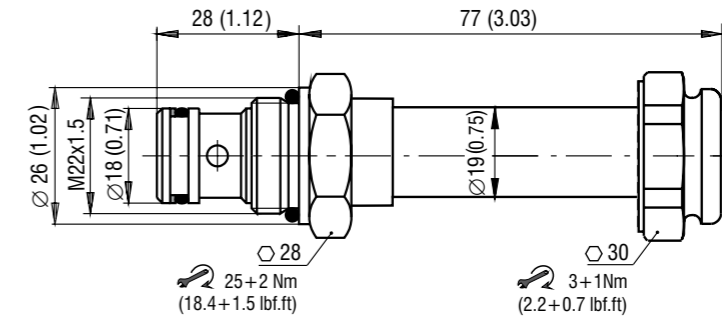
Pressure drop related to flow rate



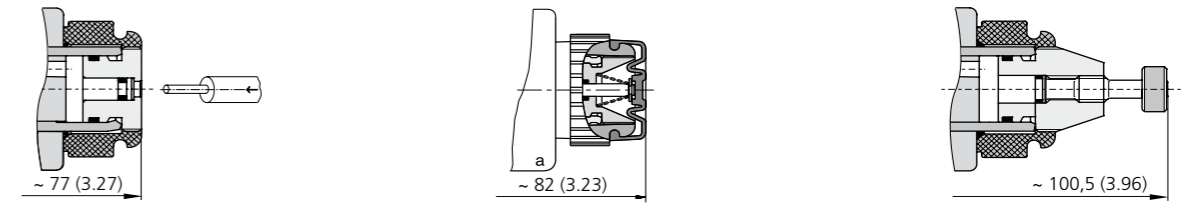
	Model	Connection
1	S5	2→1
2	S5	1→2
3	S6	2→1*
4	S6	1→2*

* flow up to 15 l/min (4 GPM)

Dimensions in millimeters (inches)

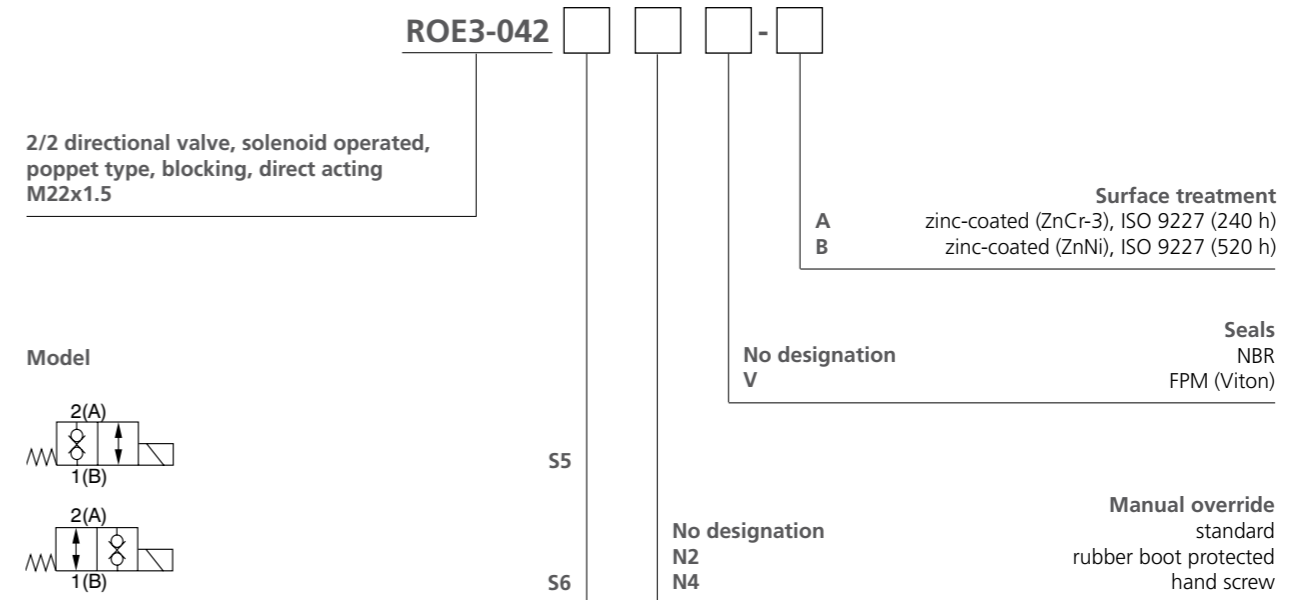


Manual Override in millimeters (inches)



In case of solenoid malfunction or power failure, the spool of the valve can be shifted by manual override as long as the pressure in port T does not exceed 25 bar (363 PSI). For alternative manual overrides contact our technical support.

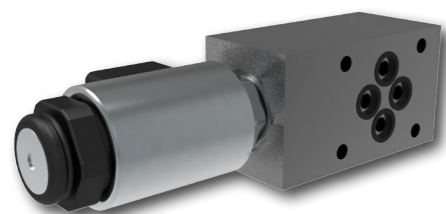
Ordering Code



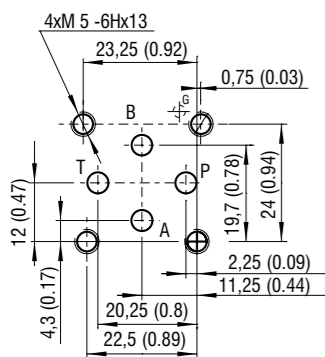
2/2 Directional Valve, Solenoid Operated, Poppet Type, Blocking, Direct Acting, Modular

ROE3-042S5(S6)/M

Size 04 (D02), 06 (D03) • Q_{max} 25 l/min (7 GPM) • p_{max} 250 bar (3600 PSI)

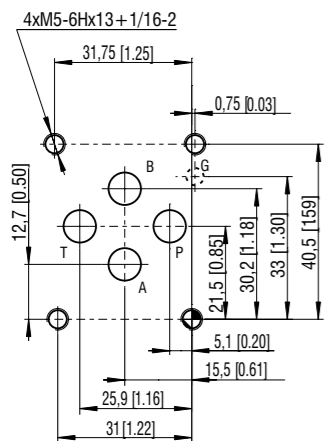


ISO 4401-02-01-0-05



Ports P, A, B, T - max Ø 4.5 mm (0.18 in)

ISO 4401-03-02-0-05



Ports P, A, B, T - max Ø 7.5 mm (0.29 in)

Technical Features

- 2/2 directional valve, solenoid operated, poppet type, blocking, direct acting with subplate interface acc. ISO 4401, DIN 24340 (CETOP 02 and 03) or as an in-line device
- Hardened precision parts
- High flow capacity and leak-free closing
- High transmitted hydraulic power
- Normally open (NO) and normally closed (NC) versions
- Wide range of manual overrides available
- All ports may be fully pressurized
- Coils interchangeable across ROE / RPE3-04 product line
- In the standard version, the valve is zinc-coated for 240 h protection acc. to ISO 9227 and the valve body is phosphated

Functional Description

2-way, 2-position high pressure direct acting poppet valve in the form of a screw-in cartridge. Usable in various subplate and in-line arrangements. The valve is used mainly for ON-OFF bi-directional control of flow from and to actuators with secure leak-free closing in both directions.

Technical Data

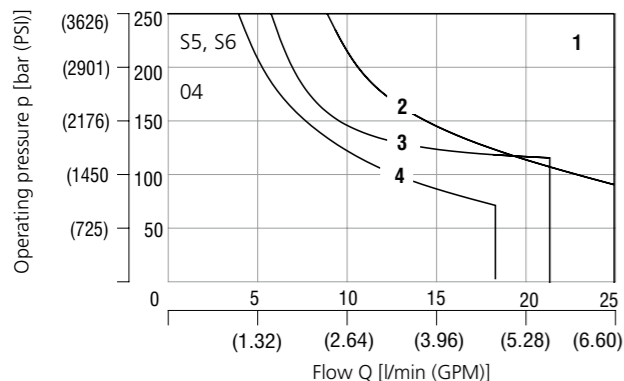
Valve size / Cartridge cavity		04 (02) / QG2	06 (03) / QG2
Max. flow	l/min (GPM)	25 (6.6)	25 (6.6)
Max. operating pressure	bar (PSI)	250 (3630)	
Fluid temperature range (NBR)	°C (°F)	-30 ... +80 (-22 ... +176)	
Fluid temperature range (FPM)	°C (°F)	-20 ... +80 (-4 ... +176)	
Ambient temperature range	°C (°F)	-20 ... +50 (-4 ... +122)	
Supply voltage tolerance	%	AC, DC: ± 10	
Max. switching frequency	1/h	15 000	
Switching time, at v = 32 mm ² /s (156 SUS)	ON	DC 25 ... 35 AC 25 ... 35	DC 30 ... 50 AC 30 ... 110
	OFF	DC 15 ... 25 AC 50 ... 100	DC 80 ... 130 AC 100 ... 150
Mass	- valve with 1 solenoid	Modular 1.2 (2.5)	Modular 1.5 (3.2)
	- valve with 2 solenoids	Modular 1.7 (3.6)	Modular 2.0 (4.3)
		In-line 1.6 (3.5)	

	Data Sheet	Type
General information	GI_0060	Products and operating conditions
Cavity details	SMT_0019	Size 04, 06
Spare parts	SP_8010	

Characteristics measured at v = 32 mm²/s (156 SUS)

Operating limits

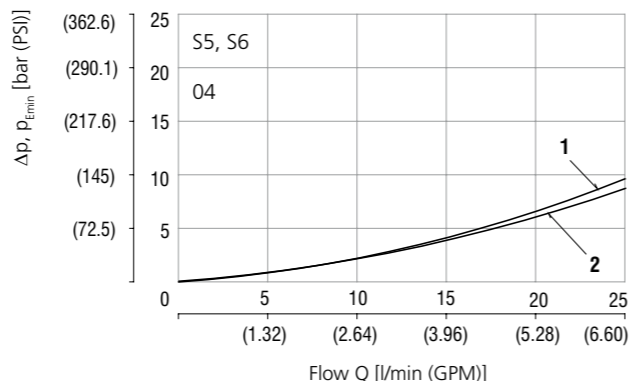
Operating limits for maximum hydraulic power at rated temperature and supplied with voltage equal to 90% of the nominal value



	1	2	3	4
Model	S5	S5	S6	S6
Direction	A-B	B-A	A-B	B-A

Pressure drop related to flow rate

In-line body design R*

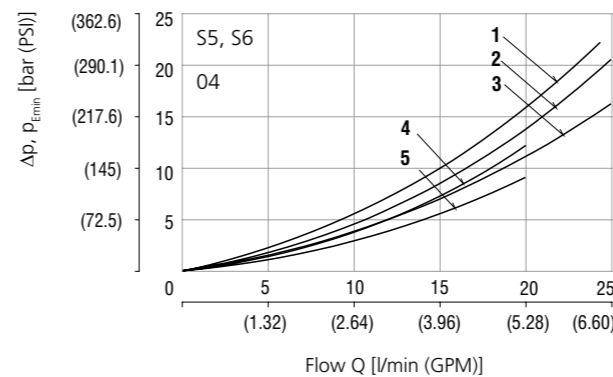


	1	2
Model	R1, R3	R2, R4
Direction	A-B, B-A	A-B, B-A

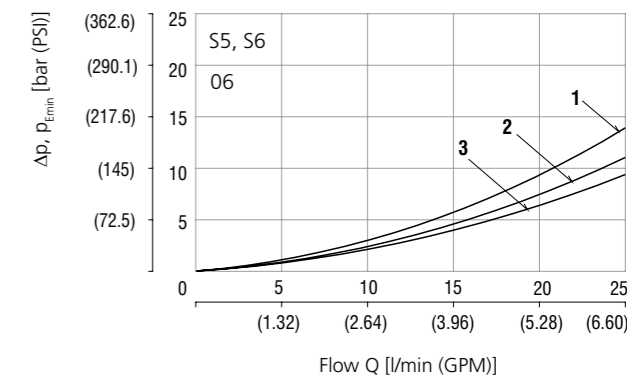
Characteristics measured at v = 32 mm²/s (156 SUS)

Pressure drop related to flow rate

Modular plate M*



S5	Model	Direction	S6	Model	Direction
1	MD04	A-T, T-A	2	MD04	A-T, T-A
	ME04	B-T, T-B		ME04	B-T, T-B
	MF04	A-T, T-A A-T, B-T T-A, T-B		MF04	A-T, B-T T-A, T-B
2	MX04	A-B, B-A	4	MX04	A-B, B-A
	MA04	A1-A2 A2-A1		MA04	A1-A2, A2-A1
3	MB04	B1-B2, B2-B1	5	MB04	B1-B2, B2-B1
	MC04	A1-A2, A2-A1 B1-B2, B2-B1		MC04	A1-A2, A2-A1 B1-B2, B2-B1



S5	Model	Direction	S6	Model	Direction (to 20 l/min)
1	MD06	A-T, T-A	1	MD06	T-A
	ME06	B-T, T-B		ME06	T-B
	MF06	A-T, B-T / T-A, T-B		MF06	T-A, T-B
2	MA06	A1-A2	2	MD06	A-T
	MB06	B1-B2		ME06	B-T
	MC06	A1-A2 / B1-B2		MF06	A-T, T-B
	MX06	B-A		MA06	A1-A2, A2-A1
3	MA06	A2-A1	3	MB06	B1-B2, B2-B1
	MB06	B1-B2		MC06	A1-A2, A2-A1
	MC06	A2-A1 / B2-B1		MX06	B1-B2, B2-B1

Ordering Code

ROE3-042 [] / [] / [] / [] / [] - []

2/2 directional valve, solenoid operated, poppet type, blocking, direct acting, modular

normally closed (NC), blocking S5

normally open (NO), blocking S6

Surface treatment

No designation phosphated body, steel parts
 A zinc-coated (ZnCr-3), ISO 9227 (240 h)
 B zinc-coated (ZnNi), ISO 9227 (520 h)

Seals

No designation NBR
 V FPM (Viton)

Manual override

No designation standard
 N2 covered with rubber boot
 N4 with hand screw

Connector type

EN 175301-803-A
 E1 with quenching diode
 E2 AMP Junior Timer - radial direction (2 pins; male)
 E3 with quenching diode
 E3A AMP Junior Timer - axial direction (2 pins; male)
 E4A E3A with quenching diode
 E5 EN 175301-803-A with integrated rectifier
 E8 loose conductors (two insulated wires)
 E9 E8 with quenching diode
 E12A Deutsch DT04-2P - axial direction
 E13A E12A with quenching diode

The AC coils correspond to E5.

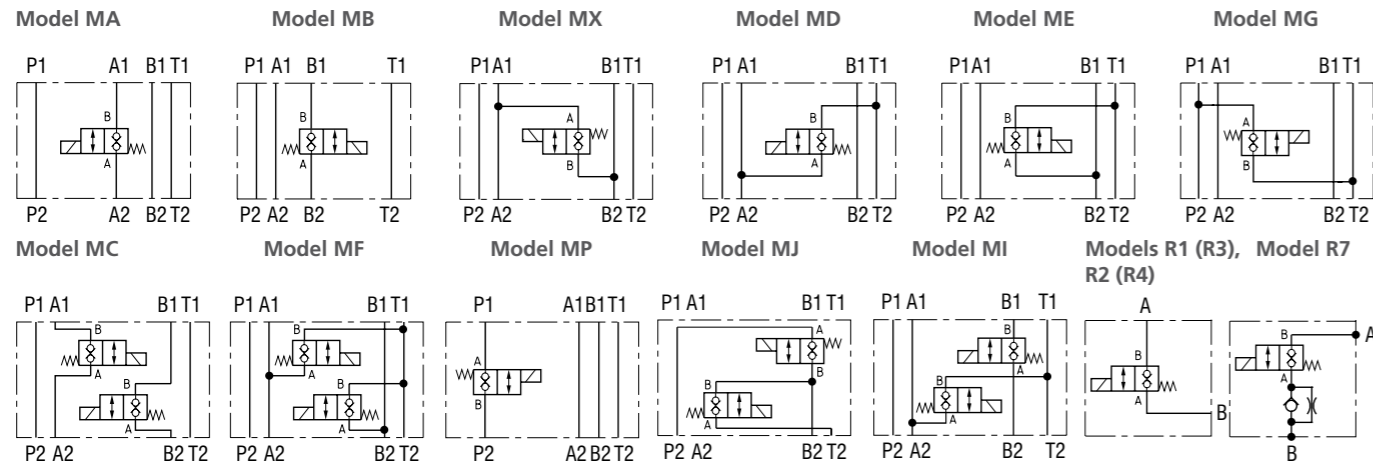
Model	MA
modular valve, connection A2-A1	MA
modular valve, connection B2-B1	MB
modular valve, connection A-B	MX
modular valve, connection A-T	MD
modular valve, connection B-T	ME
modular valve, connection B2-B1, A2-A1	MC
modular valve, connection B-T, A-T	MF
modular valve, connection P-T	MG
modular valve, connection P2-P1	MP*
modular valve, connection B2-P2, B2-T2	MJ
modular valve, connection A-T, B2-B1	MI
in-line valve, 2 ports, thread G3/8	R1
in-line valve, 2 ports, thread G1/2	R2
in-line valve, 2 ports, thread SAE 8, 3/4-16	R3
in-line valve, 2 ports, thread SAE 10, 7/8-14	R4
in-line valve, 2 ports, thread SAE 10, 7/8-14	R7

*only available for size 06 (D03)

Rated supply voltage of solenoids (at the coil terminals)	
01200	12 V DC / 2.41 A
01400	14 V DC / 1.66 A
02100	21 V DC / 1.31 A
02400	24 V DC / 1.15 A
02700	27 V DC / 0.89 A
20500	205 V DC / 0.12 A
02450	24 V AC / 1.44 A / 50 (60) Hz
12060	120 V AC / 0.22 A / 50 (60) Hz
23050	230 V AC / 0.12 A / 50 (60) Hz

Functional Symbols

Example: ROE3-04255M*



Solenoid Coil in millimeters (inches)

E1 - EN 175301-803-A E2 - E1 with quenching diode Protection degree IP65	E3 - AMP Junior Timer - radial direction E4 - E3 with quenching diode Protection degree IP67	E3A - AMP Junior Timer - axial direction E4A - E3A with quenching diode Protection degree IP67	E5 - EN 175301-803-A and integrated rectifier Protection degree IP65
E8 - Loose conductors (two insulated cables) E9 - (E8 with quenching diode) Protection degree IP65	E12A - Deutsch DT04-2P E13A - E12A with quenching diode Protection degree IP67 / IP69K		

Note: A = Standard 300 mm (11.81 in), other sizes on demand

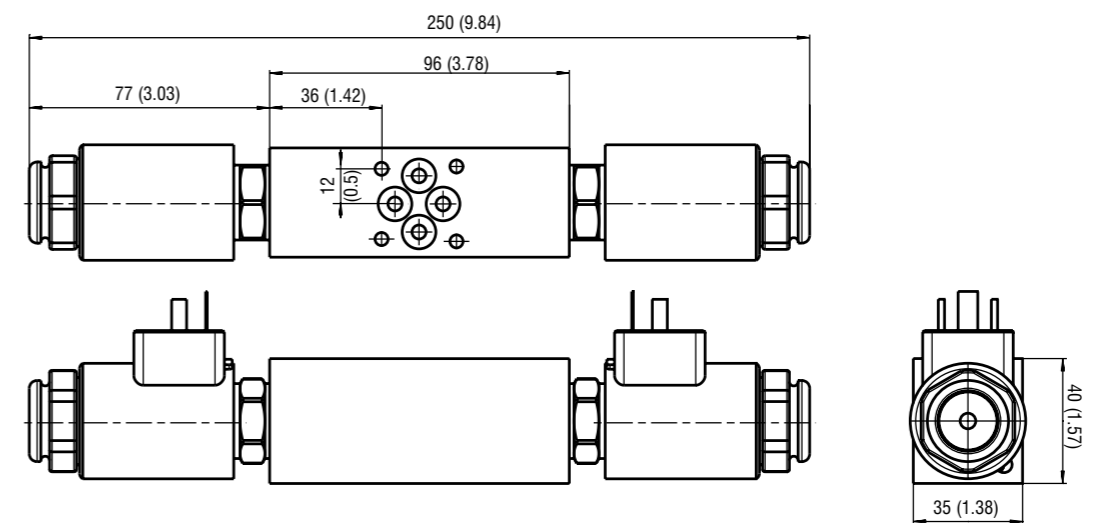
The indicated IP protection level is only reached with a properly mounted connector.

Manual Override in millimeters (inches)

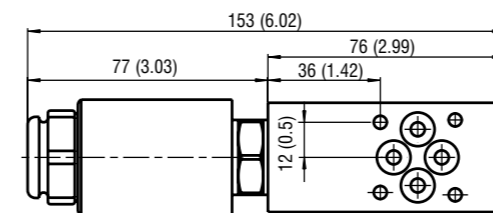
No designation - standard 	Designation N2 - rubber boot 	Designation N4 - hand screw
-------------------------------	----------------------------------	---------------------------------

Dimensions in millimeters (inches)

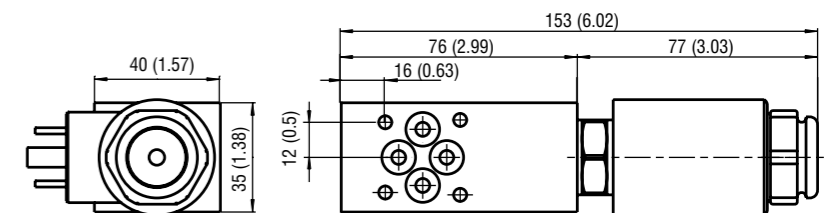
Models MC, MF, MI, MJ



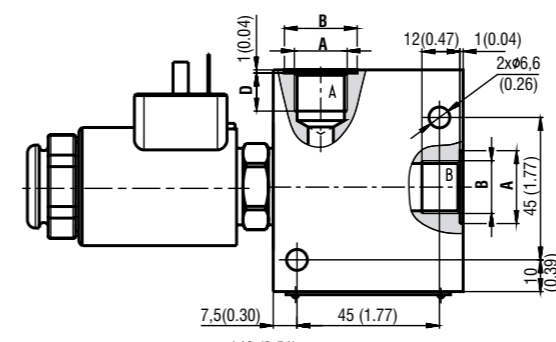
Models MA, MX, MD, MG, MP



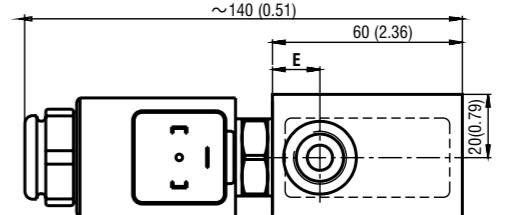
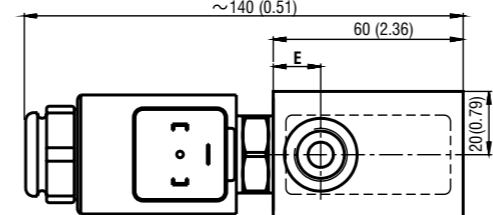
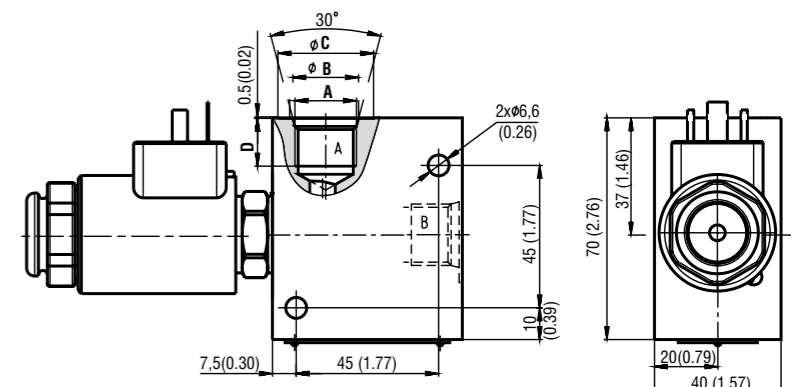
Models MB, ME



Models R1 (R2)



Models R3 (R4)



R1	G3/8-A	∅ 23	12 (0.47)
R2	G1/2-A	∅ 28	14 (0.55)

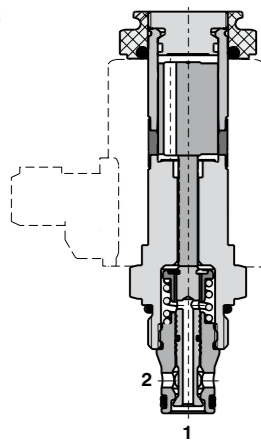
R3	A	B	C	D	E
R3	3/4-16UNF-2B	∅ 20.6	∅ 30	15 (0.59)	16 (0.61)
R4	7/8-14UNF-2B	∅ 23.9	∅ 34	16.7 (0.66)	18 (0.71)

2/2 Directional Valve, Solenoid Operated, Poppet Type, Blocking, Direct Acting

SD1E-A2

3/4-16 UNF • Q_{max} 30 l/min (8 GPM) • p_{max} 350 bar (5100 PSI)

255



Technical Features

- › Hardened precision parts
- › High flow capacity and leak-free closing (up to 3 drops per minute)
- › High transmitted hydraulic power up to 350 bar
- › Normally open and normally closed version
- › Wide range of manual overrides available
- › All ports may be fully pressurized
- › Coil interchangeability among SD*-A*/H product line
- › In the standard version, the valve is zinc-coated for 240 h protection acc. to ISO 9227

Functional Description

2-way, 2 position high pressure direct acting poppet valve in form of a screw-in cartridge. The valve is used mainly for ON-OFF bi-directional control of flow to actuators with leak-free closing in both directions.

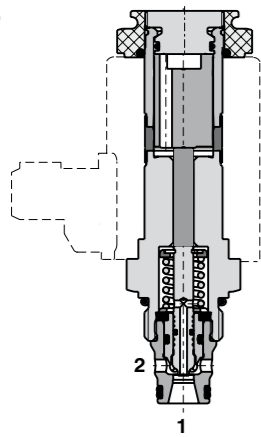
Model Code	255	256
Symbol		

Technical Data

Valve size / Cartridge cavity	3/4-16 UNF-2A / A2	
Max. flow	l/min (GPM)	30 (7.9)
Max. operating pressure	bar (PSI)	350 (5080)
Fluid temperature range	°C (°F)	-20...80 (-4...176)
Ambient temperature range	°C (°F)	-20...80 (-4...176)
Supply voltage tolerance	%	AC, DC: ± 15
Max. switching frequency	1/h	15 000
Mass without coil	kg (lbs)	0.19 (0.42)

	Datasheet	Type
General information	GI_0060	Products and operating conditions
Coil types	C_8007	C19B*
Valve bodies	In-line mounted	SB-A2*
	Sandwich mounted	SB-*A2*
Cavity details / Form tools	SMT_0019	SMT-A2*
Spare parts	SP_8010	

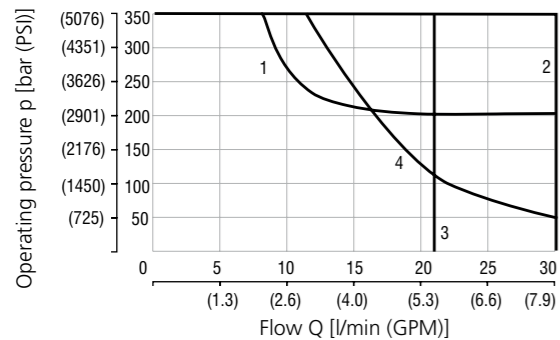
256



Characteristics measured at v = 32 mm²/s (156 SUS)

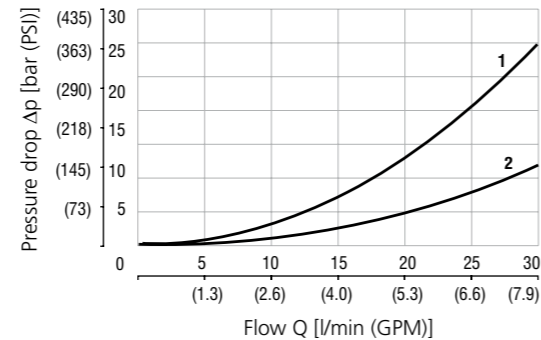
Operating limits

Oil 80 °C (176 °F) / Ambient temperature 50 °C (122 °F) / Voltage U_n -10% (21.6 VDC)



	Model	Connection
1	255	1→2
2	255	2→1
3	256	2→1
4	256	1→2

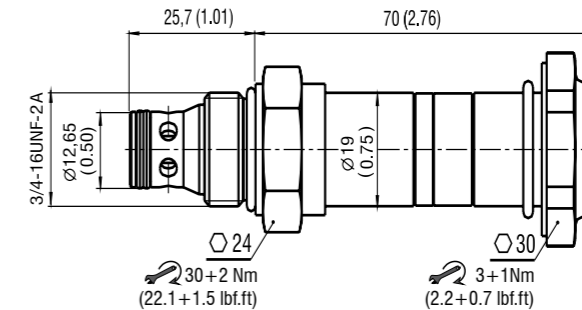
Pressure drop related to flow rate



	Model	Connection
1	255	1→2
1	255	2→1
2	256	1→2
2	256	2→1

Dimensions in millimeters (inches)

255, 256



Manual Override in millimeters (inches)

No designation - standard	Designation M2 - rubber boot protected	Designation M4 - hand screw	Designation M5 - socket head screw, size 2.5	Designation M9 - without manual override
~ 70,0 (2.76)	~ 81,5 (3.21)	~ 90 (3.54)	~ 77,5 (3.05)	~ 70,0 (2.76)

In case of solenoid malfunction or power failure, the spool of the valve can be shifted by manual override as long as the pressure in port T does not exceed 25 bar (363 PSI). For alternative manual overrides contact our technical support.

Ordering Code

SD1E-A2 / [] [] [] [] - []

2/2 directional valve, solenoid operated, poppet type, blocking, direct acting, 3/4-16 UNF

High performance H

Model

255

256

Surface treatment

A zinc-coated (ZnCr-3), ISO 9227 (240 h)

B zinc-coated (ZnNi), ISO 9227 (520 h)

Seals

NBR

FPM (Viton)

Manual override

No designation standard

M2 rubber boot protected

M4 hand screw

M5 socket head screw

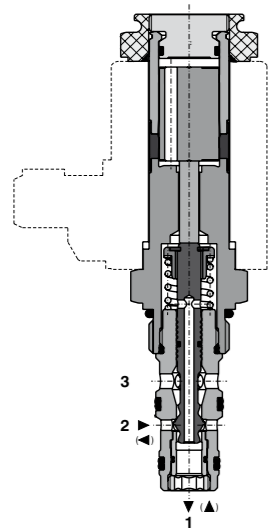
M9 without manual override

3/2 Directional Valve, Solenoid Operated, Poppet Type, Blocking, Direct Acting

SD1E-A3

3/4-16 UNF • Q_{max} 30 l/min (8 GPM) • p_{max} 350 bar (5100 PSI)

257



Technical Features

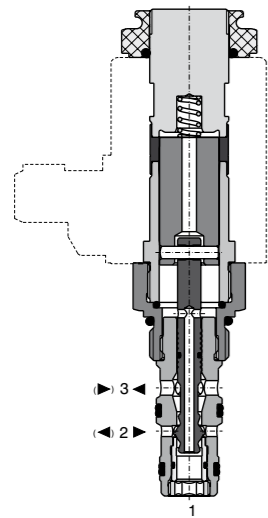
- › Hardened precision parts
- › High flow capacity and leak-free closing (up to 3 drops per minute)
- › High transmitted hydraulic power up to 350 bar
- › 3-way valve with two basic spool types
- › Wide range of manual overrides available
- › All ports may be fully pressurized
- › Coil interchangeability among SD*-A*/H product line
- › In the standard version, the valve is zinc-coated for 240 h protection acc. to ISO 9227

Functional Description

3-way, 2 positions, high pressure direct acting poppet valve in form of a screw-in cartridge. The valve is used mainly for ON-OFF bi-directional control of flow to actuators with leak-free closing in both directions.

Model Code	257	258
Symbol		

258



Technical Data

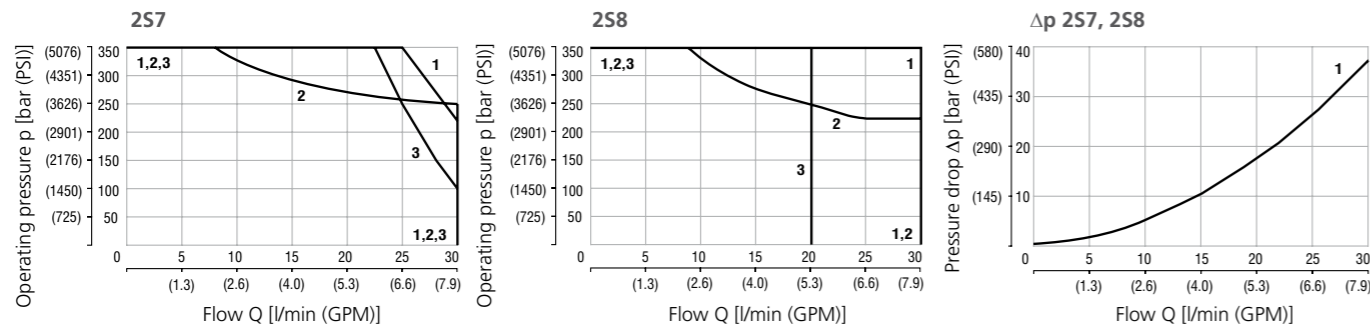
Valve size / Cartridge cavity	3/4-16 UNF-2A / A3	
Max. flow	l/min (GPM)	30 (7.9)
Max. operating pressure	bar (PSI)	350 (5080)
Fluid temperature range	°C (°F)	-20...80 (-4...176)
Ambient temperature range	°C (°F)	-20...80 (-4...176)
Supply voltage tolerance	%	AC, DC: ± 15
Max. switching frequency	1/h	15 000
Mass without coil	257 258	kg (lbs)
		0.21 (0.45) 0.22 (0.47)
	Datasheet	Type
General information	GI_0060	Products and operating conditions
Coil types	C_8007	C19B*
Valve bodies	In-line mounted Sandwich mounted	SB-A3* SB-04(06)_0028 SB-*A3*
Cavity details / Form tools	SMT_0019	SMT-A3*
Spare parts	SP_8010	

Characteristics measured at $v = 32 \text{ mm}^2/\text{s}$ (156 SUS)

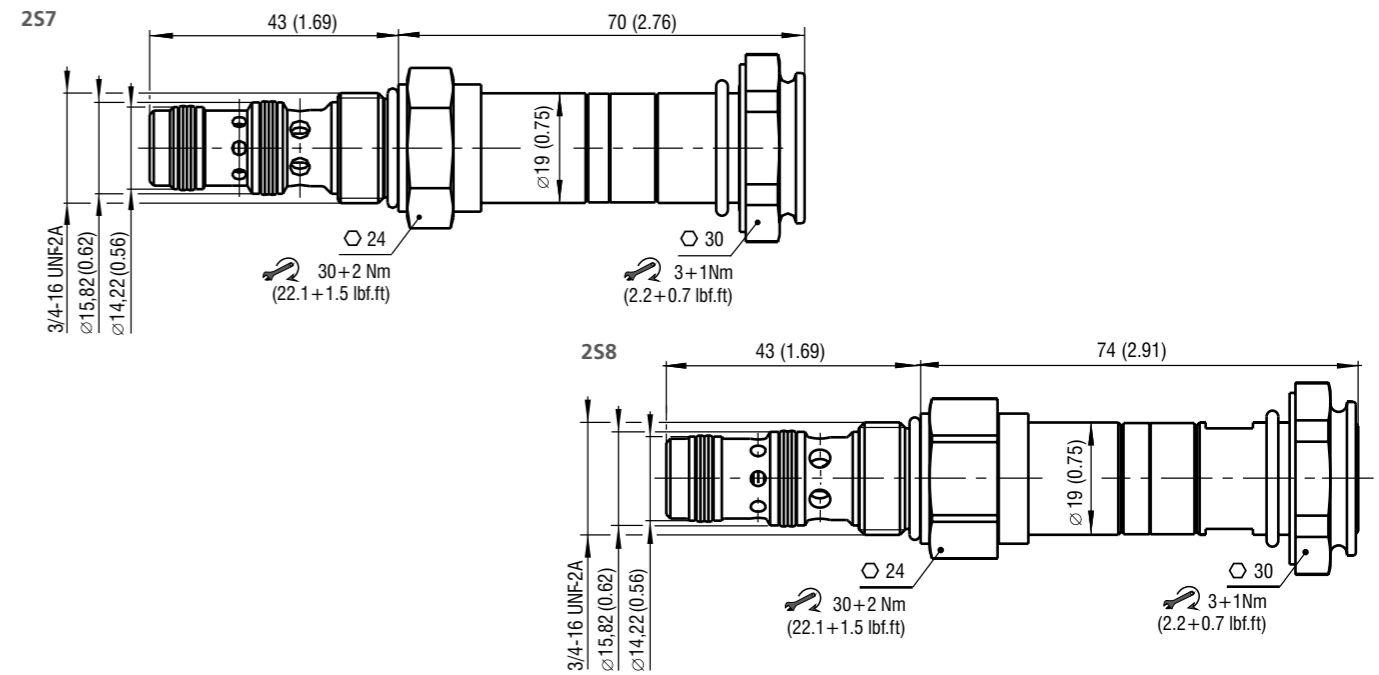
Operating limits

Oil 80 °C (176 °F) / Ambient temperature 50 °C (122 °F) / Voltage U_n -10% (21.6 VDC)

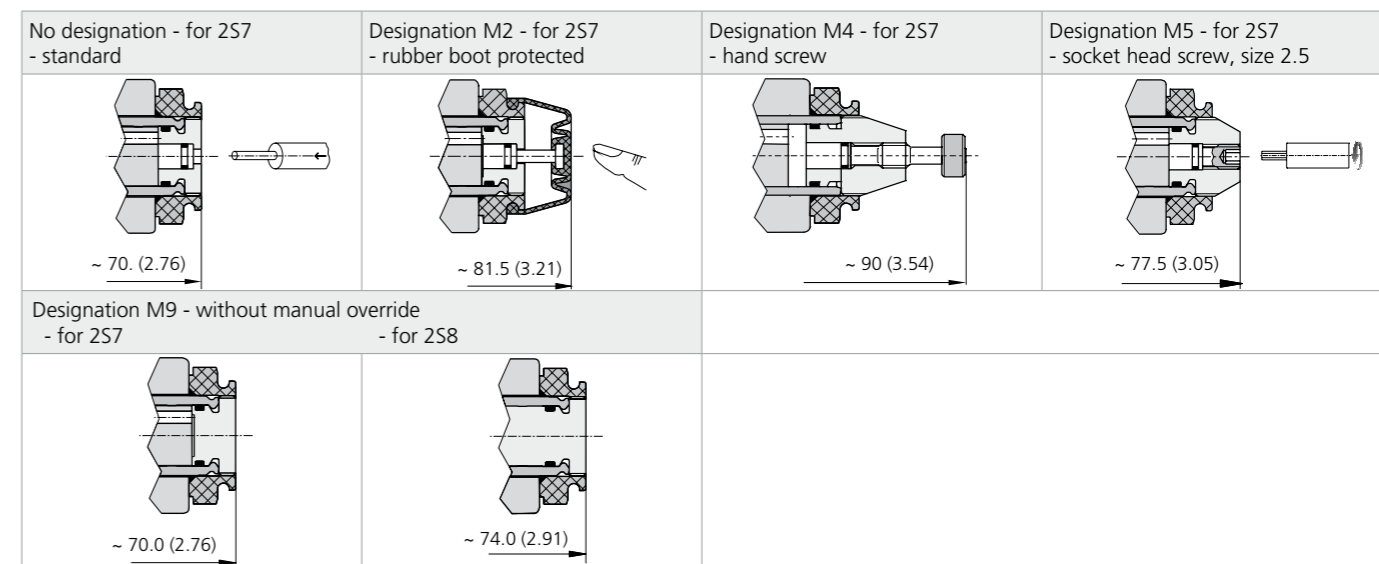
Pressure drop related to flow rate



Dimensions in millimeters (inches)



Manual Override in millimeters (inches)



In case of solenoid malfunction or power failure, the spool of the valve can be shifted by manual override as long as the pressure in port T does not exceed 25 bar (363 PSI). For alternative manual overrides contact our technical support.

Ordering Code

SD1E-A3 / [] [] [] [] - []

3/2 directional valve, solenoid operated, poppet type, blocking, direct acting, 3/4-16 UNF

High performance **H**

Model

257

258

Surface treatment

A zinc-coated (ZnCr-3), ISO 9227 (240 h)

B zinc-coated (ZnNi), ISO 9227 (520 h)

Seals

No designation NBR

V FPM (Viton)

Manual override

No designation standard

M2 rubber boot protected

M4 hand screw

M5 socket head screw

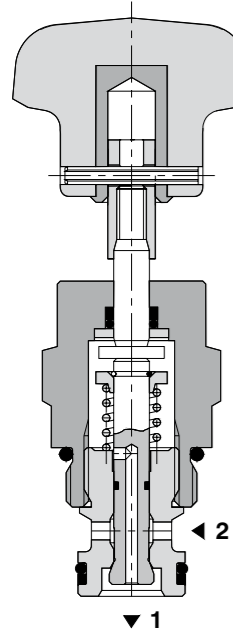
M9 without manual override

2/2 Directional Valve, Manually Operated, Poppet Type, Blocking, Direct Acting

ROR3-062

M22x1.5 • Q_{max} 35 l/min (9 GPM) • p_{max} 320 bar (4600 PSI)

Normally closed
Push-to-open



Technical Features

- › Hardened precision parts
- › High flow capacity and leak-free closing
- › Wide range of actuation alternatives, available with microswitch option
- › Standard version zinc-coated with surface protection acc. to ISO 9227 (240 h salt spray)

Functional Description

A manually operated 2-way blocking and push-to-open directional valve in form of a screw-in cartridge. The preferential flow is from 2 to 1. Possibility to throttle the flow. The model with a hand lever and microswitch has 3 positions. In position 0 - middle position - the valve is closed. Position I opens the valve against the return spring. Position II actuates a contact (only the model with micro switch).

Model Code	1, 2	3	4
Symbol			

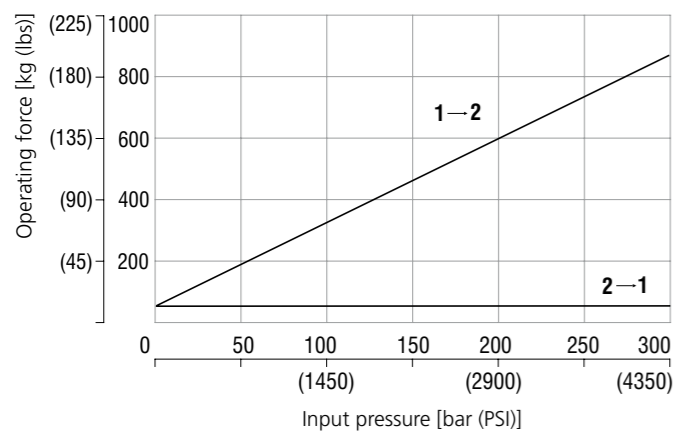
Technical Data

Valve size / Cartridge cavity		M22x1.5 / QG2			
Max. flow	l/min (GPM)	35 (9.2)			
Max. operating pressure	bar (PSI)	320 (4640)			
Max. operating force	N (lbf)	see characteristics			
Fluid temperature range (NBR)	°C (°F)	-30 ... +100 (-22 ... +176)			
Fluid temperature range (FPM)	°C (°F)	-20 ... +120 (-4 ... +248)			
Service life	cycles	10 ⁶			
Microswitch	D2SW-3D	2 A - 250 V ~		0.1 A - 30 V =	
Mass	model	1	2	3	4
	kg (lbs)	0.15 (0.33)	0.25 (0.55)	0.66 (1.46)	0.77 (1.7)

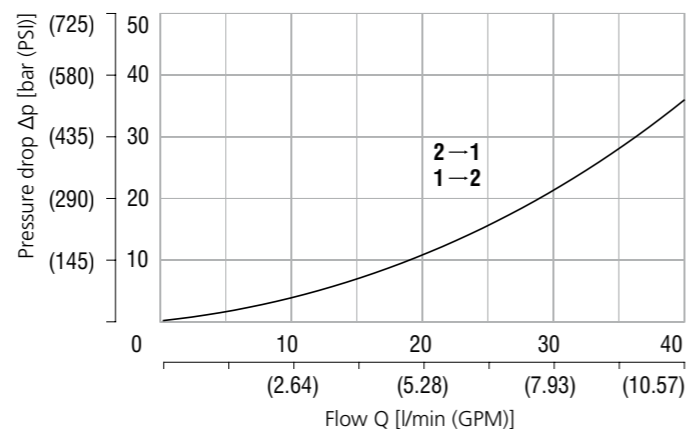
General information		Type	
GI_0060		Products and operating conditions	
Valve bodies	In-line mounted	SB_0018	SB-QG2*
	Sandwich mounted	SB-4(06)_0028	SB-*QG2*
Cavity details	SMT_0019	SMT-QG2*	
Spare parts	SP_8010		

Characteristics measured at v = 32 mm³/s (156 SUS)

Operating limits

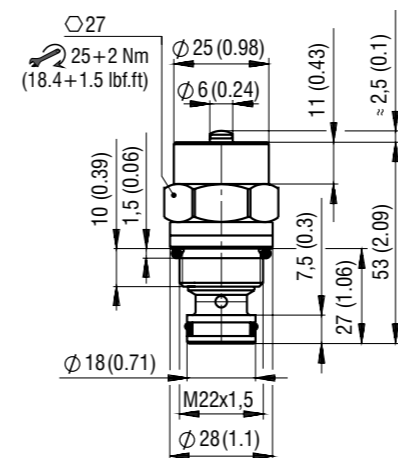


Pressure drop related to flow rate

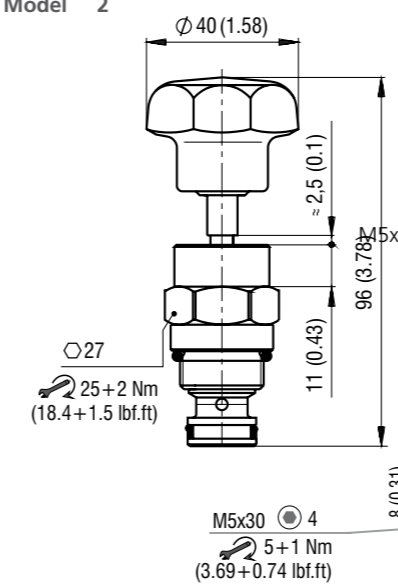


Dimensions in millimeters (inches)

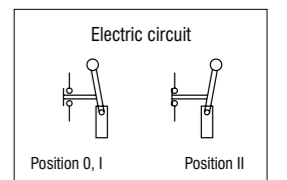
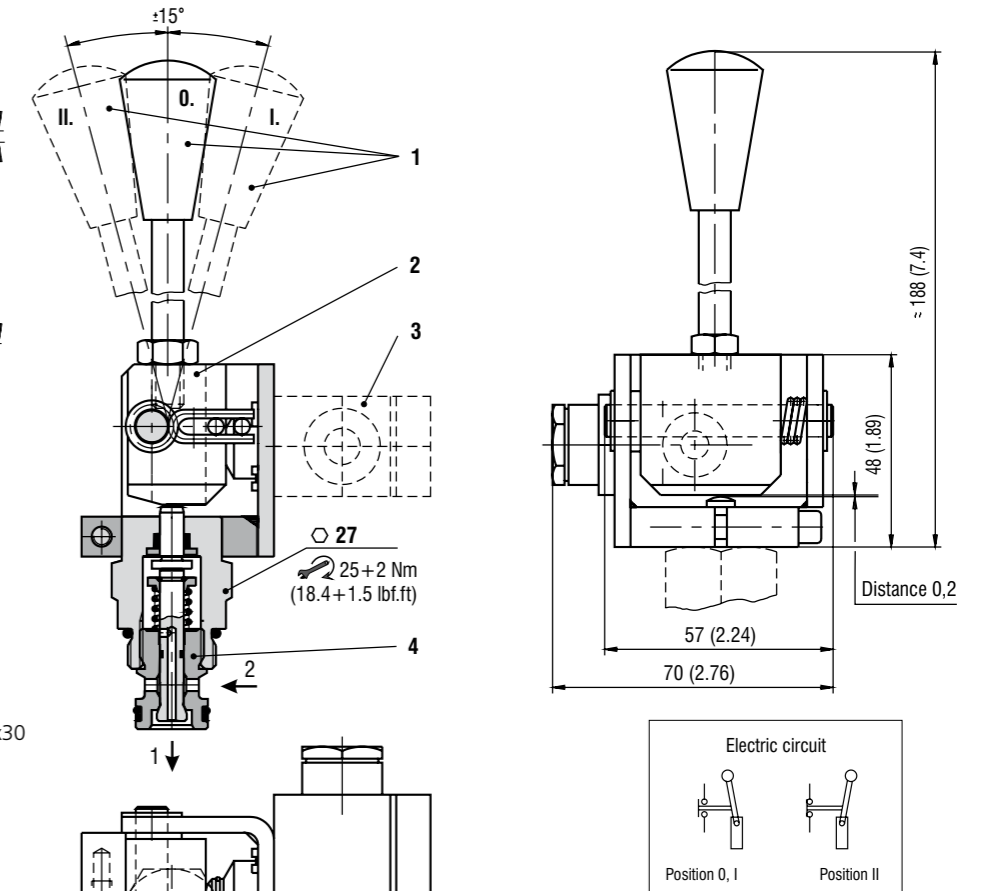
Model 1



Model 2



Model 3, 4



- 1 Hand lever
- 0 middle position with detent
- I. first position - opens the valve
- II. second position - closes the contact of the microswitch
- 2 Section of the hand lever
- 3 Microswitch - only with SD1M-QG2/L2S5-4
- 4 SD1M-QG2

Ordering Code

ROR3-062 - [] - [] - [] - []

2/2 directional valve, manually operated, poppet type, blocking, direct acting M22x1.5

Surface treatment
A zinc-coated (ZnCr-3), ISO 9227 (240 h)
B zinc-coated (ZnNi), ISO 9227 (520 h)

Seals
NBR
FPM (Viton)

No designation V

Actuation
plunger
hand push knob
hand lever without microswitch
hand lever with microswitch

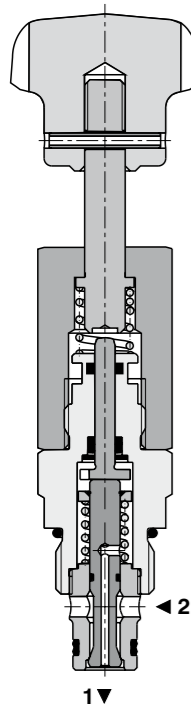
Flow restrictor without flow restrictor 00

1
2
3
4

2/2 Directional Valve, Manually Operated, Poppet Type, Blocking, Direct Acting

SD1M-A2/L

3/4-16 UNF • Q_{max} 20 l/min (5 GPM) • p_{max} 250 bar (3600 PSI)



Technical Features

- › Hardened precision parts
- › High flow capacity and leak-free closing
- › Wide range of manual operations available with microswitch option
- › Standard version zinc-coated with surface protection acc. to ISO 9227 (240 h salt spray)

Functional Description

A manually operated, 2-way, blocking, push-to-open valve in the form of a screw-in cartridge. The preferential flow is from 2 to 1. The valve provides the possibility to throttle the flow. The model with a hand lever and micro-switch has 3 operating positions. Position 0, middle hand lever position - the valve is closed. Position I, opens the valve against the return spring. Position II, actuates a contact (only the model with micro switch).

Model Code	1	2	3
Symbol			

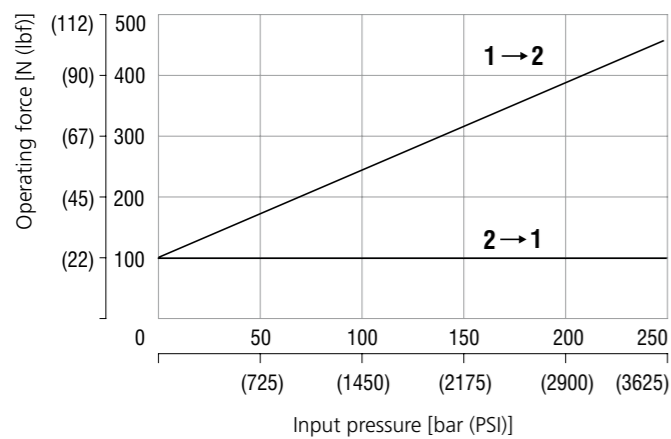
Technical Data

Valve size / Cartridge cavity		3/4-16 UNF-2A / A2		
Max. flow	l/min (GPM)	20 (5.3)		
Max. operating pressure	bar (PSI)	250 (3630)		
Max. operating force	N (lbf)	see characteristics		
Fluid temperature range (NBR)	°C (°F)	-30 ... 100 (-22 ... +212)		
Fluid temperature range (FPM)	°C (°F)	-20 ... 120 (-4 ... +248)		
Service life	cycles	10 ⁶		
Microswitch	D2SW-3D	2 A - 250 V ~	0.1 A - 30 V =	
Mass	model	1	2	3
	kg (lbs)	0.27 (0.60)	0.38 (0.84)	0.38 (0.84)

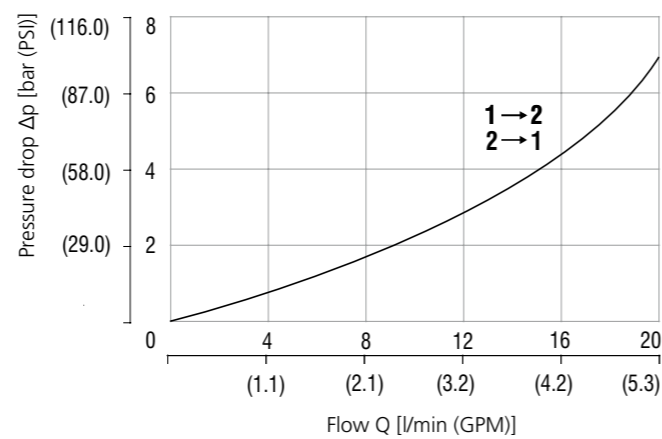
		Datasheet	Type
General information		GI_0060	Products and operating conditions
Valve bodies	In line mounted	SB_0018	SB-A2*
	Sandwich mounted	SB-04(06)_0028	SB-*A2*
Cavity details / Form tools		SMT_0019	SMT-A2*
Spare parts		SP_8010	

Characteristics measured at v = 32 mm²/s (156 SUS)

Operating limits

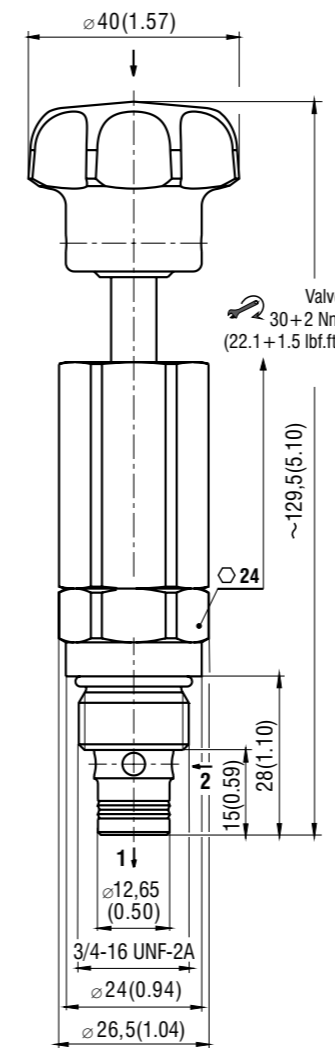


Pressure drop related to flow rate

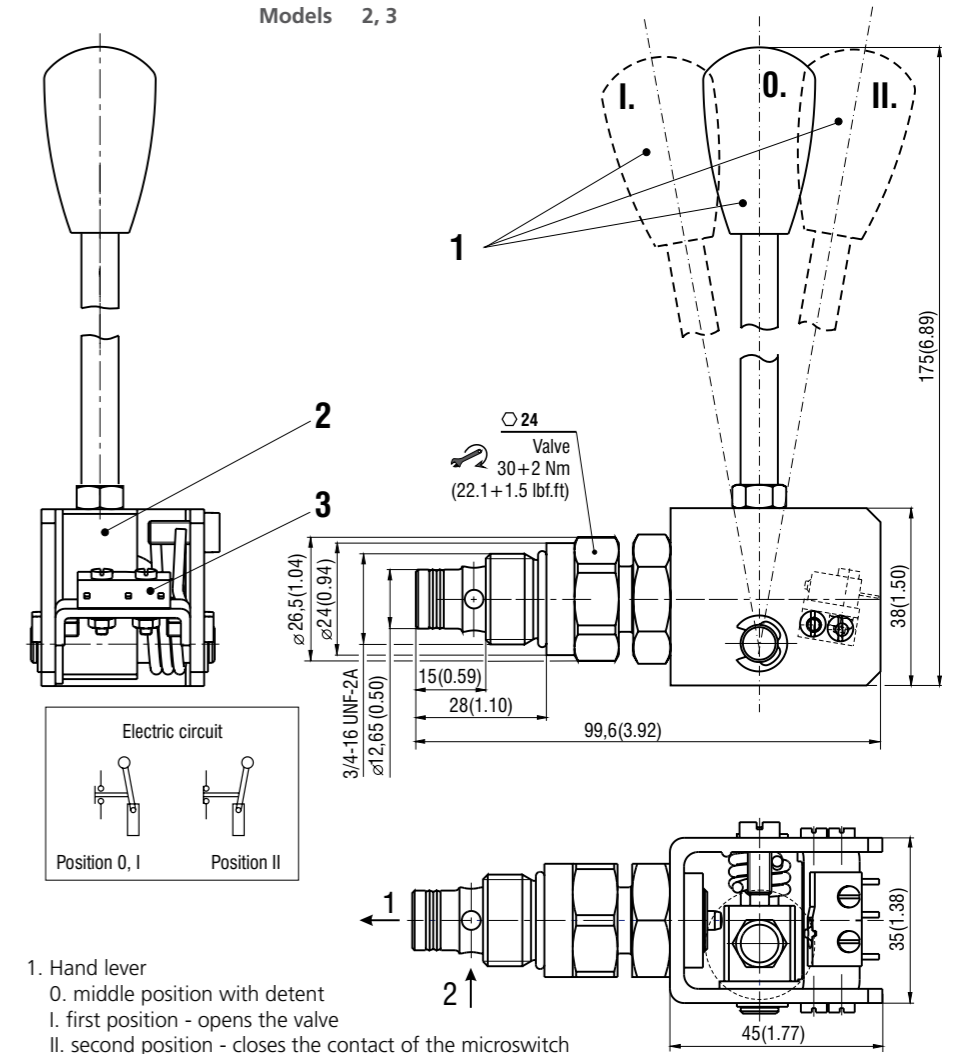


Dimensions in millimeters (inches)

Model 1



Models 2, 3



1. Hand lever
0. middle position with detent
- I. first position - opens the valve
- II. second position - closes the contact of the microswitch
2. Section of the hand lever
3. Microswitch - only with SD1M-A2/L2S5-3

Ordering Code

SD1M-A2 / [] - [] - [] - []

2/2 directional valve, manually operated poppet type, blocking, direct acting 3/4-16 UNF

Lightline L

Model 255

Surface treatment
A zinc-coated (ZnCr-3), ISO 9227 (240 h)
B zinc-coated (ZnNi), ISO 9227 (520 h)

Seals
NBR
FPM (Viton)

No designation V

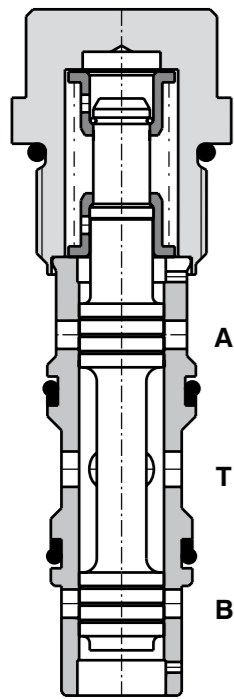
Actuation
hand push knob
hand lever without microswitch
hand lever with microswitch

1
2
3

3/3 Directional Valve, Hydraulically Operated, Spool Type, Direct Acting, (Hot Oil) Shuttle

SD2H-LA3

M24x1.5 • Q_{max} 40 l/min (11 GPM) • p_{max} 320 bar (4600 PSI)

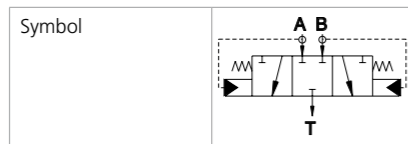


Technical Features

- › Hardened precision parts
- › High flow capacity
- › Simple and reliable design
- › Optional spring ranges
- › Automatic alternating fluid discharge from the low-pressure side of the circuit
- › Standard version zinc-coated with surface protection acc. to ISO 9227 (240 h salt spray)

Functional Description

3-way, 3-position spool type, spring centered hot oil shuttle valve, used typically on hydrostatic transmissions for hot oil discharge to a system cooler or tank.



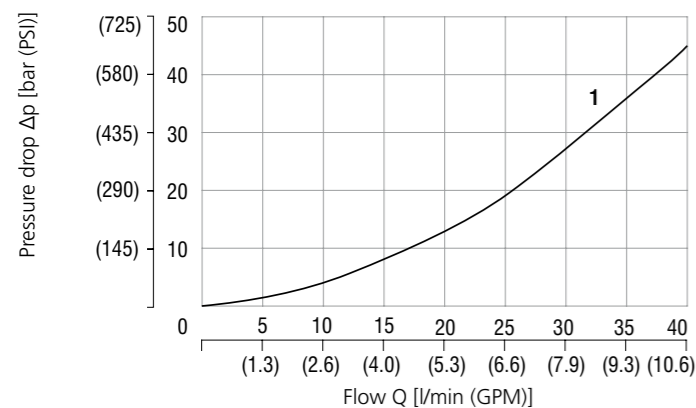
Technical Data

Valve size / Cartridge cavity		M24x1.5 / LA3	
Max flow	l/min (GPM)	40 (10.6)	
Max. operating pressure	bar (PSI)	320 (4640)	
Cracking pressure	bar (PSI)	7 (101.5)	12 (174.0)
Fluid temperature range (NBR)	°C (°F)	-30...+100 (-22 ...+212)	
Fluid temperature range (FPM)	°C (°F)	-20 ...+120 (-4 ...+248)	
Mass	kg (lbs)	0.23 (0.50)	

General information		Datasheet	Type
		GI_0060	Products and operating conditions
Valve bodies	In-line mounted	SB_0018	SB-LA3*
	Sandwich mounted	SB-04(06)_0028	SB-*LA3*
Cavity details		SMT_0019	SMT-LA3*
Spare parts		SP_8010	

Characteristics measured at v = 32 mm²/s (156 SUS)

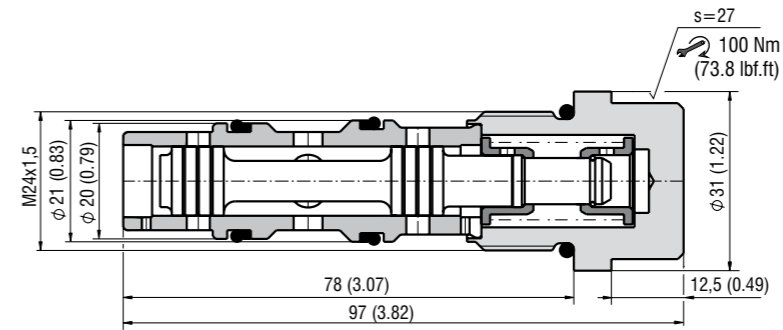
Pressure drop related to flow rate



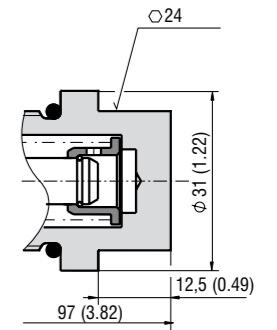
Connection
1 B → T, A → T

Dimensions in millimeters (inches)

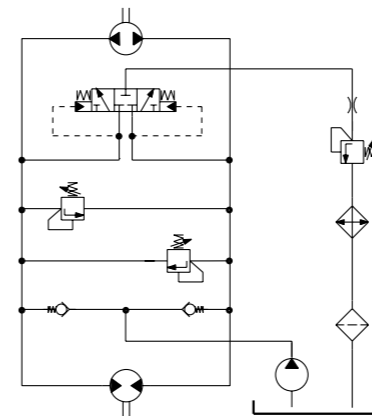
Cover cup - Standard



Cover cup - P



Application example



This hot oil shuttle valve is typically used in hydrostatic transmissions. It discharges approximately 10 % of the closed-loop hydrostatic flow to the cooler or to the tank. The respective high pressure side of the circuit automatically pilots the valve to the discharge position of the low pressure side. The discharge amount is normally controlled by a downstream pressure relief valve which is typically set at 15 to 30 bar (200 to 400 PSI).

Ordering Code

SD2H-LA3 / [] [] [] [] - []

3/3 directional valve, hydraulically operated, spool type, direct acting, (hot oil) shuttle M24x1.5

High performance H

Cracking pressure
7.0 bar (102 PSI) 070
12.0 bar (174 PSI) 120

Surface treatment
A zinc-coated (ZnCr-3), ISO 9227 (240 h)
B zinc-coated (ZnNi), ISO 9227 (520 h)

Seals
No designation V
NBR
FPM (Viton)

Cover cup
No designation P
standard - across flats 27 mm
HEX 24

Content

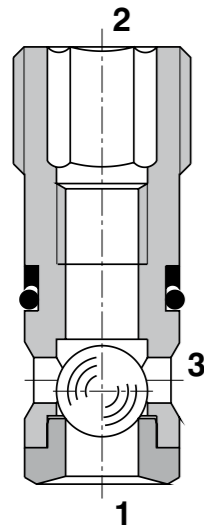
Symbol Example	Flow l/min (GPM)	Pressure bar (PSI)	Type Code	Cartridge	Size 04; D02	Size 06; D03	Size 10; D05	Line Mounted	Page	Data Sheet
Load Shuttle Valves										
	8 (2)	500 (7300)	LV1-043		X			(X)	150	HA 5008
	8 (2)	500 (7300)	LV2-043		X			(X)	152	HA 5028
	40 (11)	320 (4600)	LV1-063/S			X		(X)	154	HA 5015
	40 (11)	320 (4600)	LV1-063/M			X			156	HA 5030
	15 (4)	210 (3000)	VJL2-304	X					158	HA 5007
	20 (5)	250 (3600)	SH1F-A3	X					160	HA 5029
Check Valves										
	20 (5)	320 (4600)	VJ01-06/S	X		X			162	HA 5004
	80 (21)	350 (5100)	VJ01-10/S	X			X		164	HA 5307
	30 (8)	320 (4600)	VJ01-04/M		X				166	HA 5012
	40 (11)	420 (6100)	SC1F-A2	X	(X)			(X)	168	HA 5010
	40 (11)	420 (6100)	SC1F-A3	X	(X)			(X)	170	HA 5016
	120 (32)	420 (6100)	SC1F-B2	X		(X)		(X)	172	HA 5017
	50 (13)	350 (5100)	MVJ3-06			X			174	HA 5018
	100 (26)	350 (5100)	MVJ3-10				X		176	HA 5020
	400 (106)	320 (4600)	VJ3	X				X	178	HA 5009
Check Valves, One-Way Throttling										
	250 (66)	320 (4600)	VJS3	X				X	180	HA 5019
Pilot Operated Check Valves, Pilot to Open										
	20 (5)	250 (3600)	RJV1-05	X					182	HA 5111
	20 (5)	320 (4600)	VJR1-04/M		X				184	HA 5023
	30 (8)	350 (5100)	SC5H-Q3/I	X				(X)	186	HA 5217
	60 (16)	320 (4600)	2RJV1-06/M			X			188	HA 5021
	90 (24)	350 (5100)	SC5H-R3/I	X				(X)	190	HA 5218
	90 (24)	350 (5100)	SCD5H-R3/I	X				(X)	192	HA 5219
	140 (37)	350 (5100)	VJR3-10/M				X		194	HA 5035
120 (32)	350 (5100)	SC5H-S3/I	X				(X)	196	HA 5220	
Pilot Operated Check Valves, Pilot to Close										
	30 (8)	350 (5100)	SCC5H-Q3/I	X				(X)	198	HA 5221
	120 (32)	350 (5100)	SCC5H-S3/I	X				(X)	200	HA 5222

Notes

Load Shuttle Valve, Ball Type

LV1-043

G1/8 • Q_{max} 8 l/min (2 GPM) • p_{max} 500 bar (7300 PSI)

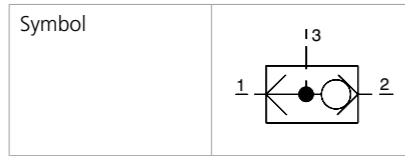


Technical Features

- › Rapid response to changes in load direction
- › Hardened precision parts
- › Sharp-edged steel seats for dirt-tolerant performance
- › Leak-free closing, suitable for fast cycling with long life
- › Compact design for limited installation space availability
- › In the standard version, the valve is without surface coating

Functional Description

A high pressure shuttle valve in the form of a screw-in cartridge. This valve prioritizes the respective higher pressure signal from either port 1 or 2. Tightness between ports 1 and 3 is ensured by a sharp-edge steel valve seat.



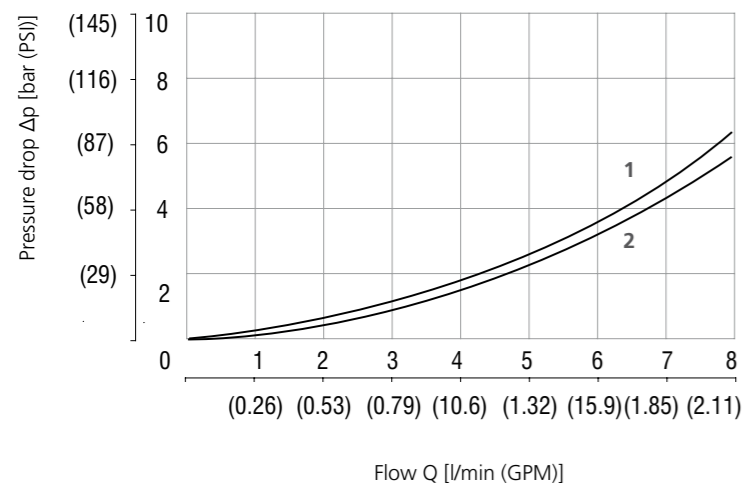
Technical Data

Valve size / Cartridge cavity		G1/8 / QY3
Max. flow	l/min (GPM)	8 (2.1)
Max. operating pressure	bar (PSI)	500 (7250)
Fluid temperature range (NBR)	°C (°F)	-30 ... +100 (-22 ... +212)
Fluid temperature range (FPM)	°C (°F)	-20 ... +120 (-4 ... +248)
Mass	kg (lbs)	0.01 (0.022)

		Datasheet	Type
General information		GI_0060	Products and operating conditions
Valve bodies	In-line mounted	SB_0018	SB-QY3*
Cavity details		SMT_0019	SMT-QY3*
Spare parts		SP_8010	

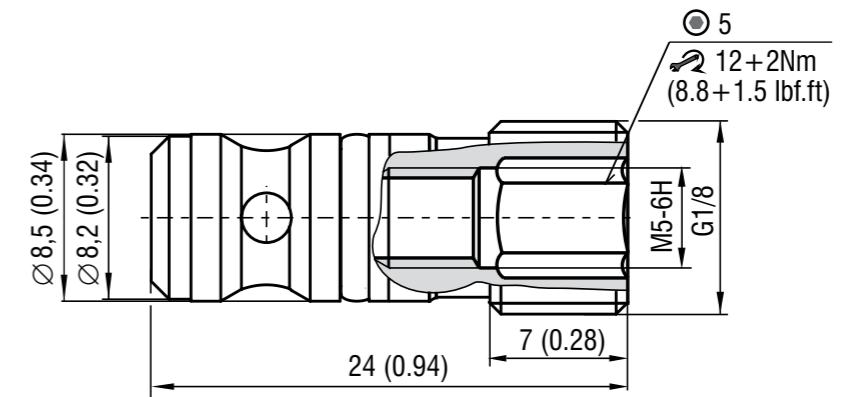
Characteristics measured at v = 32 mm²/s (156 SUS)

Pressure drop related to flow rate

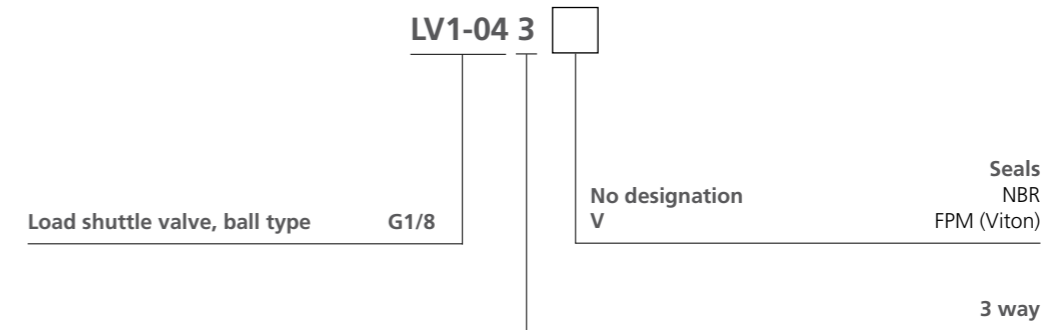


	Flow direction
1	2→3
2	1→3

Dimensions in millimeters (inches)



Ordering Code



Load Shuttle Valve Rubber Sealed Ports

LV2-043

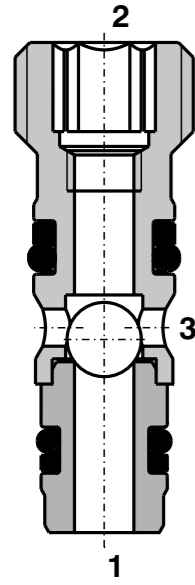
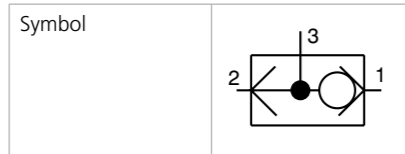
M12x1,5 • Q_{max} 8 l/min (2 GPM) • p_{max} 500 bar (7300 PSI)

Technical Features

- › Hardened and precision working parts
- › Leak-free in closed position
- › Fast response to load direction changes
- › Compact size with small installation space

Functional Description

A high pressure shuttle, screw-in, cartridge valve. Used for blocking or opening hydraulic circuits to define priority of flow/direction given by higher pressure circuit over a lower one. Tightness between all ports is ensured by rubber seal.



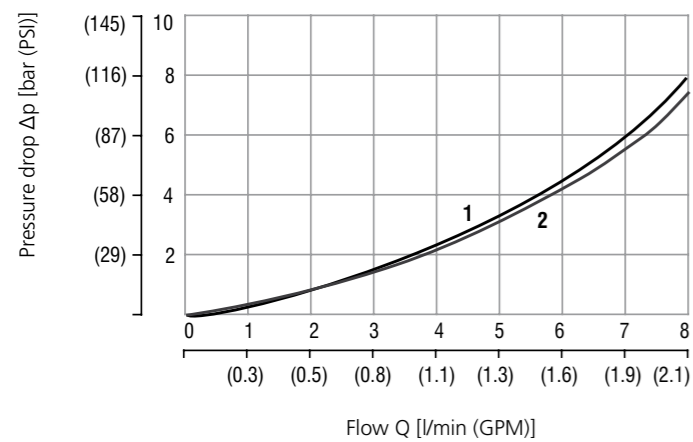
Technical Data

Valve size / Cartridge cavity		M12x1,5 / QD3
Max. flow rate	l/min (GPM)	8 (2.1)
Max. operating pressure	bar (PSI)	500 (7250)
Fluid temperature range (NBR)	°C (°F)	-30 ... +100 (-22 ... +212)
Fluid temperature range (FPM)	°C (°F)	-20 ... +120 (-4 ... +248)
Weight	kg (lbs)	0,01 (0.022)

	Data Sheet	Type
General information	GI_0060	products and operating conditions
Bodies for valves	In-line mounted SB_0018	SB-QD3*
Cavity details	SMT_0019	SMT-QD3*
Spare parts	SP_8010	

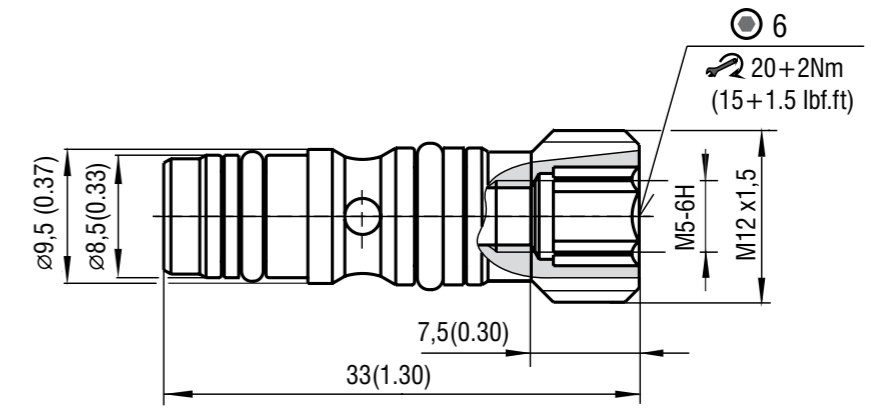
Characteristics measured at v = 32 mm²/s (156 SUS)

Pressure drops p-ΔQ

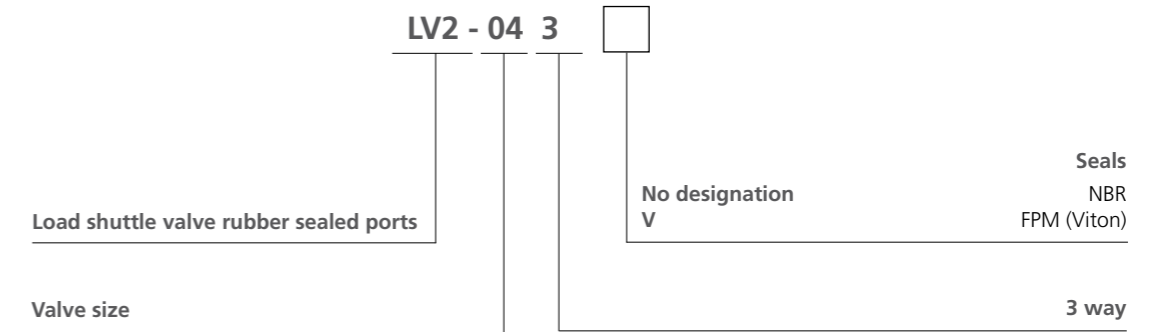


	Flow in direction
1	2 → 3
2	1 → 3

Dimensions in millimeters (inches)



Ordering Code

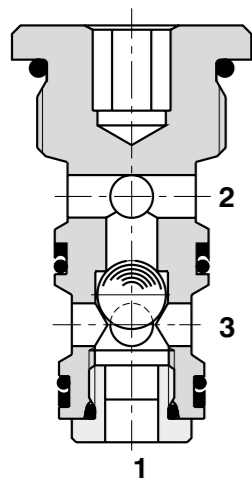


Load Shuttle Valve, Ball Type

LV1-063/S

M22x1.5 • Q_{max} 40 l/min (11 GPM) • p_{max} 320 bar (4600 PSI)

LV1-063/S

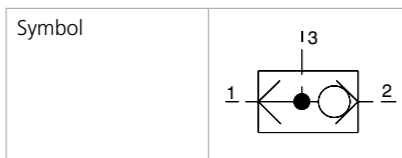


Technical Features

- › Rapid response to changes in load direction
- › Hardened precision parts
- › Sharp-edged steel seats for dirt-tolerant performance
- › Leak-free closing, suitable for fast cycling with long life
- › High flow capacity
- › In the standard version, the valve is zinc-coated for 240 h protection acc. to ISO 9227

Functional Description

A high pressure shuttle valve in the form of a screw-in cartridge. This valve prioritizes the respective higher pressure signal from either port 1 or 2. Tightness between ports 1 and 3 is ensured by a sharp-edge steel valve seat.



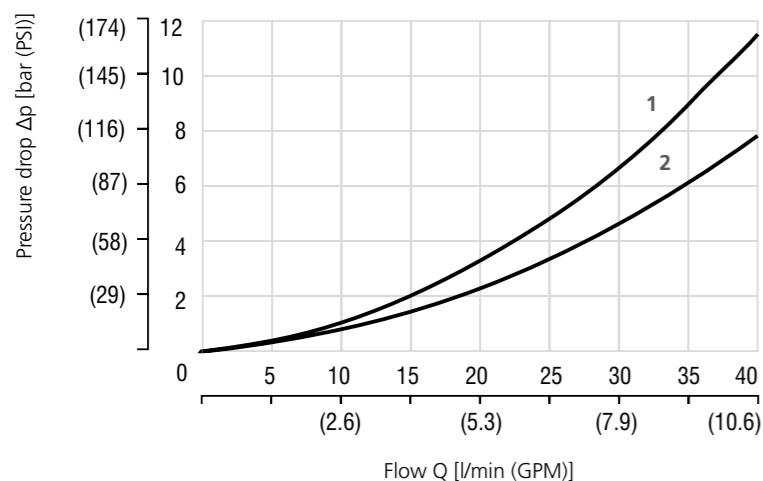
Technical Data

Valve size / Cartridge cavity		M22x1,5 / QF3
Max. flow	l/min (GPM)	40 (10.6)
Max. operating pressure	bar (PSI)	320 (4640)
Fluid temperature range (NBR)	°C (°F)	-30 ... +100 (-22 ... +212)
Fluid temperature range (FPM)	°C (°F)	-20 ... +120 (-4 ... +248)
Mass	kg (lbs)	0.078 (0.172)

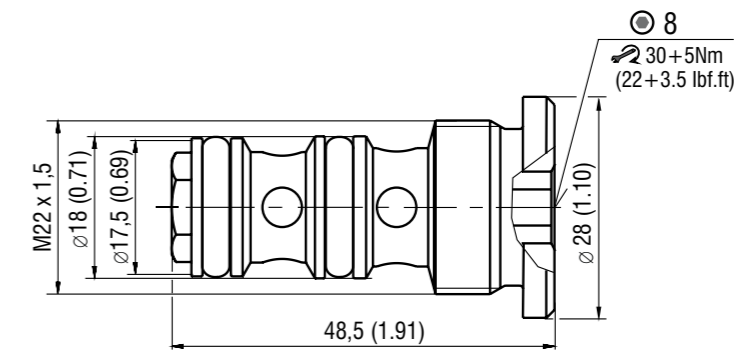
		Datasheet	Type
General information		GI_0060	Products and operating conditions
Valve bodies	In-line mounted	SB_0018	SB-QF3*
	Sandwich mounted	SB-04(06)_0028	SB-*-QF3*
Cavity details		SMT_0019	SMT-QF3*
Spare parts		SP_8010	

Characteristics measured at v = 32 mm²/s (156 SUS)

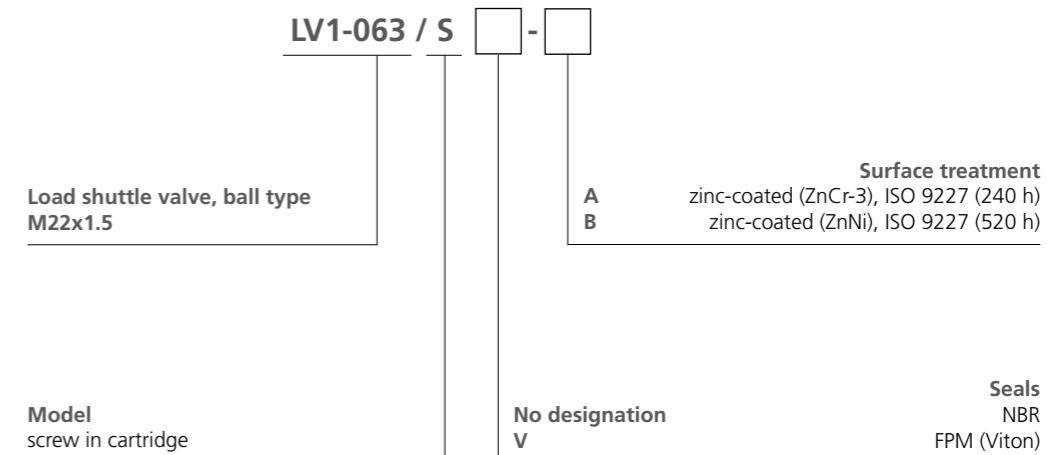
Pressure drops Δp-Q



Dimensions in millimeters (inches)



Ordering Code



Load Shuttle Valve, Ball Type, Modular

LV1-063/M

Size 06 (D03) • Q_{max} 40 l/min (11 GPM) • p_{max} 320 bar (4600 PSI)

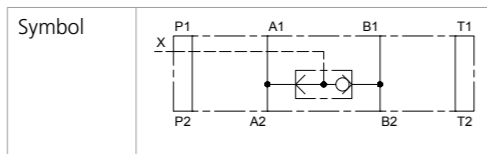


Technical Features

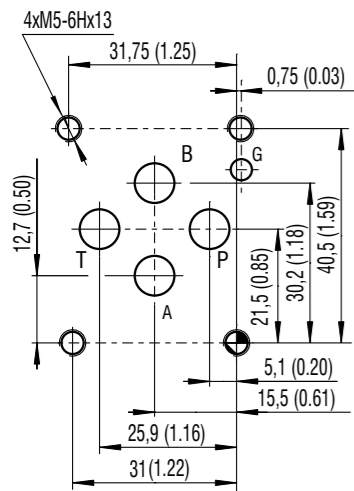
- › Load shuttle valve, ball type with subplate mounting interface acc. to ISO 4401, DIN 24340 (CETOP 03)
- › Sandwich plate design for use in vertical stacking assemblies
- › Rapid response to changes in load direction
- › Hardened precision parts
- › Sharp-edged steel seats for dirt-tolerant performance
- › Leak-free closing, suitable for fast cycling with long life
- › High flow capacity
- › In the standard version, the valve housing is phosphated and steel parts are zinc-coated for 240 h protection acc. to ISO 9227

Functional Description

This high pressure shuttle valve in sandwich design is used in vertical stack assemblies to prioritize flows of higher pressure over those with lower pressure. Tightness between ports 1 and 3 is ensured by a sharp-edge steel valve seat.



ISO 4401-03-02-0-05



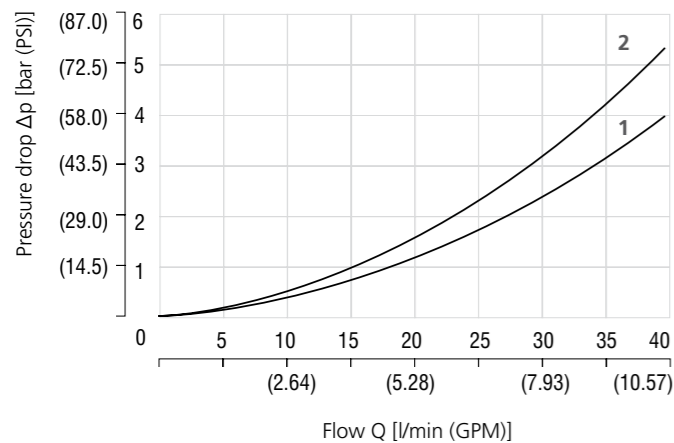
Ports P, A, B, T max. \varnothing 7.5 mm (0.29)

Technical Data

Valve size		06 (D03)
Max. flow	l/min (GPM)	40 (10.6)
Max. operating pressure	bar (PSI)	320 (4640)
Fluid temperature range (NBR)	°C (°F)	-30 +100 (-22 ... +212)
Fluid temperature range (FPM)	°C (°F)	-20 +120 (-4 ... +248)
Mass	kg (lbs)	1.17 (2.58)
		Datasheet Type
General information	GI_0060	Products and operating conditions
Mounting interface	SMT_0019	Size 06
Spare parts	SP_8010	

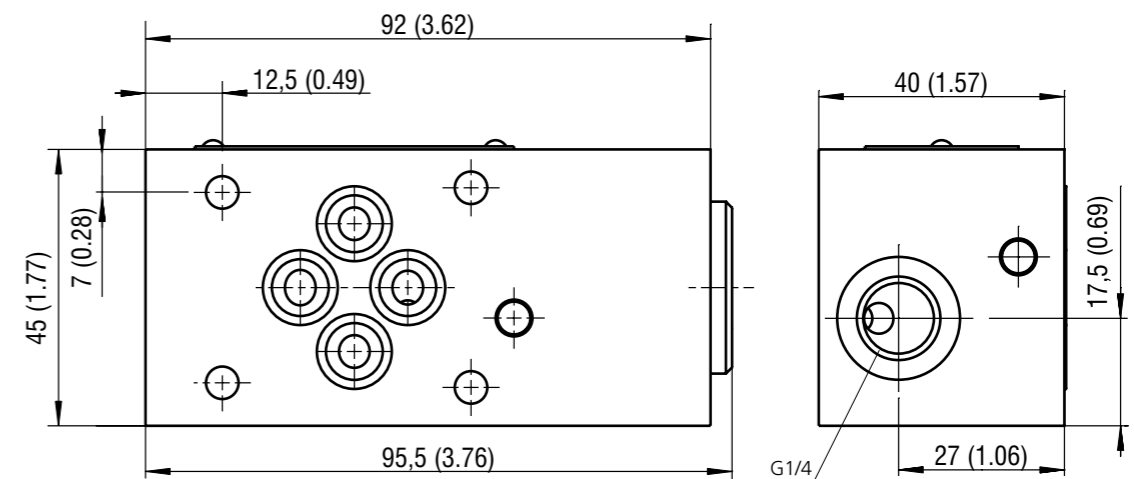
Characteristics measured at v = 32 mm²/s (156 SUS)

Pressure drop related to flow rate



	Flow direction
1	A → X
2	B → X

Dimensions in millimeters (inches)



Ordering Code

LV1-063 / M -

Load shuttle valve, ball type, modular

Model
sandwich plate design

Surface treatment
No designation body phosphated, steel parts
A zinc-coated (ZnCr-3), ISO 9227 (240 h)
B zinc-coated (ZnNi), ISO 9227 (520 h)

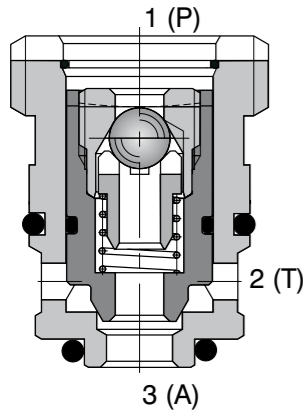
Seals
No designation NBR
V FPM (Viton)

Load Shuttle Valve, Kick Down, Ball Type

VJL2-304

M22x1.5 • Q_{max} 15 l/min (4 GPM) • p_{max} 210 bar (3000 PSI)

Model M, G

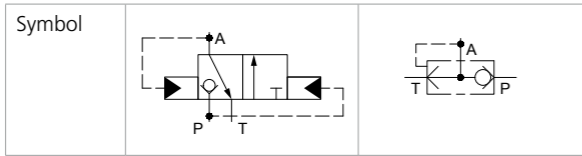


Technical Features

- › Rapid response to changes in load direction
- › Hardened precision parts
- › Sharp-edged steel seats for dirt-tolerant performance
- › Leak-free closing, suitable for fast cycling with long life
- › Compact design for limited installation space availability
- › In the standard version, the valve is without surface coating

Functional Description

A poppet-type hydraulic directional shuttle valve in the form of a screw-in cartridge for use in single acting cylinder applications. Pressure at port 1(P) opens the ball check valve, allowing fluid to pass to port 3(A). The poppet tightly closes the connection between ports 3(A) and 2(T). If there is no pressure at port 1(P), any pressure at port 3(A) - like from a cylinder's return spring - causes the poppet to shift such that fluid can pass from 3(A) to 2(T) but not from 3(A) and 1(P).



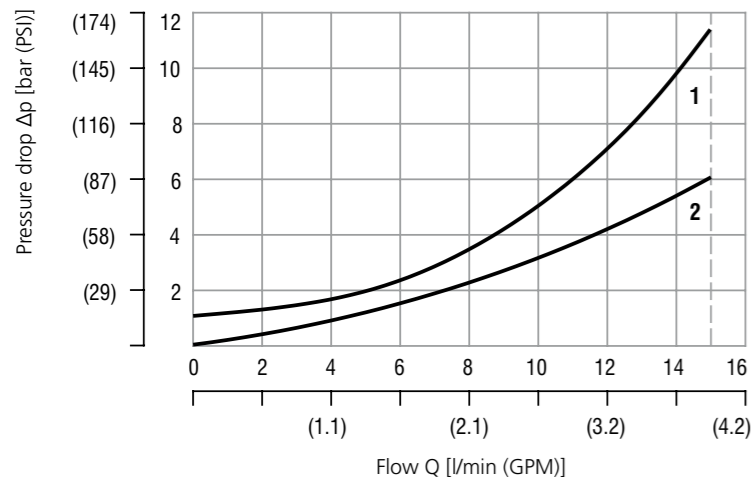
Technical Data

Valve size / Cartridge cavity		M22x1.5 / QG3
Max. flow	l/min (GPM)	15 (4)
Max. operating pressure	bar (PSI)	210 (3000)
Cracking pressure	bar (PSI)	2 ± 0.5 (29 ± 7 PSI)
Fluid temperature range (NBR)	°C (°F)	-30 ... +100 (-22 ... +212)
Fluid temperature range (FPM)	°C (°F)	-20 ... +120 (-4 ... +248)
Mass	kg (lbs)	0.04 (0.088)

	Datasheet	Type
General information	GI_0060	Products and operating conditions
Cavity details	SMT_0019	SMT-QG3*
Spare parts	SP_8010	

Characteristics measured at v = 32 mm³/s (156 SUS)

Pressure drop related to flow rate

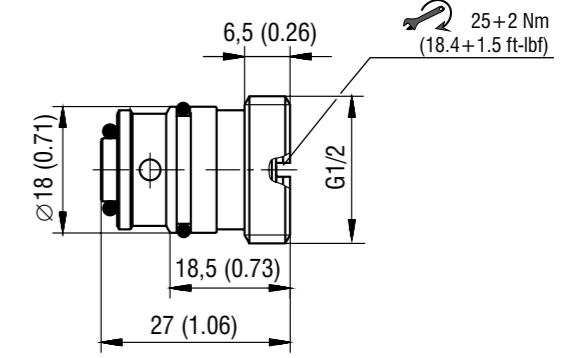
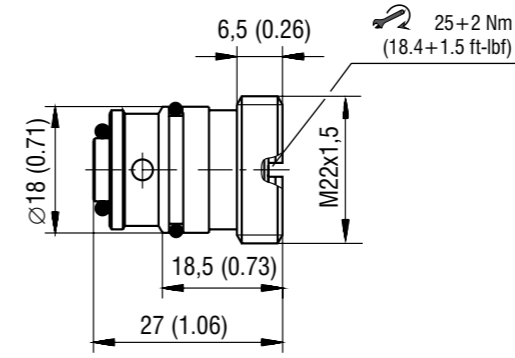


	Flow direction
1	P (1) → A (3)
2	A (3) → T(2)

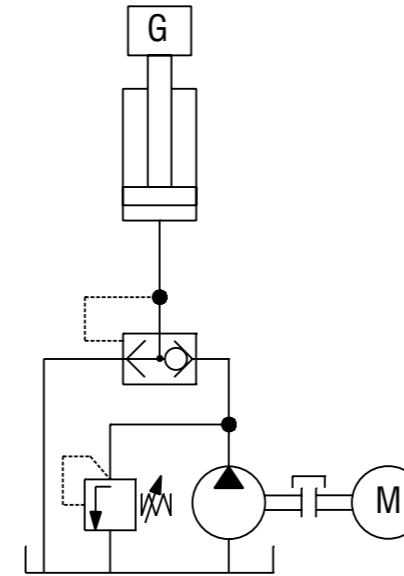
Dimensions in millimeters (inches)

Model M

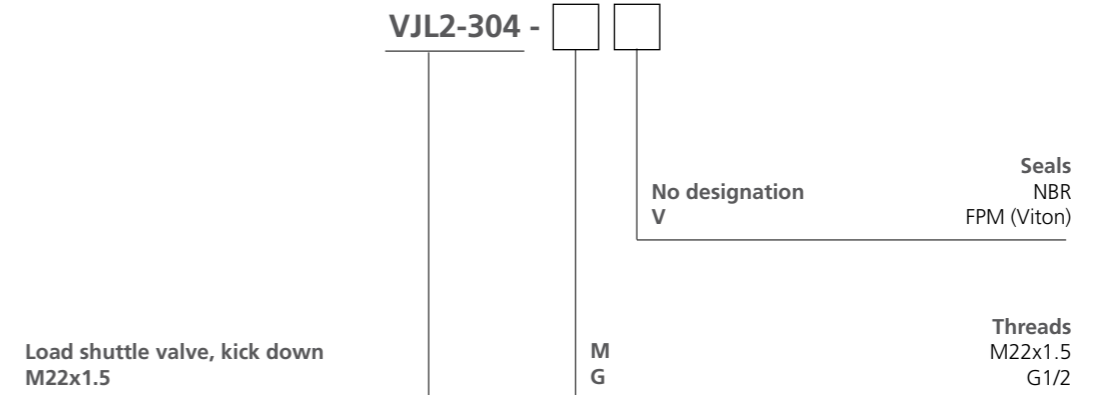
Model G



Application example



Ordering Code



Load Shuttle Valve, Kick Down

SH1F-A3

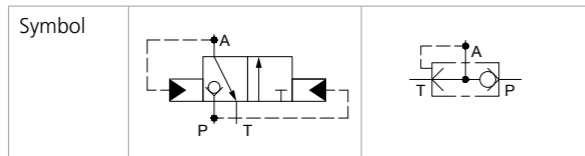
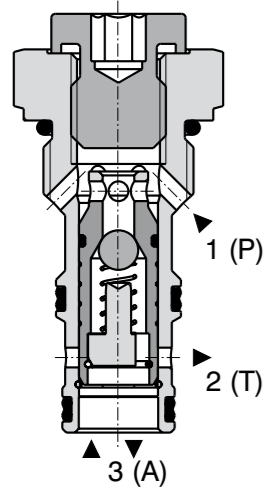
3/4-16 UNF • Q_{max} 20 l/min (5 GPM) • p_{max} 250 bar (3600 PSI)

Technical Features

- › Rapid response to changes in load direction
- › Hardened precision parts
- › Sharp-edged steel seats for dirt-tolerant performance
- › Leak-free closing, suitable for fast cycling with long life
- › High flow capacity
- › In the standard version, the valve is zinc-coated for 240 h protection acc. to ISO 9227

Functional Description

A poppet type hydraulic directional shuttle valve in the form of a screw-in cartridge for use in single acting cylinder applications. Pressure at port 1(P) opens the ball check valve, allowing fluid to pass to port 3(A). The poppet tightly closes the connection between ports 3(A) and 2(T). If there is no pressure at port 1(P), any pressure at port 3(A) - like from a cylinder's return spring - causes the poppet to shift such that fluid can pass from 3(A) to 2(T) but not from 3(A) and 1(P).

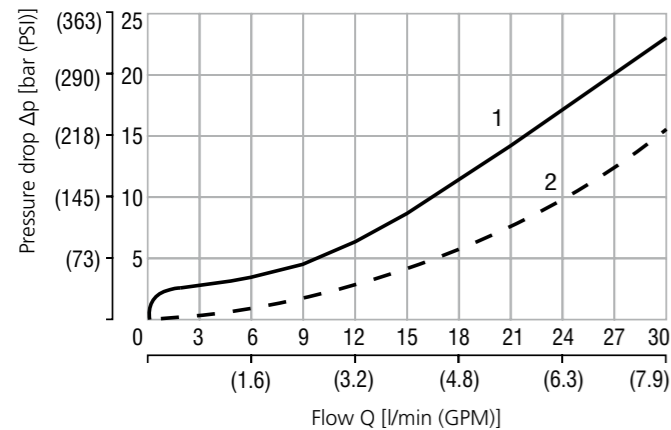


Technical Data

Valve size / Cartridge cavity		3/4-16 UNF-2A / A3
Max. flow	l/min (GPM)	20 (5.3)
Max. operating pressure	bar (PSI)	250 (3630)
Cracking pressure	bar (PSI)	2 ± 0,5 (29 ± 7 PSI)
Fluid temperature range (NBR)	°C (°F)	-30 ... +100 (-22 ... +212)
Fluid temperature range (FPM)	°C (°F)	-20 ... +120 (-4 ... +248)
Mass	kg (lbs)	0.08 (0.18)
General information		Datasheet GI_0060 Type Products and operating conditions
Cartridge cavity / Form tools		SMT_0019 SMT-A3
Spare parts		SP_8010

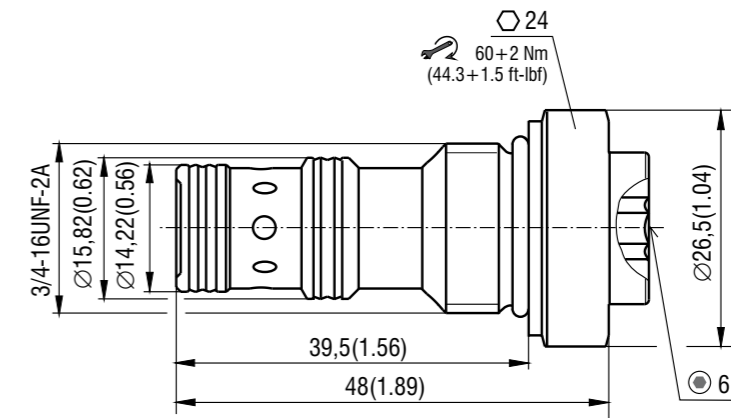
Characteristics measured at v = 32 mm²/s (156 SUS)

Pressure drop related to flow rate

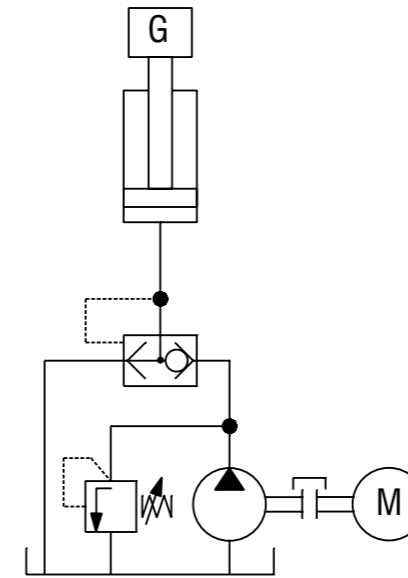


	Flow direction
1	P (1) → A (3)
2	A (3) → T (2)

Dimensions in millimeters (inches)



Application example



Ordering Code

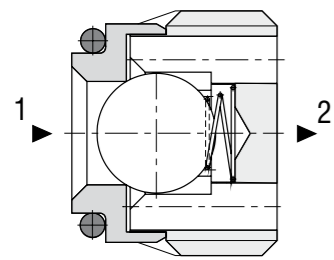
SH1F-A3 /							
Load shuttle valve, kick down 3/4-16 UNF							
Valve cavity	A3						
Version Lightline			L				
Cracking pressure 2 ± 0.5 bar (29 ± 7 PSI)				020			
					No designation V		
						Seals NBR FPM (Viton)	
						Surface treatment A zinc-coated (ZnCr-3), ISO 9227 (240 h) B zinc-coated (ZnNi), ISO 9227 (520 h)	

Check Valve, Ball Type

VJO1-06/S

Size 06 • Q_{max} 20 l/min (5 GPM) • p_{max} 320 bar (4600 PSI)

Model 01



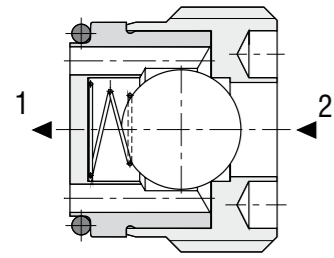
Technical Features

- › Hardened precision parts
- › Sharp-edged steel seats for dirt-tolerant performance
- › Leak-free closing, suitable for fast cycling with long life
- › Compact design for limited installation space availability
- › High flow capacity
- › In the standard version, the valve is without surface coating

Functional Description

A hydraulic check valve in the form of a screw-in cartridge-style for use as a blocking or load-holding device. The cartridge has a ball check which is closed by spring until sufficient pressure is applied at port 1(2) to open flow to port 2(1).

Model 02



Symbol	Model 01	Model 02

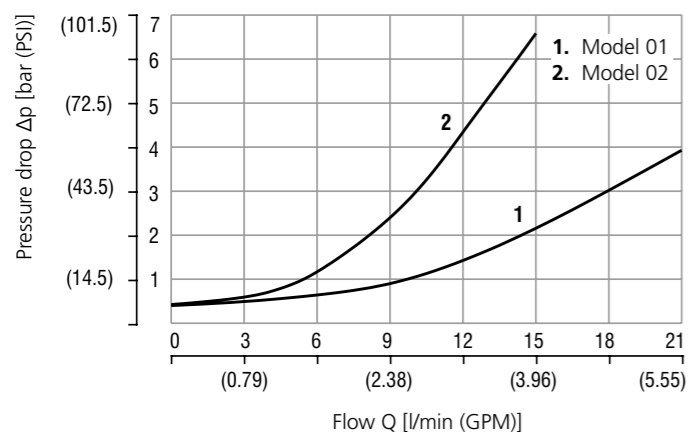
Technical Data

Valve size	06	
Max. flow	l/min (GPM)	20 (5.3)
Max. operating pressure	bar (PSI)	320 (4640)
Cracking pressure	bar (PSI)	0.25 (3.62)
Fluid temperature range (NBR)	°C (°F)	-30 +100 (-22 ... +212)
Fluid temperature range (FPM)	°C (°F)	-20 +120 (-4 ... +248)
Mass	kg (lbs)	0.007 (0.015)

	Datasheet	Type
General information	GI_0060	Products and operating conditions
Spare parts	SP_8010	

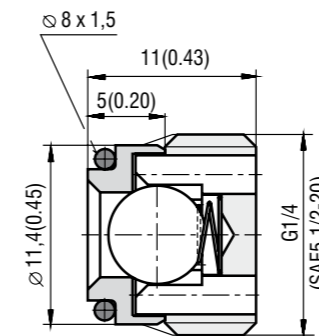
Characteristics measured at v = 32 mm²/s (156 SUS)

Pressure drop related to flow rate

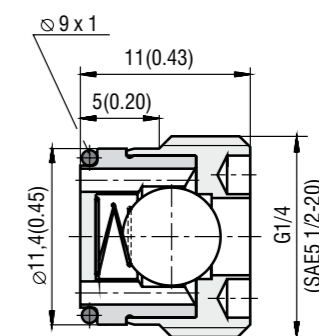


Dimensions in millimeters (inches)

Model 01

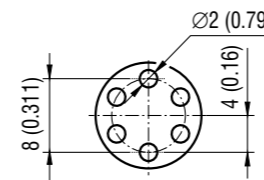


Model 02

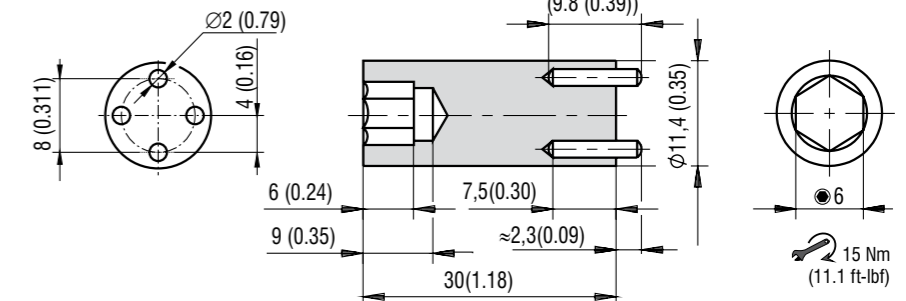


Mounting Tool in millimeters (inches)

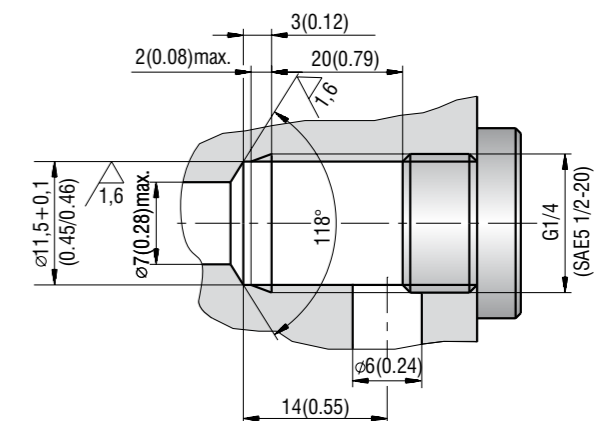
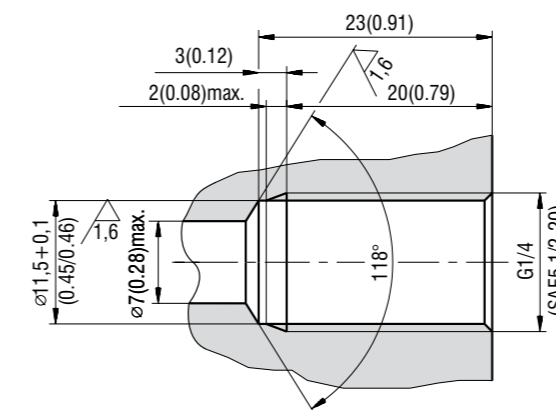
Model 01



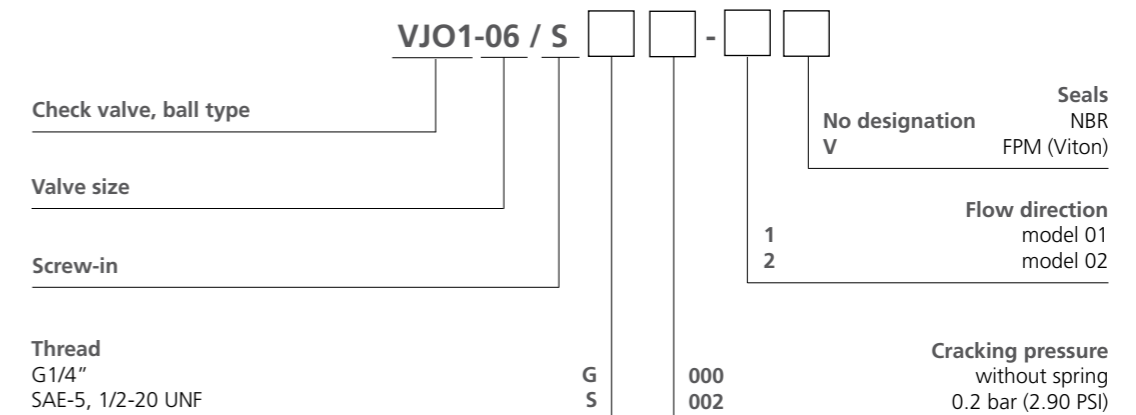
Model 02



Cavity in millimeters (inches)



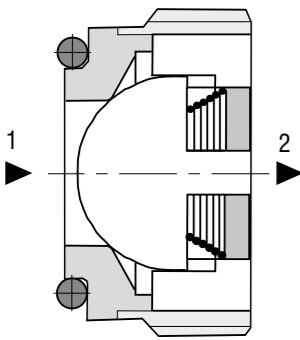
Ordering Code



Check Valve, Ball Type

VJO1-10/S

Size 10 / M20x1.5 • Q_{max} 80 l/min (21 GPM) • p_{max} 350 bar (5100 PSI)



Technical Features

- > Hardened precision parts
- > Sharp-edged steel seats for dirt-tolerant performance
- > Leak-free closing, suitable for fast cycling with long life
- > Compact design for limited installation space availability
- > High flow capacity
- > In the standard version, the valve is without surface coating

Functional Description

A hydraulic check valve in the form of a screw-in cartridge-style for use as a blocking or load-holding device. The cartridge has a ball check which is closed by spring until sufficient pressure is applied at port 1 to open flow to port 2.



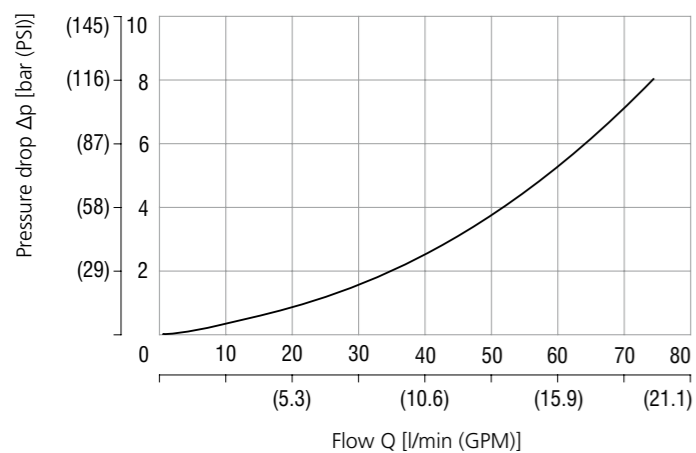
Technical Data

Valve size	10 / M20x1.5	
Max. flow	l/min (GPM)	80 (21.1)
Max. operating pressure	bar (PSI)	350 (5076)
Cracking pressure	bar (PSI)	0.5 (7.25)
Fluid temperature range (NBR)	°C (°F)	-30 ... +100 (-22 ... +212)
Fluid temperature range (FPM)	°C (°F)	-20 ... +120 (-4 ... +248)
Mass	kg (lbs)	0.017 (0.038)

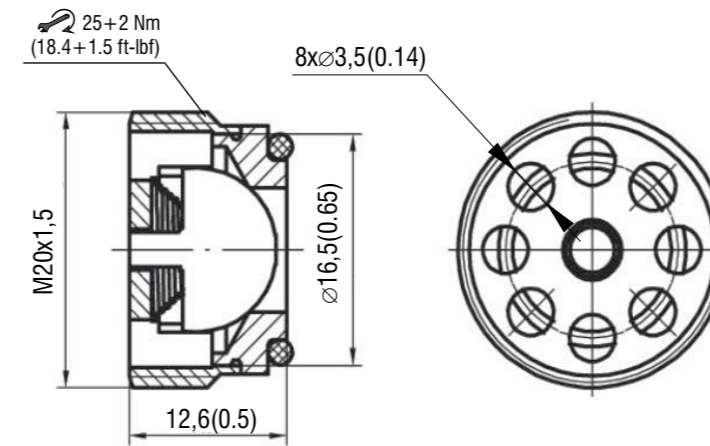
	Datasheet	Type
General information	GI_0060	Products and operating conditions
Spare parts	SP_8010	

Characteristics measured at v = 32 mm²/s (156 SUS)

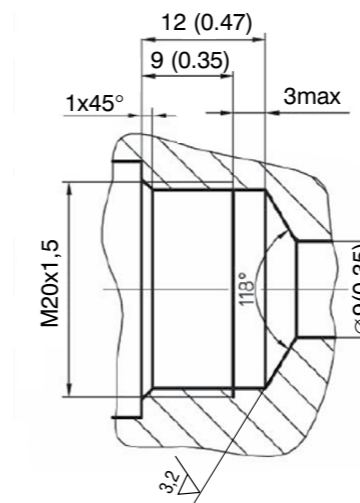
Pressure drop related to flow rate



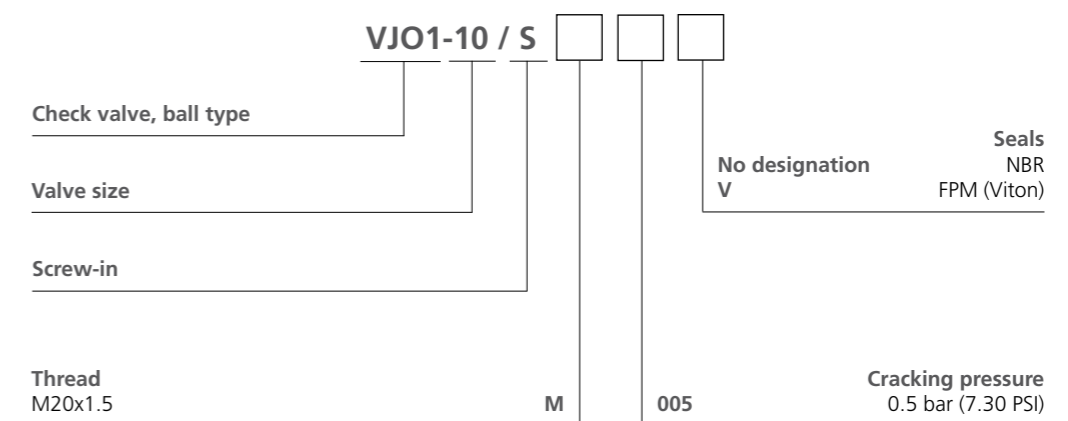
Dimensions in millimeters (inches)



Cavity in millimeters (inches)



Ordering Code



Check Valve, Poppet Type, Modular

VJO1-04/M

Size 04 (D02) • Q_{max} 30 l/min (8 GPM) • p_{max} 320 bar (4600 PSI)

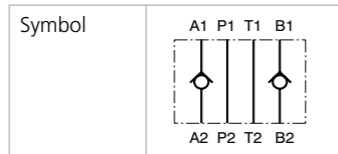


Technical Features

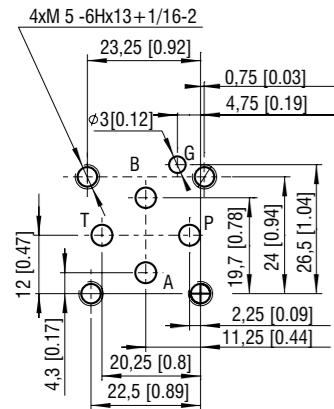
- › Poppet type check valve with subplate mounting interface acc. to ISO 4401, DIN 24340 (CETOP 02)
- › Sandwich plate design for use in vertical stacking assemblies
- › Leak-free closing in one or two channels, suitable for fast cycling with long life
- › Sharp-edged steel seats for dirt-tolerant performance
- › High flow capacity
- › Optional bias spring ranges for back-pressure control
- › In the standard version, the valve housing is phosphated and steel parts are zinc-coated for 240 h protection acc. to ISO 9227

Functional Description

These check valves in sandwich plate design allow flow in one and prevent flow in the other direction. The sandwich design enables vertical stacking with other components of the same size. The check valves can be built into one or two channels, the other passages are unobstructed. The cracking pressure depends on the selected bias spring.



ISO 4401-02-01-0-05



Ports P, A, B, T max \varnothing 4.5 mm (0.18 in)

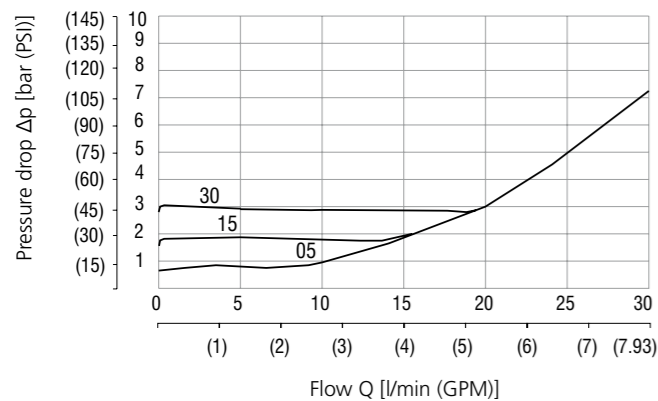
Technical Data

Valve size	04 (D02)		
Max. flow	l/min (GPM)	30 (7.9)	
Max. operating pressure	bar (PSI)	320 (4640)	
Cracking pressure	bar (PSI)	0.5 (7.3)	1.5 (21.8) 3 (43.5)
Fluid temperature range (NBR)	°C (°F)	-30 ... +100 (-22 ... +212)	
Fluid temperature range (FPM)	°C (°F)	-20 ... +120 (-4 ... +248)	
Mass	kg (lbs)	0.4 (0.88)	

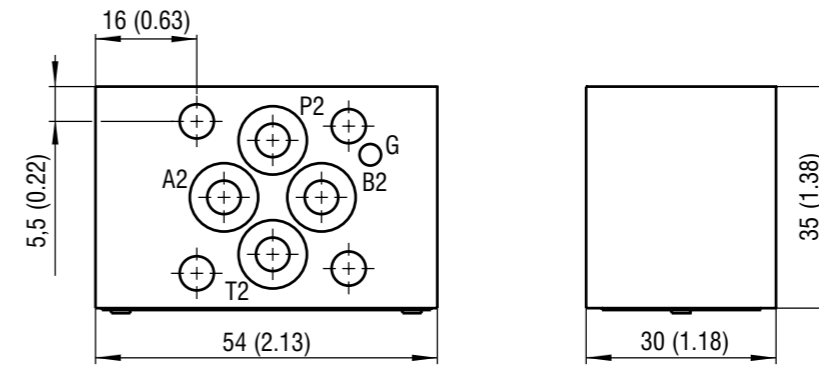
	Datasheet	Type
General information	GI_0060	Products and operating conditions
Mounting interface / Tolerances	SMT_0019	Size 04
Spare parts	SP_8010	

Characteristics measured at $v = 32 \text{ mm}^2/\text{s}$ (156 SUS)

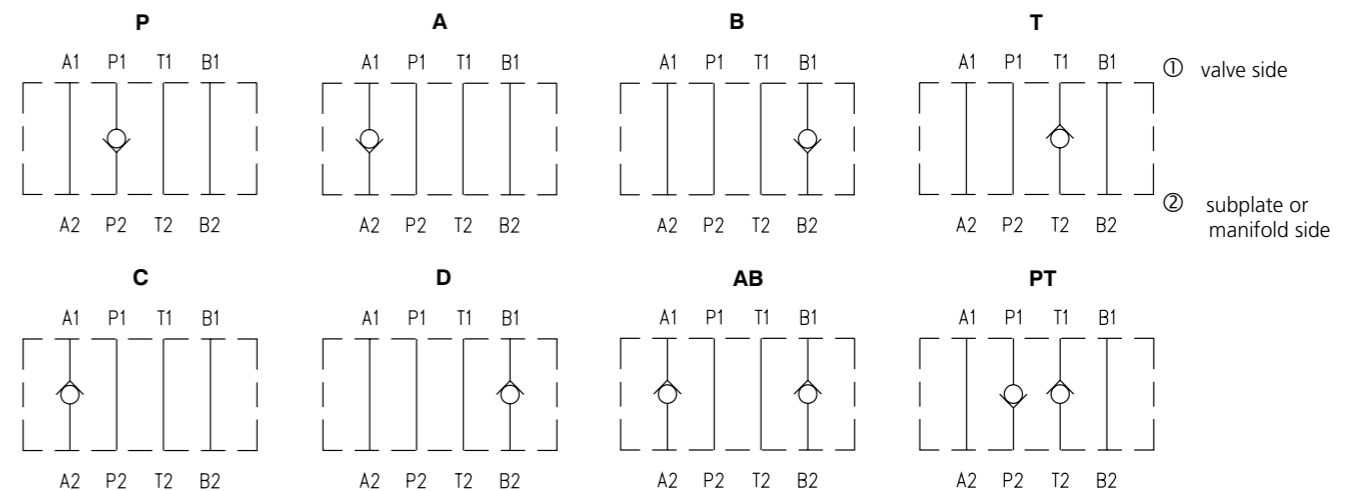
Pressure drop related to flow rate



Dimensions in millimeters (inches)

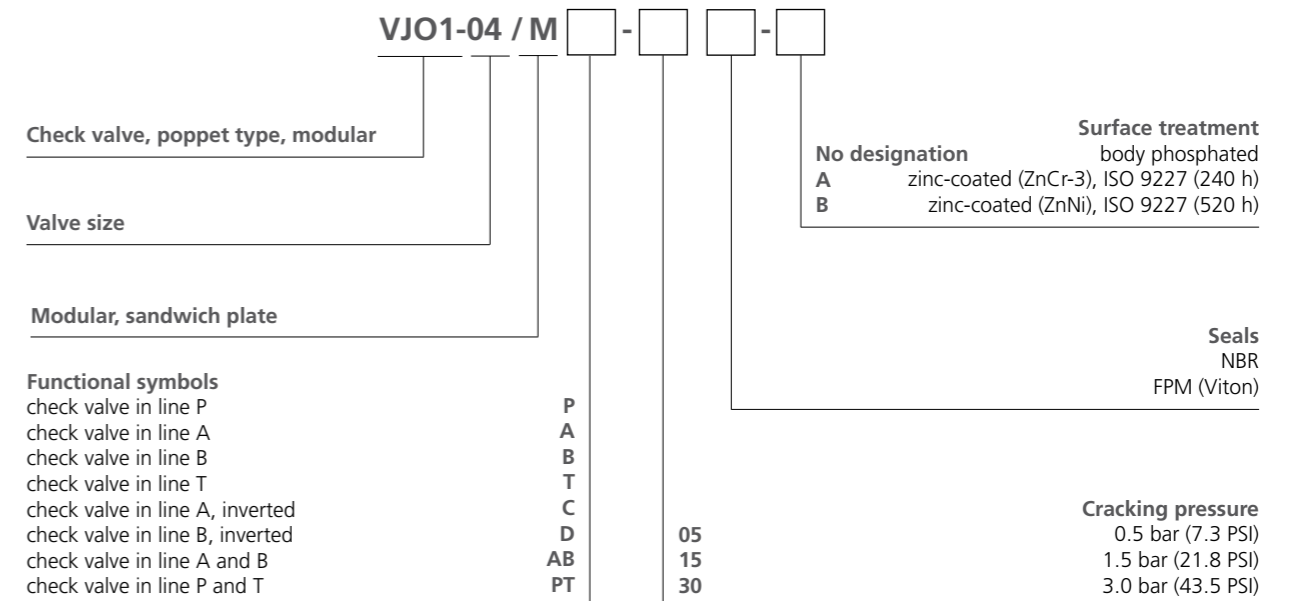


Functional symbols



Notes: The orientation of the symbol on the name plate corresponds with the valve function.

Ordering Code

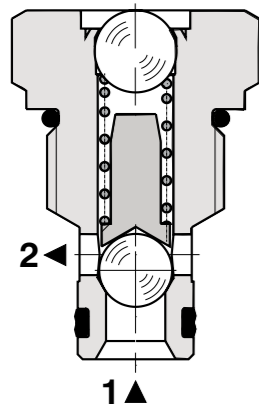


Check Valve, Ball Type

SC1F-A2

3/4-16 UNF • Q_{max} 40 l/min (11 GPM) • p_{max} 420 bar (6100 PSI)

High performance



Technical Features

- › Hardened precision parts
- › Sharp-edged steel seats for dirt-tolerant performance
- › Leak-free closing, suitable for fast cycling with long life
- › High flow capacity
- › Optional bias spring ranges for back-pressure control
- › In the standard version, the valve is zinc-coated for 240 h protection acc. to ISO 9227

Functional Description

A hydraulic check valve in the form of a screw-in cartridge-style for use as a blocking or load-holding device. The cartridge has a ball check which is closed by spring until sufficient pressure is applied at port 1 to open flow to port 2.



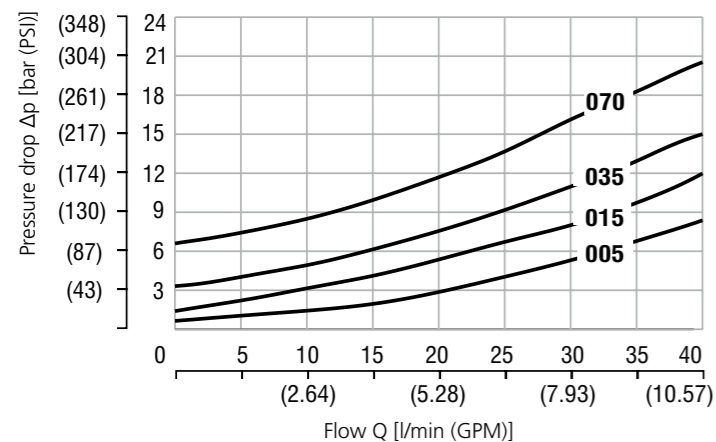
Technical Data

Valve size / Cartridge cavity		3/4-16 UNF-2A / A2			
Max. flow	l/min (GPM)	40 (10.6)			
Max. operating pressure	bar (PSI)	420 (6090)			
Cracking pressure	bar	0.5	1.5	3.5	7.0
	(PSI)	(7.3)	(21.8)	(50.8)	(101.5)
Fluid temperature range (NBR)	°C (°F)	-30 ... +100 (-22 ... +212)			
Fluid temperature range (FPM)	°C (°F)	-20 ... +120 (-4 ... +248)			
Mass	kg (lbs)	0.06 (0.13)			

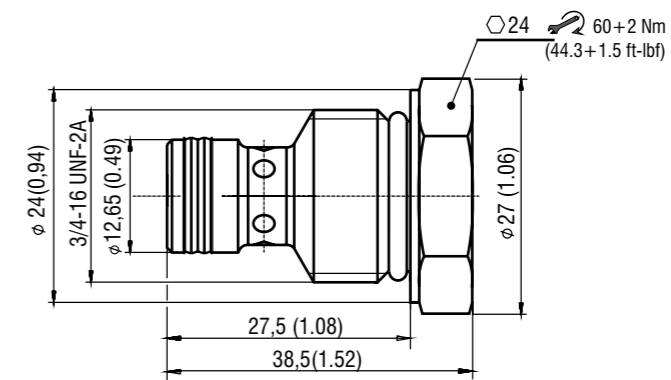
		Datasheet	Type
General information		GI_0060	Products and operating conditions
Valve bodies	In-line mounted	SB_0018	SB-A2*
	Sandwich mounted	SB-04(06)_0028	SB-*A2*
Cavity details / Form tools		SMT_0019	SMT-A2*
Spare parts		SP_8010	

Characteristics measured at v = 32 mm²/s (156 SUS)

Pressure drop related to flow rate



Dimensions in millimeters (inches)



Ordering Code

SC1F-A2 / [] [] [] - []

Check valve, ball type 3/4-16 UNF

High performance H

Surface treatment
A zinc-coated (ZnCr-3), ISO 9227 (240 h)
B zinc-coated (ZnNi), ISO 9227 (520 h)

Seals
NBR
FPM (Viton)

No designation V

Cracking pressure
without spring
0.2 bar (2.92 PSI)
0.5 bar (7.3 PSI)
1.5 bar (21.8 PSI)
3.5 bar (50.8 PSI)
7.0 bar (101.5 PSI)

000
002
005
015
035
070

Check Valve With Pressure Gauge Port

SC1F-A3

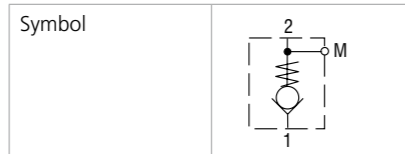
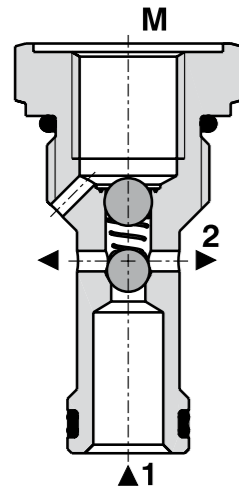
3/4-16 UNF • Q_{max} 20 l/min (5 GPM) • p_{max} 350 bar (5100 PSI)

Technical Features

- ▶ Hardened precision parts
- ▶ Sharp-edged steel seats for dirt-tolerant performance
- ▶ Leak-free closing, suitable for fast cycling with long life
- ▶ Integrated pressure gauge port G 1/4" or SAE
- ▶ In the standard version, the valve is zinc-coated for 240 h protection acc. to ISO 9227

Functional Description

A hydraulic check valve in the form of a screw-in cartridge for use as a blocking or load-holding device. The cartridge has a ball check which is closed by spring until sufficient pressure is applied at port 1 to open flow to port 2.



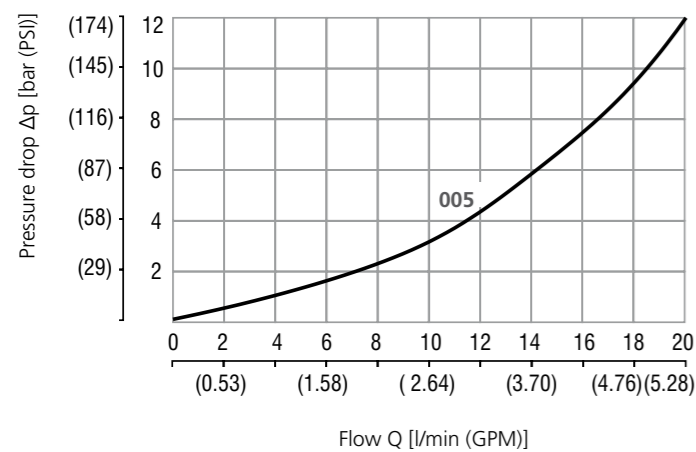
Technical Data

Valve size / Cartridge cavity		3/4-16 UNF-2A / A3
Max. flow	l/min (GPM)	20 (5.3)
Max. operating pressure	bar (PSI)	350 (5080)
Cracking pressure	bar (PSI)	0.5 (7.3)
Fluid temperature range (NBR)	°C (°F)	-30 +100 (-22 ... +212)
Fluid temperature range (FPM)	°C (°F)	-20 +120 (-4 ... +248)
Mass	kg (lbs)	0.05 (0.11)

		Datasheet	Type
General information		GI_0060	Products and operating conditions
Valve bodies	In-line mounted	SB_0018	SB-A3*
	Sandwich mounted	SB-04(06)_0028	SB-*A3*
Cavity details / Form tools		SMT_0019	SMT-A3*
Spare parts		SP_8010	

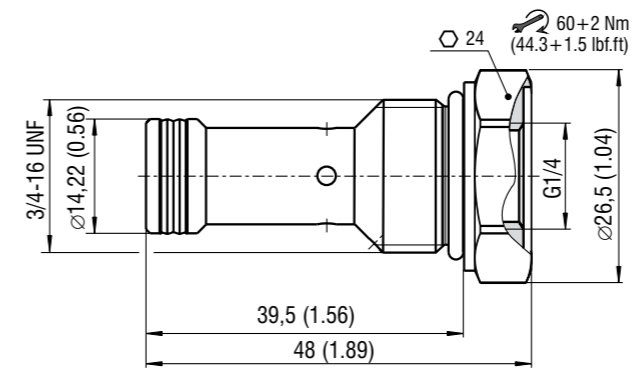
Characteristics measured at v = 32 mm²/s (156 SUS)

Pressure drop related to flow rate

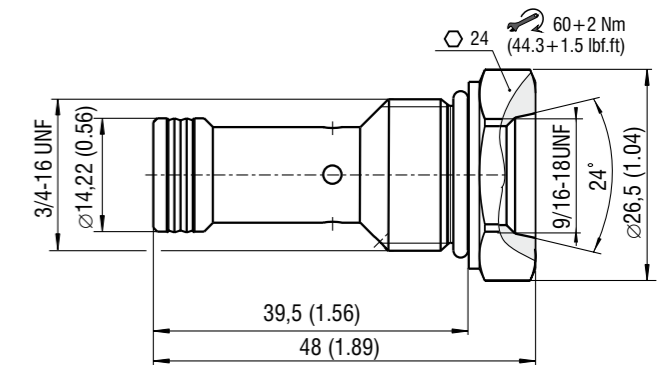


Dimensions in millimeters (inches)

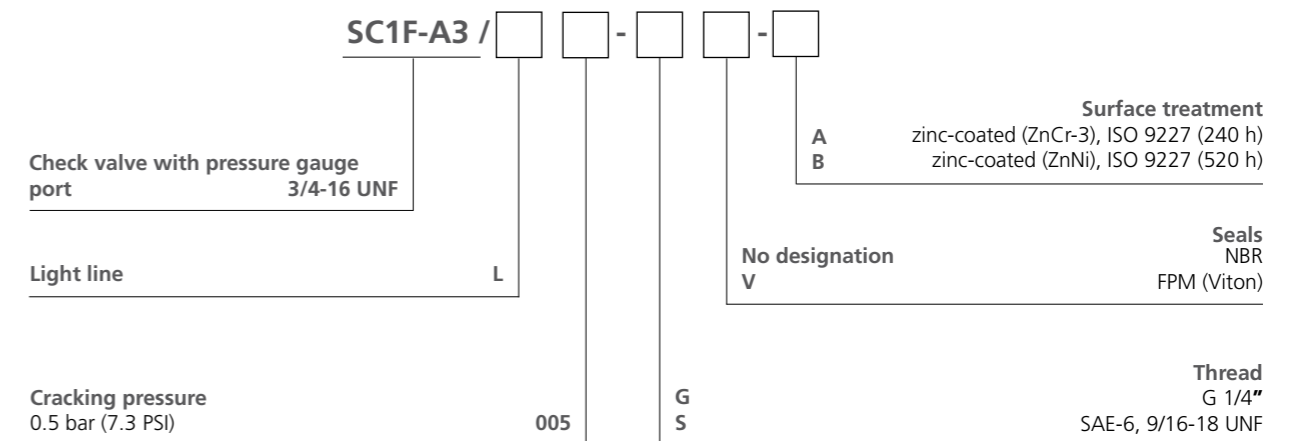
Model G



Model S



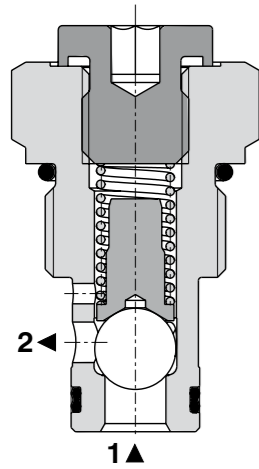
Ordering Code



Check Valve, Ball Type

SC1F-B2

7/8-14 UNF • Q_{max} 120 l/min (32 GPM) • p_{max} 420 bar (6100 PSI)

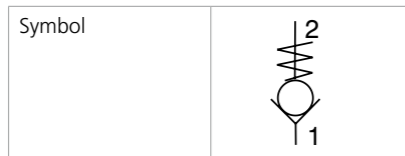


Technical Features

- › Hardened precision parts
- › Sharp-edged steel seats for dirt-tolerant performance
- › Leak-free closing, suitable for fast cycling with long life
- › High flow capacity
- › Optional bias spring ranges for back-pressure control
- › In the standard version, the valve is zinc-coated for 240 h protection acc. to ISO 9227

Functional Description

A hydraulic check valve in the form of a screw-in cartridge for use as a blocking or load-holding device. The cartridge has a ball check which is closed by spring until sufficient pressure is applied at port 1 to open flow to port 2.



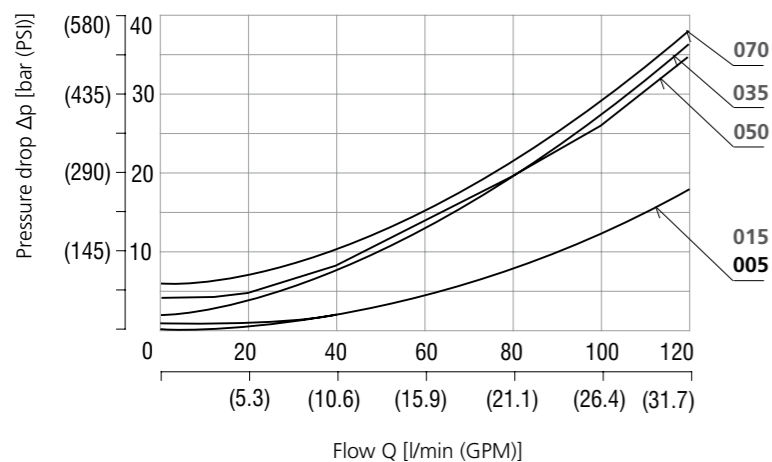
Technical Data

Valve size / Cartridge cavity		7/8-14 UNF-2A / B2				
Max. flow	l/min (GPM)	120 (31.7)				
Max. operating pressure	bar (PSI)	420 (6090)				
Cracking pressure	bar	0.5	1.5	3.5	5.0	7.0
	(PSI)	(7.3)	(21.8)	(50.8)	(72.5)	(101.5)
Fluid temperature range (NBR)	°C (°F)	-30 ... +100 (-22 ... +212)				
Fluid temperature range (FPM)	°C (°F)	-20 ... +120 (-4 ... +248)				
Mass	kg (lbs)	0.12 (0.27)				

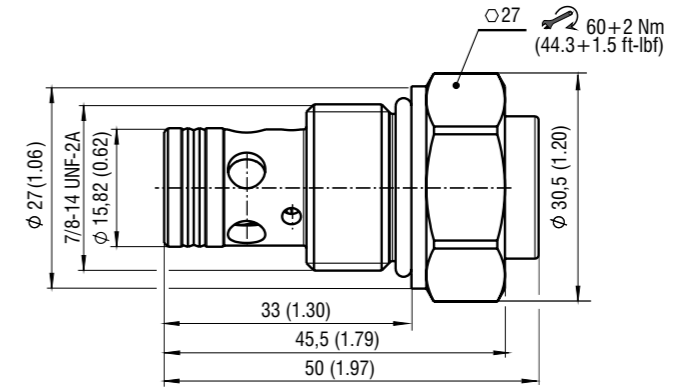
		Datasheet	Type
General information		GI_0060	Products and operating conditions
Valve bodies	In-line mounted	SB_0018	SB-B2*
	Sandwich mounted	SB-04(06)_0028	SB-*B2*
Cavity details / Form tools		SMT_0019	SMT-B2*
Spare parts		SP_8010	

Characteristics measured at v = 32 mm²/s (156 SUS)

Pressure drop related to flow rate



Dimensions in millimeters (inches)



Ordering Code

SC1F-B2 /					
Check valve, ball type 7/8-14 UNF					
High performance					

Surface treatment	Seals	Cracking pressure
A zinc-coated (ZnCr-3), ISO 9227 (240 h)	NBR	without spring
B zinc-coated (ZnNi), ISO 9227 (520 h)	FPM (Viton)	0.2 bar (2.9 PSI)
No designation		0.5 bar (7.3 PSI)
		1.0 bar (14.6 PSI)
		1.5 bar (21.8 PSI)
		2.0 bar (29.2 PSI)
		3.5 bar (50.8 PSI)
		5.0 bar (73 PSI)
		7.0 bar (101.5 PSI)

Check Valve, Poppet Type, Modular

MVJ3-06

Size 06 (D03) • Q_{max} 50 l/min (13 GPM) • p_{max} 350 bar (5100 PSI)

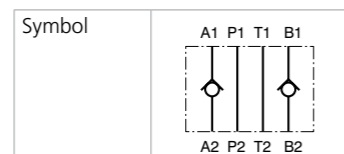


Technical Features

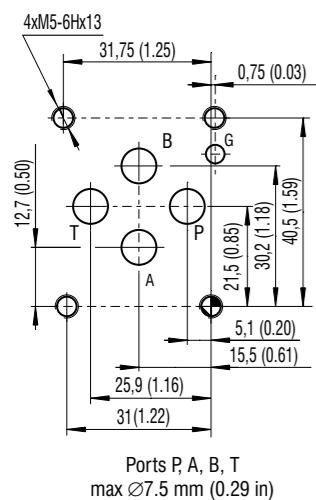
- › Poppet type check valve with subplate mounting interface acc. to ISO 4401, DIN 24340 (CETOP 03)
- › Sandwich plate design for use in vertical stacking assemblies
- › Leak-free closing in one or two service ports, suitable for fast cycling with long life
- › Sharp-edged steel seats for dirt-tolerant performance
- › High flow capacity
- › Optional bias spring ranges for back-pressure control
- › In the standard version, the valve housing is phosphated and steel parts are zinc-coated for 240 h protection acc. to ISO 9227

Functional Description

These check valves in sandwich plate design allow flow in one and prevent flow in the other direction. The sandwich design enables vertical stacking with other components of the same size. The check valves can be built into one or two channels, the other passages are unobstructed. The cracking pressure depends on the selected bias spring.



ISO 4401-03-02-0-05



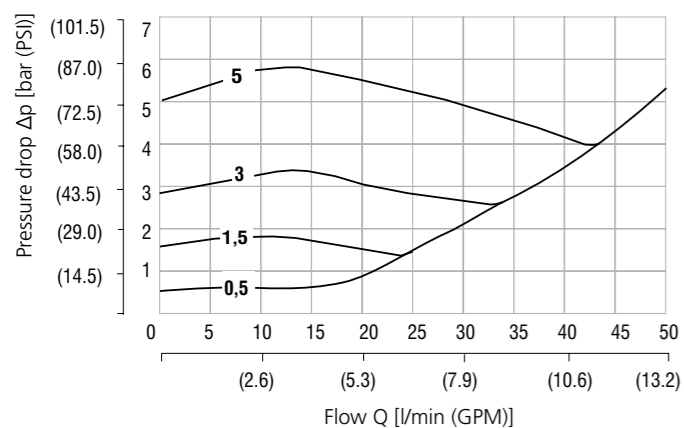
Technical Data

Valve size	06 (D03)				
Max. flow	l/min (GPM)	50 (13.2)			
Max. operating pressure	bar (PSI)	350 (5080)			
Cracking pressure	bar	0.5	1.5	3	5
	(PSI)	(7.3)	(21.8)	(43.5)	(72.5)
Fluid temperature range (NBR)	°C (°F)	-30 ... +100 (-22 ... +212)			
Fluid temperature range (FPM)	°C (°F)	-20 ... +120 (-4 ... +248)			
Mass	kg (lbs)	0.8 (1.76)			

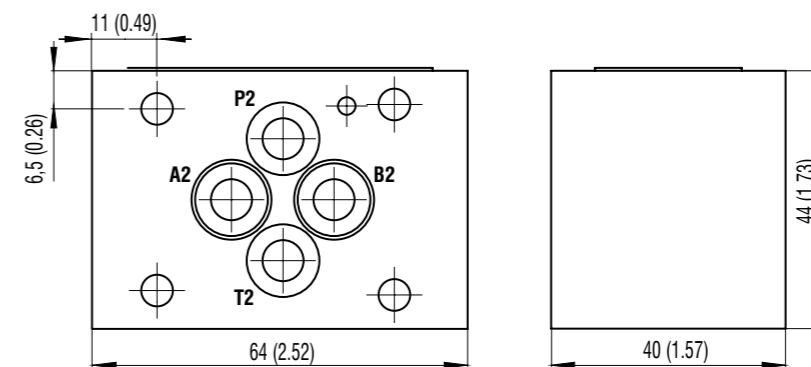
	Datasheet	Type
General information	GI_0060	Products and operating conditions
Mounting interface / Tolerances	SMT_0019	Size 06
Spare parts	SP_8010	

Characteristics measured at v = 32 mm²/s (156 SUS)

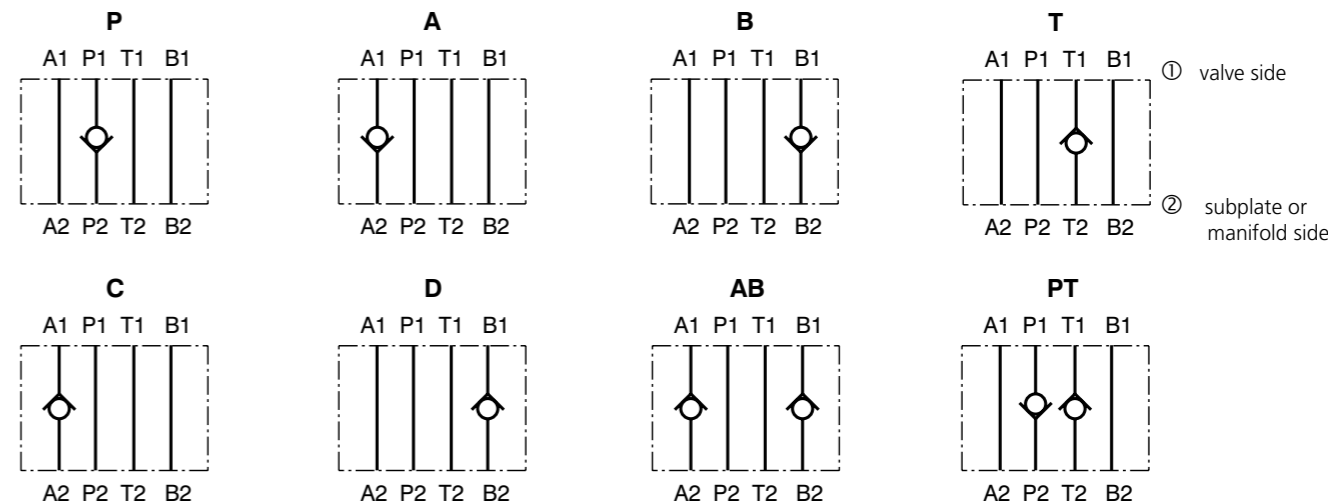
Pressure drop related to flow rate



Dimensions in millimeters (inches)

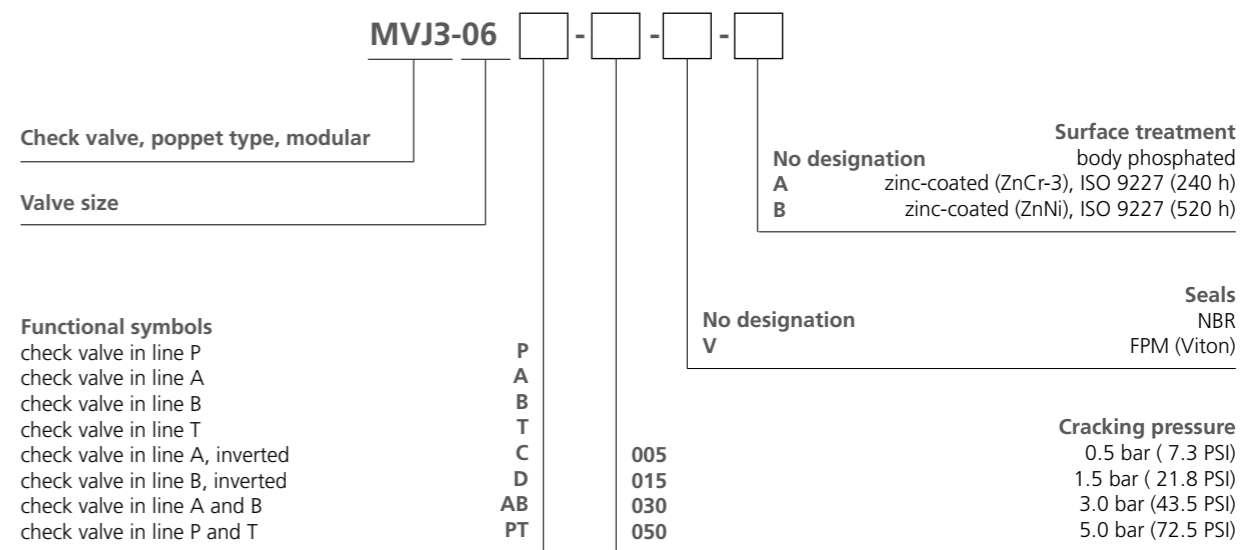


Functional Symbols



Note: The orientation of the symbol on the name plate corresponds with the valve function.

Ordering Code



Check Valve, Poppet Type, Modular

MVJ3-10

Size 10 (D05) • Q_{max} 100 l/min (26 GPM) • p_{max} 350 bar (5100 PSI)

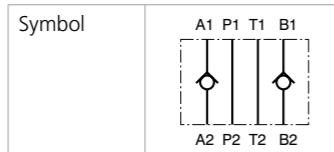


Technical Features

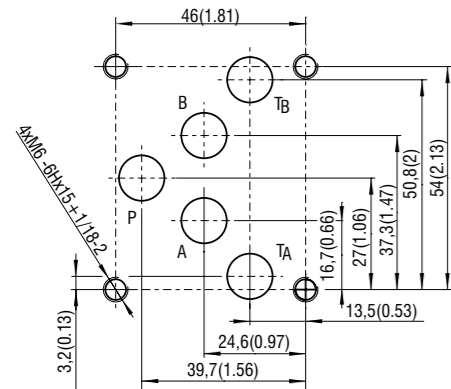
- › Poppet type check valve with subplate mounting interface acc. to ISO 4401, DIN 24340 (CETOP 05)
- › Sandwich plate design for use in vertical stacking assemblies
- › Leak-free closing in one or two channels, suitable for fast cycling with long life
- › Sharp-edged steel seats for dirt-tolerant performance
- › High flow capacity
- › Optional bias spring ranges for back-pressure control
- › In the standard version, the valve housing is phosphated and steel parts are zinc-coated for 240 h protection acc. to ISO 9227

Functional Description

These check valves in sandwich plate design allow flow in one and prevent flow in the other direction. The sandwich design enables vertical stacking with other components of the same size. The check valves can be built into one or two channels, the other passages are unobstructed. The cracking pressure depends on the selected bias spring.



ISO 4401-05-04-0-05



Ports P, A, B, T max. Ø11.2 mm (0.44 in)

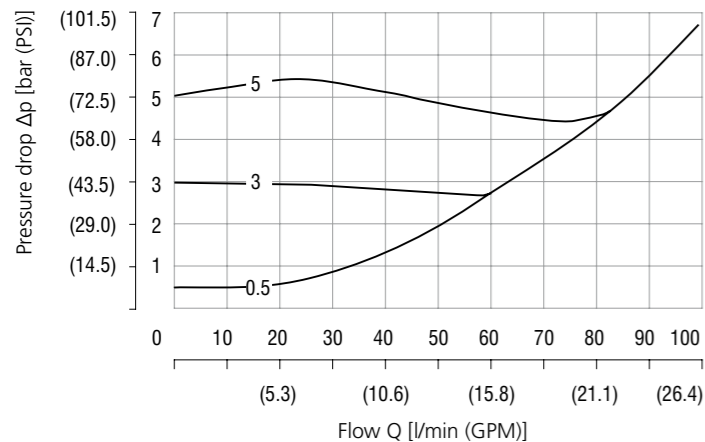
Technical Data

Valve size	10 (D05)		
Max. flow	l/min (GPM)	100 (26.4)	
Max. operating pressure	bar (PSI)	350 (5080)	
Cracking pressure	bar (PSI)	0.5 (7.3)	3 (43.5) 5 (72.5)
Fluid temperature range (NBR)	°C (°F)	-30 ... +100 (-22 ... +212)	
Fluid temperature range (FPM)	°C (°F)	-20 ... +120 (-4 ... +248)	
Mass	kg (lbs)	2.25 (4.96)	

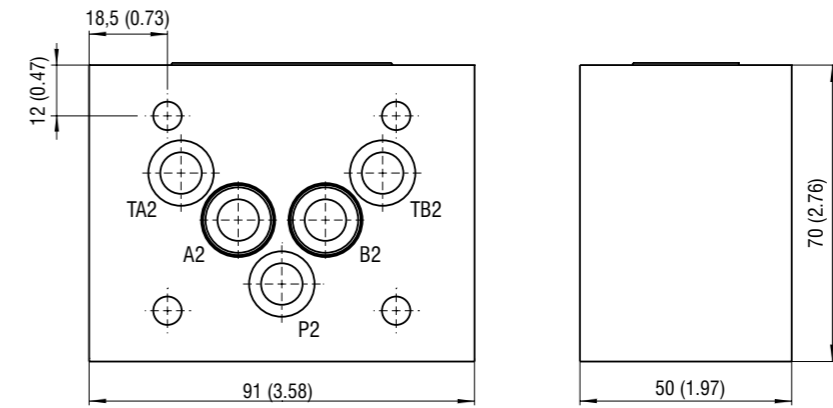
	Datasheet	Type
General information	GI_0060	Products and operating conditions
Mounting interface / Tolerances	SMT_0019	Size 10
Spare parts	SP_8010	

Characteristics measured at v = 32 mm²/s (156 SUS)

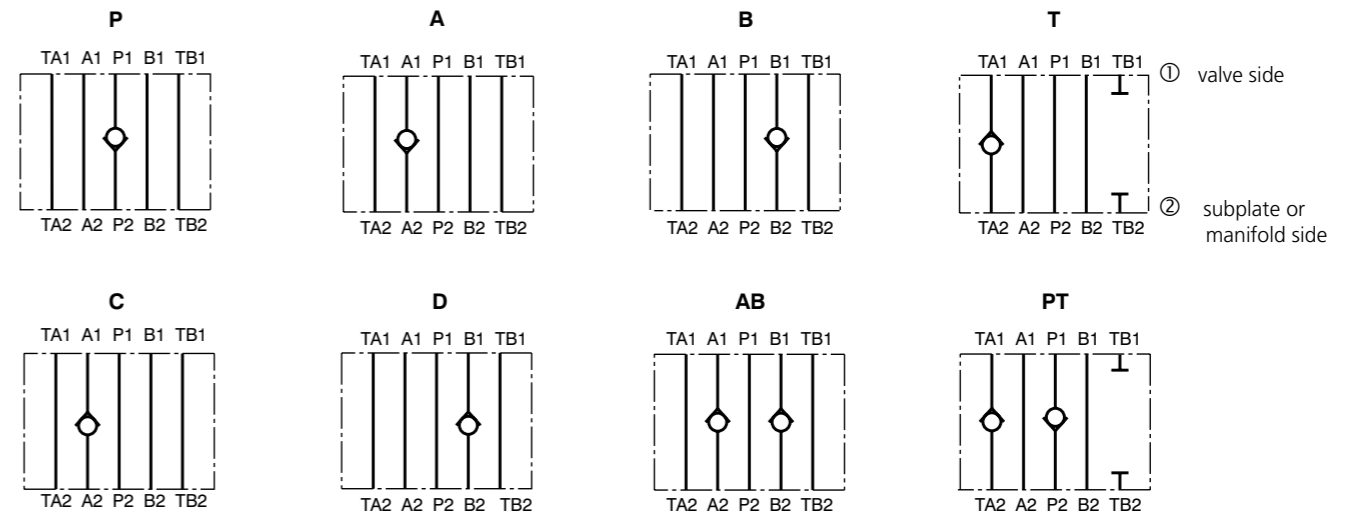
Pressure drop related to flow rate



Dimensions in millimeters (inches)

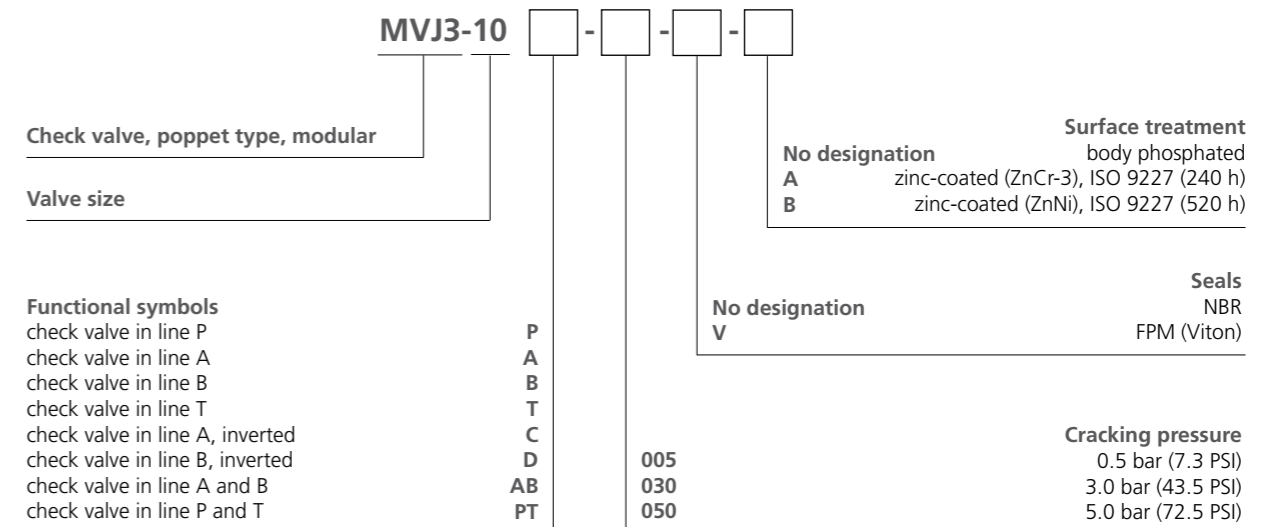


Functional Symbols



Note: The orientation of the symbol on the name plate corresponds with the valve function.

Ordering Code

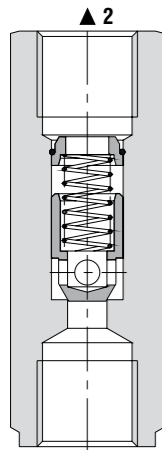


Check Valve, Poppet Type, In-Line

VJ3

Size 06, 08, 10, 16, 20, 25, 30 • Q_{max} 400 l/min (106 GPM) • p_{max} 320 bar (4600 PSI)

Model G1, M1, S

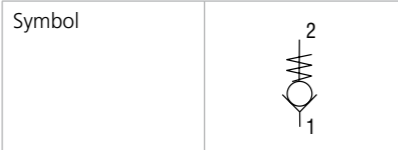


Technical Features

- › Poppet type check valve, guided in-line mounting or slip-in design
- › Hardened precision parts
- › Sharp-edged steel seats for dirt-tolerant performance
- › Leak-free closing, suitable for fast cycling with long life
- › Optional bias spring ranges for back-pressure control
- › High flow capacity
- › In the standard version, the valve is zinc-coated for 240 h protection acc. to ISO 9227

Functional Description

A hydraulic check valve in the form of an in-line or slip-in cartridge for use as a blocking or load-holding device. The valve has a poppet check which is closed by spring until sufficient pressure is applied at port 1 to open flow to port 2.

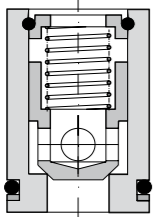


Technical Data

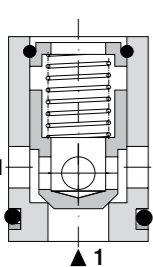
Valve size	06	08	10	16	20	25	30
Maximum flow rate	30	40	60	160	250	300	400
	(7.9)	(10.6)	(15.9)	(42.3)	(66)	(79.3)	(105.7)
Max. operating pressure	320 (4640)						
Cracking pressure	0.5	1.0	1.5	3.0	5.0		
	(7.25)	(14.5)	(21.8)	(43.5)	(72.5)		
Fluid temperature range (NBR)	-30 ... +100 (-22 ... +212)						
Mass - model G1	0.11	0.2	0.34	0.52	0.95	1.95	2.35
	(0.24)	(0.04)	(0.75)	(1.15)	(2.09)	(4.30)	(5.18)
- models M1, S		-					
- models 02, 03	0.05	-	0.09	0.22	0.26	-	-
	(0.11)		(0.2)	(0.49)	(0.57)		

	Datasheet	Type
General information	GI_0060	Products and operating conditions
Cavity details	SMT_0019	
Spare parts	SP_8010	

Model 02

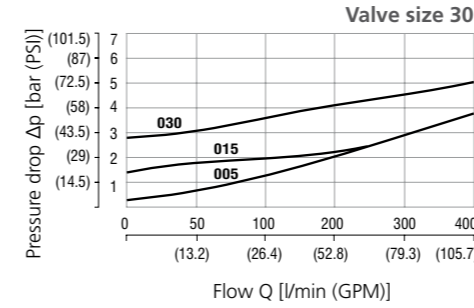


Model 03



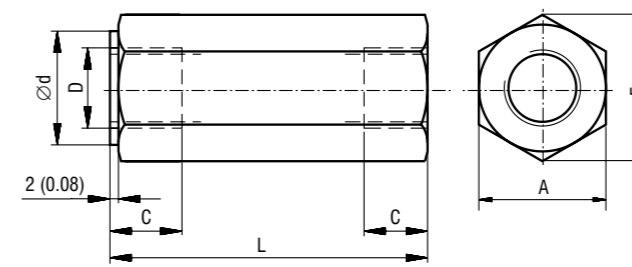
Characteristics measured at v = 32 mm²/s (156 SUS)

Pressure drop related to flow rate

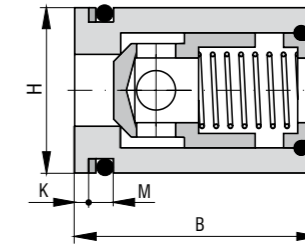


Dimensions in millimeters (inches)

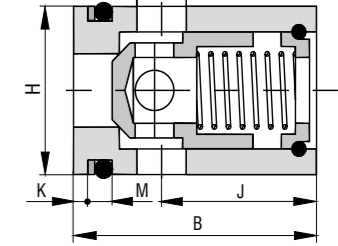
Models G1, M1, S



Model 02



Model 03

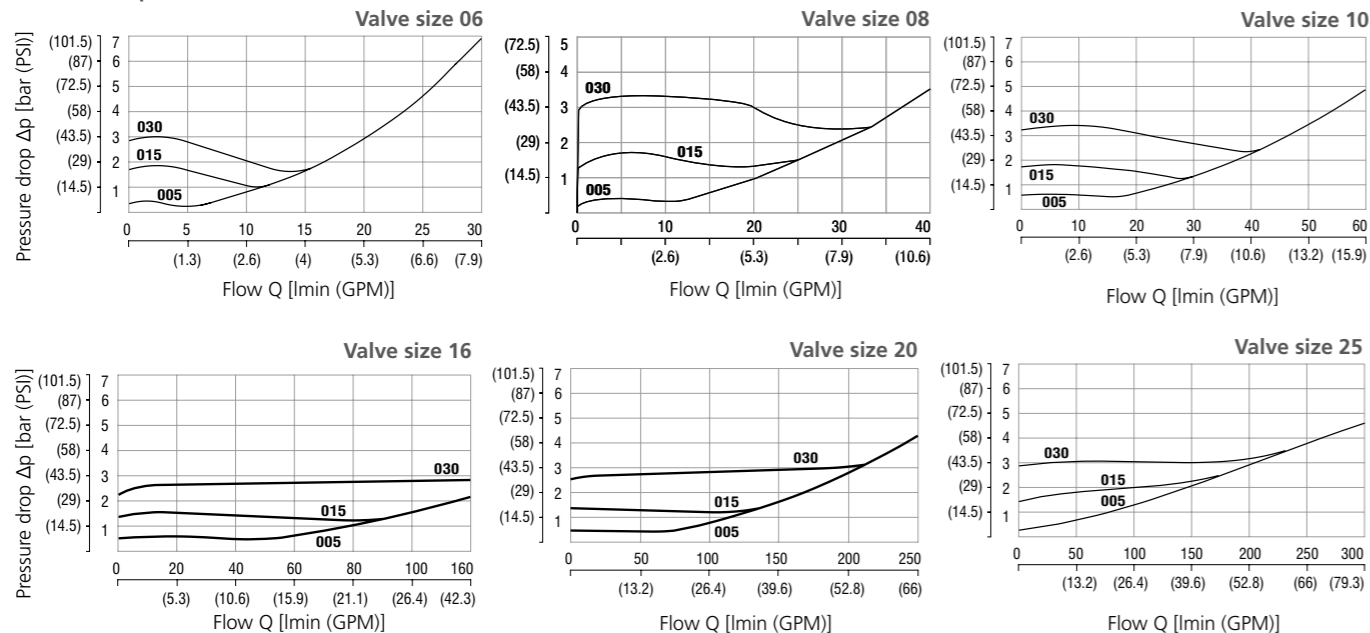


Size	A	B	C	D			Ø d
				G1	M1	S	
06	19 (0.75)	27 - 0.2 (1.06 - 0.008)	12 (0.47)	G 1/4	M14x1.5	SAE-6, 9/16-18	19 (0.75)
08	24 (0.95)	-	12 (0.47)	G 3/8	-	-	24 (0.94)
10	30 (1.18)	32 - 0.2 (1.26 - 0.008)	14 (0.55)	G 1/2	M18x1.5	SAE-8, 3/4-16	30 (1.18)
16	36 (1.42)	45 - 0.2 (1.77 - 0.008)	16 (0.63)	G 3/4	M27x2	SAE-12, 1 1/16-12	36 (1.42)
20	46 (1.81)	45 - 0.2 (1.77 - 0.008)	18 (0.71)	G 1	M33x2	SAE-16, 1 5/16-12	46 (1.81)
25	60 (2.36)	-	20 (0.79)	G 1 1/4	-	-	60 (2.36)
30	65 (2.56)	-	22 (0.87)	G 1 1/2	-	-	65 (2.56)

Size	Ø d1	E	H	J	K	L	M
06	3.5 (0.14)	22 (0.87)	Ø 20 (0.79 f8)	18 (0.71)	1.6 (0.06)	58 (2.28)	4.4 + 0.2 (0.17 + 0.008)
08	-	27.7 (1.09)	-	-	-	58 (2.28)	-
10	5.5 (0.22)	34.5 (1.36)	Ø 25 (0.98 f8)	20 (0.79)	1.6 (0.06)	72 (2.83)	4.4 + 0.2 (0.17 + 0.008)
16	8.5 (0.34)	41.5 (1.63)	Ø 35 (1.38 f8)	27 (1.06)	2.2 (0.09)	85 (3.35)	5.3 + 0.2 (0.21 + 0.008)
20	10.5 (0.41)	53.6 (2.09)	Ø 40 (1.58 f8)	25 (0.98)	2.2 (0.09)	98 (3.86)	5.3 + 0.2 (0.21 + 0.008)
25	-	69 (2.72)	-	-	-	120 (4.72)	-
30	-	75 (2.95)	-	-	-	132 (5.20)	-

Characteristics measured at v = 32 mm²/s (156 SUS)

Pressure drop related to flow rate



Ordering Code

VJ3 - [] - [] - [] - []

Check valve, poppet type, in-line

Valve size

06	06
08	08
10	10
16	16
20	20
25	25
30	30

Cracking pressure

without spring	000
0.5 bar (7.3 PSI)	005
1.0 bar (14.5 PSI)	010
1.5 bar (21.8 PSI)	015
3.0 bar (43.5 PSI)	030
5.0 bar (72.5 PSI)	050

Surface treatment

A	zinc-coated (ZnCr-3), ISO 9227 (240 h)
B	zinc-coated (ZnNi), ISO 9227 (520 h)

Interface

G1	in-line mounting - with G threads
M1	with metric threads
S*	with SAE threads
02*	slip-in cartridge
03*	slip-in cartridge

*For sizes 06, 10, 16, 20 only

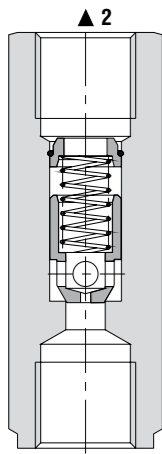
Besides the shown, commonly used valves other special models are available. Contact our technical support for their identification, feasibility and operating limits.

Check Valve with One-Way Throttling, Poppet Type, In-Line

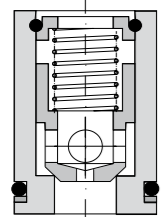
VJS3

Size 06, 10, 16, 20 • Q_{max} 250 l/min (66 GPM) • p_{max} 320 bar (4600 PSI)

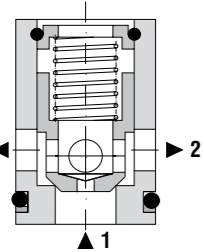
Model G1, M1, S



Model 02



Model 03

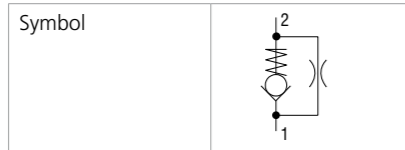


Technical Features

- › Check valve, one-way throttling, poppet type, guided in-line mounted or slip-in cartridge
- › Hardened precision parts
- › Sharp-edged steel seats for dirt-tolerant performance
- › Wide range of orifice diameters available
- › Optional bias spring ranges for back-pressure control
- › High flow capacity
- › In the standard version, the valve is zinc-coated for 240 h protection acc. to ISO 9227

Functional Description

An in-line or drop-in hydraulic check valve for use as a blocking or load-holding device. Includes a by-pass throttling orifice. The valve has a poppet check which is closed by spring until sufficient pressure is applied at port 1 to open flow to port 2. In the direction from port 2 to 1 the flow is restricted by the orifice.



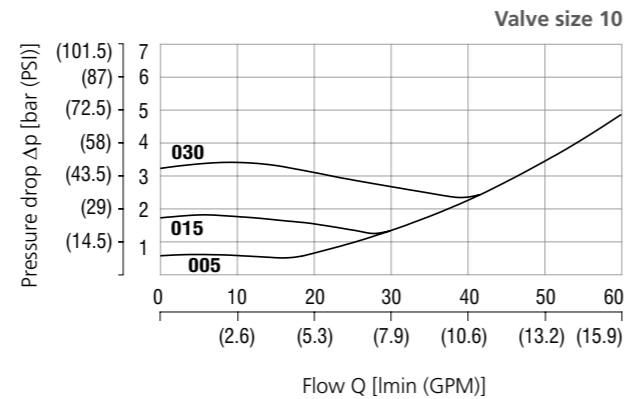
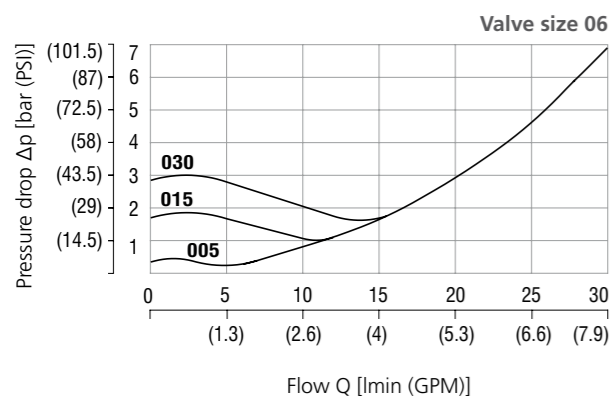
Technical Data

Valve size		06	10	16	20
Max. flow	l/min (GPM)	30 (7.9)	60 (15.9)	160 (42.3)	250 (66)
Max. operating pressure	bar (PSI)	320 (4640)			
Cracking pressure	bar	0.5	1.0	1.5	3.0
	(PSI)	(7.25)	(14.5)	(21.8)	(43.5)
Fluid temperature range (NBR)	°C (°F)	-30 +100 (-22 ... +212)			
Mass	- models G1, M1, S	0.11 (0.24)	0.34 (0.75)	0.52 (1.15)	0.95 (2.09)
	- models 02, 03	0.05 (0.11)	0.09 (0.2)	0.22 (0.49)	0.26 (0.57)

	Datasheet	Type
General information	GI_0060	Products and operating conditions
Cavity details	SMT_0019	
Spare parts	SP_8010	

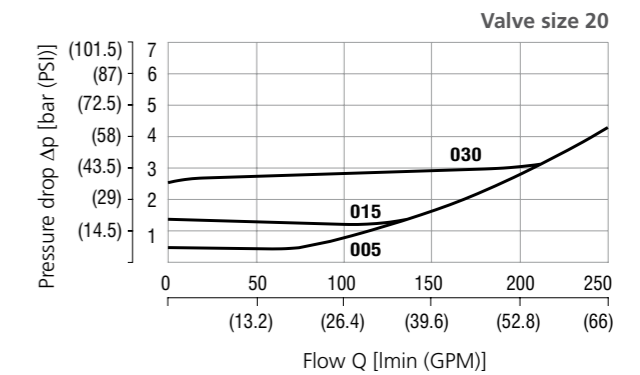
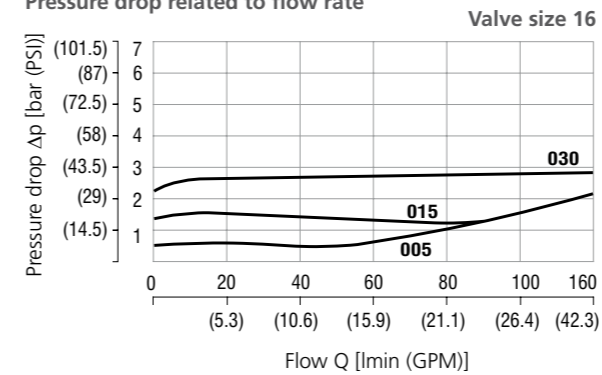
Characteristics measured at v = 32 mm²/s (156 SUS)

Pressure drop related to flow rate



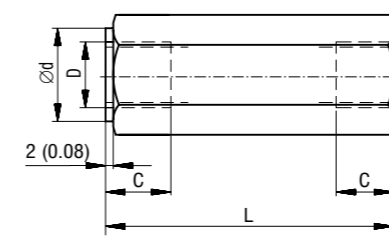
Characteristics measured at v = 32 mm²/s (156 SUS)

Pressure drop related to flow rate

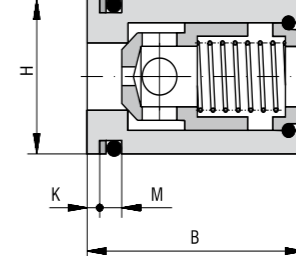


Dimensions in millimeters (inches)

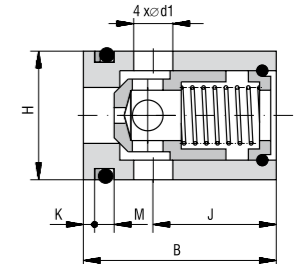
Models G1, M1, S



Model 02



Model 03



Size	A	B	C	D			∅ d
				G1	M1	S	
06	19 (0.75)	27 - 0.2 (1.06 - 0.008)	12 (0.47)	G 1/4	M14x1.5	SAE-6, 9/16-18	19 (0.75)
10	30 (1.18)	32 - 0.2 (1.26 - 0.008)	14 (0.55)	G 1/2	M18x1.5	SAE-8, 3/4-16	30 (1.18)
16	36 (1.42)	45 - 0.2 (1.77 - 0.008)	16 (0.63)	G 3/4	M27x2	SAE-12, 1 1/16-12	36 (1.42)
20	46 (1.81)	45 - 0.2 (1.77 - 0.008)	18 (0.71)	G 1	M33x2	SAE-16, 1 5/16-12	46 (1.81)

Size	∅ d1	E	H	J	K	L	M
06	3.5 (0.14)	22 (0.87)	∅ 20 (0.79) f8	18 (0.71)	1.6 (0.06)	58 (2.28)	4.4 + 0.2 (0.17 + 0.008)
10	5.5 (0.22)	34.5 (1.36)	∅ 25 (0.98) f8	20 (0.79)	1.6 (0.06)	72 (2.83)	4.4 + 0.2 (0.17 + 0.008)
16	8.5 (0.34)	41.5 (1.63)	∅ 35 (1.38) f8	27 (1.06)	2.2 (0.09)	85 (3.35)	5.3 + 0.2 (0.21 + 0.008)
20	10.5 (0.41)	53.6 (2.09)	∅ 40 (1.58) f8	25 (0.98)	2.2 (0.09)	98 (3.86)	5.3 + 0.2 (0.21 + 0.008)

Ordering Code

VJS3- [] - [] - [] - [] - []

Check valve with one-way throttling, poppet type, in-line

Valve size
06 06
10 10
16 16
20 20

Cracking pressure
without spring 000
0.5 bar (7.3 PSI) 005
1.0 bar (14.5 PSI) 010
1.5 bar (21.8 PSI) 015
3.0 bar (43.5 PSI) 030
5.0 bar (72.5 PSI) 050

Surface treatment
A zinc-coated (ZnCr-3), ISO 9227 (240 h)
B zinc-coated (ZnNi), ISO 9227 (520 h)

Orifice diameter
020 0.20 mm (0.008 inch)
050 0.50 mm (0.02 inch)
080 0.80 mm (0.03 inch)
100 1 mm (0.04 inch)
150 1.5 mm (0.06 inch)
200 2 mm (0.08 inch)
300 3 mm (0.12 inch)

Installation
G1 in-line, with G threads
M1 in-line, with metric threads
S* in-line, with SAE threads
02* slip-in cartridge
03* slip-in cartridge

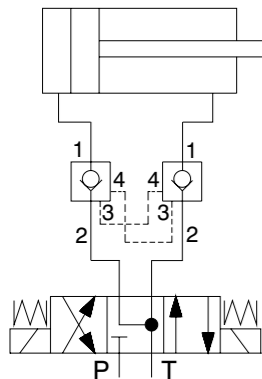
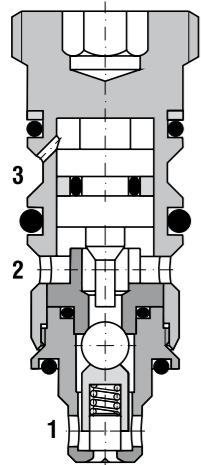
*For sizes 06, 10, 16, 20 only

Besides the shown, commonly used valve versions other special models are available. Contact our technical support for their identification, feasibility and operating limits.

Check Valve, Ball Type, Pilot to Open

RJV1-05

M24x1.5 • Q_{max} 20 l/min (5 GPM) • p_{max} 250 bar (3600 PSI)



Hydraulic circuit with two pilot operated check valves. If pressured, the respective valve will pilot the other to open, thereby enabling cylinder motion in both directions. Without pressure at either valve, the cylinder is locked in place. (see application picture)

Technical Features

- Hardened precision parts
- Sharp-edged steel seats for dirt-tolerant performance
- Leak-free closing, suitable for fast cycling with long life
- High flow capacity
- Optional sealed piston and flow restrictor integrated in hollow bolt
- Design suitable for direct cylinder mounting through hollow bolt
- In the standard version, the valve is zinc-coated for 240 h protection acc. to ISO 9227

Functional Description

The valve allows flow to pass from port 2 to 1 while under load normally inhibiting flow from 1 to 2. When pressure is applied at port 3, flow passes from port 1 to 2. The cartridge valve has a pilot ratio of 5.76:1, meaning that a minimum of 17 % of the load pressure must be applied at port 3 to open the valve. The check valve is spring closed to secure the holding position in static conditions and without load. The valve is optionally offered with a sealed piston and a flow restrictor valve. Port 4 is available for use in double acting applications using two pilot operated check valves.

Model Code	RJV1-05	S	J1	J2
Symbol				

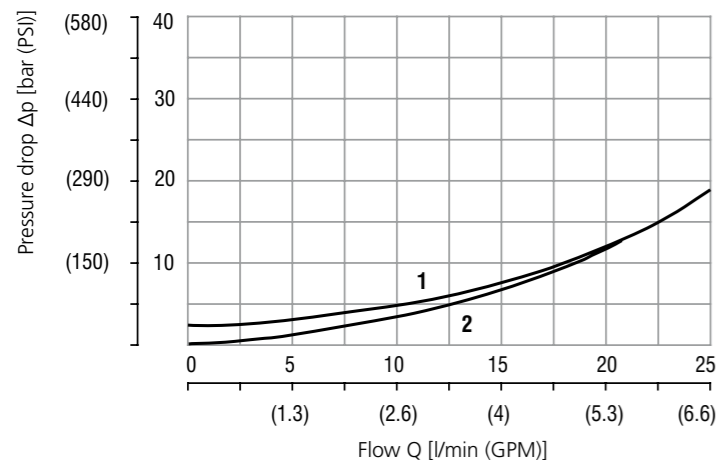
Technical Data

Valve size / Cartridge cavity	M24x1.5 / QJ2	
Max. flow	l/min (GPM)	20 (5.3)
Max. operating pressure	bar (PSI)	250 (3630)
Pilot ratio		5.76:1
Fluid temperature range (NBR)	°C (°F)	-30 ... +100 (-22 ... +212)
Fluid temperature range (FPM)	°C (°F)	-20 ... +120 (-4 ... +248)
Mass of the cartridge valve	kg (lbs)	0.08 (0.18)
Mass of the cartridge valve with body	kg (lbs)	1.6 (3.53)

	Datasheet	Type
General information	GI_0060	Products and operating conditions
Cavity details	SMT_0019	SMT-QJ2*
Spare parts	SP_8010	

Characteristics measured at $v = 32 \text{ mm}^3/\text{s}$ (156 SUS)

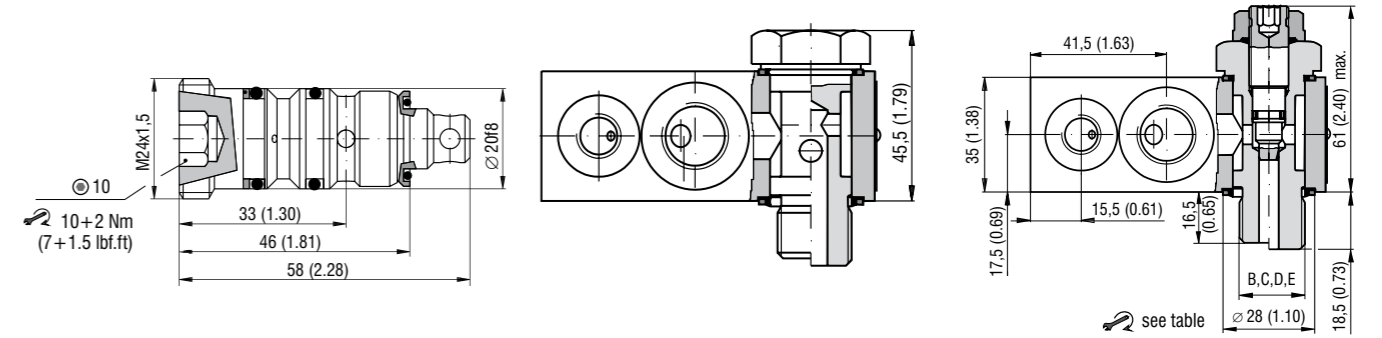
Pressure drop related to flow rate



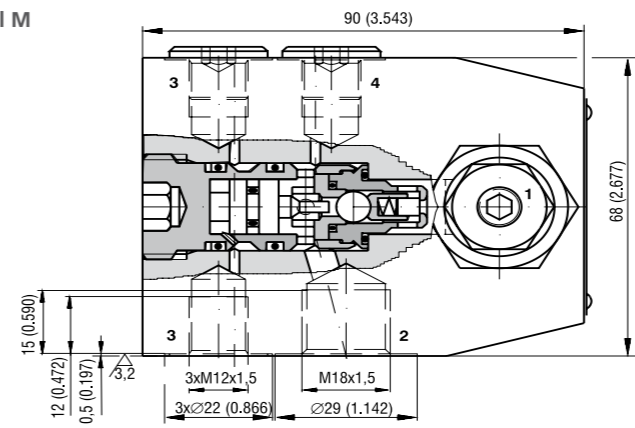
1	free flow (2→1)
2	pilot open (1→2)

Dimensions in millimeters (inches)

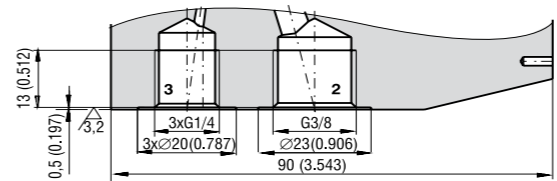
Cartridge valve RJV1-05



Model M



Model G



Type	Port size	∅ D max mm (in)	Tightening torque Nm (ft-lbf)
B	M18x1.5	18 ^{+0.2} (0.708 / 0.716)	30+3 (22.13+2.21)
C	M22x1.5	22 ^{+0.2} (0.866 / 0.874)	70+5 (51.63+3.69)
D	G1/2	21 ^{+0.2} (0.826 / 0.834)	70+5 (51.63+3.69)
E	G3/8	16,6 ^{+0.2} (0.653 / 0.661)	25+3 (18.43+2.21)

Ordering Code

RJV1-05 [] [] / [] [] [] []

- Check valve, pilot to open, ball type**
- Valve size**
- Pilot piston seal**
without seal: No designation
with seal: S
- Model**
Cartridge valve: No designation
with body - metric threads: M
with body - BSP threads: G
- Surface treatment**
No designation: body and flow restrictor phosphated, check valve black-coated and hollow bolt zinc-coated (ZnCr-3), ISO9227 (240 h)
A: parts zinc-coated (ZnCr-3), ISO 9227 (240 h)
B: parts zinc-coated (ZnNi), ISO 9227 (520 h)
- Seals**
No designation: NBR
V: FPM (Viton)
- Hollow bolt**
only for models with valve body
No designation: without flow restrictor
S: with flow restrictor VSV1
J1: with flow restrictor VSVJ01 and check valve
J2: with flow restrictor VSVJ1 and check valve - reversed
- Hollow bolt threads**
only for models with valve body
B: M18x1.5
C: M22x1.5
D: G1/2
E: G3/8

Check Valve, Poppet Type, Pilot to Open, Modular

VJR1-04/M

Size 04 (D02) • Q_{max} 20 l/min (5 GPM) • p_{max} 320 bar (4600 PSI)

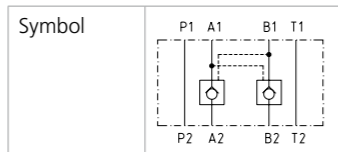


Technical Features

- › Pilot to open check valve, poppet type with subplate mounting interface acc. to ISO 4401, DIN 24340 (CETOP 02)
- › Sandwich plate design for use in vertical stacking assemblies
- › Sharp-edged steel seats for dirt-tolerant performance
- › Leak-free closing, suitable for fast cycling with long life
- › High flow capacity
- › In the standard version, the valve housing is phosphated and steel parts are zinc-coated for 240 h protection acc. to ISO 9227

Functional Description

The valve allows flow to pass from port A(B)1 to A(B)2 while normally under load inhibiting flow from A(B)2 to A(B)1. When pressure is applied at the pilot port, the valve is opened and flow passes from port 2 to 1. The valve has a 3:1 pilot ratio, meaning that at least one third of the load pressure must be applied to open the valve. The check valve is spring closed to secure the holding position in static conditions and without load.

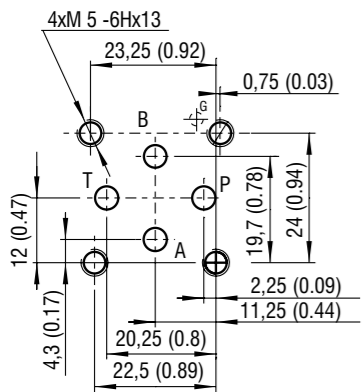


Technical Data

Valve size	04 (D02)	
Max. flow	l/min (GPM)	20 (5.3)
Max. operating pressure	bar (PSI)	320 (4640)
Cracking pressure	bar (PSI)	1 (14.5)
Fluid temperature range (NBR)	°C (°F)	-30 +100 (-22 ... +212)
Fluid temperature range (FPM)	°C (°F)	-20 +120 (-4 ... +248)
Pilot ratio	3 : 1	
Mass	kg (lbs)	0.7 (1.54)

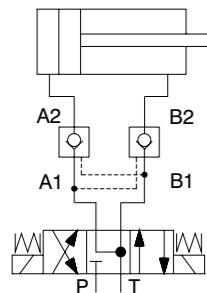
	Datasheet	Type
General information	GI_0060	Products and operating conditions
Mounting interface / tolerances	SMT_0019	Size 04
Spare parts	SP_8010	

ISO 4401-02-01-0-05



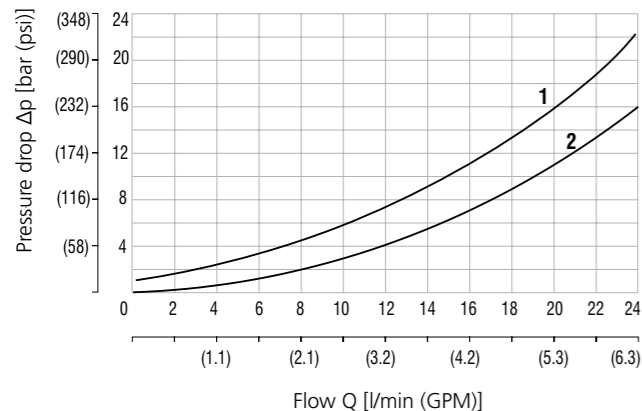
Ports P, A, B, T
max Ø4.5 mm (0.18 in)

Typical circuit with pilot operated check valve

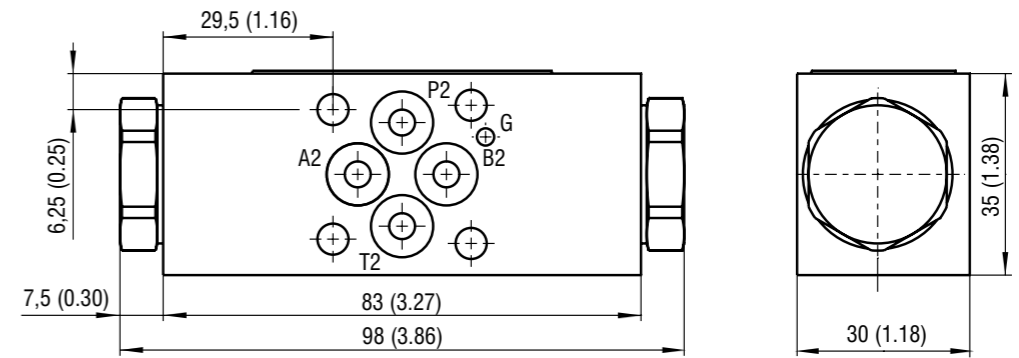


Characteristics measured at v = 32 mm²/s (156 SUS)

Pressure drop related to flow rate

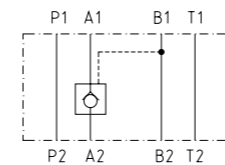


Dimensions in millimeters (inches)

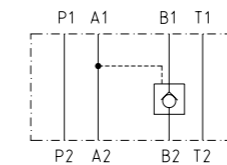


Functional symbols

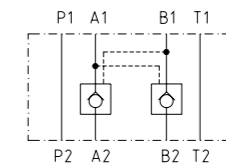
VJR1-04/MA



VJR1-04/MB



VJR1-04/MC



- ① valve side
- ② subplate or manifold side

Notes: The orientation of the symbol on the name plate corresponds with the valve function.

Ordering Code

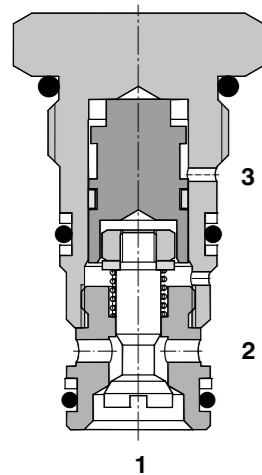
VJR1-04 / M [] - [] - [] - []

- Check valve, pilot to open, poppet type, modular**
- Valve size**
- Modular sandwich plate design**
- Functional symbols**
check valve in line A (A)
check valve in line B (B)
check valve in line A and B (C)
- Pilot ratio**
3 : 1
- Surface treatment**
No designation: body phosphated, steel parts zinc-coated (ZnCr-3), ISO9227 (240 h)
A: zinc-coated (ZnCr-3), ISO 9227 (240 h)
B: zinc-coated (ZnNi), ISO 9227 (520 h)
- Seals**
No designation: NBR
V: FPM (Viton)
- Cracking pressure**
010: 1 bar (14.5 PSI)

Check Valve, Poppet Type, Pilot to Open

SC5H-Q3/I

M20x1.5 • Q_{max} 30 l/min (8 GPM) • p_{max} 350 bar (5100 PSI)

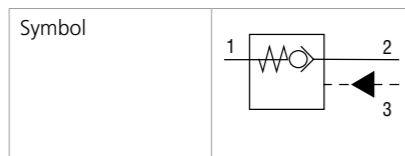


Technical Features

- › Hardened precision parts
- › Sharp-edged steel seats for dirt-tolerant performance
- › Leak-free closing, suitable for fast cycling with long life
- › High flow capacity
- › Optional sealed piston
- › In the standard version, the valve is zinc-coated for 240 h protection acc. to ISO 9227

Functional Description

The valve allows flow to pass from port 2 to 1 while under load normally inhibiting flow from 1 to 2. When pressure is applied at port 3, flow passes from port 1 to 2. The cartridge valve has a pilot ratio of 3:1, meaning that at least one-third of the load pressure must be applied at port 3 to open the valve. The check valve is spring closed to secure the holding position in static conditions and without load.



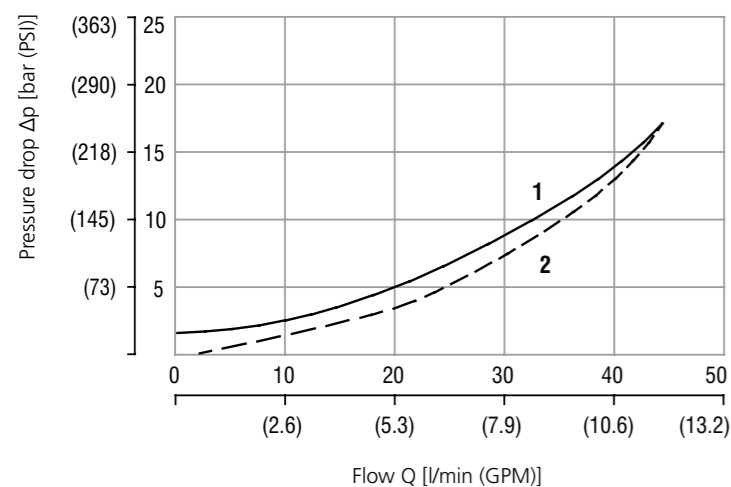
Technical Data

Valve size / Cartridge cavity		M20x1.5 / Q3
Max. flow	l/min (GPM)	30 (8)
Max. operating pressure	bar (PSI)	350 (5080)
Pilot ratio		3:1
Fluid temperature range (NBR)	°C (°F)	-20 +90 (-4 ... +194)
Mass	kg (lbs)	0.08 (0.18)

		Datasheet	Type
General information		GI_0060	Products and operating conditions
Valve bodies	In-line mounted	SB_0018	SB-Q3*
	Sandwich mounted	SB-04(06)_0028	SB-*Q3*
Cavity details		SMT_0019	SMT-Q3*
Spare parts		SP_8010	

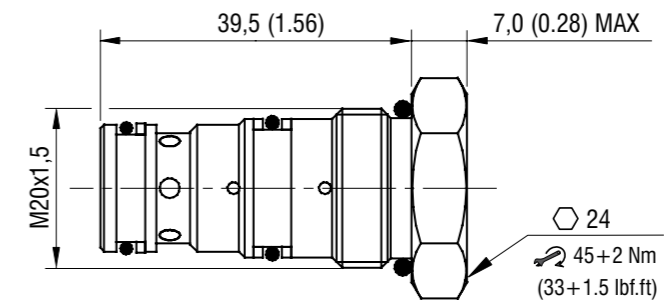
Characteristics measured at v = 40 mm²/s (195 SUS)

Pressure drop related to flow rate

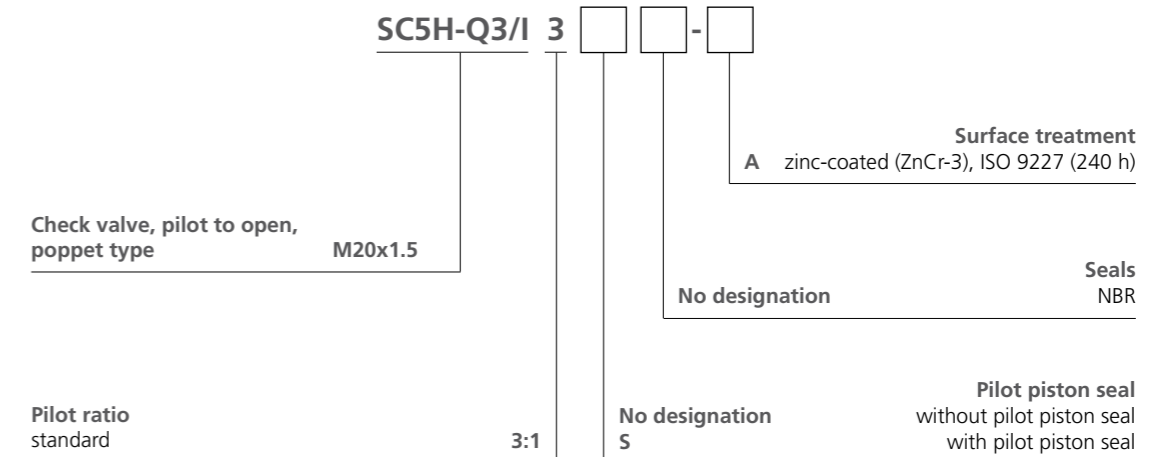


1	free flow (2→1)
2	pilot open (1→2)

Dimensions in millimeters (inches)



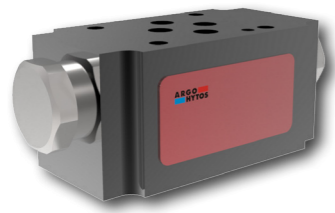
Ordering Code



Check Valve, Poppet Type, Pilot to Open, Modular

2RJV1-06/M

Size 06 (D03) • Q_{max} 60 l/min (16 GPM) • p_{max} 320 bar (4600 PSI)

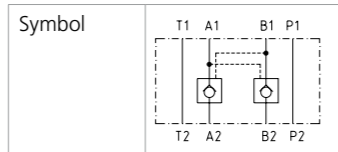


Technical Features

- > Pilot to open check valve, poppet type with subplate mounting interface acc. to ISO 4401, DIN 24340 (CETOP 03)
- > Sandwich plate design for use in vertical stacking assemblies
- > Sharp-edged steel seats for dirt-tolerant performance
- > Leak-free closing, suitable for fast cycling with long life
- > High flow capacity
- > Optional bias spring ranges for back-pressure control
- > Two pilot ratios available
- > In the standard version, the valve housing is phosphated and steel parts are zinc-coated for 240 h protection acc. to ISO 9227

Functional Description

The valve allows flow to pass from port A(B)1 to A(B)2 while normally closing flow from A(B)2 to A(B)1 with load. When pressure is applied at pilot port. The flow passes from port 2 to 1. The valve has two pilot ratios option. This requires at least one-third (ratio 3:1) or one-ninth (ratio 9:1) of the load pressure to be applied at the opposite port to open the valve. The check valve is spring closed to secure the holding position in static conditions and without load. The valve is offered with optional bias spring ranges for back-pressure control.

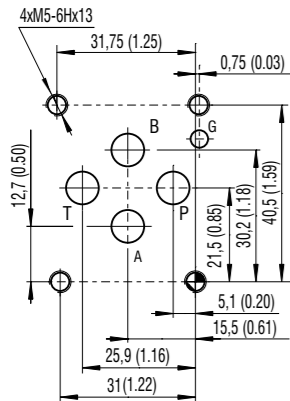


Technical Data

Valve size	06 (D03)	
Max. flow	l/min (GPM)	60 (15.9)
Max. operating pressure	bar (PSI)	320 (4640)
Cracking pressure	bar (PSI)	3 (43.5) 4 (58) 5 (72.5) 8 (116) 12 (174)
Fluid temperature range (NBR)	°C (°F)	-30 +100 (-22 ... +212)
Fluid temperature range (FPM)	°C (°F)	-20 +120 (-4 ... +248)
Pilot ratio	3 : 1 / 9 : 1	
Mass	kg (lbs)	0.8 (1.76)

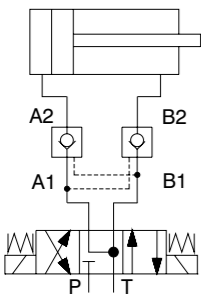
	Datasheet	Type
General information	GI_0060	Products and operating conditions
Mounting interface	SMT_0019	Size 06
Spare parts	SP_8010	

ISO 4401-03-02-0-05



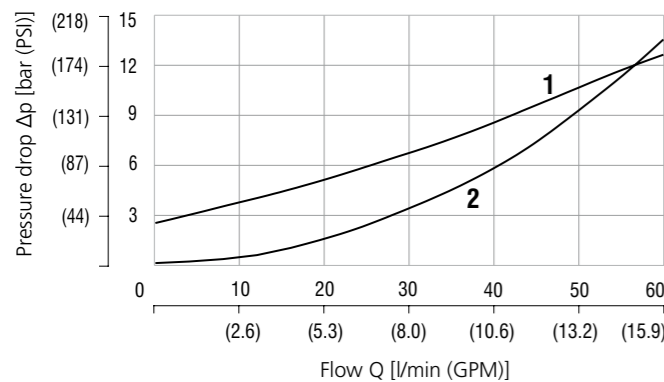
Ports P, A, B, T max. \varnothing 7.5 mm (0.29 in)

Typical circuit with pilot operated check valve



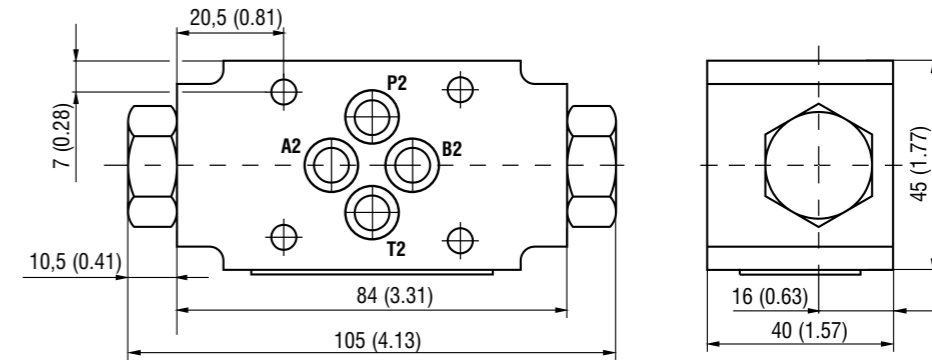
Characteristics measured at $v = 32 \text{ mm}^2/\text{s}$ (156 SUS)

Pressure drop related to flow rate



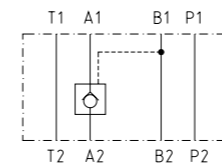
	Flow direction
1	A1→A2 (B1→B2)
2	A2→A1 (B2→B1)

Dimensions in millimeters (inches)

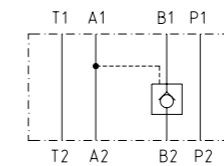


Functional symbols

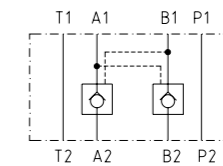
2RJV1-06/MA



2RJV1-06/MB



2RJV1-06/MC



- ① valve side
- ② subplate or manifold side

Notes: The orientation of the symbol on the name plate corresponds with the valve function.

Ordering Code

2RJV1 - 06 / M

- Check valve, pilot to open, poppet type, modular
- Valve size
- Modular sandwich plate design
- Functional symbols: check valve in line A (A), check valve in line B (B), check valve in line A and B (C)
- Pilot ratio: 3 : 1 (3), 9 : 1 (9)
- Surface treatment: No designation (body phosphated, steel parts), A (zinc-coated ZnCr-3, ISO 9227 240h), B (zinc-coated ZnNi, ISO 9227 520h)
- Seals: No designation (NBR), V (FPM/Viton)
- Cracking pressure: 000 (no spring), 030 (3 bar), 040* (4 bar), 050* (5 bar), 080* (8 bar), 120* (12 bar)

*Only for pilot ratio 3:1

Check Valve, Poppet Type, Pilot to Open

SC5H-R3/I

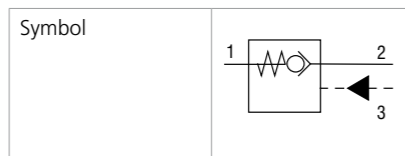
M27x1.5 • Q_{max} 90 l/min (24 GPM) • p_{max} 350 bar (5100 PSI)

Technical Features

- › Hardened precision parts
- › Sharp-edged steel seats for dirt-tolerant performance
- › Leak-free closing, suitable for fast cycling with long life
- › High flow capacity
- › Optional sealed piston
- › In the standard version, the valve is zinc-coated for 240 h protection acc. to ISO 9227

Functional Description

The valve allows flow to pass from port 2 to 1 while under load normally inhibiting flow from 1 to 2. When pressure is applied at port 3, flow passes from port 1 to 2. The cartridge valve has a pilot ratio of 4:1, meaning at least one fourth of the load pressure must be applied at port 3 to open the valve. The check valve is spring closed to secure the holding position in static conditions and without load.



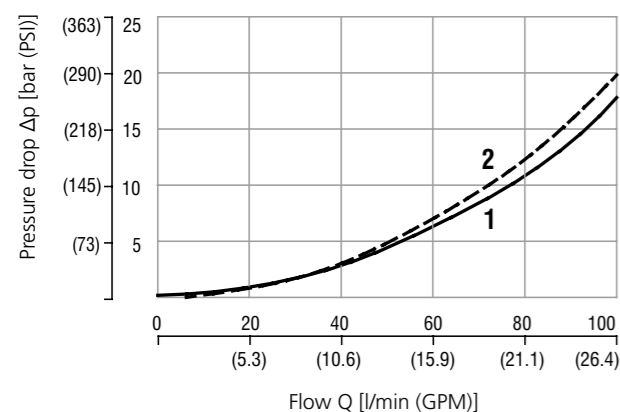
Technical Data

Valve size / Cartridge cavity	M27x1.5 / R3	
Max. flow	l/min (GPM)	90 (23.8)
Max. operating pressure	bar (PSI)	350 (5080)
Pilot ratio	4:1	
Fluid temperature range (NBR)	°C (°F)	-20 ... +90 (-4 ... +194)
Mass	kg (lbs)	0.27 (0.60)

	Datasheet	Type
General information	GI_0060	Products and operating conditions
Valve bodies	In-line mounted SB_0018	SB-R3*
Cavity details	SMT_0019	SMT-R3*
Spare parts	SP_8010	

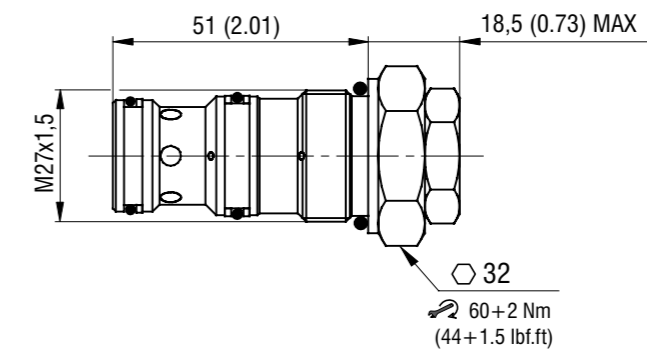
Characteristics measured at v = 40 mm²/s (195 SUS)

Pressure drop related to flow rate

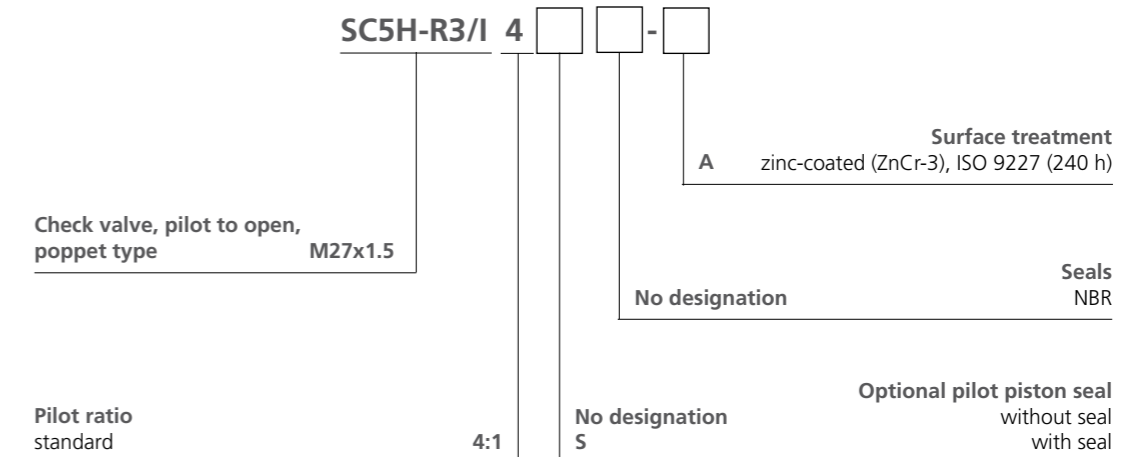


1	free flow (2→1)
2	pilot open (1→2)

Dimensions in millimeters (inches)



Ordering Code



Check Valve, Poppet Type, Pilot to Open, with Decompression Stage

SCD5H-R3/I

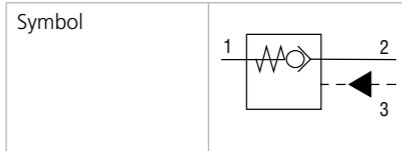
M27x1.5 • Q_{max} 90 l/min (24 GPM) • p_{max} 350 bar (5100 PSI)

Technical Features

- › Hardened precision parts
- › Sharp-edged steel seats for dirt-tolerant performance
- › Leak-free closing, suitable for fast cycling with long life
- › High flow capacity
- › Integrated decompression stage
- › Optional sealed piston
- › In the standard version, the valve is zinc-coated for 240 h protection acc. to ISO 9227

Functional Description

The valve allows flow to pass from port 2 to 1 while under load normally inhibiting flow from 1 to 2. When pressure is applied at port 3, flow passes from port 1 to 2. The cartridge valve has a pilot ratio of 3:1, meaning at least one third of the load pressure must be applied at port 3 to open the valve. The valve includes a decompression stage with pilot ratio of 25:1 to reduce hydraulic shocks. The check valve is spring closed to secure the holding position in static conditions and without load.



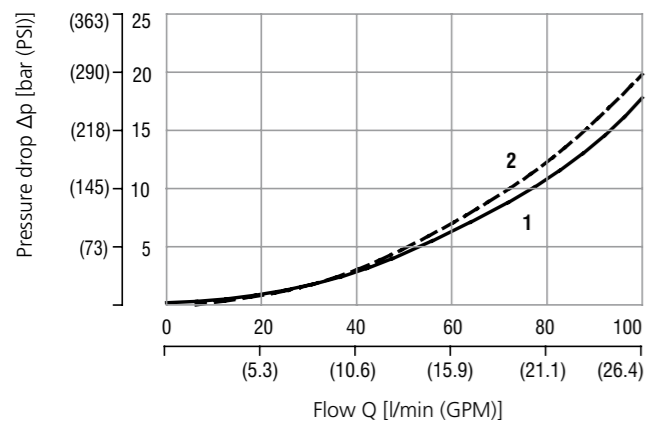
Technical Data

Valve size / Cartridge cavity		M27x1.5 / R3
Max. flow	l/min (GPM)	90 (23.8)
Max. operating pressure	bar (PSI)	350 (5080)
Pilot ratio decompression		25:1
Pilot ratio full flow		3:1
Fluid temperature range (NBR)	°C (°F)	-20 ... +90 (-4 ... +194)
Mass	kg (lbs)	0.24 (0.53)

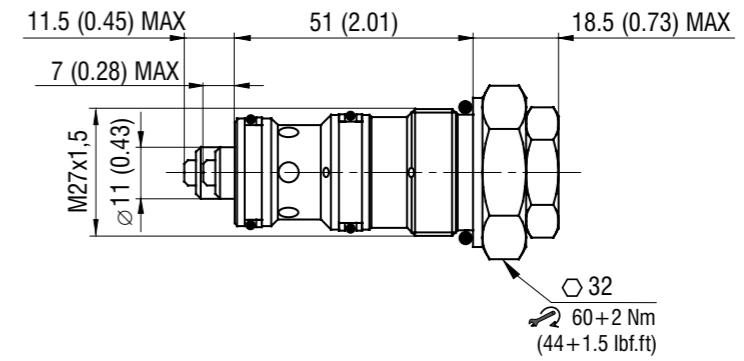
		Datasheet	Type
General information		GI_0060	Products and operating conditions
Valve bodies	In-line mounted	SB_0018	SB-R3*
Cavity details		SMT_0019	SMT-R3*
Spare parts		SP_8010	

Characteristics measured at v = 40 mm²/s (195 SUS)

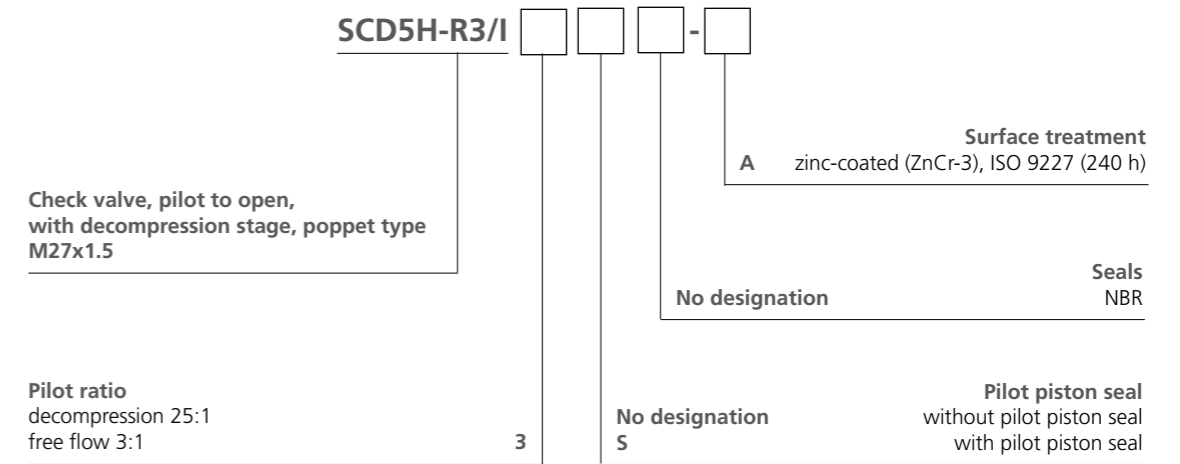
Pressure drop related to flow rate



Dimensions in millimeters (inches)



Ordering Code



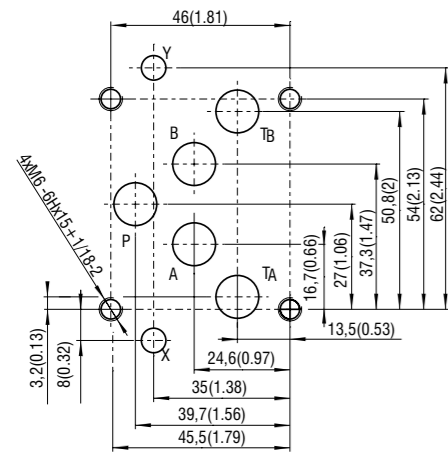
Pilot to Open Operated Check Valve, Poppet Type, Modular

VJR3-10/M

Size 10 (D05) • Q_{max} 140 l/min (37 GPM) • p_{max} 350 bar (5100 PSI)

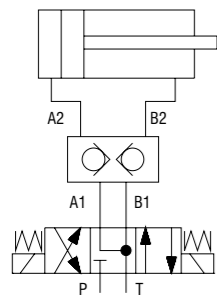


ISO 4401-05-04-0-05



Ports P, A, B, T - max. Ø11,2 mm (0.44 in)

Typical circuit with pilot operated check valve

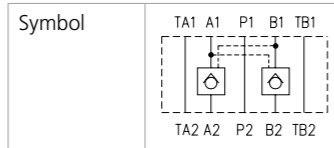


Technical Features

- › Pilot to open operated check valve, poppet type with subplate mounting surface acc. to ISO 4401, DIN 24340 (CETOP 05) standards
- › Sandwich plate design for use in vertical stacking assemblies
- › Sharp-edged ground steel seats for dirt-tolerant performance
- › Leak-free closing and suitable for fast cycling with long life
- › High flow capacity
- › Valve is fitted with decompression stage facilitating steady opening without pressure peaks
- › In the standard version, the valve housing is phosphated and steel parts zinc coated for 240 h protection acc. to ISO 9227

Functional Description

The valve allows flow to pass from port A(B)1 to A(B)2 while normally closing flow from A(B)2 to A(B)1 with load. When pressure is applied at pilot port. The flow passes from port 2 to 1. The valve has a 6:1 pilot ratio. The check valve is also spring closed to secure holding position in static conditions without the load. The valve is offered with optional bias spring ranges for back-pressure control.

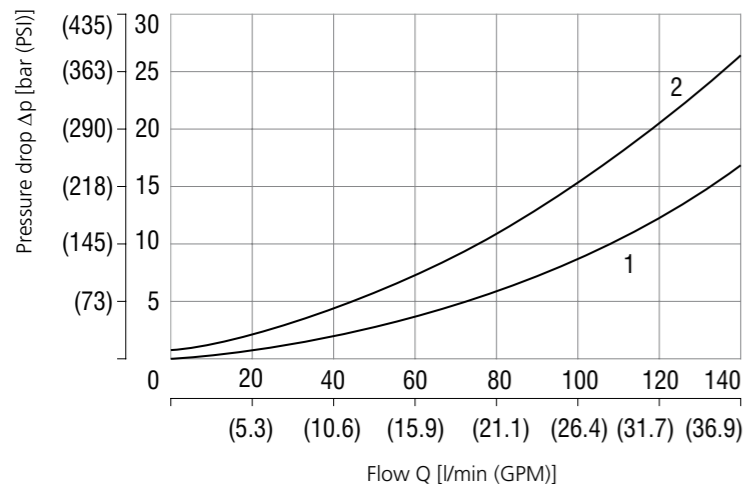


Technical Data

Valve size		10 (D05)
Max. flow	l/min (GPM)	140 (37)
Max. operating pressure	bar (PSI)	350 (5080)
Cracking pressure	bar (PSI)	2 (29)
Fluid temperature range (NBR)	°C (°F)	-30 +100 (-22 ... +212)
Fluid temperature range (FPM)	°C (°F)	-20 +120 (-4 ... +248)
Pilot ratio		6:1
Weight	kg (lbs)	2.2 (4.85)
	Datasheet	Type
General information	GI_0060	products and operating conditions
Mounting interface / tolerances	SMT_0019	Size 10
Spare parts	SP_8010	

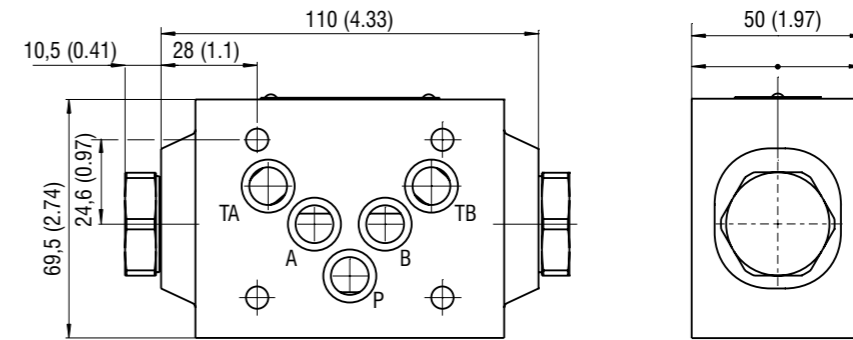
Characteristics measured at v = 32 mm²/s (156 SUS)

Pressure drop related to flow rate



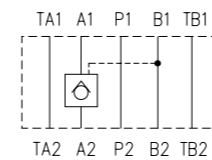
Dimensions in millimeters (inches)

Model "C,"

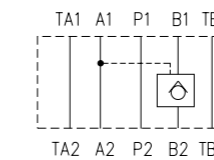


Functional symbols

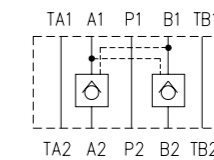
VJR3-10/MA



VJR3-10/MB



VJR3-10/MC



① valve side

② subplate or manifold side

Notes: The orientation of the symbol on the name plate corresponds with the valve function.

Ordering Code

VJR3-10 / M [] [] - [] [] - [] []

Check valve, pilot to open, poppet type, modular

Valve size

Modular sandwich plate design

Functional symbols
 Check valve in line A
 Check valve in line B
 Check valve in line A and B

Pilot ratio
6:1

Surface treatment
 No designation body phosphated, steel parts zinc-coated (ZnCr-3), ISO9227 (240 h)
 A zinc-coated (ZnCr-3), ISO 9227 (240 h)
 B zinc-coated (ZnNi), ISO 9227 (520 h)

Seals
 No designation
 V NBR
 FPM (Viton)

Cracking pressure
2.0 bar (29 PSI)

A
B
C

6

020

Check Valve, Poppet Type, Pilot to Open

SC5H-S3/I

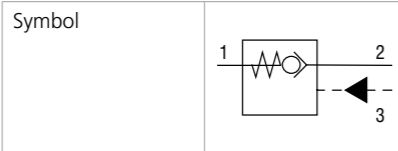
1-5/16-12 UNF • Q_{max} 120 l/min (32 GPM) • p_{max} 350 bar (5100 PSI)

Technical Features

- › Hardened precision parts
- › Sharp-edged steel seats for dirt-tolerant performance
- › Leak-free closing, suitable for fast cycling with long life
- › High flow capacity
- › Optional external pilot port
- › Optional sealed piston
- › In the standard version, the valve is zinc-coated for 240 h protection acc. to ISO 9227

Functional Description

The valve allows flow to pass from port 2 to 1 while under load normally inhibiting flow from 1 to 2. When pressure is applied at port 3, flow passes from port 1 to 2. The cartridge valve has a pilot ratio of 3:1, meaning at least one third of the load pressure must be applied at port 3 to open the valve. The check valve is spring closed to secure the holding position in static conditions and without load.



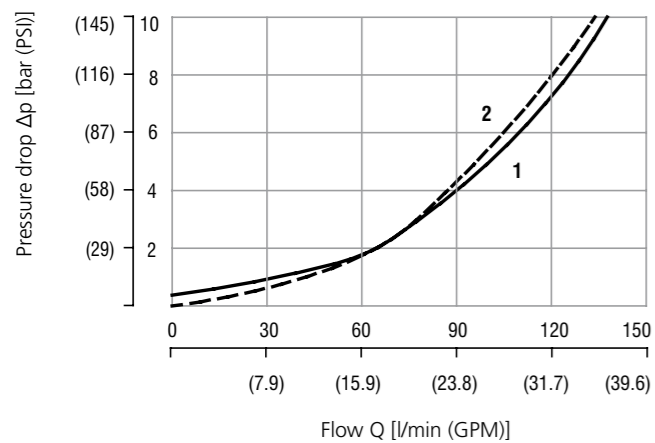
Technical Data

Valve size / Cartridge cavity		1-5/16-12 UNF-2A / S3
Max. flow	l/min (GPM)	120 (31.7)
Max. operating pressure	bar (PSI)	350 (5080)
Pilot ratio		3:1
Fluid temperature range (NBR)	°C (°F)	-20 ... +90 (-4 ... +194)
Mass	kg (lbs)	0.28 (0.62)

	Datasheet	Type
General information	GI_0060	Products and operating conditions
Valve bodies	In-line mounted SB_0018	SB-S3*
Cavity details	SMT_0019	SMT-S3*
Spare parts	SP_8010	

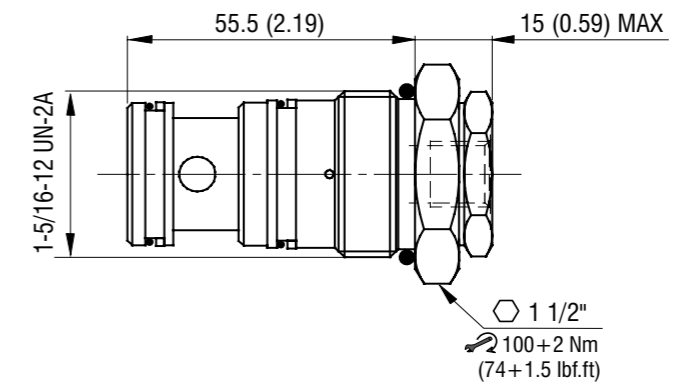
Characteristics measured at v = 40 mm²/s (195 SUS)

Pressure drop related to flow rate

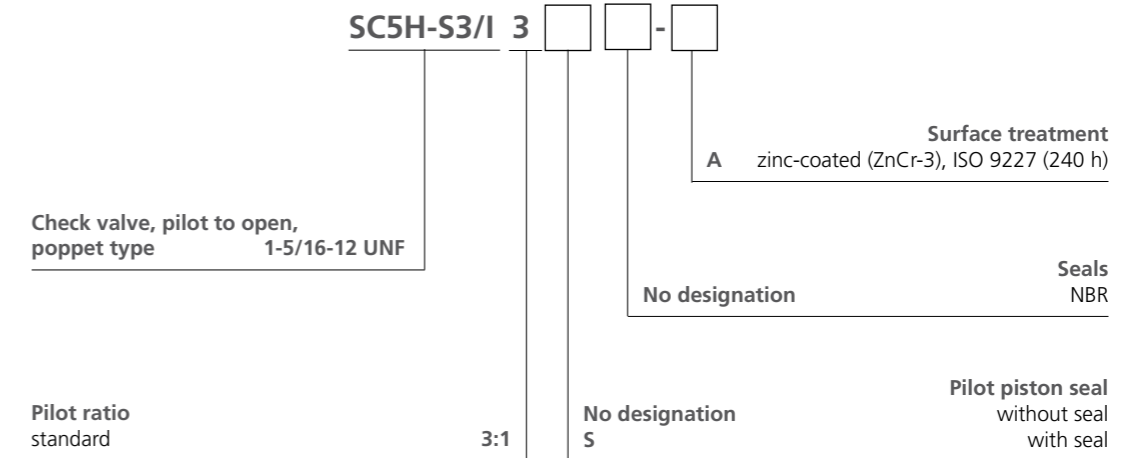


1	free flow (2→1)
2	pilot open (1→2)

Dimensions in millimeters (inches)



Ordering Code



Check Valve, Poppet Type, Pilot to Close

SCC5H-Q3/I

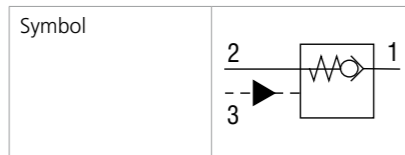
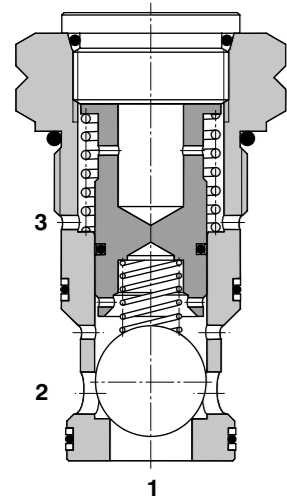
M20x1.5 • Q_{max} 30 l/min (8 GPM) • p_{max} 350 bar (5100 PSI)

Technical Features

- › Hardened precision parts
- › Sharp-edged steel seats for dirt-tolerant performance
- › Leak-free closing, suitable for fast cycling with long life
- › High flow capacity
- › In the standard version, the valve is zinc-coated for 240 h protection acc. to ISO 9227

Functional Description

The valve allows flow to pass from port 1 to 2 while normally inhibiting flow from 2 to 1 under load. When pressure is applied at port 3, the poppet locks the ball valve in place, inhibiting flow from port 1 to 2. The cartridge valve has a 2:1 pilot ratio. The check valve is spring closed to secure the holding position in static conditions and without load.



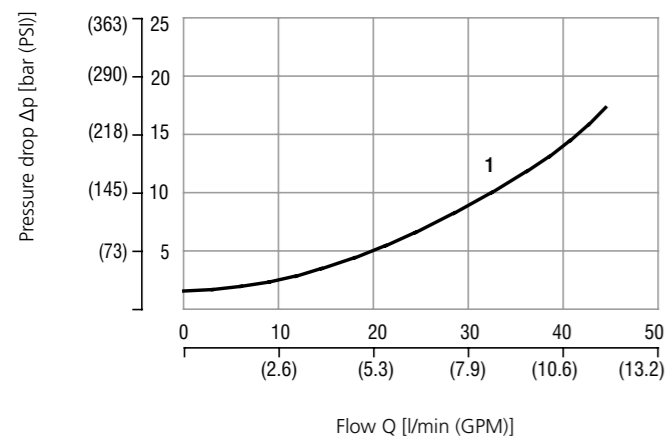
Technical Data

Valve size / Cartridge cavity		M20x1.5 / Q3
Max. flow	l/min (GPM)	30 (8)
Max. operating pressure	bar (PSI)	350 (5080)
Pilot ratio		2:1
Fluid temperature range (NBR)	°C (°F)	-20 +90 (-4 ... +194)
Mass	kg (lbs)	0.08 (0.18)

		Datasheet	Type
General information		GI_0060	Products and operating conditions
Valve bodies	In-line mounted	SB_0018	SB-Q3*
	Sandwich mounted	SB-04(06)_0028	SB-*Q3*
Cavity details		SMT_0019	SMT-Q3*
Spare parts		SP_8010	

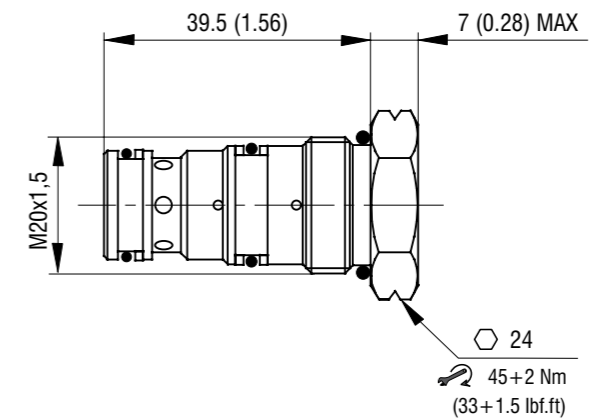
Characteristics measured at v = 40 mm²/s (195 SUS)

Pressure drop related to flow rate

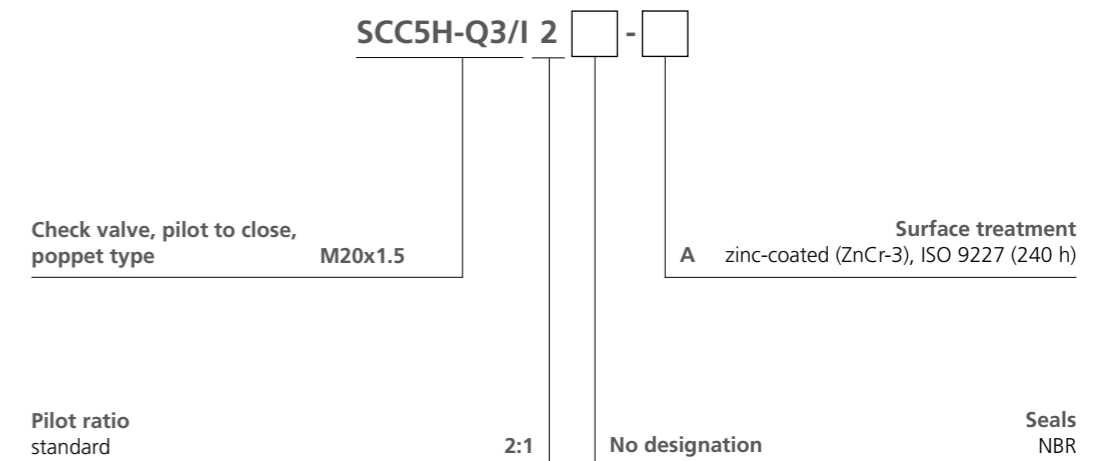


1	Free flow (1→2)
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Dimensions in millimeters (inches)



Ordering Code



Check Valve, Poppet Type, Pilot to Close

SCC5H-S3/I

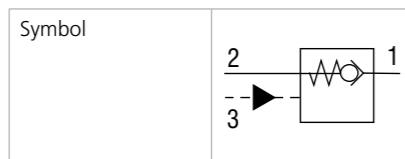
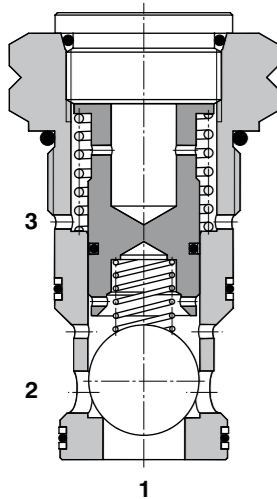
1-5/16-12 UNF • Q_{max} 120 l/min (32 GPM) • p_{max} 350 bar (5100 PSI)

Technical Features

- › Hardened precision parts
- › Sharp-edged steel seats for dirt-tolerant performance
- › Leak-free closing, suitable for fast cycling with long life
- › High flow capacity
- › In the standard version, the valve is zinc-coated for 240 h protection acc. to ISO 9227

Functional Description

The valve allows flow to pass from port 1 to 2 while normally inhibiting flow from 2 to 1 under load. When pressure is applied at port 3, the poppet locks the ball valve in place, inhibiting flow from port 1 to 2. The cartridge valve has a 2:1 pilot ratio. The check valve is spring closed to secure the holding position in static conditions and without load.



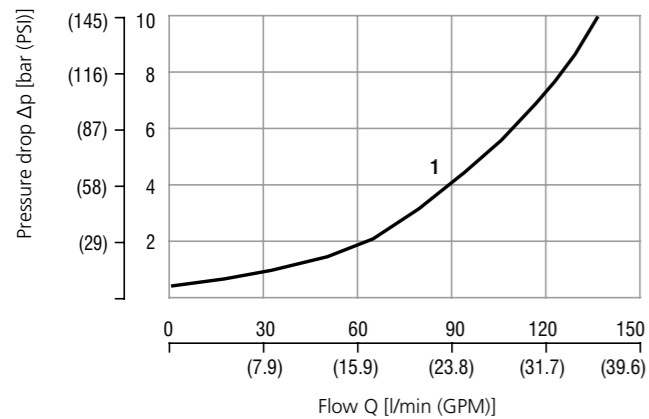
Technical Data

Valve size / Cartridge cavity		1-5/16-12 UNF-2A / S3
Max. flow	l/min (GPM)	120 (31.7)
Max. operating pressure	bar (PSI)	350 (5080)
Pilot ratio		2:1
Fluid temperature range (NBR)	°C (°F)	-20 ... +90 (-4 ... +194)
Mass	kg (lbs)	0.28 (0.62)

		Datasheet	Type
General information		GI_0060	Products and operating conditions
Valve bodies	In-line mounted	SB_0018	SB-S3*
Cavity details		SMT_0019	SMT-S3*
Spare parts		SP_8010	

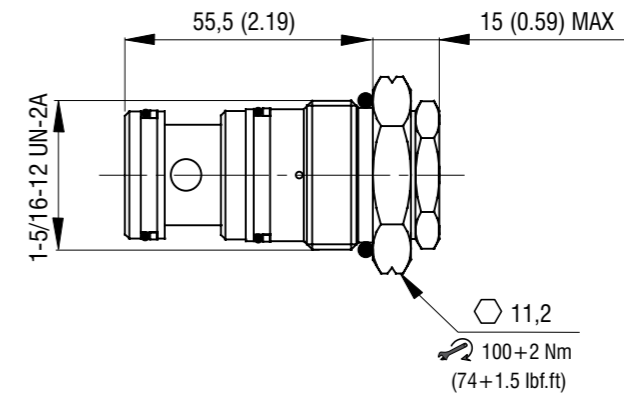
Characteristics measured at v = 40 mm²/s (195 SUS)

Pressure drop related to flow rate

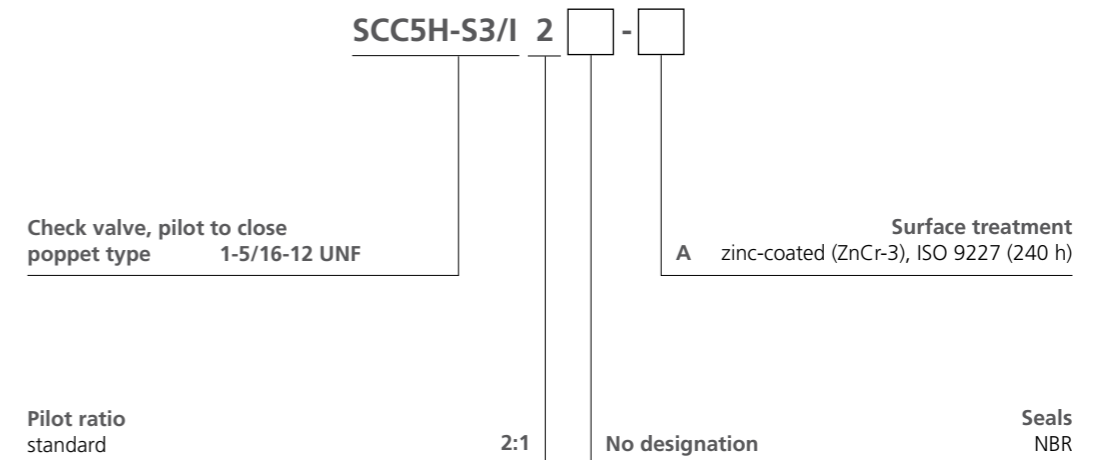


1	Free flow (1→2)
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Dimensions in millimeters (inches)



Ordering Code



Content

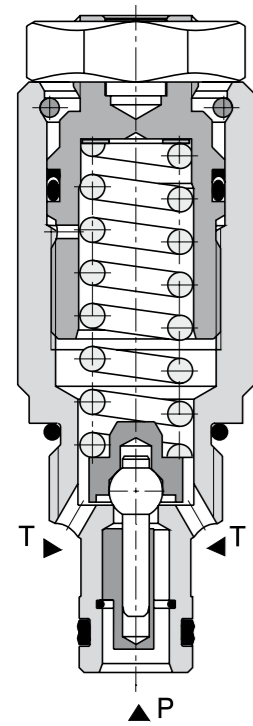
Symbol Example	Flow l/min (GPM)	Pressure bar (PSI)	Type Code	Cartridge	Size 04; D02	Size 06; D03	Size 10; D05	Line Mounted	Page	Data Sheet
Pressure Relief Valves, Poppet Type, Direct Acting										
	30 (8)	350 (5100)	SR1A-A2	X	(X)			(X)	204	HA 5063
	40 (11)	320 (4600)	VPP2-04/S	X	(X)	(X)		(X)	206	HA 5093
	40 (11)	320 (4600)	VPP2-04/M(R)		X	X		X	208	HA 5094
	50 (13) 120 (32)	320 (4600)	VPP1-06(08,10)	X				(X)	210	HA 5061
	50 (13)	320 (4600)	VPP2-06	X		(X)		(X)	212	HA 5062
	50 (13)	320 (4600)	VPP2-06-SV/xx-CE1017	X		(X)		(X)	214	HA 5066
	60 (16)	420 (6100)	SR1A-B2	X		(X)		(X)	216	HA 5064
	60 (16)	420 (6100)	SR1A-B2/HxSx-CE1017	X				(X)	218	HA 5084
	120/400 (32/106)	350 (5100)	VPP-R-16(25)	X					220	HA 5300
	120 (32)	350 (5100)	VPP-R-16-xx-L-CE1017	X					222	HA 5095
Pressure Relief Valves, Spool Type, Pilot Operated										
	70 (18)	320 (4600)	VPN1-06/S	X		(X)		(X)	224	HA 5161
	70 (18)	320 (4600)	VPN1-06/M(R)		X	X		X	226	HA 5160
	100 (26)	350 (5100)	SR4A-B2	X		(X)		(X)	228	HA 5065
	150 (40)	350 (5100)	VPN2-10/S	X			(X)	(X)	230	HA 5163
	150 (40)	350 (5100)	VPN2-10/MR				X		232	HA 5164
Pressure Relief Valves, Solenoid Operated, Spool Type										
	60 (16)	350 (5100)	SR4E-B2	X		(X)		(X)	234	HA 5068
Pressure Reducing - Relieving Valves, Direct-Acting										
	20 (5)	350 (5100)	SP2A-A3	X	(X)			(X)	236	HA 5143
	60 (16)	420 (6100)	SP2A-B3	X		(X)		(X)	238	HA 5146
	20 (5)	320 (4600)	VRP2-04		X				240	HA 5142
	50 (13)	350 (5100)	VRP2-06			X			242	HA 5145
Pressure Reducing - Relieving Valves, Pilot Operated										
	40 (11)	320 (4600)	VRN2-06/S	X		(X)			244	HA 5153
	40 (11)	320 (4600)	VRN2-06/M (R)			X			246	HA 5155
	60 (16)	350 (5100)	SP4A-B3	X		(X)		(X)	248	HA 5144
	150 (40)	320 (4600)	VRN2-10/S	X			(X)		250	HA 5154
	150 (40)	320 (4600)	VRN2-10/M (R)				X		252	HA 5156
Pressure Relief Valves with Reverse Flow Check										
	200 (53)	420 (6100)	DBV3	X					254	HA 5092

Symbol Example	Flow l/min (GPM)	Pressure bar (PSI)	Type Code	Cartridge	Size 04; D02	Size 06; D03	Size 10; D05	Line Mounted	Page	Data Sheet
Sequence Valves										
	30 (8)	350 (5100)	SS4A-A3	X					256	HA 5049
Unloading Valves										
	60 (16)	350 (5100)	SU6A-U3/I	X				(X)	258	HA 5224
	60 (16)	350 (5100)	SUD6A-U4/I	X				(X)	260	HA 5226
	200 (53)	350 (5100)	SUD6A-V4/I	X				(X)	262	HA 5225

Pressure Relief Valve, Poppet Type, Direct Acting

SR1A-A2

3/4-16 UNF • Q_{max} 30 l/min (8 GPM) • p_{max} 350 bar (5100 PSI)



Technical Features

- › Excellent stability throughout flow range with rapid response to dynamic pressure changes
- › Low hysteresis, accurate pressure control and low pressure drop through CFD optimized flow paths
- › Wide pressure range up to 350 bar
- › Hardened precision parts
- › Sharp-edged steel seats for dirt-tolerant performance
- › Leak-free closing, suitable for fast cycling with long life
- › Adjustable by allen key or hand screw
- › In the standard version, the valve is zinc-coated for 240 h protection acc. to ISO 9227

Functional Description

A poppet type, direct acting hydraulic relief valve in the form of a screw-in cartridge intended for use as a pressure limiting device for common hydraulic circuit protection. The spring acts on the poppet and presses it onto the valve seat. If the hydraulic pressure is below the pre-set value, the valve is closed. If the hydraulic force exceeds the pre-set value the valve opens and flow passes to the tank port until the system pressure falls below the spring pre-set value and the valve closes again.

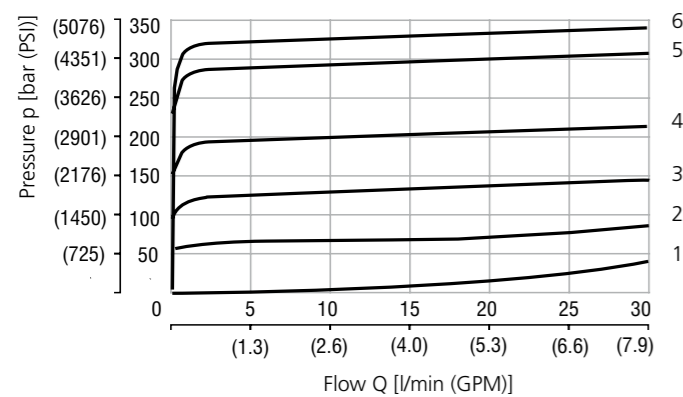


Technical Data

Valve size / Cartridge cavity		3/4-16 UNF-2A / A2
Max. flow	l/min (GPM)	30 (7.9)
Max. operating pressure	bar (PSI)	350 (5080)
Max. pressure (port T)	bar (PSI)	160 (2320)
Fluid temperature range (NBR)	°C (°F)	-30 ... +100 (-22 ... 212)
Fluid temperature range (FPM)	°C (°F)	-20 ... +120 (-4 ... 248)
Mass	kg (lbs)	0.13 (0.29)
Datashet		Type
General information		GL_0060 Products and operating conditions
Valve bodies	In-line mounted	SB_0018 SB-A2*
	Sandwich mounted	SB-04(06)_0028 SB-*A2*
Cavity details / Form tools		SMT_0019 SMT-A2*
Spare parts		SP_8010

Characteristics measured at v = 32 mm²/s (156 SUS)

Relief pressure related to flow rate



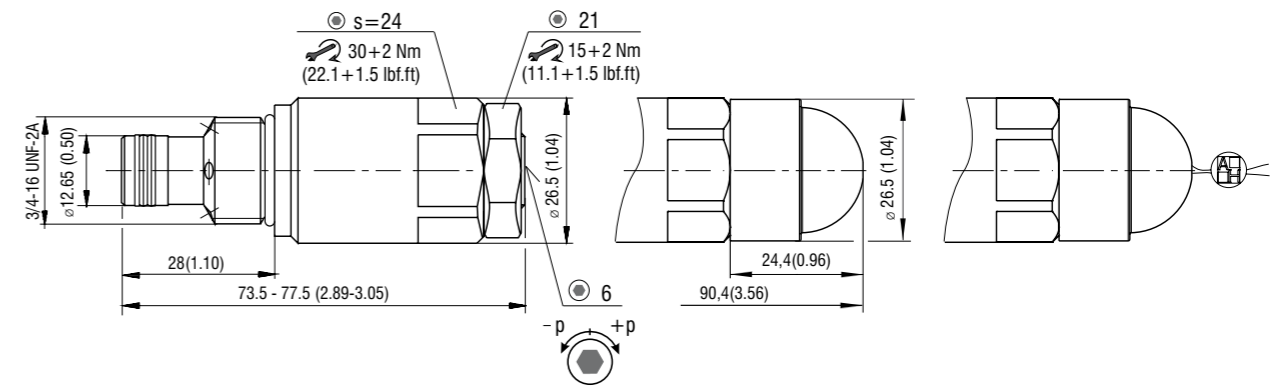
Pressure range	Setting
6	35
5	25
4	16
3	10
2	6
1	Min. pressure setting

Dimensions in millimeters (inches)

Model S

Model T

Model L



Ordering Code

SR1A-A2 / [] [] [] [] - []

Pressure relief valve, poppet type, direct acting 3/4-16 UNF

Model L

Lightline

Pressure range

up to 63 bar (914 PSI)	6
up to 100 bar (1450 PSI)	10
up to 160 bar (2320 PSI)	16
up to 250 bar (3630 PSI)	25
up to 350 bar (5080 PSI)	35

Surface treatment

A	zinc-coated (ZnCr-3), ISO 9227 (240 h)
B	zinc-coated (ZnNi), ISO 9227 (520 h)

Seals

No designation	V	NBR
		FPM (Viton)

Adjustment option

S	allen key (hex. 6), without protective cap
T	allen key (hex. 6), with protective cap
L	allen key (hex. 6), with protective cap, sealable (lockwire holes)

Pressure Relief Valve, Poppet Type, Direct Acting

VPP2-04/S

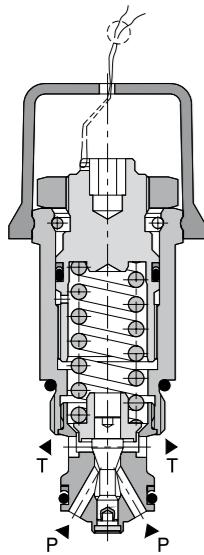
M22x1.5 • Q_{max} 40 l/min (11 GPM) • p_{max} 320 bar (4600 PSI)

Technical Features

- › Excellent stability throughout flow range with rapid response to dynamic pressure changes
- › Low hysteresis, accurate pressure control and low pressure drop
- › Wide pressure range up to 320 bar
- › Hardened precision parts
- › Sharp-edged steel seats for dirt-tolerant performance
- › Leak-free closing, suitable for fast cycling with long life
- › Adjustable by allen key or hand screw
- › In the standard version, the valve is zinc-coated for 240 h protection acc. to ISO 9227

Functional Description

A poppet type, direct acting hydraulic relief valve in the form of a screw-in cartridge intended for use as a pressure limiting device for common hydraulic circuit protection. The spring acts on the poppet and presses it onto the valve seat. If the hydraulic pressure is below the pre-set value, the valve is closed. If the hydraulic force exceeds the pre-set value the valve opens and flow passes to the tank port until the system pressure falls below the spring pre-set value and the valve closes again.



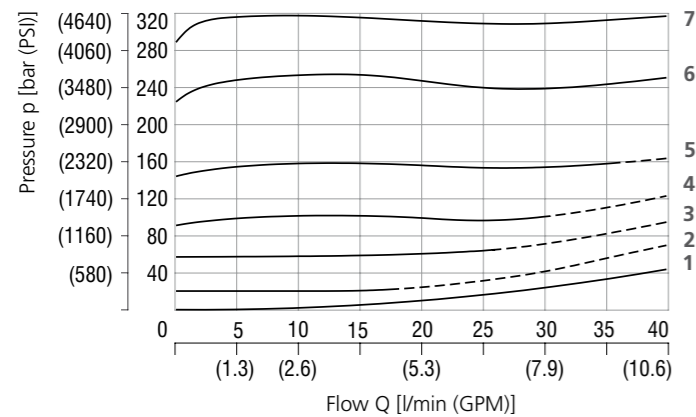
Technical Data

Valve size / Cartridge cavity		M22x1.5 / QG2
Max. flow	l/min (GPM)	40 (10.6)
Max. operating pressure	bar (PSI)	320 (4640)
Fluid temperature range (NBR)	°C (°F)	-30 ... +100 (-22 ... 212)
Fluid temperature range (FPM)	°C (°F)	-20 ... +120 (-4 ... 248)
Mass	kg (lbs)	0.17 (0.37)

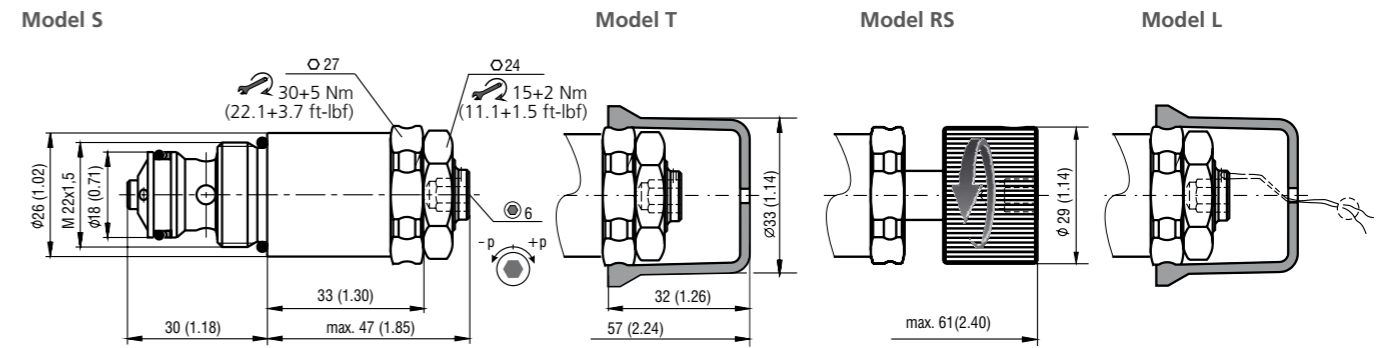
		Datasheet	Type
General information		GI_0060	Products and operating conditions
Valve bodies	In-line mounted	SB_0018	SB-QG2*
	Sandwich mounted	SB-04(06)_0028	SB-*QG2*
Cavity details		SMT_0019	SMT-QG2*
Spare parts		SP_8010	SMT-B2*

Characteristics measured at v = 32 mm²/s (156 SUS)

Relief pressure related to flow rate



Dimensions in millimeters (inches)



Ordering Code

VPP2-04 / S - [] - [] - []

Pressure relief valve, poppet type, direct acting M22x1.5

Model screw-in cartridge S

Pressure range
 up to 25 bar (360 PSI) 2
 up to 63 bar (910 PSI) 6
 up to 100 bar (1450 PSI) 10
 up to 160 bar (2320 PSI) 16
 up to 250 bar (3630 PSI) 25
 up to 320 bar (4600 PSI) 32

Surface treatment
 A zinc-coated (ZnCr-3), ISO 9227 (240 h)
 B zinc-coated (ZnNi), ISO 9227 (520 h)

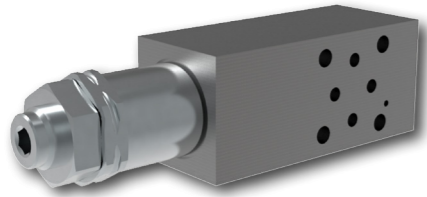
Seals
 No designation V
 NBR
 FPM (Viton)

Adjustment option
 S allen key (hex. 6), without protective cap
 T allen key (hex. 6), with protective cap
 RS hand screw, metal
 L allen key (hex. 6), with protective cap, sealable (lockwire holes)

Pressure Relief Valve, Poppet Type, Direct Acting, Modular

VPP2-04/M(R)

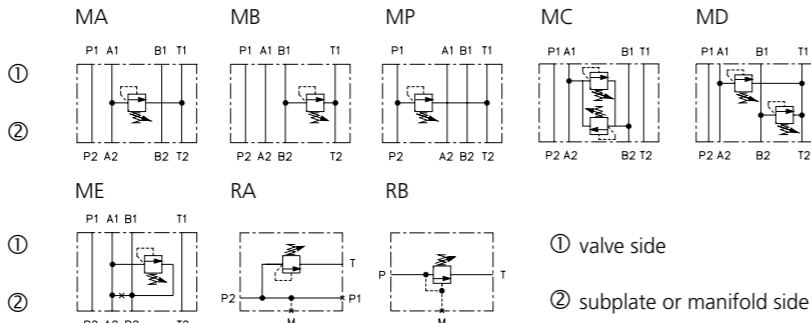
Size 04 (D02), 06 (D03) • Q_{max} 40 l/min (11 GPM) • p_{max} 320 bar (4600 PSI)



Technical Features

- Pressure relief valve, poppet type, direct acting, modular with mounting interface acc. to ISO 4401, DIN 24340 (CETOP 02 and 03) or in-line design
- Excellent stability throughout flow range with rapid response to dynamic pressure changes
- Low hysteresis, accurate pressure control and low pressure drop
- Wide pressure range up to 320 bar
- Hardened precision parts
- Sharp-edged steel seats for dirt-tolerant performance
- Leak-free closing, suitable for fast cycling with long life
- Adjustable by allen key or hand screw
- In the standard version, the valve is zinc-coated for 240 h protection acc. to ISO 9227 and the valve body is phosphated

Functional Symbols

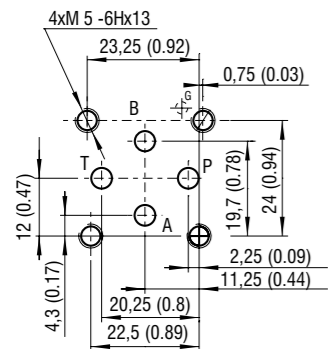


Notice: The orientation of the symbol on the name plate corresponds with the valve function.

Technical Data

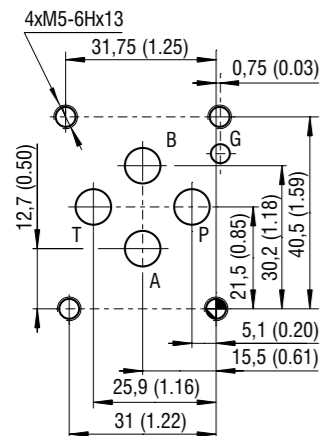
Valve size		04 (D02), 06 (D03)
Max. flow	l/min (GPM)	40 (10.6)
Max. pressure	bar (PSI)	320 (4640)
Fluid temperature range (NBR)	°C (°F)	-30...+100 (-22...+212)
Fluid temperature range (FPM)	°C (°F)	-20...+120 (-4...+248)
Mass	kg (lbs)	0.82 (1.81) - models MA (B, P) 04 - models MC (D, E) 04 - models MA (B, P) 06 - models MC (D, E) 06 - models RA1 (2), RB1 (2) 1.32 (2.91), ME 1.25 (2.76) 1.12 (2.46) 1.42 (3.12), ME 1.35 (2.98) 1.17 (2.57)
Datasheet	Type	
General information	GI_0060	Products operating conditions
Mounting interface	SMT_0019	Size 04 / 06
Spare parts	SP_8010	

ISO 4401-02-01-0-05



Ports P, A, B, T - max. Ø4.5 mm (0.18 in)

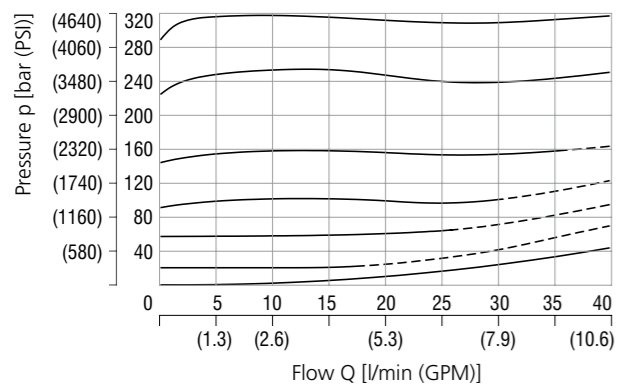
ISO 4401-03-02-0-05



Ports P, A, B, T - max. Ø7.5 mm (0.29 in)

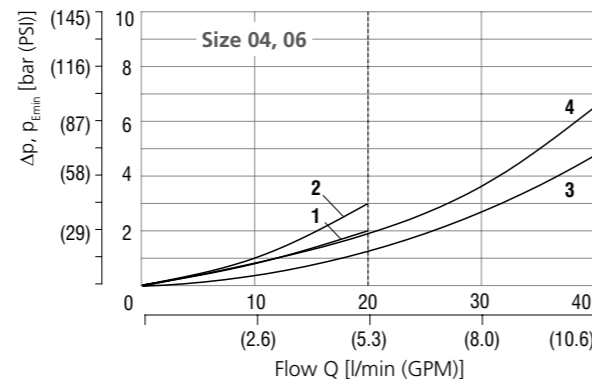
Characteristics measured at v = 32 mm²/s (156 SUS)

Relief pressure related to flow rate



Pressure range	Min. pressure setting	2	6	10	16	25	32
1	2	3	4	5	6	7	

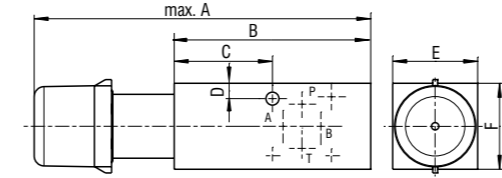
Minimum set and circulation pressure



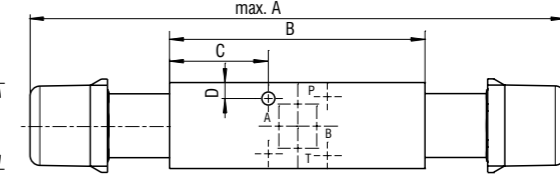
Size 04	Size 06	Models
1	3	MA, MB, MP, MD
2	4	MC, ME

Dimensions in millimeters (inches)

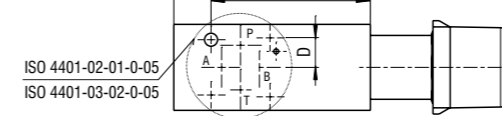
Model MA



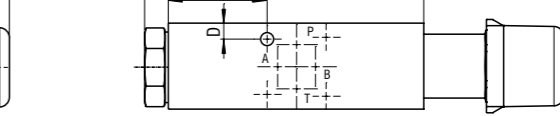
Model MC, MD



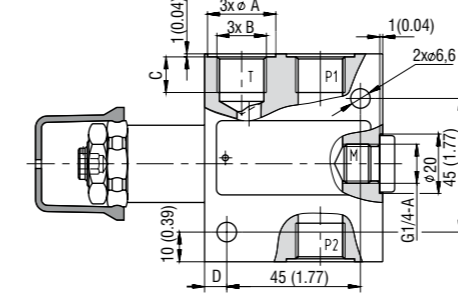
Model MB, MP



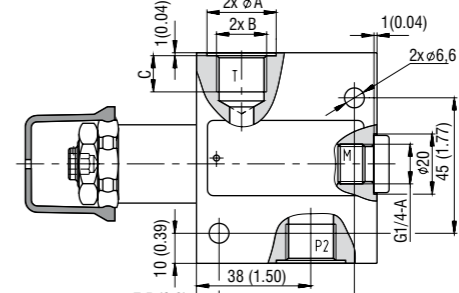
Model ME



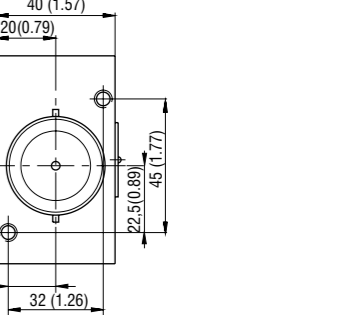
Model RA1, RA2



Model RB1, RB2

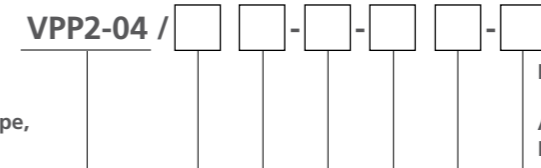


Version	Size	04 (D02)	06 (D03)
MA (B,P)	A	137 (5.39)	
MC (D)		218 (8.58)	208 (8.19)
ME	B	170.5 (6.71)	160.5 (6.32)
MA (B,P)		80 (3.15)	
MC (D,E)	C	104 (4.09)	94 (3.70)
MA (C,D,E)		40 (1.57)	25.5 (1.0)
MB (P)	D	64 (2.52)	68.5 (2.7)
MA (B,C)			6.25 (0.25)
	E	35 (1.38)	40 (1.57)
	F	35 (1.38)	45 (1.77)



	RA1, RB1	RA2, RB2
A	Ø 23	Ø 28
B	G3/8-A	G1/2-A
C	12 (0.47)	14 (0.55)
D	7.5 (0.3)	18 (0.71)
E	60 (2.36)	70 (2.76)
F	39 (1.54)	46 (1.81)
G	12.5 (0.49)	16 (0.63)
H	117 (4.61)	127 (5)

Ordering Code



Pressure relief valve, poppet type, direct acting, modular

Surface treatment
No designation body phosphated, steel parts
A zinc-coated (ZnCr-3), ISO 9227 (240 h)
B zinc-coated (ZnNi), ISO 9227 (520 h)

Seals
No designation NBR
V FPM (Viton)

Model

- modular, valve from A to T
- modular, valve from B to T
- modular, valve from P to T
- modular, valve from A to B and B to A
- modular, valve from A to T and B to T
- modular, valve from A to B
- in-line valve, three ports, thread G 3/8 (P1, P2, T)
- in-line valve, three ports, thread G 1/2 (P1, P2, T)
- in-line valve, two ports, thread G 3/8 (P, T)
- in-line valve, two ports, thread G 1/2 (P, T)

- MA
- MB
- MP
- MC
- MD
- ME
- RA1
- RA2
- RB1
- RB2

Adjustment option*
S allen key (hex. 6), without protective cap
T allen key (hex. 6), with protective cap
RS hand screw, metal
L allen key (hex. 6), with protective cap, sealable (lockwire holes)
S/R/S Model with two pressure relief cartridges
A side, allen key (hex. 6), without protective cap
B side, hand screw, metal

*for dimensions of adjustment options see data sheet No.5093

Pressure range
2 up to 25 bar (360 PSI)
6 up to 63 bar (910 PSI)
10 up to 100 bar (1450 PSI)
16 up to 160 bar (2320 PSI)
25 up to 250 bar (3630 PSI)
32 up to 320 bar (4600 PSI)

Model with two pressure relief cartridges
32/10 320 bar (4600 PSI) in port A, 100 bar (1450 PSI) in port B

Pressure Relief Valve, Poppet Type, Direct Acting

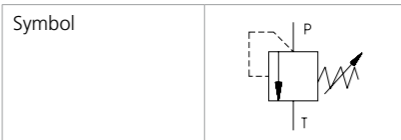
VPP1-06(08,10) M28x1.5 / M35x1.5 • Q_{max} 50 l/min (13 GPM) / 120 l/min (32 GPM) • p_{max} 320 bar (4600 PSI)

Technical Features

- ▶ Excellent stability throughout flow range with rapid response to dynamic pressure changes
- ▶ Low hysteresis, accurate pressure control and low pressure drop
- ▶ Wide pressure range up to 320 bar
- ▶ Hardened precision parts
- ▶ Sharp-edged steel seats for dirt-tolerant performance
- ▶ Leak-free closing, suitable for fast cycling with long life
- ▶ Adjustable by allen key or hand screw
- ▶ In the standard version, the cartridge valve is black oxide coated and the valve body is phosphated

Functional Description

A poppet type, direct acting hydraulic relief valve in the form of a screw-in cartridge intended for use as a pressure limiting device for common hydraulic circuit protection. The spring acts on the poppet and presses it onto the valve seat. If the hydraulic pressure is below the pre-set value, the valve is closed. If the hydraulic force exceeds the pre-set value the valve opens and flow passes to the tank port until the system pressure falls below the spring pre-set value and the valve closes again.



Technical Data

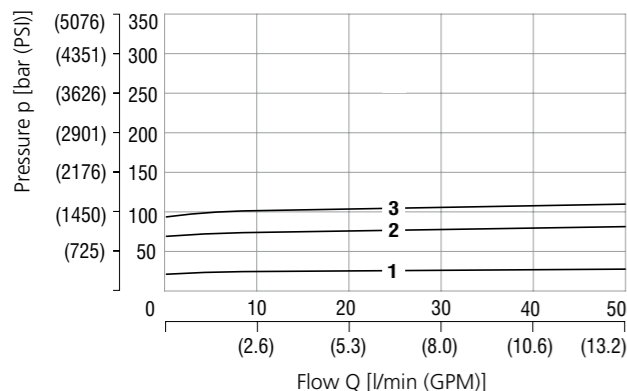
Valve size / Cartridge cavity		M28x1.5 / QP2	M35x1.5 / QT2
Max. flow	l/min (GPM)	50 (13.2)	120 (31.7)
Max. operating pressure	bar (PSI)	320 (4640)	
Fluid temperature range (NBR)	°C (°F)	-30...+100 (-22...212)	
Fluid temperature range (FPM)	°C (°F)	-20...+120 (-4...248)	
Mass	kg (lbs)	0.4 (0.88)	0.5 (1.10)

General information		Datasheet			Type		
General information		GI_0060			Products and operating conditions		
Valve bodies	In-line mounted	SB_0018	SB-QP2*	SB-QT2*			
Cavity details		SMT_0019	SMT-QP2*	SMT-QT2*			
Spare parts		SP_8010					

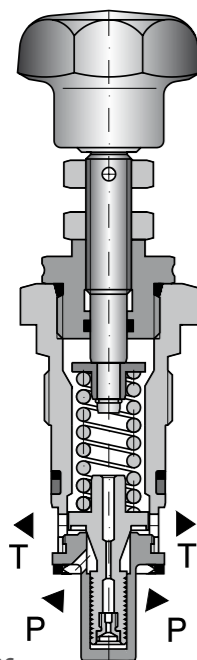
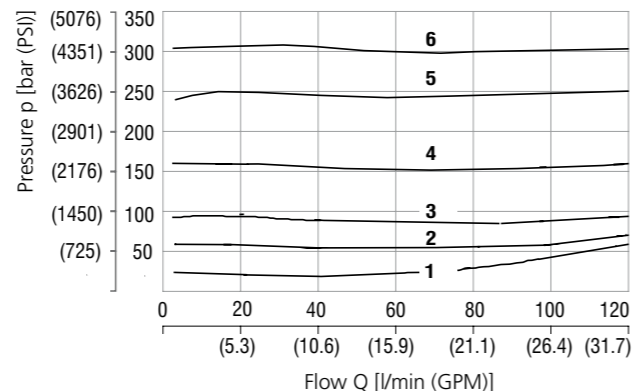
Characteristics measured at v = 32 mm²/s (156 SUS)

Relief pressure related to flow rate

Size 06



Size 10

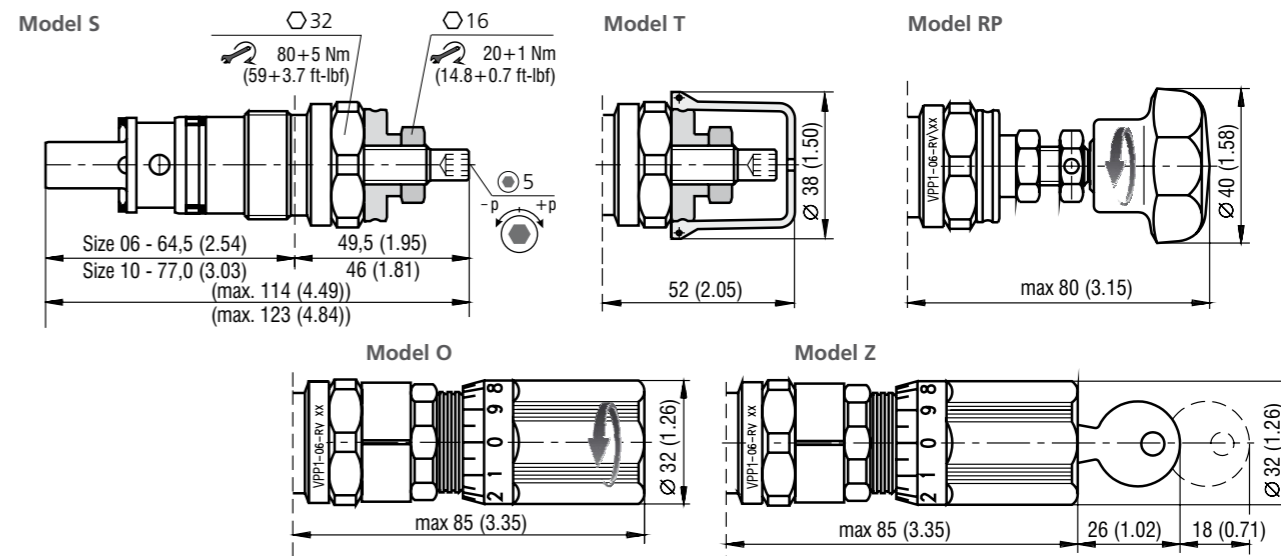


Size 06

Size 10

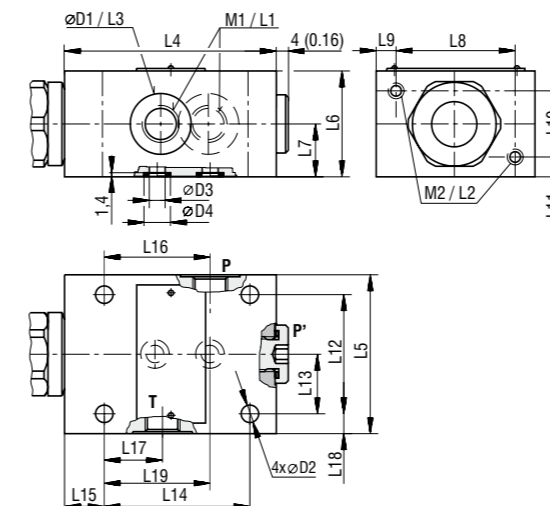


Dimensions in millimeters (inches)



Dimensions in millimeters (inches)

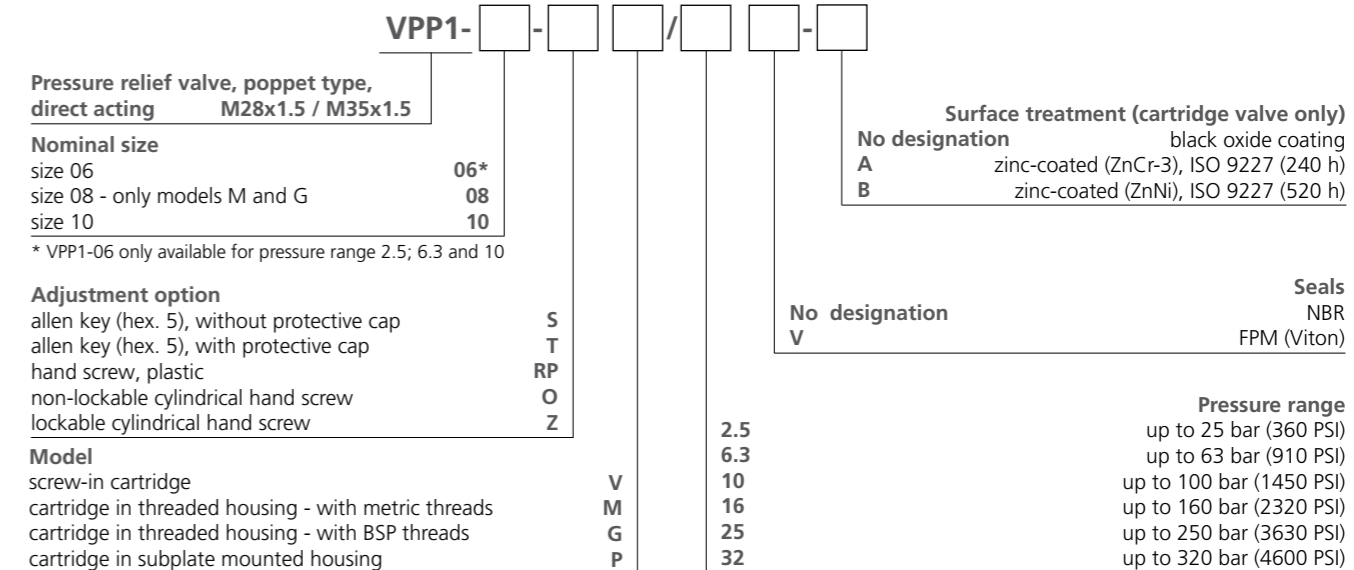
Cartridge in threaded housing - models „M”, „G” and „P”



Port P' (as input can be used P or P') thread M1/L1

Model	06-xM/x	06-xG/x	06-xP/x	08-xM/x	08-xG/x	10-xM/x	10-xG/x	10-xP/x
M1	M14x1.5	G1/4	G1/4	M18x1.5	G3/8	M22x1.5	G1/2	G1/4
M2	M6			M8				
ØD1	25(0.98)			30(1.18)	28(1.10)	34(1.34)		
ØD2	6.6(0.26)			9(0.35)				
ØD3		6(0.24)						10(0.39)
ØD4		10.8(0.43)						15.6(0.61)
L1	12(0.47)			16(0.63)				
L2	10(0.39)			20(0.79)				
L3	0.5(0.02)			0.5(0.02)				
L4	80(3.15)			100(3.94)				
L5	60(2.36)			80(3.15)				
L6	40(1.57)			60(2.36)				
L7	20(0.79)			30(1.18)				
L8	45(1.77)			60(2.36)				
L9	7.5(0.30)			10(0.39)				
L10	25(0.98)			40(1.57)				
L11	7.5(0.30)			10(0.39)				
L12	45(1.77)			60(2.36)				
L13	22.5(0.89)			30(1.18)				
L14	55(2.17)			70(2.76)				
L15	15(0.59)			20(0.79)				
L16	40(1.57)			49(1.93)				
L17	20(0.79)			21(0.83)				
L18	7.5(0.30)			10(0.39)				
L19			40(1.57)					45(1.77)

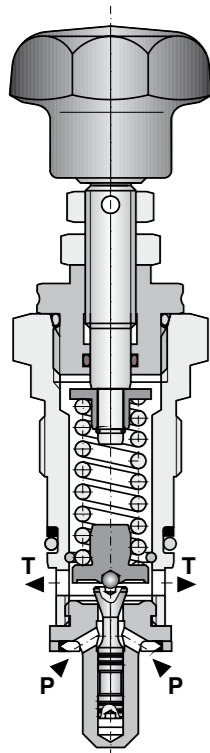
Ordering Code



Pressure Relief Valve, Poppet Type, Direct Acting

VPP2-06

M28x1.5 • Q_{max} 50 l/min (13 GPM) • p_{max} 320 bar (4600 PSI)



Technical Features

- Excellent stability throughout flow range with rapid response to dynamic pressure changes
- Low hysteresis, accurate pressure control and low pressure drop
- Wide pressure range up to 320 bar
- Hardened precision parts
- Sharp-edged steel seats for dirt-tolerant performance
- Leak-free closing, suitable for fast cycling with long life
- Adjustable by allen key or hand screw
- In the standard version, the valve is black oxide coated

Functional Description

A poppet type, direct acting hydraulic relief valve in the form of a screw-in cartridge intended for use as a pressure limiting device for common hydraulic circuit protection. The spring acts on the poppet and presses it onto the valve seat. If the hydraulic pressure is below the pre-set value, the valve is closed. If the hydraulic force exceeds the pre-set value the valve opens and flow passes to the tank port until the system pressure falls below the spring pre-set value and the valve closes again.

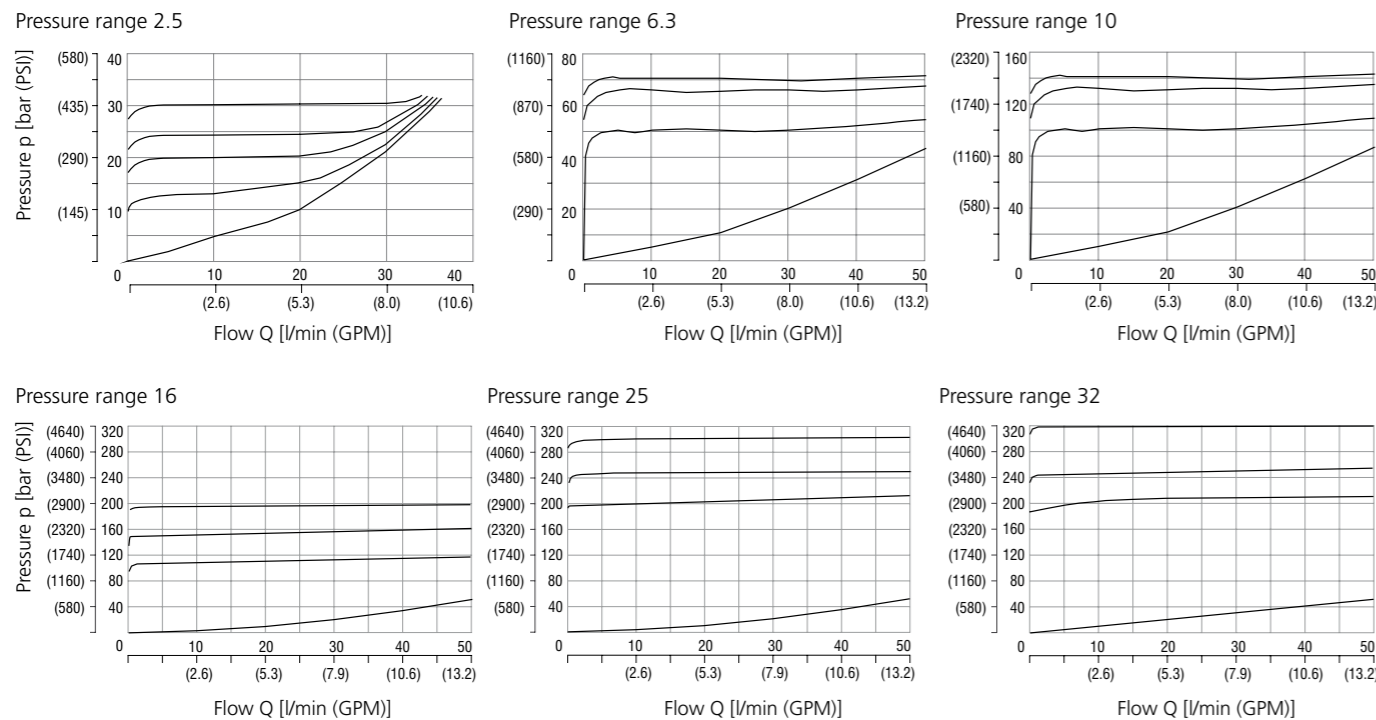


Technical Data

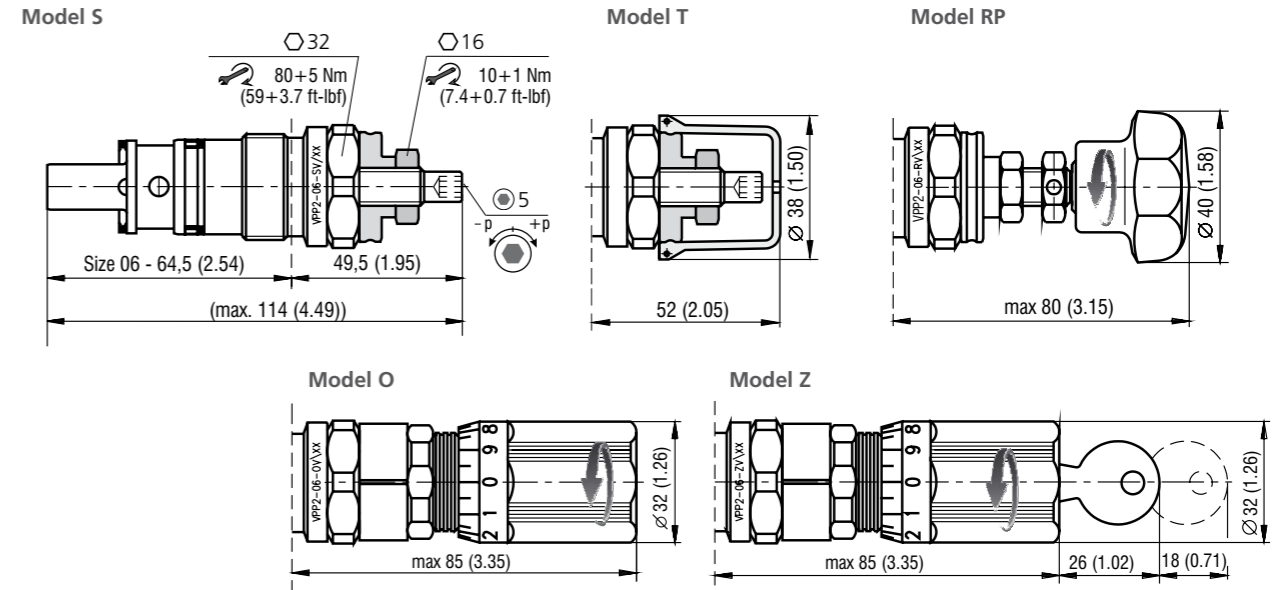
Valve size / Cartridge cavity		M28x1.5 / QP2
Max. flow	l/min (GPM)	50 (13.2)
Max. operating pressure	bar (PSI)	320 (4640)
Fluid temperature range (NBR)	°C (°F)	-30...+100 (-22...+212)
Fluid temperature range (FPM)	°C (°F)	-20...+120 (-4...+248)
Mass	kg (lbs)	0.4 (0.88)
General information		Datasheet
Valve bodies		GI_0060
Cavity details		SMT_0019
Spare parts		SP_8010
Type		Products and operating conditions
In-line mounted	SB_0018	SB-QP2*
	SMT_0019	SMT-QP2*

Characteristics measured at v = 32 mm²/s (156 SUS)

Relief pressure related to flow rate

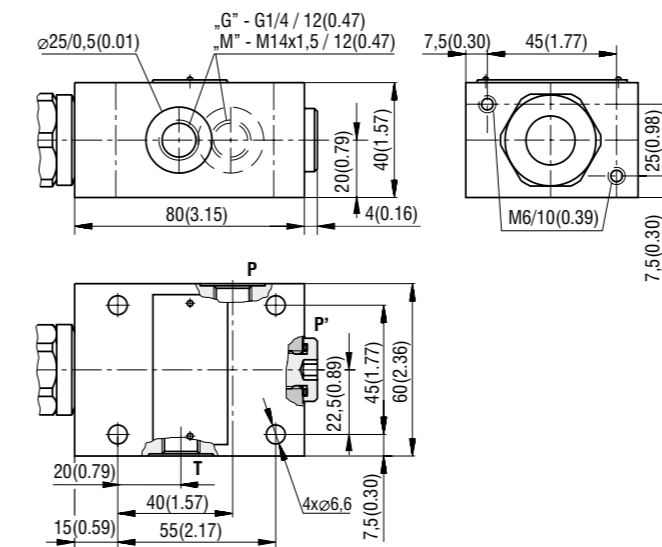


Dimensions in millimeters (inches)

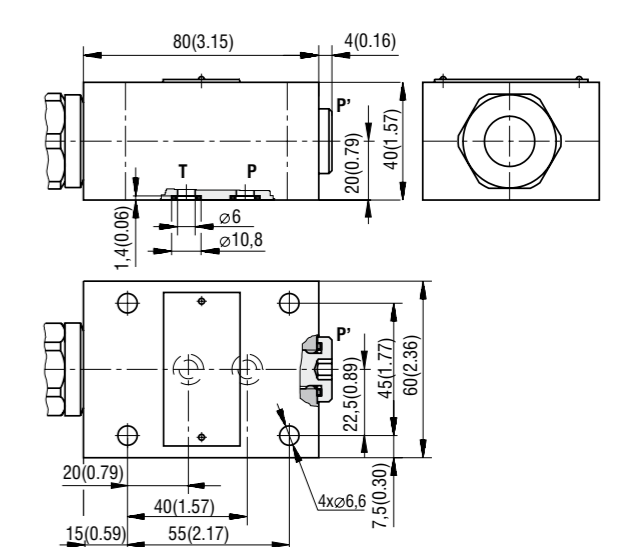


Dimensions in millimeters (inches)

Cartridge in threaded housing - models „M“ and „G“



Cartridge in subplate mounted housing - model „P“



Port P' (either P or P' can be used as input port), thread G1/4 (M14x1.5), depth 12 mm (0.47in)

Port P' (e.g. for pressure measuring), thread M14x1.5, depth 12 mm (0.47 in)
Note: subplates - see catalog HA 0002

Ordering Code

VPP2-06 - [] / [] - []

Pressure relief valve, poppet type, direct acting
M28x1.5

Adjustment option
allen key (hex. 5), without protective cap: S
allen key (hex. 5), with protective cap: T
hand screw, plastic: RP
non-lockable cylindrical hand screw: O
lockable cylindrical hand screw: Z

Model
screw-in cartridge: V
cartridge in threaded housing - metric threads: M
cartridge in threaded housing - with BSP threads: G
cartridge in subplate mounted housing: P

Surface treatment (cartridge valve only)
No designation: black oxide coating
A: zinc-coated (ZnCr-3), ISO 9227 (240 h)
B: zinc-coated (ZnNi), ISO 9227 (520 h)

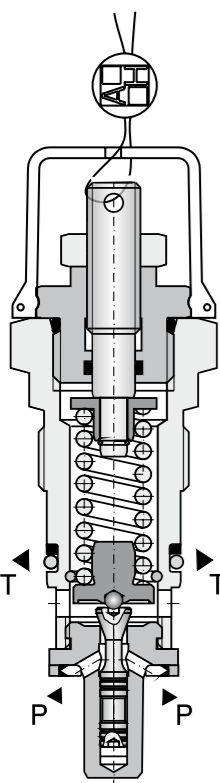
Seals
No designation: NBR
V: FPM (Viton)

Pressure range
2.5: up to 25 bar (360 PSI)
6.3: up to 63 bar (910 PSI)
10: up to 100 bar (1450 PSI)
16: up to 160 bar (2320 PSI)
25: up to 250 bar (3630 PSI)
32: up to 320 bar (4600 PSI)

Pressure Relief Valve, PED Certified, Poppet Type, Direct Acting

VPP2-06-SV/xx-CE1017

M28x1.5 • Q_{max} 50 l/min (13 GPM) • p_{max} 320 bar (4600 PSI)



Technical Features

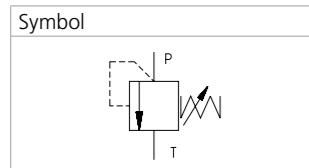
- Hydraulic safety relief valve suitable for use as a safety device in Category IV Group 2 applications acc.to European Commission (EC) Pressure Equipment Directive (PED) 2014/68/EU
- CE marked valves are supplied with "Declaration of Conformity", "Operating Instructions" and the list of residual risks
- Always follow the operating instructions supplied with the valve
- Excellent stability throughout flow range with rapid response to dynamic pressure changes
- Low hysteresis, accurate pressure control and low pressure drop through CFD optimized flow paths
- Wide pressure range up to 320 bar
- Hardened precision parts
- Sharp-edged steel seats for dirt-tolerant performance
- Leak-free closing, suitable for fast cycling with long life
- In the standard version, the valve is black oxide coated

Functional Description

A poppet type, direct acting hydraulic relief valve in the form of a screw-in cartridge intended for use as a pressure limiting device for common hydraulic circuit protection. The spring acts on the poppet and presses it onto the valve seat. If the hydraulic pressure is below the pre-set value, the valve is closed. If the hydraulic force exceeds the pre-set value the valve opens and flow passes to the tank port until the system pressure falls below the spring pre-set value and the valve closes again.

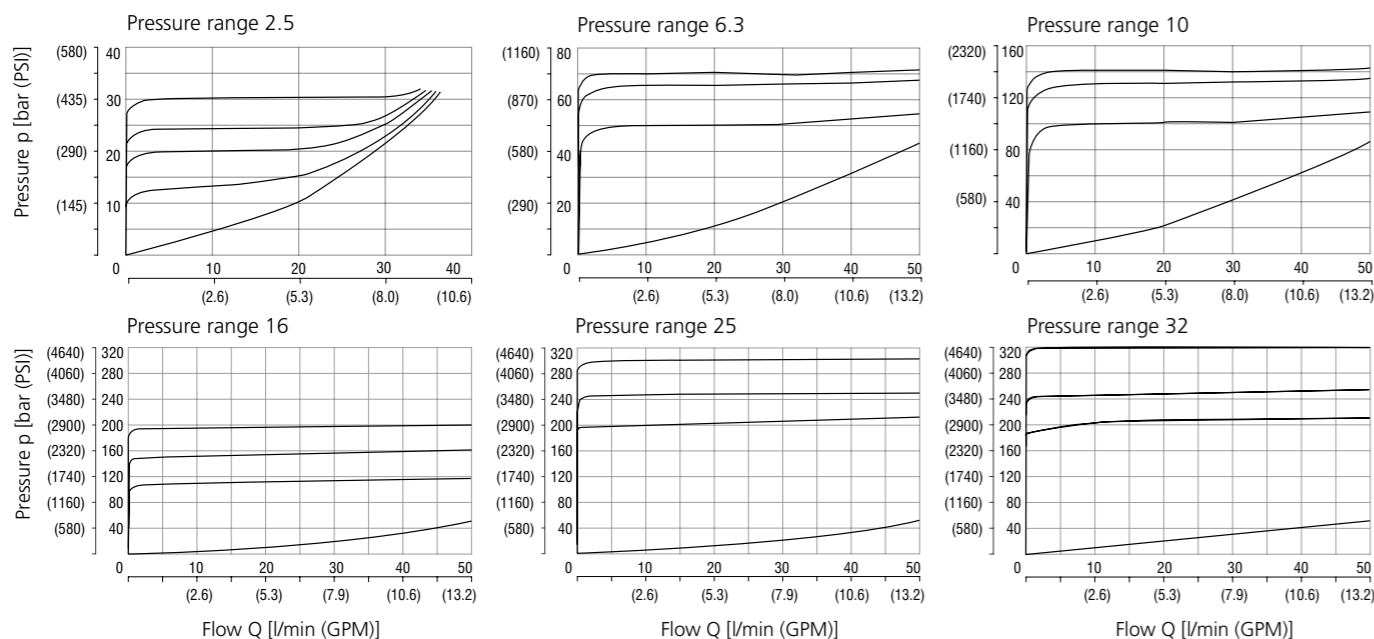
Technical Data

Valve size / Cartridge cavity	M28x1.5 / QP2	
Max. flow	l/min (GPM)	50 (13.2)
Max. operating pressure	bar (PSI)	320 (4640)
Fluid temperature range (NBR)	°C (°F)	-30 ... +100 (-22... 212)
Fluid temperature range (FPM)	°C (°F)	-20 ... +120 (-4... 248)
Viscosity range	mm ² /s (SUS)	10 ... 500 (49 ... 2450)
Mass	kg (lbs)	0.4 (0.88)
General information	Datasheet	Type
Valve bodies	GI_0060	Product and operating conditions
Valve bodies	In-line mounted	SB_0018
Cavity details	SMT_0019	SB-QP2*
Spare parts	SP_8010	SMT-QP2*



Characteristics measured at v = 32 mm²/s (156 SUS)

Relief pressure related to flow rate



Valves Adjusted at the Manufacturer

- The valves are adjusted for the specified pressure at the relevant flow rate and they are fitted with tamper-indicating seals
- The pressure and flow rate values are indicated in the valve description on the product [pressure: in bar, flow rate in l/min]
- The seals bear the company logo

Valves NOT Adjusted at the Manufacturer

- Valves have no tamper-indicating seals
- No pressure and no flow rate indicated
- After the completion of the functional test, the adjusting screw is completely loosened and the pressure is set to p = 0 bar
- To adjust the required valve pressure proceed as follows:
 - turn the adjusting screw to the right (clockwise) to increase the pressure
 - turn the adjusting screw to the left (counter-clockwise) to decrease the pressure
- The manufacturer accepts no responsibility for the adjustment, securing, and sealing of the valve

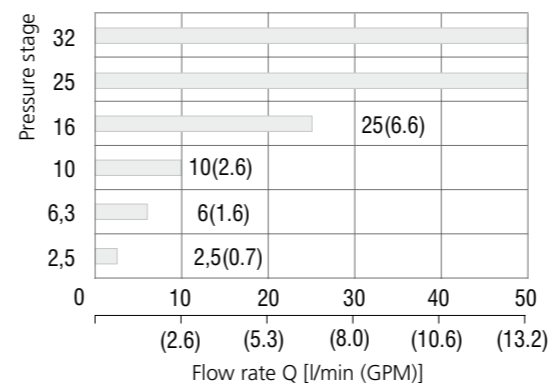
Residual Risks

Residual risks are listed and preventive measures against the occurrence of residual risk are described in the document „Operating instructions for pressure relief valve VPP2-06-SV/xx-CE1017“ which is delivered with each valve.

Operating Region

The diagram shows the operating region where the valve meets the requirements of Directive 2014/68/EU and Standard ISO 4126-1 on maximum short-time overshoot of system pressure by 10 % above the set cracking pressure when the valve opens. The dynamics of the valve depend on the kinematic viscosity of working fluid.

Measurement conditions: oil Renolin VG 32, T = 40 °C (104 °F), V = 0.5 l (0.132 gal US)

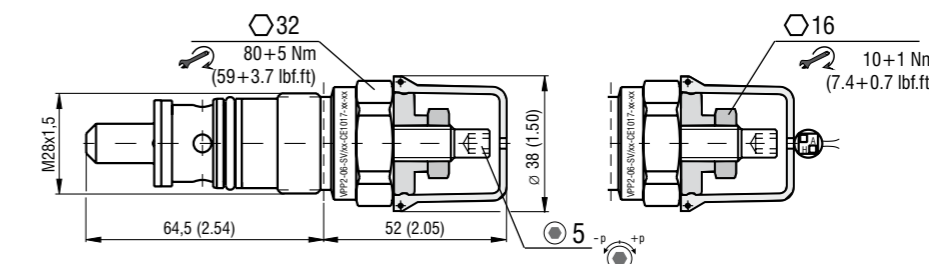


Operating region characteristics from certification of VPP2-06*CE*

Dimensions in millimeters (inches)

Model T

Model L



Ordering Code

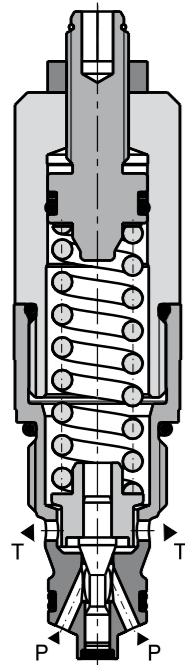
VPP2-06-	V /	-	CE1017-	-	-	
Pressure relief valve, PED certified, poppet type, direct acting M28x1.5	Adjustment option: allen key (hex. 5), with protective cap (lockwire holes)	Model: screw-in cartridge	Pressure range: up to 25 bar (360 PSI), up to 63 bar (910 PSI), up to 100 bar (1450 PSI), up to 160 bar (2320 PSI), up to 250 bar (3630 PSI), up to 320 bar (4600 PSI)	Surface treatment: No designation (black oxide coating), A (zinc-coated (ZnCr-3), ISO 9227 (240 h)), B (zinc-coated (ZnNi), ISO 9227 (520 h))	Relief pressure and flow rate setting: 120/5.8	Certification PED: notified body number CE1017
			2,5 6,3 10 16 25 32			Seals: No designation (NBR), V (FPM (Viton))

If not preset valves are ordered, pressure and flow rate information is not shown.

Pressure Relief Valve, Poppet Type, Direct Acting

SR1A-B2

7/8-14 UNF • Q_{max} 60 l/min (16 GPM) • p_{max} 420 bar (6100 PSI)



Technical Features

- › Excellent stability throughout flow range with rapid response to dynamic pressure changes
- › Low hysteresis, accurate pressure control and low pressure drop through CFD optimized flow paths
- › Wide pressure range up to 420 bar
- › Hardened precision parts
- › Sharp-edged steel seats for dirt-tolerant performance
- › Leak-free closing, suitable for fast cycling with long life
- › Adjustable by allen key or hand screw
- › In the standard version, the valve is zinc-coated for 240 h protection acc. to ISO 9227

Functional Description

A poppet type, direct acting hydraulic relief valve in the form of a screw-in cartridge intended for use as a pressure limiting device for common hydraulic circuit protection. The spring acts on the poppet and presses it onto the valve seat. If the hydraulic pressure is below the pre-set value, the valve is closed. If the hydraulic force exceeds the pre-set value the valve opens and flow passes to the tank port until the system pressure falls below the spring pre-set value and the valve closes again.



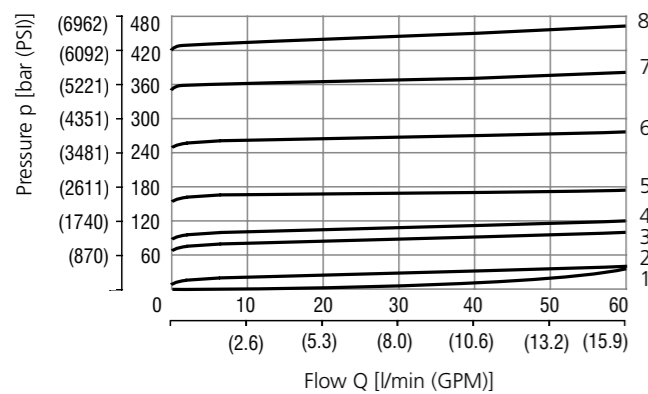
Technical Data

Valve size / Cartridge cavity		7/8-14 UNF-2A / B2
Max. flow	l/min (GPM)	60 (15.9)
Max. operating pressure	bar (PSI)	420 (6090)
Max. pressure (port T)	bar (PSI)	250 (3630)
Fluid temperature range (NBR)	°C (°F)	-30 ... +100 (-22 ... 212)
Fluid temperature range (FPM)	°C (°F)	-20 ... +120 (-4 ... 248)
Mass	kg (lbs)	0.25 (0.55)

		Datasheet	Type
General information		GI_0060	Products operating conditions
Valve bodies	In-line mounted	SB_0018	SB-B2*
	Sandwich mounted	SB-04(06)_0028	SB-*B2*
Cavity details / Form tools		SMT_0019	SMT-B2*
Spare parts		SP_8010	

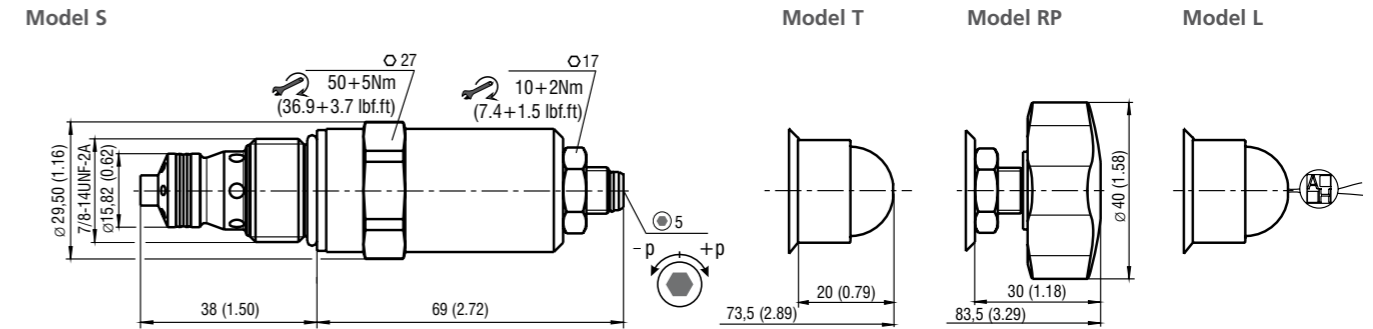
Characteristics measured at v = 32 mm²/s (156 SUS)

Relief pressure related to flow rate



Setting	Pressure range
8	420
7	350
6	250
5	160
4	100
3	60
2	20
1	Min. pressure setting

Dimensions in millimeters (inches)



Ordering Code

SR1A-B2 / [] [] [] [] - []

Pressure relief valve, poppet type, direct acting 7/8 -14 UNF

Model High performance **H**

Surface treatment
A zinc-coated (ZnCr-3), ISO 9227 (240 h)
B zinc-coated (ZnNi), ISO 9227 (520 h)

Seals
NBR
FPM (Viton)

Adjustment option
S allen key (hex. 5), without protective cap
T allen key (hex. 5), with protective cap
RP hand screw, plastic
L allen key (hex. 5), with protective cap, sealable (lockwire holes)

No designation **V**

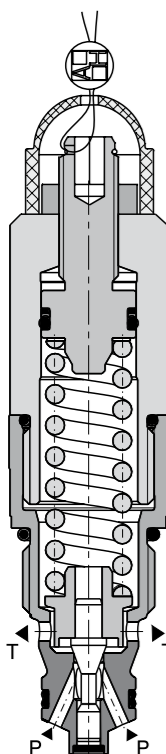
Pressure range

up to 25 bar (360 PSI)	2
up to 63 bar (910 PSI)	6
up to 100 bar (1450 PSI)	10
up to 160 bar (2320 PSI)	16
up to 250 bar (3630 PSI)	25
up to 350 bar (5080 PSI)	35
up to 420 bar (6090 PSI)	42

Pressure Relief Valve, PED Certified, Poppet Type, Direct Acting

SR1A-B2/HxSx-CE1017

7/8-14 UNF • Q_{max} 60 l/min (16 GPM) • p_{max} 420 bar (6100 PSI)



Technical Features

- Hydraulic safety relief valve suitable for use as a safety device in Category IV Group 2 applications acc.to European Commission (EC) Pressure Equipment Directive (PED) 2014/68/EU
- CE marked valves are supplied with "Declaration of Conformity", "Operating Instructions" and the list of residual risks
- Always follow the operating instructions supplied with the valve!
- Excellent stability throughout flow range with rapid response to dynamic pressure changes
- Low hysteresis, accurate pressure control and low pressure drop through CFD optimized flow paths
- Wide pressure range up to 420 bar
- Hardened precision parts
- Sharp-edged steel seats for dirt-tolerant performance
- Leak-free closing and suitable for fast cycling with long life
- In the standard version, the valve is zinc-coated for 240 h protection acc. to ISO 9227

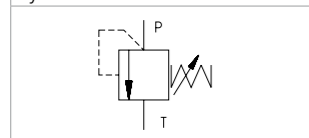
Functional Description

A poppet type, direct acting hydraulic relief valve in the form of a screw-in cartridge intended for use as a pressure limiting device for common hydraulic circuit protection. The spring acts on the poppet and presses it onto the valve seat. If the hydraulic pressure is below the pre-set value, the valve is closed. If the hydraulic force exceeds the pre-set value the valve opens and flow passes to tank port until the system pressure falls below the spring pre-set value and the valve closes back again.

Technical Data

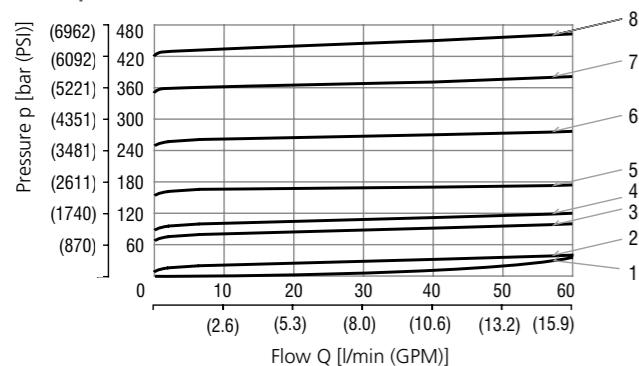
Valve size / Cartridge cavity	7/8-14 UNF-2A / B2		
Max. flow	l/min (GPM)	60 (15.9)	
Max. operating pressure	bar (PSI)	420 (6090)	
Max. pressure (T port)	bar (PSI)	250 (3630)	
Fluid temperature range (NBR)	°C (°F)	-30 ... +100 (-22 ... 212)	
Fluid temperature range (FPM)	°C (°F)	-20 ... +120 (-4 ... 248)	
Max. leakage of closed valve at 80 % cracking pressure	cm ³ /min	0.1	
Viscosity range	mm ² /s (SUS)	10 ... 500 (49 ... 2450)	
Mass	kg (lbs)	0.27 (0.60)	
	Datasheet	Type	
General information	GI_0060	Products operating conditions	
Valve bodies	In-line mounted	SB_0018	SB-B2*
	Sandwich mounted	SB-04(06)_0028	SB-*B2*
Cavity details / Form tools	SMT_0019	SMT-B2*	
Spare parts	SP_8010		

Symbol



Characteristics measured at $v = 32 \text{ mm}^2/\text{s}$ (156 SUS)

Relief pressure related to flow rate



Pressure range	Setting
8	42
7	35
6	25
5	16
4	10
3	6
2	2
1	Min. pressure setting

Valves Adjusted at the Manufacturer

- The valves are adjusted for the specified pressure at the relevant flow rate and they are fitted with tamper-indicating seals
- The pressure and flow rate values are indicated in the valve description on the product [pressure: in bar, flow rate in l/min]
- The seals bear the company logo

Valves NOT Adjusted at the Manufacturer

- Valves have no tamper-indicating seals
- No pressure and no flow rate indicated
- After the completion of the functional test, the adjusting screw is completely loosened and the pressure is set to $p = 0$ bar
- To adjust the required valve pressure proceed as follows:
 - turn the adjusting screw to the right (clockwise) to increase the pressure
 - turn the adjusting screw to the left (counter-clockwise) to decrease the pressure
- The manufacturer accepts no responsibility for the adjustment, securing, and sealing of the valve

Residual Risks

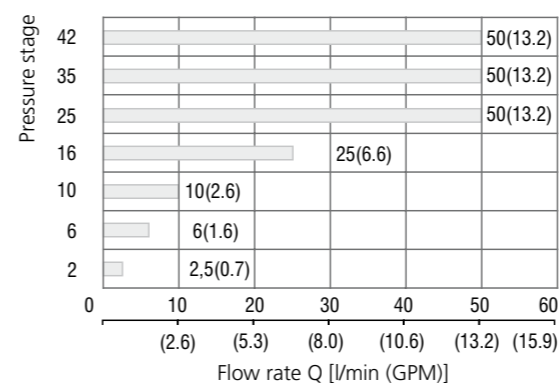
Residual risks are listed and preventive measures against the occurrence of residual risk are described in the document „Operating instructions for pressure relief valve SR1A-B2/HxSx-CE1017“ which is delivered with each valve.

Operating Region

The diagram shows the operating region where the valve meets the requirements of Directive 2014/68/EU and Standard ISO 4126-1 on maximum short-time overshoot of system pressure by 10 % above the set cracking pressure when the valve opens.

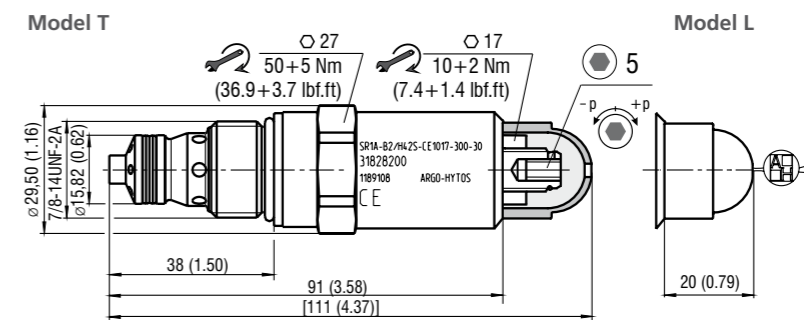
The dynamics of the valve depend on the kinematic viscosity of working fluid.

Measurement conditions: oil Renolin VG 32, $T = 40 \text{ °C}$ (104 °F), $V = 0.5 \text{ l}$ (0.132 gal US)



Operating region characteristics from certification of SR1A-B2/HxSx-CE1017*

Dimensions in millimeters (inches)



Ordering Code

SR1A-B2 / H [] [] [] - **CE1017** - [] - []

Pressure relief valve, PED certified, poppet type, direct acting 7/8-14 UNF

Model
High performance

Pressure range
up to 25 bar (360 PSI) **2**
up to 63 bar (910 PSI) **6**
up to 100 bar (1450 PSI) **10**
up to 160 bar (2320 PSI) **16**
up to 250 bar (3630 PSI) **25**
up to 350 bar (5080 PSI) **35**
up to 420 bar (6090 PSI) **42**

Surface treatment
A zinc-coated (ZnCr-3), ISO 9227 (240 h)
B zinc-coated (ZnNi), ISO 9227 (520 h)

Relief pressure and flow rate setting
120/5.8 120 bar / 5.8 l/min

Certification PED
notified body number CE1017

Seals
NBR
FPM (Viton)

Adjustment option
T allen key (hex. 5), with protective cap
L allen head (hex. 5), with protective cap, sealable (lockwire holes)

No designation V

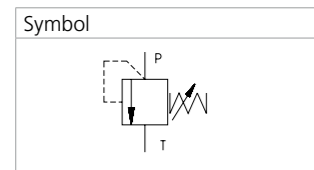
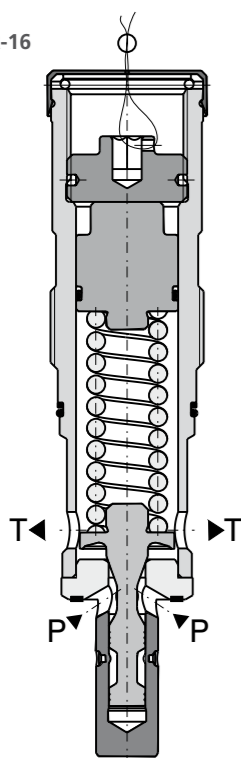
If not preset valves are ordered, pressure and flow rate information is not shown.

Pressure Relief Valve, Poppet Type, Direct Acting

VPP-R-16(25)

M36x2 / M42x2 • Q_{max} 120 / 400 l/min (32 / 106 GPM) • p_{max} 350 bar (5100 PSI)

VPP-R-16



Technical Features

- › Pressure relief valve, direct-acting, intended for installation in a manifold
- › Wide pressure range up to 350 bar
- › Large flow range
- › Low hysteresis, accurate pressure control and low pressure drop
- › Hardened precision parts
- › Leak-free closing, suitable for fast cycling with long life
- › Adjustment option with sealable allen head and a protective cap
- › In the standard version, the valve is zinc coated for 240 h protection acc. to ISO 9227

Functional Description

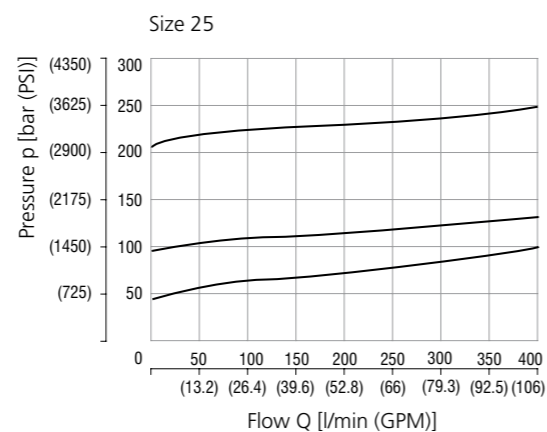
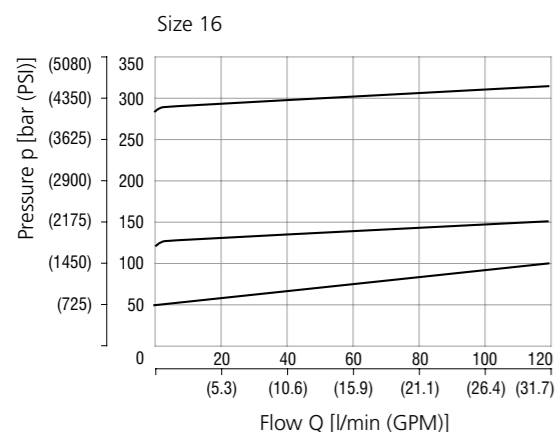
A poppet type, direct acting hydraulic relief valve in the form of a screw-in cartridge intended for use as a pressure limiting device for common hydraulic circuit protection. The spring acts on the poppet and presses it onto the valve seat. If the hydraulic pressure is below the pre-set value, the valve is closed. If the hydraulic force exceeds the pre-set value the valve opens and flow passes to the tank port until the system pressure falls below the spring pre-set value and the valve closes again.

Technical Data

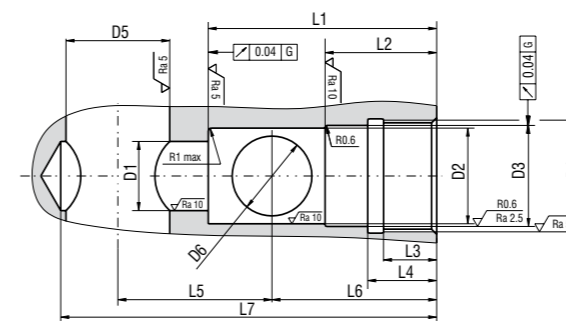
Valve size		Size 16	Size 25
Connection thread		M36x2	M42x2
Max. flow	l/min (GPM)	120 (31.7)	400 (106)
Max. inlet pressure (port P)	bar (PSI)	350 (5080)	
Max. outlet pressure (port T)	bar (PSI)	160 (2320)	
Fluid temperature range (NBR)	°C (°F)	-30 ... +100 (-22 ... 212)	
Fluid temperature range (FPM)	°C (°F)	-20 ... +120 (-4 ... 248)	
Kinematic viscosity range	mm ² /s (SUS)	10 ... 500 (49 ... 2450)	
Weight	valve	0.56 (1.23)	1.03 (2.27)
	valve with body	3.06 (6.75)	5.5 (12.1)
Datasheet		Type	
General information		GI_0060 Products and operating conditions	
Spare parts		SP_8010	

Characteristics measured at v = 32 mm²/s (156 SUS)

Relief pressure related to flow rate



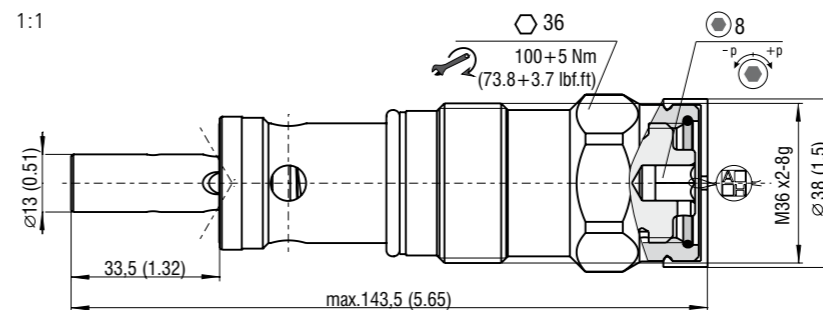
Cavity dimensions in millimeters (inches)



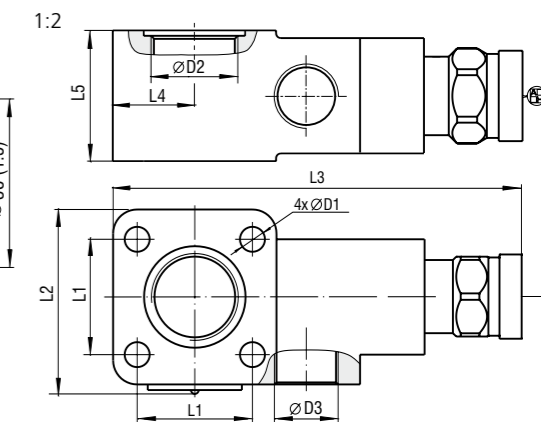
Size	∅ D1	∅ D2	∅ D3	∅ D4	∅ D5	∅ D6	Dimensions in mm (in)
16	20 H14 (0.79)	30 H11 (1.18)	32.6 H10 (1.28)	M36x2-7H	30 (1.18)	25 (0.98)	
25	26 H14 (1.02)	36 H11 (1.42)	38 H10 (1.50)	M42x2-7H	34 (1.34)	31 (1.22)	
Size	L1	L2	L3	L4	L5	L6	L7
16	66 (2.6 / 2.61)	31 (1.22 / 1.22)	18 (0.71 / 0.73)	21 (0.83 / 0.85)	46 (1.81)	44 (1.73 / 1.75)	105 (4.13)
25	86 (3.4)	44 (1.73)	20 (0.79)	26 (1.02)	58 (2.29)	62 (2.44)	135 (5.32)

Dimensions in millimeters (inches)

VPP-R-16
1:1



VPPB-R
1:2



Size	∅ D1	∅ D2	∅ D3	L1	L2	L3	L4	L5
16	10.5 (0.41)	M33x2	M27x2	48 (1.89)	66 (2.60)	168 (6.61)	33 (1.30)	57 (2.24)
25	13 (0.51)	M42x2	M33x2	60 (2.36)	85 (3.35)	218 (8.58)	42.5 (1.67)	68 (2.68)

Ordering Code

VPP **-R-** **-** **-** **-** **-** **-**

Pressure relief valve, poppet type, direct acting

Design of valve
screw-in cartridge valve with a body **B**

Valve size
size 16 **16**
size 25 **25**

Range of adjustable pressure - pressure stage size 16
50 - 130 bar (730 - 1890 PSI) **5**
130 - 280 bar (1890 - 4060 PSI) **13**
280 - 350 bar (4060 - 5080 PSI) **28**

Range of adjustable pressure - pressure stage size 25
50 - 100 bar (730 - 1450 PSI) **5**
100 - 200 bar (1450 - 2900 PSI) **10**
200 - 350 bar (2900 - 5080 PSI) **20**

Surface treatment
A zinc-coated (ZnCr-3), ISO 9227 (240 h)
B zinc-coated (ZnNi), ISO 9227 (520 h)

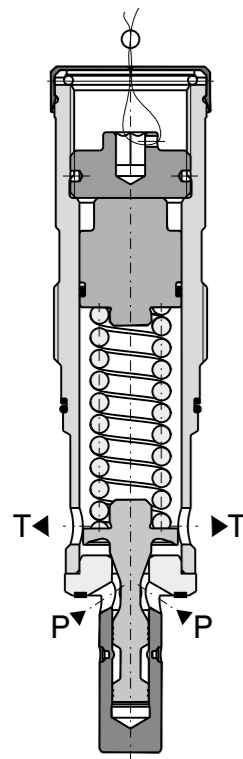
Seals
No designation NBR
V FPM (Viton)

Adjustment option
S allen key (hex. 8), without protective cap
T allen key (hex. 8), with protective cap
L allen key (hex. 8), with protective cap, sealable (lockwire holes)

Pressure Relief Valve, PED Certified, Poppet Type, Direct Acting

VPP-R-16-xx-L-CE1017

M36x2 • Q_{max} 120 l/min (32 GPM) • p_{max} 350 bar (5100 PSI)



Technical Features

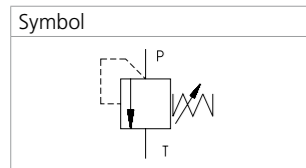
- Hydraulic safety relief valve suitable for use as a safety device in Category IV Group 2 applications acc.to European Commission (EC) Pressure Equipment Directive (PED) 2014/68/EU
- CE marked valves are supplied with "Declaration of Conformity", "Operating Instructions" and the list of residual risks
- Always follow the operating instructions supplied with the valve!
- Large flow range and pressure up to 350 bar
- Low hysteresis, accurate pressure control and low pressure drop through CFD optimized flow paths
- Hardened precision parts
- Leak-free closing, suitable for fast cycling with long life
- Adjustment option with allen head, adjustable hand knob or sealing (Lockwire holes)
- In the standard version, the valve is zinc coated for 240 h protection acc. to ISO 9227

Functional Description

A poppet type, direct acting hydraulic relief valve in the form of a screw-in cartridge intended for use as a pressure limiting device for common hydraulic circuit protection. The spring acts on the poppet and presses it onto the valve seat. If the hydraulic pressure is below the pre-set value, the valve is closed. If the hydraulic force exceeds the pre-set value the valve opens and flow passes to the tank port until the system pressure falls below the spring pre-set value and the valve closes again.

Technical Data

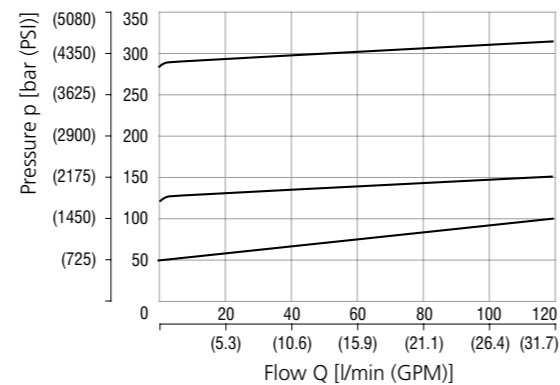
Valve size		M36x2
Max. flow	l/min (GPM)	120 (31.7)
Max. inlet pressure (port P)	bar (PSI)	350 (5080)
Max. outlet pressure (port T)	bar (PSI)	250 (3630)
Fluid temperature range (NBR)	°C (°F)	-30 ... +100 (-22 ... 212)
Fluid temperature range (FPM)	°C (°F)	-20 ... +120 (-4 ... 248)
Max. leakage of closed valve at the input pressure set on 80 % of cracking pressure	cm ³ /min	0.2
Kinematic viscosity range	mm ² /s (SUS)	10 ... 500 (49 ... 2450)
	Weight	
	valve	kg (lbs)
	valve with body	3.05 (6.73)
	Datasheet	Type
General information	GI_0060	Products and operating conditions
Spare parts	SP_8010	



Characteristics measured at v = 32 mm²/s (156 SUS)

Relief pressure related to flow rate

Pressure stage	Pressure range (PSI)
3	280 - 350
2	130 - 280
1	50 - 130



Valve adjusted at the manufacturer

- The valve is adjusted for the specified cracking pressure at the relevant flow rate and it is fitted with tamper-indicating seal.
- The pressure and flow rate values are indicated in the valve description [in bar, or liters per min respectively].
- The seal bear the ARGO-HYTOS logo.

Unadjusted valve

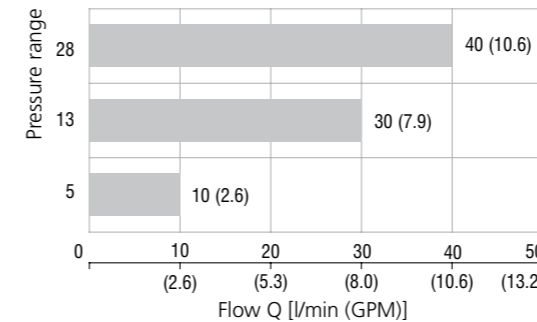
- The valve have no tamper-indicating seal.
- No adjusted pressure and flow rate are indicated for unadjusted valve - VPP-R-16-xx-L-CE1017.
- The adjusting screw is completely loosened. Pressure p = 0 bar
- For the adjustment of the valve required pressure, proceed as follows:
 - Turn right = higher pressure
 - Turn left = lower pressure
- Producer ARGO-HYTOS (CZ) takes no responsibility for the adjustment, securing and sealing the valve.

Residual risks

Residual risks are listed and preventive measures against the occurrence of residual risk are described in the document „Operating instructions for pressure relief valve VPP-R-16-xx-L-CE1017“ which is delivered with each valve.

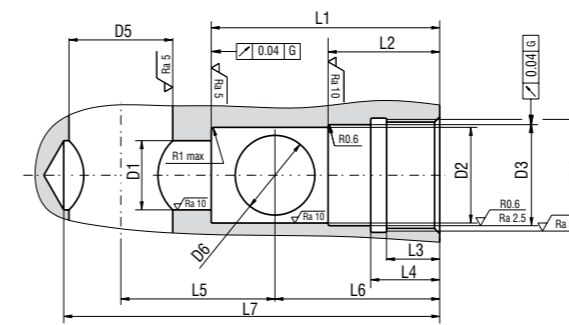
Application area

The diagram shows the area of the valve application meets the requirement of Directive 2014/68/EU and Standard ISO 4126-1 on maximal short-time overshooting of system pressure 10 % above the set cracking pressure when the valve opens. The dynamics of the valves depends on the kinematic viscosity of working fluid. Measurement conditions: oil Renolin VG 32, T = 40 °C (104 °F), V = 0.5 l (0.132 gallon US)



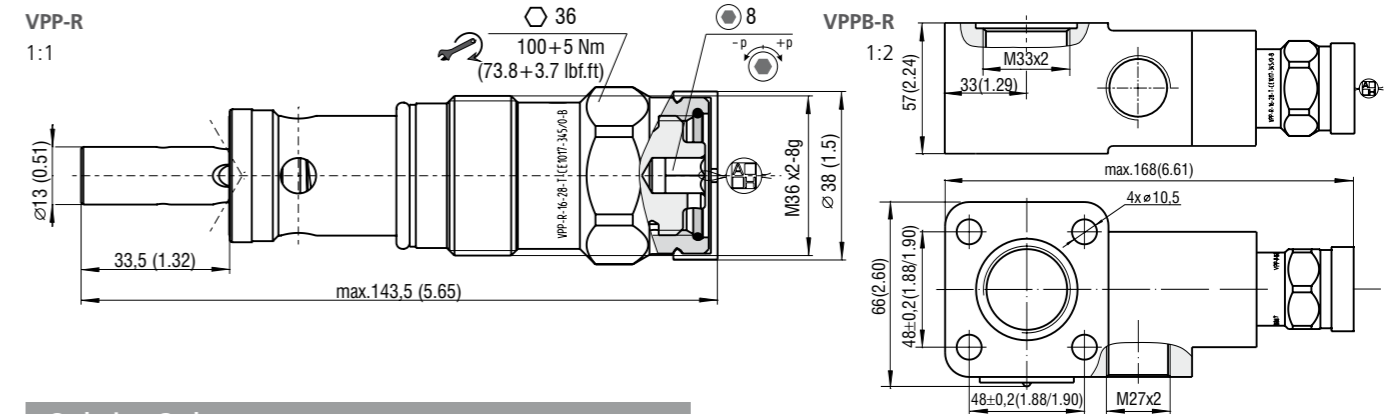
Operating region characteristics from certification of VPP-R-16*CE1017*

Cavity dimensions in millimeters (inches)



Dimensions in mm (in)			
∅ D1	20 H14 (0.79)	L1	66 (2.6 / 2.61)
∅ D2	30 H11 (1.18)	L2	31 (1.22 / 1.22)
∅ D3	32,6 H10 (1.28)	L3	18 (0.71 / 0.73)
∅ D4	M36x2-7H	L4	21 (0.83 / 0.85)
∅ D5	30 (1.18)	L5	46 (1.81)
∅ D6	25 max (0.98 max)	L6	44 (1.73 / 1.75)
		L7	105 (4.13)

Dimensions in millimeters (inches)



Ordering Code

VPP -R-16- - L - - CE1017- -

- Pressure relief valve**
PED certified,
direct acting
- Design of valve**
screw-in cartridge valve
with a body
- Valve size**
M36x2
- Range of adjustable pressure - pressure stage**
50 - 130 bar (730 - 1890 PSI) **5**
130 - 280 bar (1890 - 4060 PSI) **13**
280 - 350 bar (4060 - 5080 PSI) **28**
- Surface treatment**
A zinc-coated (ZnCr-3), ISO 9227 (240 h)
B zinc-coated (ZnNi), ISO 9227 (520 h)
- Preset cracking pressure at defined flow**
120/5.8 (example) 120 bar / 5.8 l/min
- Certification PED**
notified body number CE1017
- Seals**
NBR
FPM (Viton)
- Adjustment option**
allen head HEX 8 with protective cap and sealing (Lockwire holes)

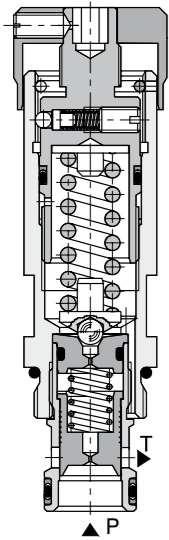
If not preset valves are ordered, pressure and flow rate information is not shown.

Pressure Relief Valve, Spool Type, Pilot Operated, External Pilot and Drain

VPN1-06/S

M22x1.5 • Q_{max} 70 l/min (18.5 GPM) • p_{max} 320 bar (4600 PSI)

Model S



Technical Features

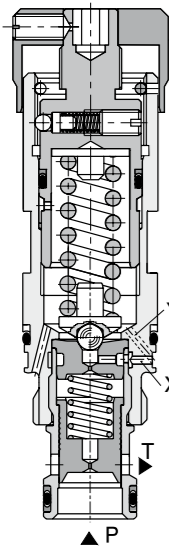
- ▶ Excellent stability throughout flow range with rapid response to dynamic pressure changes
- ▶ Low hysteresis, accurate pressure control and low pressure drop
- ▶ Wide pressure range up to 320 bar
- ▶ High flow capacity
- ▶ Hardened precision parts
- ▶ Ideal for use as control valve where accuracy and repeatability is required
- ▶ External pilot and drain option
- ▶ Adjustable by allen key or hand screw, optionally sealable (lockwire holes)
- ▶ In the standard version, the valve is zinc-coated for 240 h protection acc. to ISO 9227

Functional Description

A pilot operated, spool type hydraulic relief valve in the form of a screw-in cartridge intended for use as a pressure limiting device. Fast-acting with low hysteresis. Because of the absence of any internal seals, the valve shows excellent reseating and repeatability characteristics. It may be used as a main pressure control element but due to its two stage design it is not recommended for safety applications where operating speed is critical. Version SX has an external pilot line, version SY allows a separate drain connection.

Model	S	SX	SY
Symbol			

Model SX (SY)



Technical Data

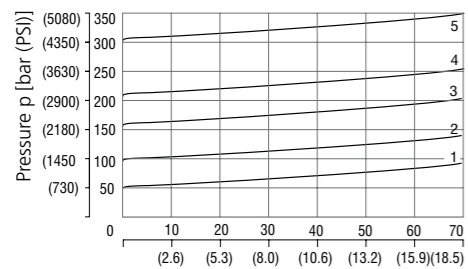
Valve size / Cartridge cavity		M22x1.5 / QG2	M22x1.5 / RD3
Model		S	SX, SY
Max. flow	l/min (GPM)	70 (18.5)	
Max. operating pressure	bar (PSI)	320 (4640)	
Fluid temperature range (NBR)	°C (°F)	-30 ... +100 (-22 ... 212)	
Fluid temperature range (FPM)	°C (°F)	-20 ... +120 (-4 ... 248)	
Mass	kg (lbs)	0.25 (0.55)	

General information		Datasheet	Type	
GI_0060			Products and operating conditions	
Valve bodies	In-line mounted	SB_0018	SB-QG2*	-
	Sandwich mounted	SB-04(06)_0028	SB-*QG2*	-
Cavity details	SMT_0019	SMT-QG2*	SMT-RD3*	
Spare parts	SP_8010			

Characteristics measured at v = 32 mm²/s (156 SUS)

Relief pressure related to flow rate

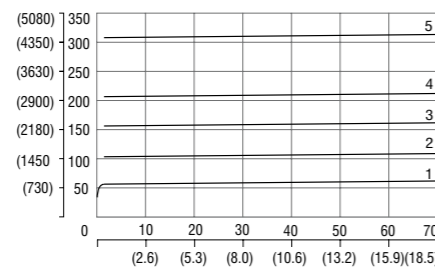
Model S, SX



Flow Q [l/min (GPM)]	Pressure range
5	32
4	21
3	16
2	10
1	6

Relief pressure related to flow rate

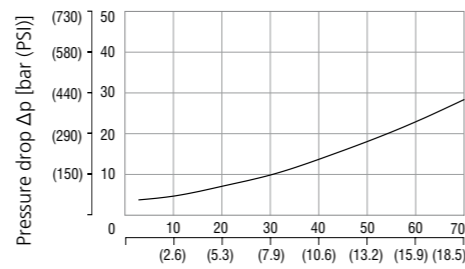
Model SY



Flow Q [l/min (GPM)]	Pressure range
5	32
4	21
3	16
2	10
1	6

Minimum set and circulation pressure

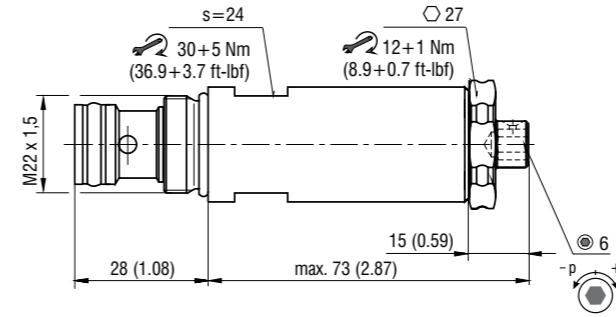
Model S, SX, SY



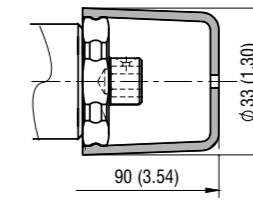
Dimensions in millimeters (inches)

VPN1-06/S

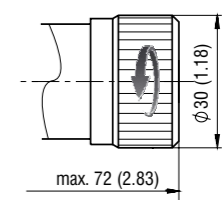
Model S



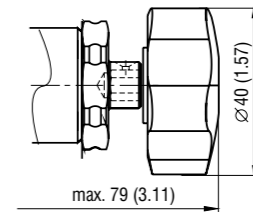
Model T



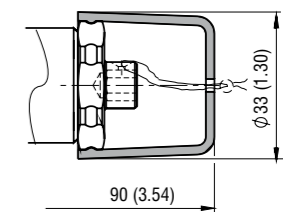
Model RS



Model RP

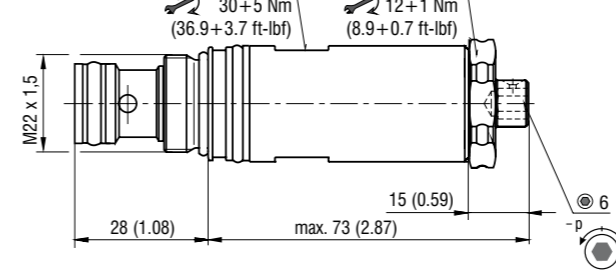


Model L

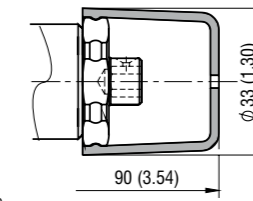


VPN1-06/SX (SY)

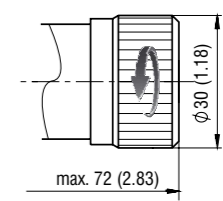
Model S



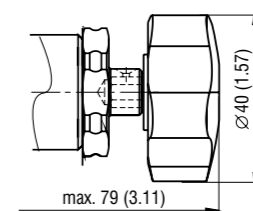
Model T



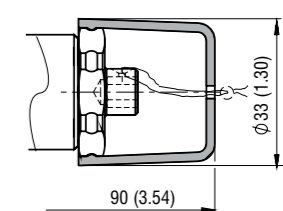
Model RS



Model RP



Model L



Ordering Code

VPN1-06 / [] - [] - [] - []

Pressure relief valve, spool type, pilot operated, external pilot and drain M22x1.5

Model
internal pilot and drain S
external pilot, internal drain SX
internal pilot, external drain SY

Pressure range
up to 63 bar (910 PSI) 6
up to 100 bar (1450 PSI) 10
up to 160 bar (2320 PSI) 16
up to 210 bar (3050 PSI) 21
up to 320 bar (4600 PSI) 32

Surface treatment
A zinc-coated (ZnCr-3), ISO 9227 (240 h)
B zinc-coated (ZnNi), ISO 9227 (520 h)

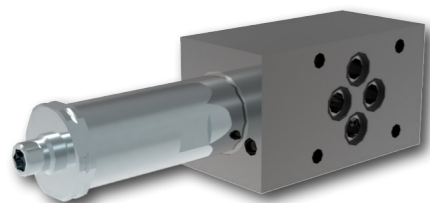
Seals
No designation NBR
V FPM (Viton)

Adjustment option
S allen key (hex. 6), without protective cap
T allen key (hex. 6), with protective cap
RS hand screw, metal
RP hand screw, plastic
L allen key (hex. 6), with protective cap, sealable (lockwire holes)

Pressure Relief Valve, Spool Type, Pilot Operated, Modular

VPN1-06/M(R)

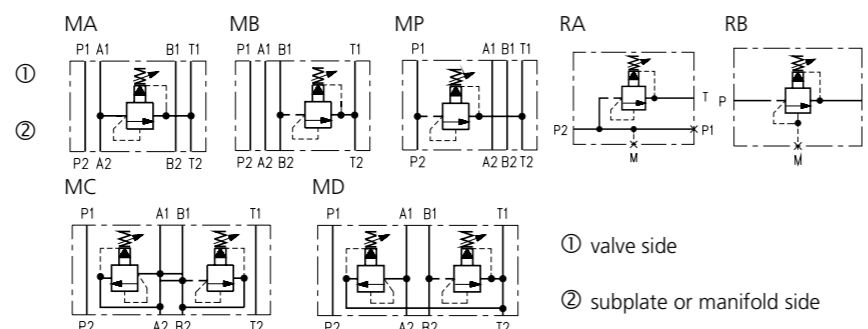
Size 04 (D02), 06 (D03) • Q_{max} 70 l/min (18.5 GPM) • p_{max} 320 bar (4600 PSI)



Technical Features

- › Pressure relief valve, spool type, pilot operated, with mounting interface acc. to ISO 4401, DIN 24340 (CETOP 02 and 03) or in-line design
- › Excellent stability throughout flow range with rapid response to dynamic pressure changes
- › Low hysteresis, accurate pressure control and low pressure drop
- › Wide pressure range up to 320 bar
- › High flow capacity
- › Hardened precision parts
- › Ideal for use as control valve where accuracy and repeatability is required
- › Adjustable by allen key or hand screw, optionally sealable (lockwire holes)
- › In the standard version, the valve housing is phosphated and steel parts are zinc-coated for 240 h protection acc. to ISO 9227

Functional Symbols

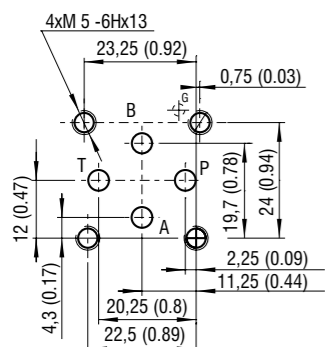


Notice: The orientation of the symbol on the name plate corresponds with the valve function.

Technical Data

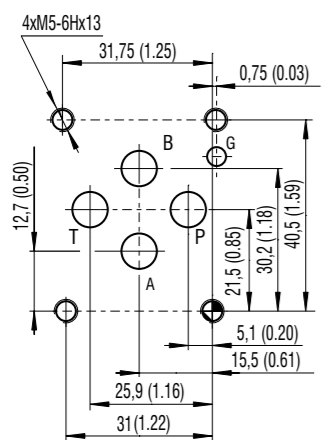
Valve size	04 (D02), 06 (D03)	
Max. flow	l/min (GPM)	70 (18.5)
Max. pressure (ports P, T)	bar (PSI)	320 (4640)
Fluid temperature range (NBR)	°C (°F)	-30...+100 (-22...+212)
Fluid temperature range (FPM)	°C (°F)	-20...+120 (-4...+248)
Mass	kg (lbs)	
- models MA (B, P) 04		0.82 (1.81)
- models MC (D) 04		1.32 (2.91)
- models MA (B, P) 06		1.2 (2.64)
- models MC (D) 06		1.5 (3.31)
- models RA1 (2), RB1 (2)		1.25 (2.76)
Datasheet	Type	
General information	GI_0060	Products operating conditions
Mounting interface	SMT_0019	Size 04 / 06
Spare parts	SP_8010	

ISO 4401-02-01-0-05



Ports P, A, B, T - max Ø4.5 mm (0.18 in)

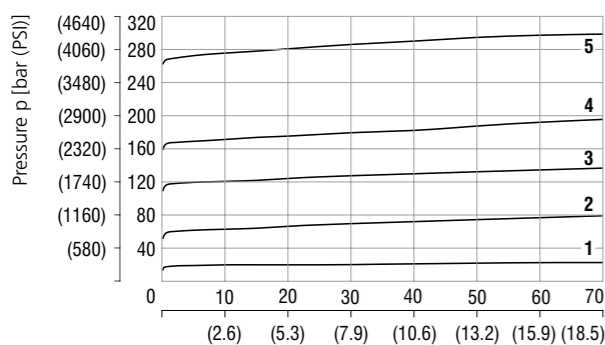
ISO 4401-03-02-0-05



Ports P, A, B, T - max Ø7.5 mm (0.29 in)

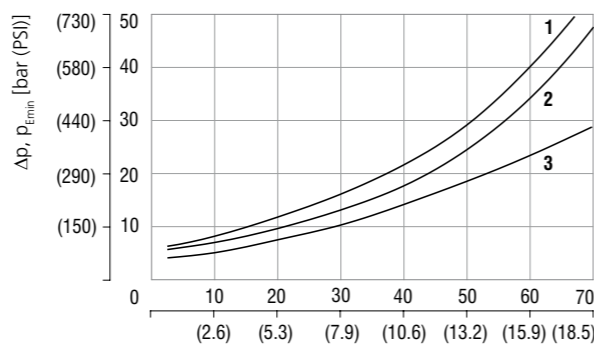
Characteristics measured at v = 32 mm³/s (156 SUS)

Relief pressure related to flow rate



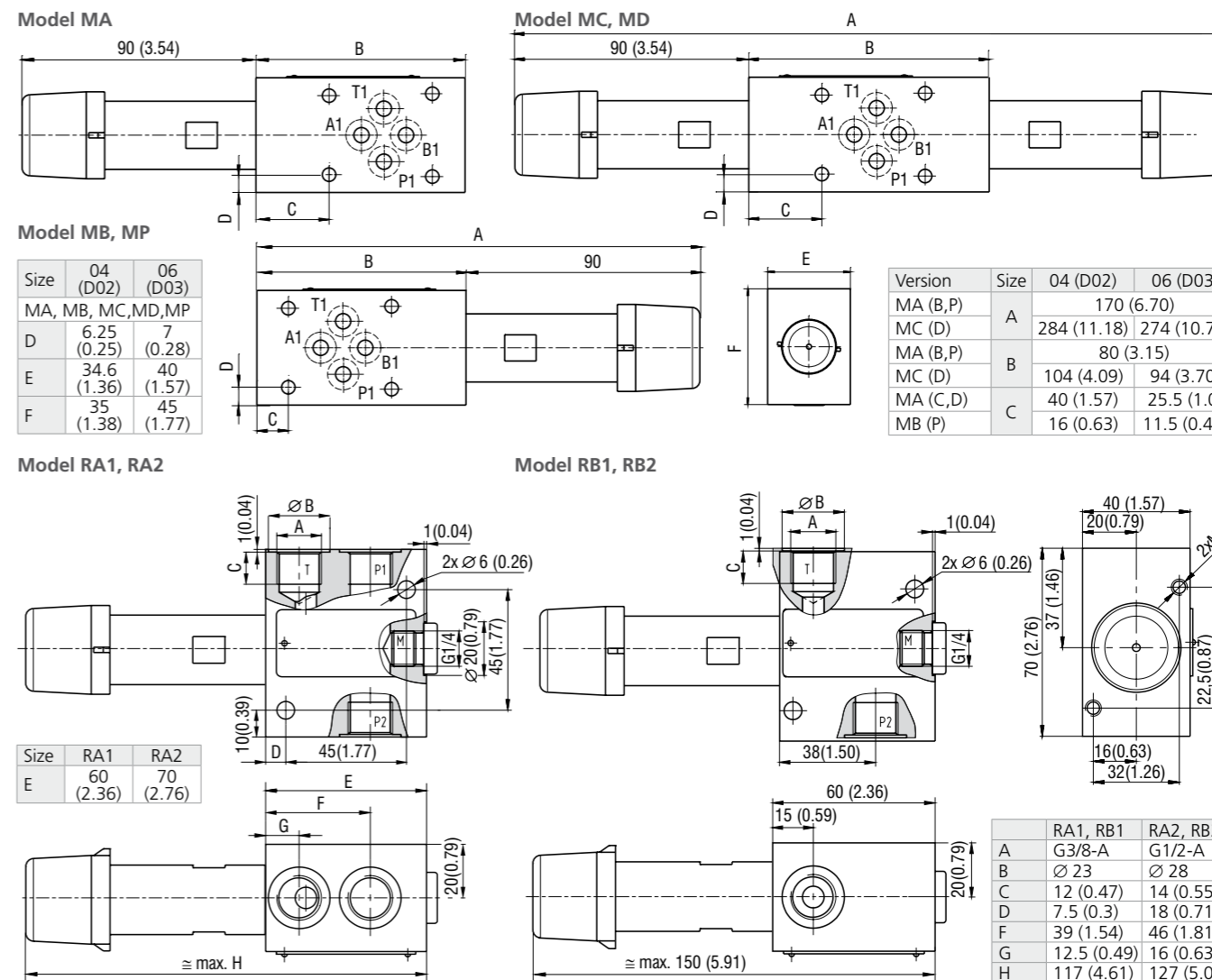
Pressure range	6	10	16	21	32
	1	2	3	4	5

Minimum set and circulation pressure



Models	MC	MA, MB MP, MD	RA, RB
	1	2	3

Dimensions in millimeters (inches)



Ordering Code

VPN1-06 / [] - [] - [] - [] - []

Pressure relief valve, spool type, pilot operated, modular

Surface treatment

- No designation: body phosphated, steel parts zinc-coated (ZnCr-3), ISO 9227 (240 h)
- A: zinc-coated (ZnCr-3), ISO 9227 (240 h)
- B: zinc-coated (ZnNi), ISO 9227 (520 h)

Seals

- No designation: NBR
- V: FPM (Viton)

Adjustment option*

- S: allen key (hex. 6), without protective cap
- T: allen key (hex. 6), with protective cap
- RS: hand screw, metal
- RP: hand screw, plastic
- L: allen key (hex. 6), with protective cap, sealable (lockwire holes)

Model with two pressure relief cartridges

- S/RS: A side, allen key (hex. 6), without protective cap
- V: B side, hand screw, metal

*for dimensions of adjustment options see data sheet No.5161

Pressure range

- 6: up to 63 bar (910 PSI)
- 10: up to 100 bar (1450 PSI)
- 16: up to 160 bar (2320 PSI)
- 21: up to 210 bar (3050 PSI)
- 32: up to 320 bar (4600 PSI)

Modular plate size

- ISO 4401-02-01-0-05, DIN 24340 (CETOP 02), size 04: **04**
- ISO 4401-03-02-0-05, DIN 24340 (CETOP 03), size 06: **06**

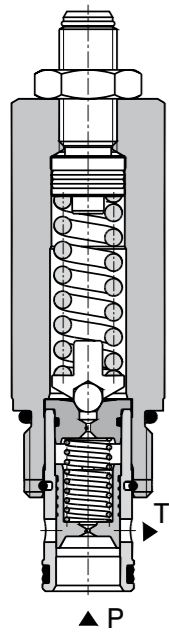
Model

- modular, valve from A to T: **MA**
- modular, valve from B to T: **MB**
- modular, valve from P to T: **MP**
- modular, valve from A to B and B to A: **MC**
- modular, valve from A to T and B to T: **MD**
- in-line valve, three ports, thread G 3/8 (P1, P2, T): **RA1**
- in-line valve, three ports, thread G 1/2 (P1, P2, T): **RA2**
- in-line valve, two ports, thread G 3/8 (P, T): **RB1**
- in-line valve, two ports, thread G 1/2 (P, T): **RB2**

Pressure Relief Valve, Spool Type, Pilot Operated

SR4A-B2

7/8-14 UNF • Q_{max} 100 l/min (26 GPM) • p_{max} 350 bar (5100 PSI)



Technical Features

- › Low hysteresis, accurate pressure control and low pressure drop through CFD optimized flow paths
- › Wide pressure range up to 350 bar
- › High flow capacity
- › Hardened precision parts
- › Ideal for use as control valve where accuracy and repeatability is required
- › Adjustable by allen key hand screw
- › In the standard version, the valve is zinc-coated for 240 h protection acc. to ISO 9227

Functional Description

A pilot operated, spool type hydraulic relief valve in the form of a screw-in cartridge intended for use as a pressure limiting device. Fast-acting with low hysteresis. Because of the absence of any internal seals, the valve shows excellent reseating and repeatability characteristics. It may be used as a main pressure control element but due to its two stage design it is not recommended for safety applications where operating speed is critical.



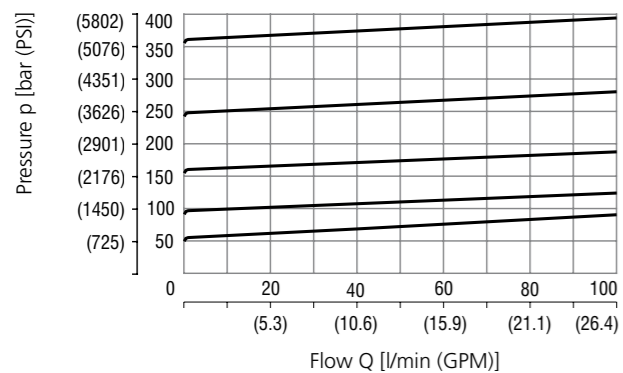
Technical Data

Valve size / Cartridge cavity		7/8-14 UNF-2A / B2
Max. flow	l/min (GPM)	100 (26)
Max. operating pressure	bar (PSI)	350 (5080)
Max. pressure (T port)	bar (PSI)	100 (1450)
Fluid temperature range (NBR)	°C (°F)	-30 ... +100 (-22 ... 212)
Fluid temperature range (FPM)	°C (°F)	-20 ... +120 (-4 ... 248)
Mass	kg (lbs)	0.24 (0.53)

		Datasheet	Type
General information		GP_0060	Products and operating conditions
Valve bodies	In-line mounted	SB_0018	SB-B2*
	Sandwich mounted	SB-04(06)_0028	SB-*B2*
Cavity details / Form tools		SMT_0019	SMT-B2*
Spare parts		SP_8010	

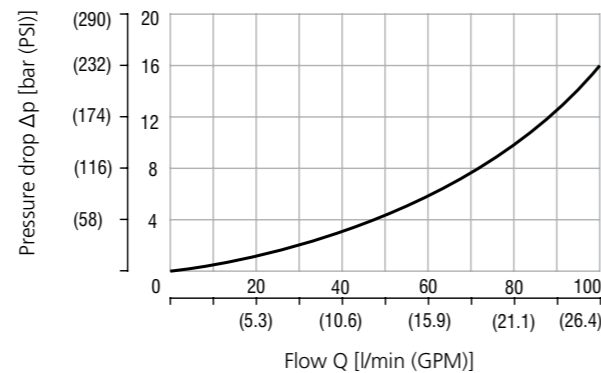
Characteristics measured at $v = 32 \text{ mm}^2/\text{s}$ (156 SUS)

Relief pressure related to flow rate



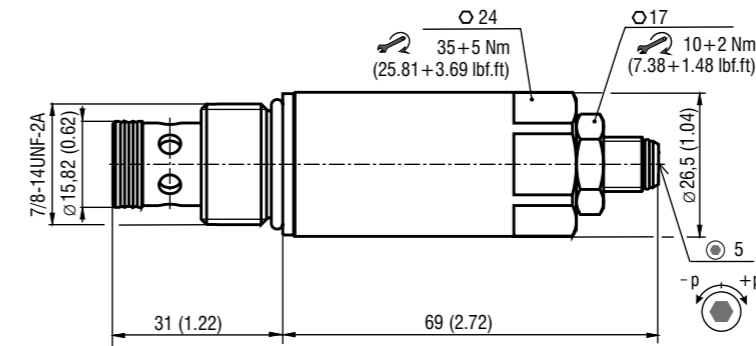
Pressure range	Value
5	35
4	25
3	16
2	10
1	6

Minimum set and circulation pressure

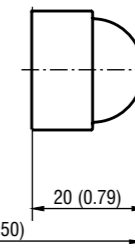


Dimensions in millimeters (inches)

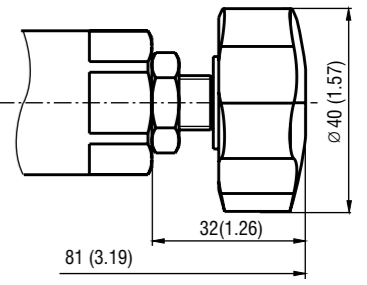
Model S



Model T



Model RP



Ordering Code

SR4A-B2 / [] [] [] [] - []

Pressure relief valve, spool type, pilot operated 7/8-14 UNF

Model
High performance **H**

Pressure range
up to 63 bar (910 PSI) **6**
up to 100 bar (1450 PSI) **10**
up to 160 bar (2320 PSI) **16**
up to 250 bar (3630 PSI) **25**
up to 350 bar (5080 PSI) **35**

Surface treatment
A zinc-coated (ZnCr-3), ISO 9227 (240 h)
B zinc-coated (ZnNi), ISO 9227 (520 h)

Seals
V No designation
NBR
FPM (Viton)

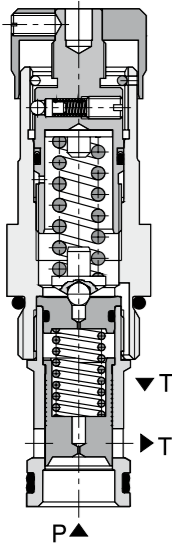
Adjustment option
S allen key (hex. 5), without protective cap
T allen key (hex. 5), with protective cap
RP hand screw, plastic

Pressure Relief Valve, Spool Type, Pilot Operated, External Pilot and Drain

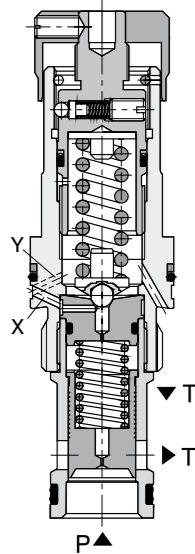
VPN2-10/S

M27x2 • Q_{max} 150 l/min (40 GPM) • p_{max} 350 bar (5100 PSI)

Model S



Model SX (SY)



Technical Features

- › Excellent stability throughout flow range with rapid response to dynamic pressure changes
- › Low hysteresis, accurate pressure control and low pressure drop
- › Wide pressure range up to 350 bar
- › High flow capacity
- › Hardened precision parts
- › Ideal for use as control valve where accuracy and repeatability is required
- › External pilot and drain option
- › Adjustable by allen key or hand screw, optionally sealable (lockwire holes)
- › In the standard version, the valve is zinc-coated for 240 h protection acc. to ISO 9227

Functional Description

A pilot operated, spool type hydraulic relief valve in the form of a screw-in cartridge intended for use as a pressure limiting device. Fast-acting with low hysteresis. Because of the absence of any internal seals, the valve shows excellent reseating and repeatability characteristics. It may be used as a main pressure control element but due to its two stage design it is not recommended for safety applications where operating speed is critical. Version SX has an external pilot line, version SY allows a separate drain connection.

Model	S	SX	SY
Symbol			

Technical Data

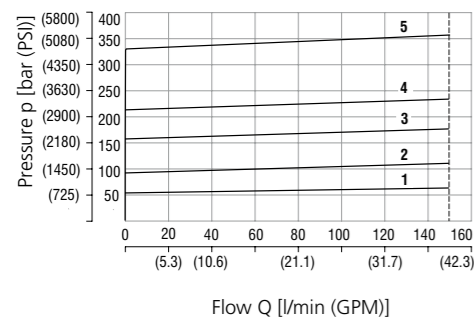
Valve size / Cartridge cavity		M27x2 / QK2	M27x2 / QL3
Model		S	SX, SY
Max. flow	l/min (GPM)	150 (39.6)	
Max. operating pressure	bar (PSI)	350 (5080)	
Fluid temperature range (NBR)	°C (°F)	-30 ... +100 (-22 ... 212)	
Fluid temperature range (FPM)	°C (°F)	-20 ... +120 (-4 ... 248)	
Mass	kg (lbs)	0.3 (0.66)	

General information		Datasheet	Type
Valve bodies		GI_0060	Products operating conditions
In-line mounted		SB_0018	SB-QK2*
Sandwich mounted		SB-04(06,10)_0028	-
Cavity details		SMT_0019	SMT-QK2*
Spare parts		SP_8010	SMT-QL3*

Characteristics measured at v = 32 mm²/s (156 SUS)

Relief pressure related to flow rate

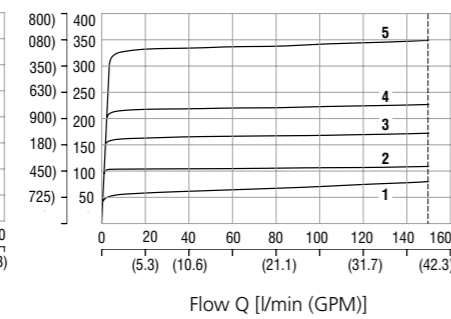
Model S, SX



Pressure range	Pressure range
5	32
4	21
3	16
2	10
1	6

Relief pressure related to flow rate

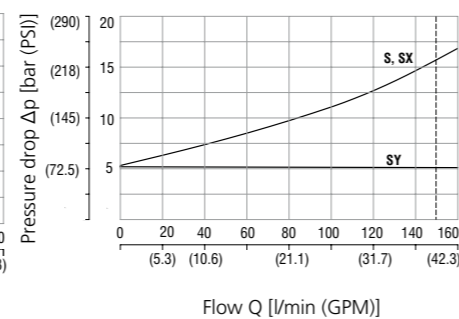
Model SY



Pressure range	Pressure range
5	32
4	21
3	16
2	10
1	6

Minimum set and circulation pressure

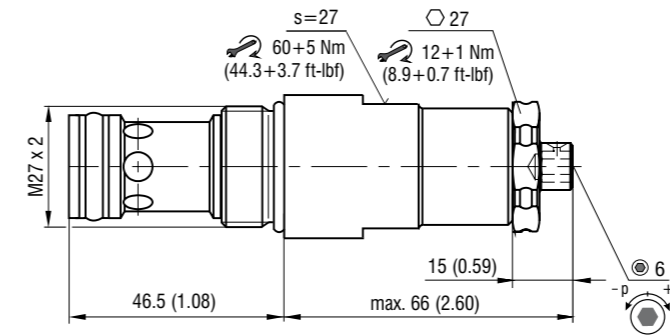
Model S, SX, SY



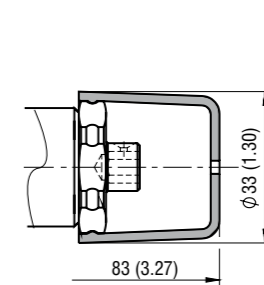
Dimensions in millimeters (inches)

VPN2-10/S

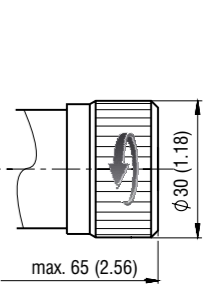
Model S



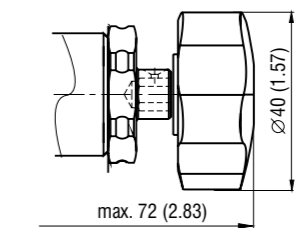
Model T



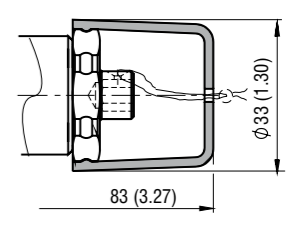
Model RS



Model RP

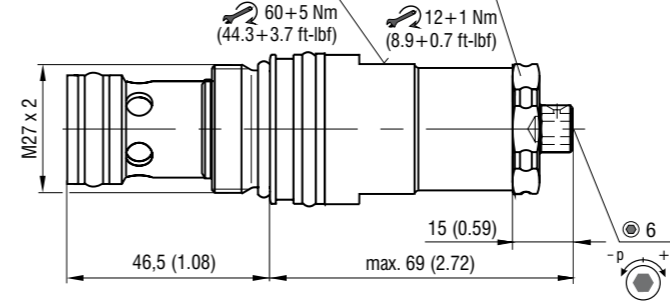


Model L

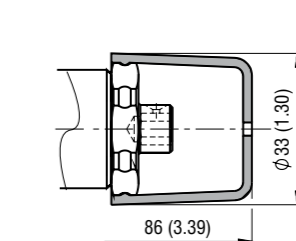


VPN2-10/SX (SY)

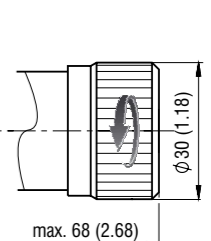
Model S



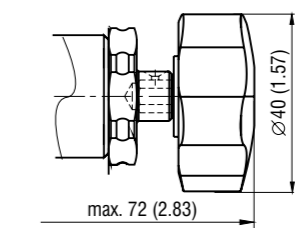
Model T



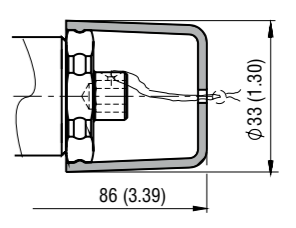
Model RS



Model RP



Model L



Ordering Code

VPN2-10 / [] - [] [] [] - []

Pressure relief valve, spool type, pilot operated, external pilot and drain M27x2

Model
 internal pilot and drain S
 external pilot, internal drain SX
 internal pilot, external drain SY

Pressure range
 up to 63 bar (910 PSI) 6
 up to 100 bar (1450 PSI) 10
 up to 160 bar (2320 PSI) 16
 up to 210 bar (3050 PSI) 21
 up to 320 bar (4600 PSI) 32

Surface treatment
 A zinc-coated (ZnCr-3), ISO 9227 (240 h)
 B zinc-coated (ZnNi, ISO 9227 (520 h)

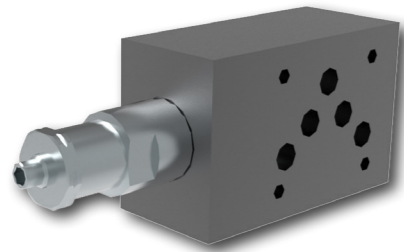
Seals
 No designation NBR
 V FPM (Viton)

Adjustment option
 S allen key (hex. 6), without protective cap
 T allen key (hex. 6), with protective cap
 RS hand screw, metal
 RP hand screw, plastic
 L allen key (hex. 6), with protective cap, sealable (lockwire holes)

Pressure Relief Valve, Spool Type, Pilot Operated, Modular

VPN2-10/M(R)

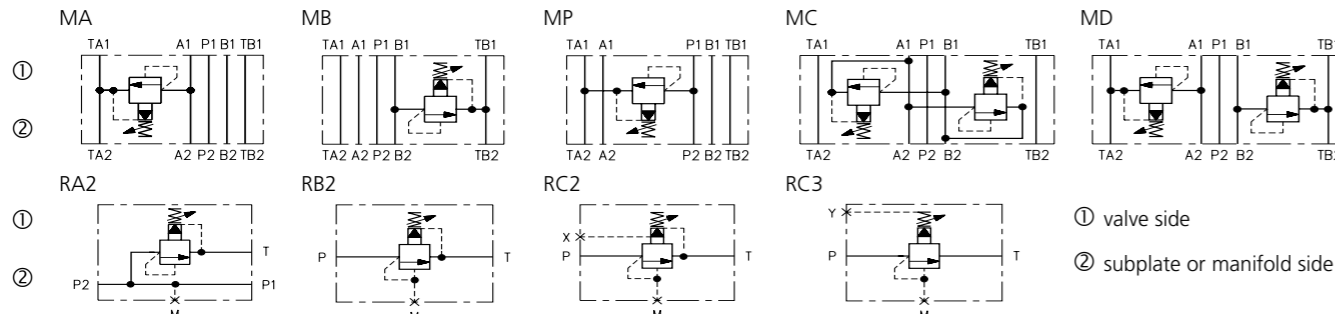
Size 10 (D05) • Q_{max} 150 l/min (40 GPM) • p_{max} 350 bar (5100 PSI)



Technical Features

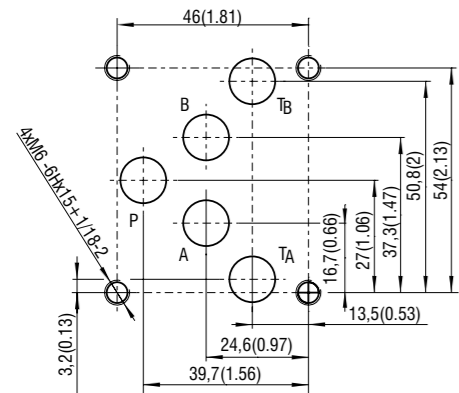
- › Pressure relief valve, spool type, pilot operated, with mounting interface acc. to ISO 4401, DIN 24340 (CETOP 05) or in-line design
- › Low hysteresis, accurate pressure control and low pressure drop
- › Wide pressure range up to 350 bar
- › High flow capacity
- › Hardened precision parts
- › Ideal for use as control valve where accuracy and repeatability is required
- › Adjustable by allen key or hand screw, optionally sealable (lockwire holes)
- › In the standard version, the valve housing is phosphated and steel parts are zinc-coated for 240 h protection acc. to ISO 9227

Functional Symbols



Notice: The orientation of the symbol on the name plate corresponds with the valve function.

ISO 4401-05-04-0-05



Ports P, A, B, T - max. Ø11.2 mm (0.44 in)

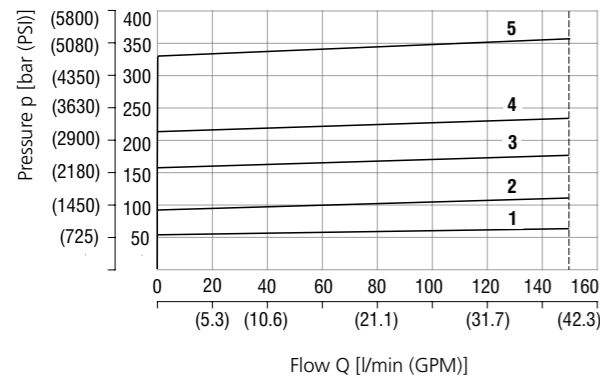
Technical Data

Valve size		10 (D05)
Max. flow	l/min (GPM)	150 (40)
Max. operating pressure	bar (PSI)	350 (5080)
Fluid temperature range (NBR)	°C (°F)	-30 ... +100 (-22 ... 212)
Fluid temperature range (FPM)	°C (°F)	-20 ... +120 (-4 ... 248)
Mass		
- models MA (B, P) 10	kg (lbs)	2.15 (4.74)
- models MC (D) 10		3.0 (6.61)
- models RA2, RB2, RC2 (3)		2.7 (5.95)

	Datasheet	Type
General information	GI_0060	Products and operating conditions
Mounting interface	SMT_0019	Size 10
Spare parts	SP_8010	

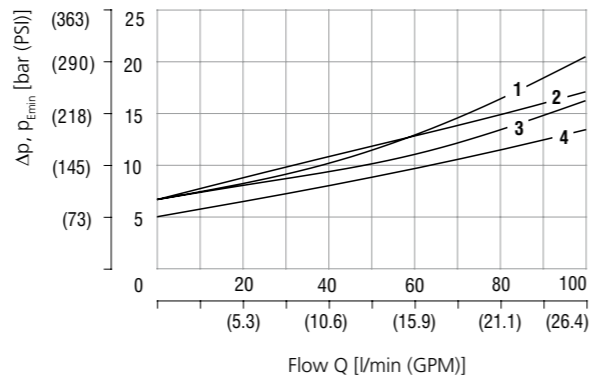
Characteristics measured at v = 32 mm²/s (156 SUS)

Relief pressure related to flow rate



Pressure range	6	10	16	21	32
	1	2	3	4	5

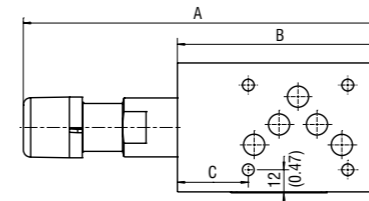
Minimum set and circulation pressure



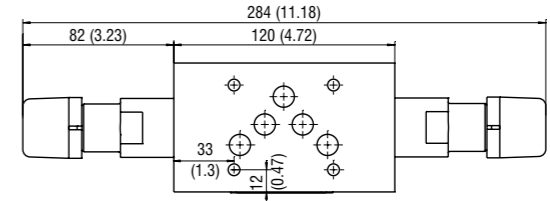
Models	MC	MP	MA, MB	RA, RB, RC
	1	2	3	4

Dimensions in millimeters (inches)

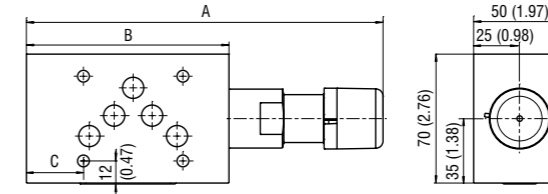
Model MA, MP



Model MC, MD

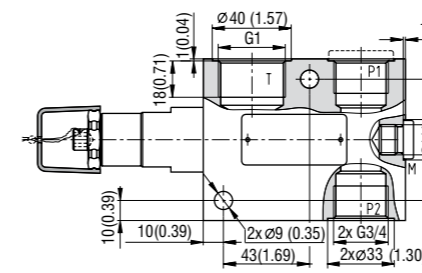


Model MB

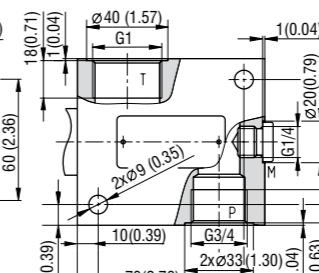


Size 10	A	B	C
MA	187 (7.36)	105 (4.13)	33 (1.30)
MB			38.5 (1.52)
MP	192 (7.56)	110 (4.33)	18 (0.71)

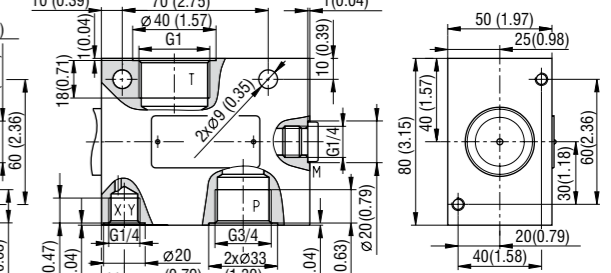
Model RA2



Model RB2



Model RC2, RC3



Ordering Code

VPN2-10 / [] - [] - [] - [] - []

Pressure relief valve, spool type, pilot operated, modular

Model
modular, valve from A to TA
modular, valve from B to TB
modular, valve from P to TA
modular, valve from A to B and B to A
modular, valve from A to TA and B to TB
in-line valve, three ports, thread P1, P2-G3/4, T-G1
in-line valve, two ports, thread P-G3/4, T-G1
in-line valve, two ports, thread P-G3/4, T-G1, X-G1/4
in-line valve, two ports, thread P-G3/4, T-G1, Y-G1/4

MA
MB
MP
MC
MD
RA2
RB2
RC2
RC3

Surface treatment
No designation body phosphated, steel parts zinc-coated (ZnCr-3), ISO 9227 (240 h)
A zinc-coated (ZnCr-3), ISO 9227 (240 h)
B zinc-coated (ZnNi, ISO 9227 (520 h)

Seals
No designation NBR
V FPM (Viton)

Adjustment option*
S allen key (hex. 6), without protective cap
T allen key (hex. 6), with protective cap
RS hand screw, metal
RP hand screw, plastic
L allen key (hex. 6), with protective cap, sealable (lockwire holes)
Model with two pressure relief cartridges
S/RS A side, allen key (hex. 6), without protective cap
B side, hand screw, metal

*for dimensions of adjustment options see data sheet No.5163

Pressure range
6 up to 63 bar (910 PSI)
10 up to 100 bar (1450 PSI)
16 up to 160 bar (2320 PSI)
21 up to 210 bar (3050 PSI)
32 up to 320 bar (4600 PSI)

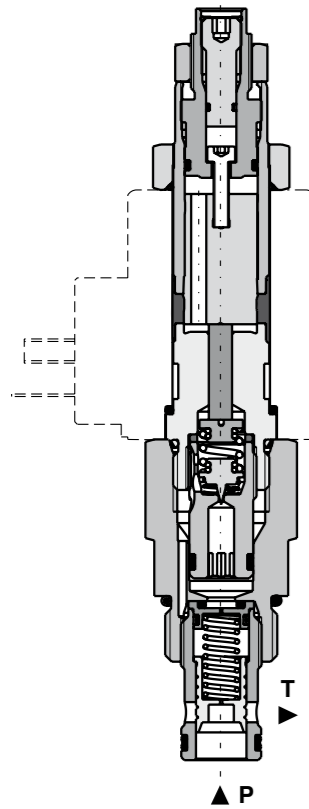
Modular plate size
ISO 4401-05-04-0-05, DIN 24340 (CETOP 05), size 10 **10**

Model with two pressure relief cartridges
32/10 320 bar (4600 PSI) in port A, 100 bar (1450 PSI) in port B

Pressure Relief Valve, Solenoid Operated, Spool Type, Piloted

SR4E-B2

7/8-14 UNF • Q_{max} 60 l/min (16 GPM) • p_{max} 350 bar (5100 PSI)



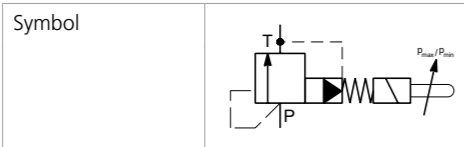
Technical Features

- › Combines the functionality of a normally-open solenoid valve with a pressure relief valve
- › Designed for cost-efficient and compact installation, typically used for motor control circuit
- › Two-stage pressure valve for ON/OFF function
- › Excellent stability throughout flow range with rapid response to dynamic pressure changes
- › Low hysteresis, accurate pressure control and low pressure drop through CFD optimized flow paths
- › Wide pressure range up to 350 bar
- › High flow capacity
- › Cartridges are voltage interchangeable
- › Coils interchangeable across SD*-B* product line
- › In the standard version, the valve is zinc-coated for 240 h protection acc. to ISO 9227

Functional Description

The valve is used as an integrated two-stage pressure valve for unloading the flow passage. It supports the setting of two pressure values, p_{min} and p_{max}. When energized the valve blocks the low-pressure passage and allows the pressure to rise at most to the circuit relief pressure (p_{max}). Both p_{min} and p_{max} are manually adjustable.

Any pressure at port T is additive to the valve setting, therefore port T should preferably be connected directly to tank. Unobstructed air venting is necessary for proper function of the valve. It is therefore recommended to install the valve in a vertical position with the solenoid facing downwards.

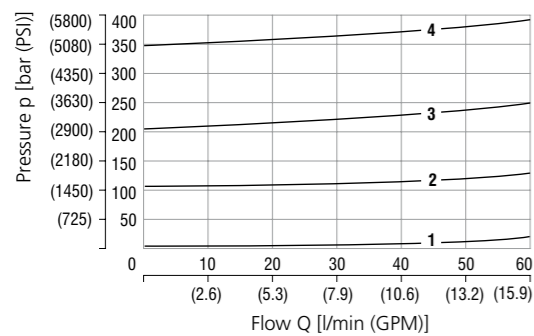


Technical Data

Valve size / Cartridge cavity		7/8-14 UNF-2A / B2
Max. flow	l/min (GPM)	60 (15.9)
Max. operating pressure	bar (PSI)	350 (5080)
Max. pressure (port T)	bar (PSI)	100 (1450)
Min. set pressure	bar (PSI)	7 (102)
Fluid temperature range (FPM)	°C (°F)	-20 ... +80 (-4 ... 176)
Ambient temperature range	°C (°F)	-20 ... +50 (-4 ... 122)
Supply voltage tolerance	%	AC, DC ± 10
Max. switching frequency	1/h	5 000
Mass	kg (lbs)	0.57 (1.23)
Mounting position: If possible, the valve should be mounted with the coil vertically downward.		
General information		Datasheet Type
Coil types		GI_0060 Products and operating conditions
Valve bodies		C_8007 C19B*
In-line mounted	SB_0018	SB-B2*
Sandwich mounted	SB-04(06)_0028	SB-*B2*
Cavity details / Form tools		SMT_0019 SMT-B2*
Spare parts		SP_8010

Characteristics measured at v = 32 mm²/s (156 SUS)

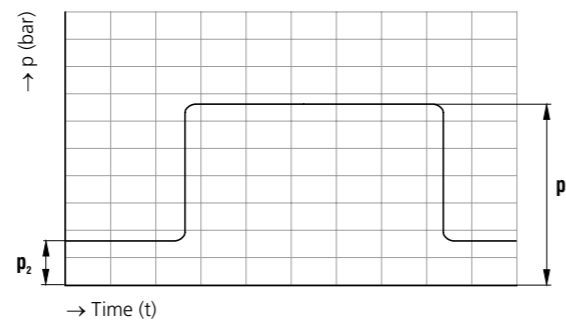
Relief pressure related to flow rate



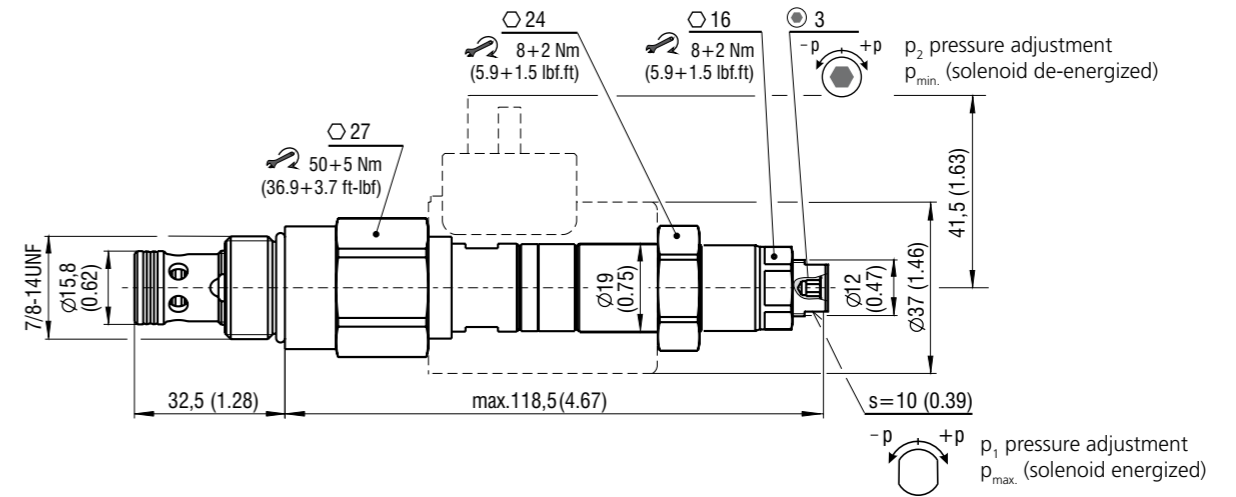
Example showing the adjustable pressures p₁ and p₂ (p₁ ≥ p₂)

p₁ (p_{max}, relief pressure) is set as the higher working pressure (solenoid energized)

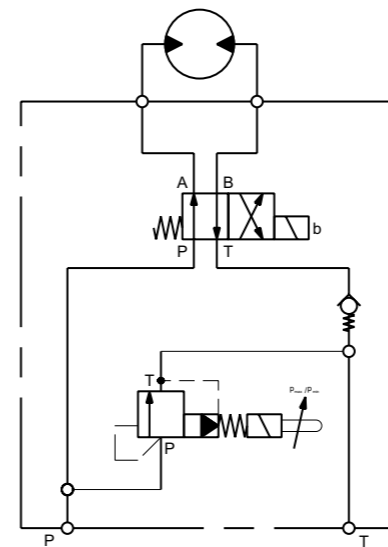
p₂ (p_{min}, vented pressure) is set as a lower working pressure (solenoid de-energized)



Dimensions in millimeters (inches)



Application example



The valve is used to unload a pump to tank with a very low pressure drop. This results in less heating of the oil and therefore lower energy costs for the user.

p₁ (p_{max}) must be set before p₂ (p_{min}). To set p₁, the solenoid is energized and the pressure adjusted with a flat wrench (size 10). The solenoid is then de-energized and the lower pressure adjusted with an allen key (hex. 3).

Ordering Code

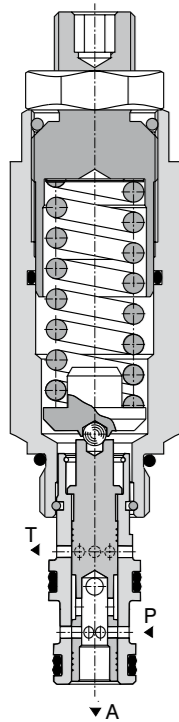
SR4E2-B2 / [] [] [] - []		
Pressure relief valve, solenoid operated, spool type, piloted 7/8-14 UNF		
Model High performance	H	
Pressure ranges up to 120 bar (1740 PSI) up to 210 bar (3050 PSI) up to 350 bar (3080 PSI)	12 21 35	
		Surface treatment A zinc-coated (ZnCr-3), ISO 9227 (240 h) B zinc-coated (ZnNi), ISO 9227 (520 h)
		Seals NBR FPM (Viton)
		No designation V

Pressure Reducing - Relieving Valve, Spool Type, Direct Acting

SP2A-A3

3/4-16 UNF • Q_{max} 20 l/min (5 GPM) • p_{max} 350 bar (5100 PSI)

Model S



Technical Features

- › Excellent stability throughout flow range with rapid response to dynamic pressure changes
- › Low hysteresis, accurate pressure control and low pressure drop
- › Wide pressure range up to 350 bar
- › Hardened precision parts
- › Adjustable by allen key or hand screw
- › In the standard version, the valve is zinc-coated for 240 h protection acc. to ISO 9227

Functional Description

The valve provides an adjustable regulated pressure level below supply pressure. This direct acting model is suitable for applications with lower flow rates and lower regulated pressures. In case of shock or surge pressures in the downstream line the valve acts as a relief valve, directing excessive pressure and flow to tank.



Technical Data

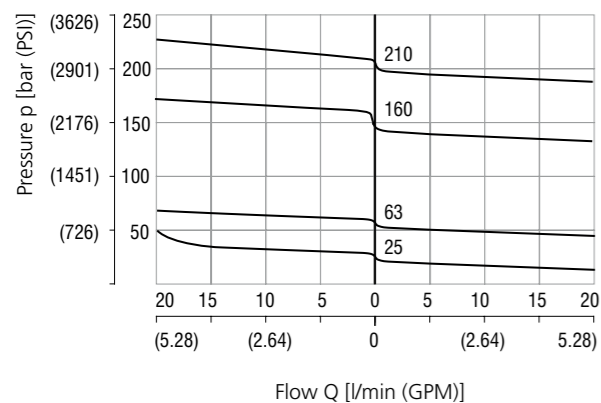
Valve size / Cartridge cavity		3/4-16 UNF-2A / A3			
Max. flow	l/min (GPM)	20 (5.3)			
Pressure range		2	6	16	21
Max. operating pressure (port P)	bar (PSI)	50 (730)	150 (2180)	250 (3630)	350 (5080)
Reduced pressure range (at Q = 5 l/min)	bar (PSI)	10-25 (150-360)	20-63 (290-910)	50-160 (730-2320)	100-210 (1450-3050)
Max. back pressure (port T)	bar (PSI)	200 (3630)			
Fluid temperature range (NBR)	°C (°F)	-30 ... +100 (-22 ... 212)			
Fluid temperature range (FPM)	°C (°F)	-20 ... +120 (-4 ... 248)			
Mass	kg (lbs)	0.13 (0.29)			

		Datasheet	Type
General information		GI_0060	Products and operating conditions
Valve bodies	In-line mounted	SB_0018	SB-A3*
	Sandwich mounted	SB-04(06)_0028	SB-*-A3*
Cavity details / Form tools		SMT_0019	SMT-A3*
Spare parts		SP_8010	

Characteristics measured at v = 32 mm²/s (156 SUS)

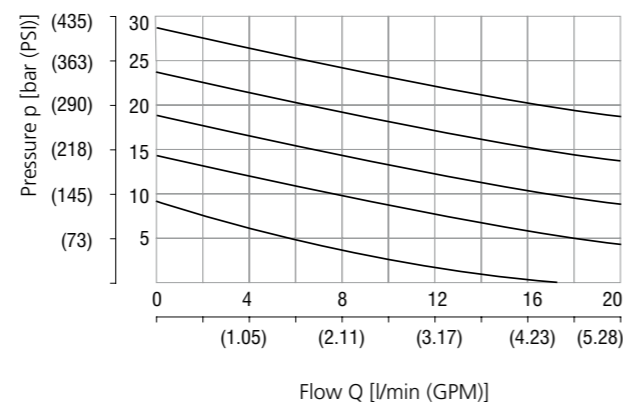
Reducing - relieving pressure related to flow rate

Relieving function A→T / Reducing function P→A



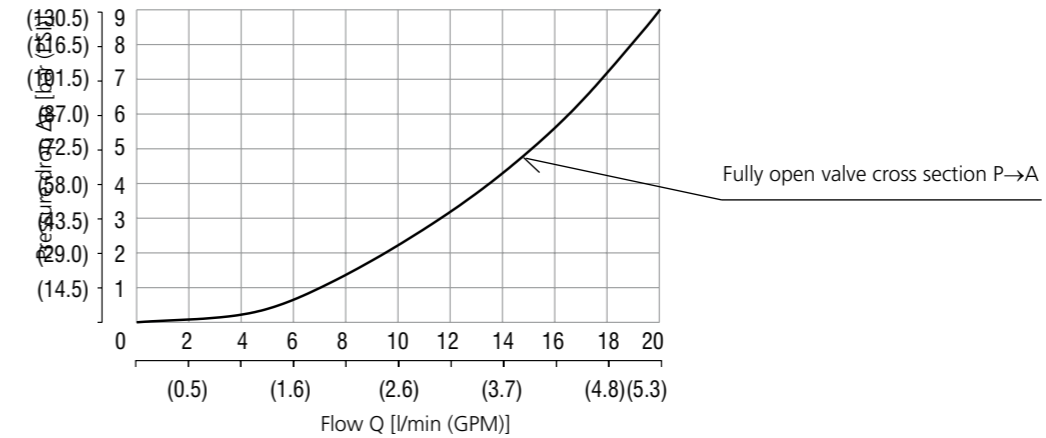
Minimum reducing pressure related to flow rate

Pressure range 6



Characteristics measured at v = 32 mm²/s (156 SUS)

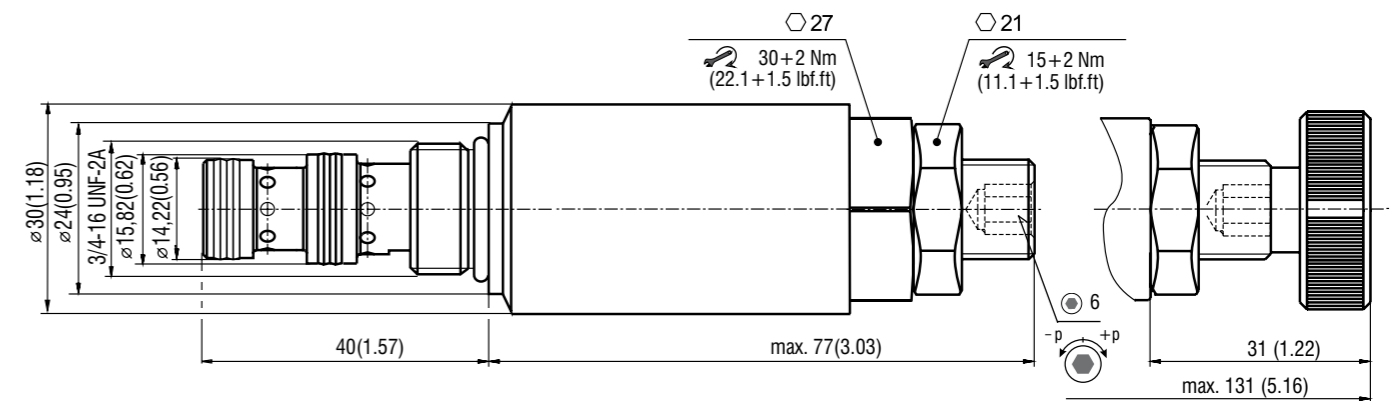
Pressure drop related to flow rate



Dimensions in millimeters (inches)

Model S

Model RS



Ordering Code

SP2A-A3 / [] [] [] [] - []

Pressure reducing - relieving valve, spool type, direct acting 3/4-16 UNF

Model Lightline

Reduced pressure ranges (at Q = 5 l/min)

10 - 25 bar (150 - 360 PSI)	2
20 - 63 bar (290 - 910 PSI)	6
50 - 160 bar (730 - 2320 PSI)	16
100 - 210 bar (1450 - 3050 PSI)	21

Surface treatment
A zinc-coated (ZnCr-3), ISO 9227 (240 h)
B zinc-coated (ZnNi), ISO 9227 (520 h)

Seals
NBR
FPM (Viton)

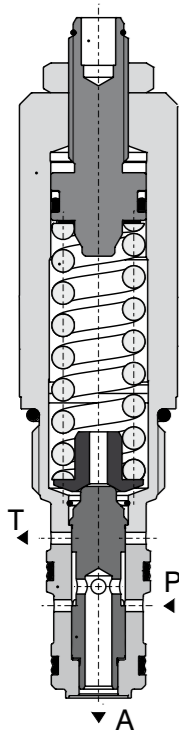
No designation V

Adjustment option
S allen key (hex. 6), without protective cap
RS hand screw, metal

Pressure Reducing - Relieving Valve, Spool Type, Direct Acting

SP2A-B3

7/8-14 UNF • Q_{max} 60 l/min (16 GPM) • p_{max} 420 bar (6100 PSI)



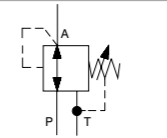
Technical Features

- › Excellent stability throughout flow range with rapid response to dynamic pressure changes
- › Low hysteresis, accurate pressure control and low pressure drop
- › Wide pressure range up to 420 bar
- › Hardened precision parts
- › Adjustable by allen key or hand screw
- › In the standard version, the valve is zinc-coated for 240 h protection acc. to ISO 9227

Functional Description

The valve provides an adjustable regulated pressure level below supply pressure. This direct acting model is suitable for applications with lower flow rates and lower regulated pressures. In cases of shock or surge pressures in the downstream line the valve acts as a relief valve, directing excessive pressure and flow to tank.

Symbol



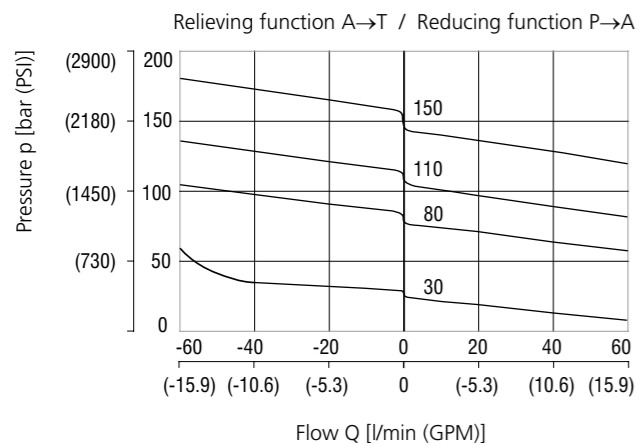
Technical Data

Valve size / Cartridge cavity		7/8-14 UNF-2A / B3			
Max. flow	l/min (GPM)	60 (15.9)			
Pressure range		3	8	11	15
Max. operating pressure	bar (PSI)	420 (6090)			
Reduced pressure range (at Q = 5 l/min)	bar (PSI)	10-30 (150-440)	20-80 (290-1160)	30-110 (440-1600)	40-150 (580-2180)
Max. back pressure (port T)	bar (PSI)	200 (3626)			
Fluid temperature range (NBR)	°C (°F)	-30 ... +100 (-22 ... 212)			
Fluid temperature range (FPM)	°C (°F)	-20 ... +120 (-4 ... 248)			
Mass	kg (lbs)	0.26 (0.57)			

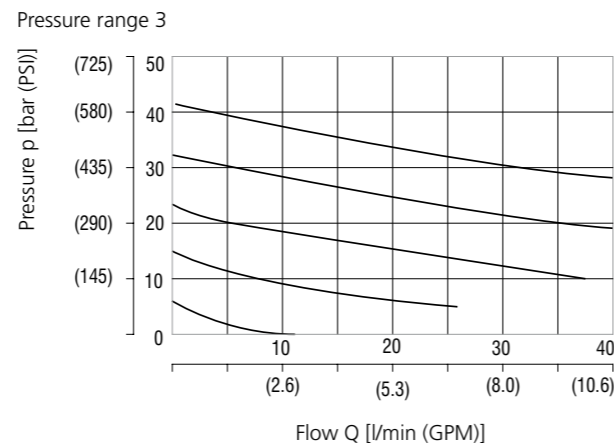
	Datasheet	Type
General information	GI_0060	Products and operating conditions
Valve bodies	In-line mounted	SB-B3*
	Sandwich mounted	SB-*-B3*
Cavity details / Form tools	SMT_0019	SMT-B3*
Spare parts	SP_8010	

Characteristics measured at v = 32 mm²/s (156 SUS)

Reducing - relieving pressure related to flow rate

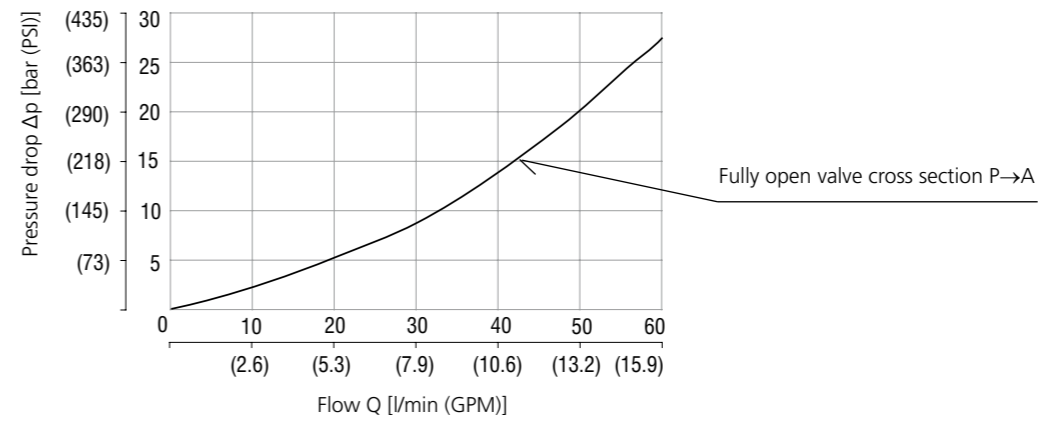


Minimum reducing pressure related to flow rate



Characteristics measured at v = 32 mm²/s (156 SUS)

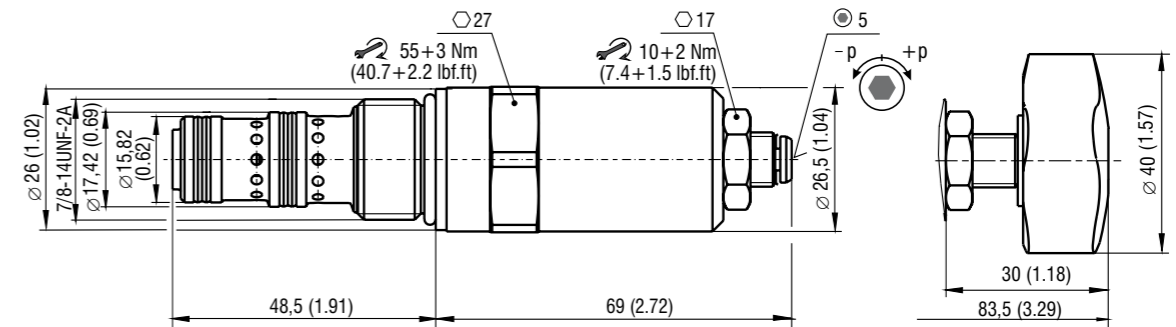
Pressure drop related to flow rate



Dimensions in millimeters (inches)

Model S

Model RP



Ordering Code

SP2A-B3 / [] [] [] [] - []

Pressure reducing - relieving valve, spool type, direct acting 7/8-14 UNF

Model
High performance **H**

Surface treatment
A zinc-coated (ZnCr-3), ISO 9227 (240 h)
B zinc-coated (ZnNi), ISO 9227 (520 h)

Seals
NBR
FPM (Viton)

No designation
V

Reduced pressure range (at Q = 5 l/min)

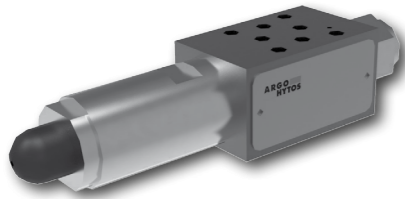
10 - 30 bar (150 - 440 PSI)	3
20 - 80 bar (290 - 1160 PSI)	8
30 - 110 bar (290 - 1600 PSI)	11
40 - 150 bar (580 - 2180 PSI)	15

Adjustment option
S allen key (hex. 5), without protective cap
RP hand screw, plastic

Pressure Reducing - Relieving Valve, Spool Type, Direct Acting, Modular

VRP2-04

Size 04 (D02) • Q_{max} 20 l/min (5 GPM) • p_{max} 320 bar (4600 PSI)



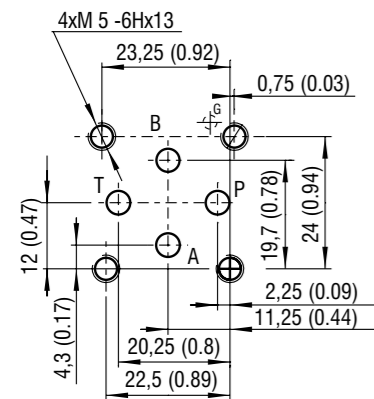
Technical Features

- › Pressure reducing - relieving valve, spool type, direct acting, with mounting interface acc. to ISO 4401, DIN 24340 (CETOP 02)
- › Excellent stability throughout flow range with rapid response to dynamic pressure changes
- › Low hysteresis, accurate pressure control and low pressure drop
- › Wide pressure range up to 320 bar
- › Hardened precision parts
- › Pressure reduction function in ports P, A, or B
- › Adjustable by allen key or hand screw
- › Good adjustment sensitivity with reduced drainage flow
- › In the standard version, the valve housing is phosphated and steel parts are zinc-coated for 240 h protection acc. to ISO 9227

Technical Data

Valve size	04 (D02)			
Max. flow	l/min (GPM)	20 (5.3)		
Max. operating pressure (ports P, A, B)	bar (PSI)	320 (4640)		
Max. operating pressure (port T)	bar (PSI)	210 (3050)		
Reduced pressure range (at Q = 5 l/min)	bar	10-25	20-63	30-160
	(PSI)	(150-360)	(290-910)	(440-2320)
Fluid temperature range (NBR)	°C (°F)	-30 ... +100 (-22 ... +212)		
Fluid temperature range (FPM)	°C (°F)	-20 ... +120 (-4 ... +248)		
Mass	- model "A"	0.82 (1.81)		
	- model "B", "P"	0.60 (1.32)		
Datasheet		Type		
General information	GI_0060	Products and operating conditions		
Mounting interface	SMT_0019	ISO 4401-02-01-0-05 DIN 24340 (CETOP 02)		
Spare parts	SP_8010			

ISO 4401-02-01-0-05



Ports P, A, B, T - max. Ø4.5 mm (0.18 in)

Functional Description

The pressure valves VRP2 are directly operated reducing-relieving valves for vertical stacking assemblies designed as 3 way valves, which means it includes pressure protection of the secondary circuit. The valve consists of the valve body, control spool, spring, and adjustment element. The body includes a port M with thread G 1/4 for attachment of a pressure measuring device or a by-pass free flow check valve.

Model A

In model A, the fluid enters the valve body from the primary circuit through port A1 and passes through the metering edge, where its pressure is reduced. The flow is passed to the output port A2 and on to the user. The reverse free flow from port A2 to port A1 passes through a check valve which is connected in parallel to the metering edge of the control spool.

Model B

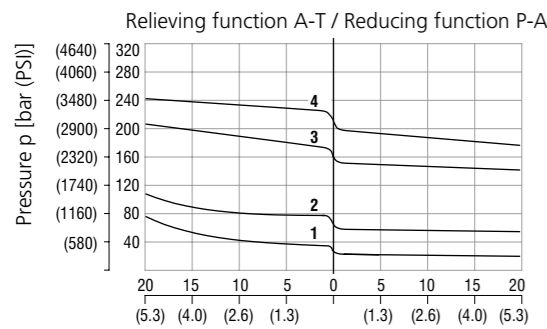
In model B, the pressure reduction occurs from port P2 to port P1, but only if the flow in port B passes towards the user (not opposite). The protection of the secondary circuit is therefore ensured for one flow direction only.

Model P

In model P, the pressure reduction occurs from port P2 to port P1, and is effective in both flow directions through the directional valve. Therefore, the protection of the secondary circuit is ensured for both flow directions.

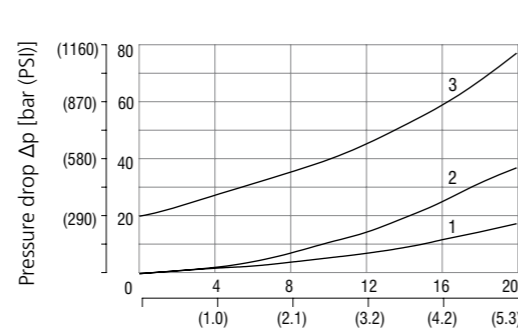
Characteristics measured at v = 32 mm²/s (156 SUS)

Reducing - relieving pressure related to flow rate



Pressure range	Flow range
4	21
3	16
2	6
1	2

Pressure drop related to flow rate

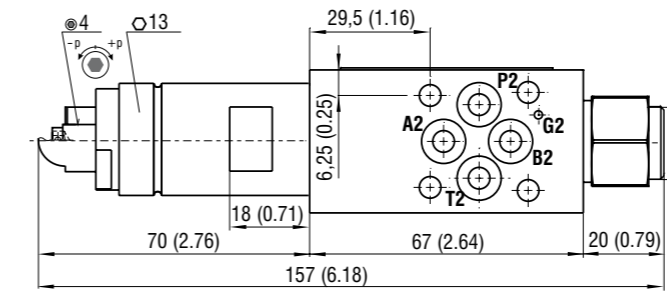


Direction	Model A	Models P, B
3	A2-T	P1-T
2	A1-A2	P2-P1
1	A2-A1	

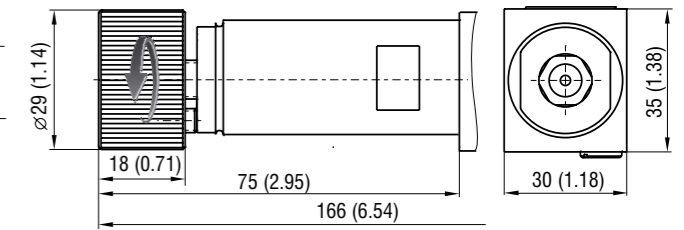
Dimensions in millimeters (inches)

Type „A“

Model S (T)

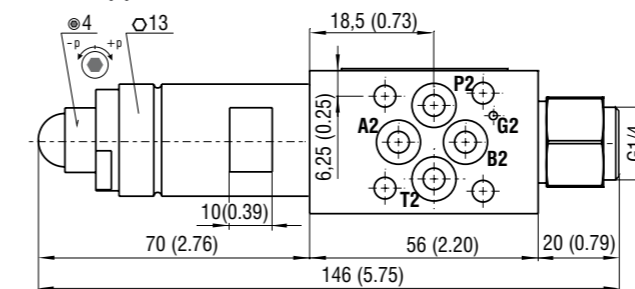


Model RS

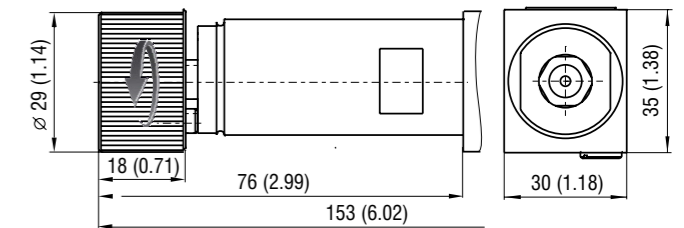


Type „B“ and „P“

Model S (T)

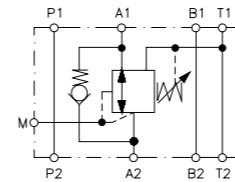


Model RS

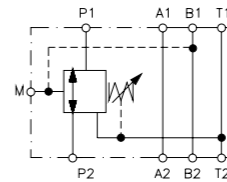


Functional symbols

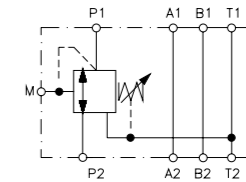
VRP2-04-A*



VRP2-04-B*



VRP2-04-P*



① valve side

② subplate or manifold side

Notice: The orientation of the symbol on the name plate corresponds with the valve function.

Ordering Code

VRP2 - 04 - [] / [] - []

Pressure reducing - relieving valve, spool type, direct acting, modular

Valve size
ISO 4401-02-01-0-05, DIN 24340 (CETOP 02), size 04

Surface treatment
No designation: body phosphated, steel parts
A: zinc-coated (ZnCr-3), ISO 9227 (240 h)
B: zinc-coated (ZnCr-3), ISO 9227 (240 h)
zinc-coated (ZnNi), ISO 9227 (520 h)

Seals
No designation: NBR
V: FPM (Viton)

Reduced pressure range (at Q = 5 l/min)
2: 10 - 25 bar (150 - 360 PSI)
6: 20 - 63 bar (290 - 910 PSI)
16: 30 - 160 bar (440 - 2320 PSI)
21: 50 - 210 bar (730 - 3050 PSI)

Model
Pressure reduction: on port A2, on port P1, on port P1
Pressure sensing: at port A2, at port B1, at port P1

Adjustment option
S: allen key (hex. 4), without protective cap
T: allen key (hex. 4), with protective cap
RS: hand screw, metal

Pressure Reducing - Relieving Valve, Spool Type, Direct Acting, Modular

VRP2-06

Size 06 (D03) • Q_{max} 50 l/min (13 GPM) • p_{max} 350 bar (5100 PSI)



Technical Features

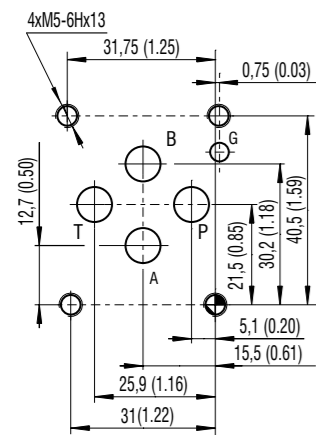
- › Pressure reducing - relieving valve, spool type, direct acting, with mounting interface acc. to ISO 4401, DIN 24340 (CETOP 03)
- › Excellent stability throughout flow range with rapid response to dynamic pressure changes
- › Low hysteresis, accurate pressure control and low pressure drop
- › Wide pressure range up to 350 bar
- › High flow capacity
- › Hardened precision parts
- › Pressure reduction function in ports P, A, or B
- › Adjustable by allen key or hand screw
- › Good adjustment sensitivity with reduced drainage flow
- › In the standard version, the valve housing is phosphated and steel parts are zinc-coated for 240 h protection acc. to ISO 9227

Technical Data

Valve size	06 (D03)			
Max. flow	l/min (GPM)	50 (13.2)		
Max. operating pressure (ports P, A, B)	bar (PSI)	350 (5080)		
Max. operating pressure (port T)	bar (PSI)	210 (3050)		
Reduced pressure range (at Q = 5 l/min)	bar	10-25	20-63	30-160
	(PSI)	(150-360)	(290-910)	(440-2320)
Fluid temperature range (NBR)	°C (°F)	-30 ... +100 (-22 ... +212)		
Fluid temperature range (FPM)	°C (°F)	-20 ... +120 (-4 ... +248)		
Mass	kg (lbs)	1.75 (3.85)		
		- model "A", "E"		
		1.50 (3.31)		
		- model "B", "P"		

General information	Datasheet	Type
	GI_0060	Products and operating conditions
Mounting interface	SMT_0019	ISO 4401-03-02-0-05 DIN 24340 (CETOP 03)
Spare parts	SP_8010	

ISO 4401-03-02-0-05



Ports P, A, B, T - max. Ø7.5 mm (0.29 in)

Functional Description

The pressure valves VRP2 are directly operated reducing-relieving valves for vertical stacking assemblies designed as 3 way valves, which means it includes pressure protection of the secondary circuit. The valve consists of the valve body, control spool, spring, and adjustment element. The body includes a port M with thread G 1/4 for attachment of a pressure measuring device or a by-pass free flow check valve.

Model A

In model A, the fluid enters the valve body from the primary circuit through port A1 and passes through the metering edge, where its pressure is reduced. The flow is passed to the output port A2 and on to the user. The reverse free flow from port A2 to port A1 passes through a check valve which is connected in parallel to the metering edge of the control spool.

Model E

In model E, the fluid enters the valve body from the primary circuit through port B1 and passes through the metering edge, where its pressure is reduced. The flow is passed to the output port B2 and on to the user. The reverse free flow from port B2 to port B1 passes through a check valve which is connected parallel to the metering edge of the control spool.

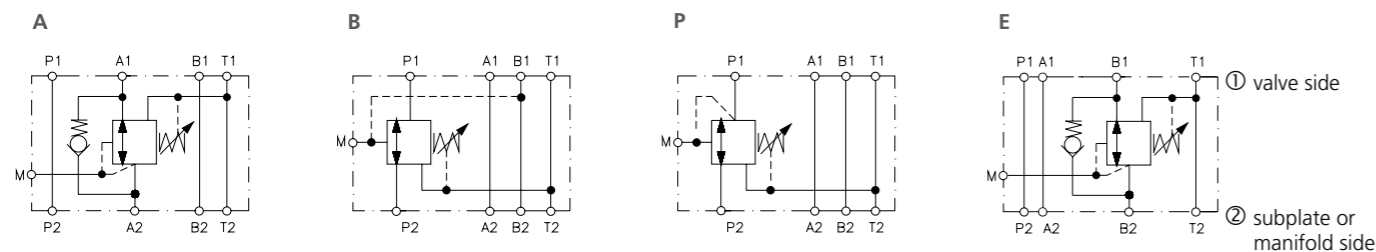
Model B

In model B, the pressure reduction occurs from port P2 to port P1, but only if the flow in port B passes towards the user (not opposite). The protection of the secondary circuit is therefore ensured for one flow direction only.

Model P

In model P, the pressure reduction occurs from port P2 to port P1, and is effective in both flow directions through the directional valve. Therefore, the protection of the secondary circuit is ensured for both flow directions.

Functional symbols



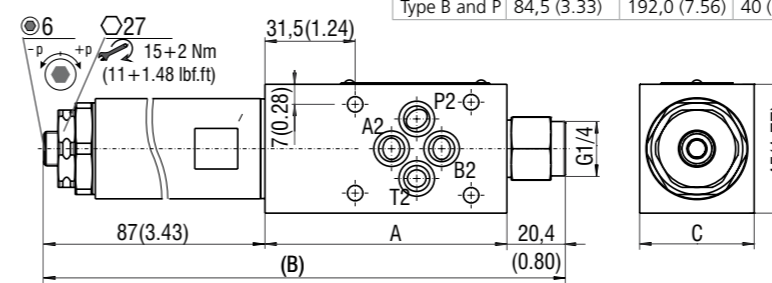
Notice: The orientation of the symbol on the name plate corresponds with the valve function.

Dimensions in millimeters (inches)

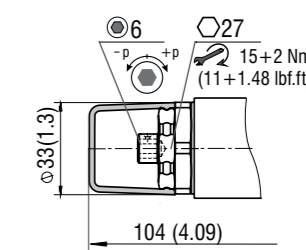
Type A, B, P

Dimensions	A	B	C
Type A	85,0 (3.35)	192,5 (7.58)	45 (1.77)
Type B and P	84,5 (3.33)	192,0 (7.56)	40 (1.57)

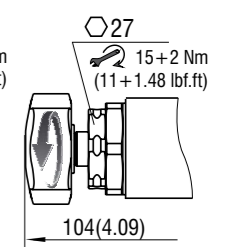
Model S



Model T

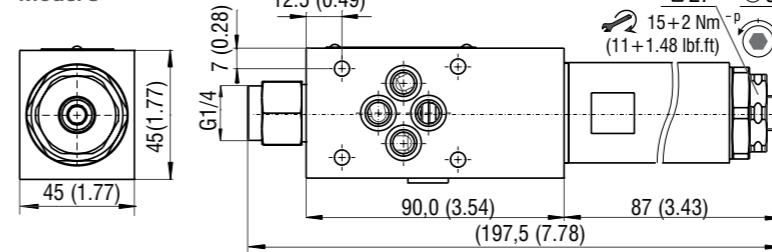


Model RP

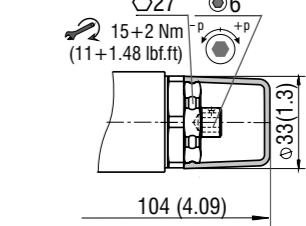


Type E

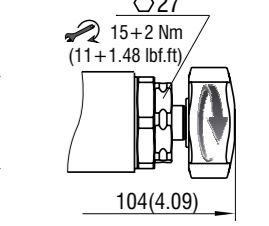
Model S



Model T

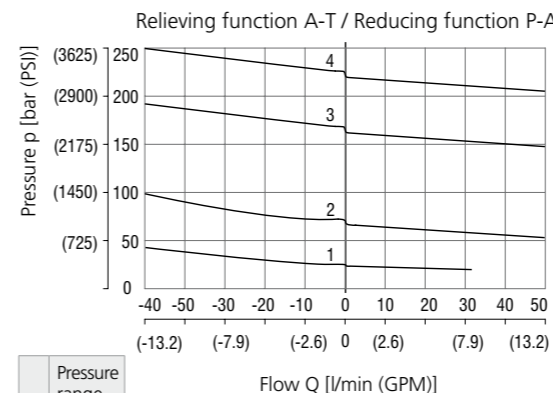


Model RP



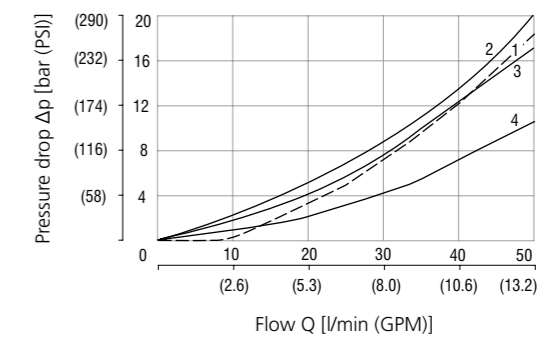
Characteristics measured at v = 32 mm²/s (156 SUS)

Reducing - relieving pressure related to flow rate



Pressure range	
4	21
3	16
2	6
1	2

Pressure drop related to flow rate



Flow direction - Model			
A	B	E	P
4	A1-A2	B1-B2	
3	A2-A1	B2-B1	
2	A2-T	P1-T	B2-T
1		P2-P1	P2-P1

- 1 (4) - Pressure drop of reducing valve at min. adjustable pressure range
- 2 - Pressure drop of relief valve at min. adjustable safety pressure
- 3 - Pressure drop of check valve

Ordering Code

VRP2 - 06 - [] / [] - []

Pressure reducing - relieving valve, spool type, direct acting, modular

Valve size
ISO 4401-03-02-0-05, DIN 24340 (CETOP 03), size 06

Model
Pressure reduction on port A2
on port P1
on port B2
on port P1

Pressure sensing
at port A2
at port B1
at port B2
at port P1

A
B
E
P

Surface treatment
body phosphated, steel parts
zinc-coated (ZnCr-3), ISO 9227 (240 h)
zinc-coated (ZnCr-3), ISO 9227 (240 h)
zinc-coated (ZnNi), ISO 9227 (520 h)

Seals
NBR
FPM (Viton)

Pressure range range (at Q = 5 l/min)
2 10 - 25 bar (150 - 360 PSI)
6 20 - 63 bar (290 - 910 PSI)
16 30 - 160 bar (440 - 2320 PSI)
21 40 - 210 bar (580 - 3050 PSI)

Adjustment option
allen key (hex. 6), without protective cap
allen key (hex. 6), with protective cap
hand screw, plastic

S
T
RP

Pressure Reducing - Relieving Valve, Spool Type, Pilot Operated

VRN2-06/S

M22x1.5 • Q_{max} 40 l/min (11 GPM) • p_{max} 320 bar (4600 PSI)

Technical Features

- ▶ Excellent stability throughout flow range with rapid response to dynamic pressure changes
- ▶ Low hysteresis, accurate pressure control and low pressure drop
- ▶ Reverse relief protection
- ▶ Wide pressure range up to 320 bar
- ▶ High flow capacity
- ▶ Hardened precision parts
- ▶ Adjustable by allen key or hand screw, optionally sealable (lockwire holes)
- ▶ In the standard version, the valve is zinc-coated for 240 h protection acc. to ISO 9227

Functional Description

This 3 way pilot operated pressure reducing valve is designed to reduce the system pressure at the consumer port. Due to its 3 way design the valve provides reverse relief protection of the secondary circuit to the tank port. The pressure can be set by an adjustment screw (by allen key or by hand screw) and the valve is optionally equipped with lockwire holes for sealing.



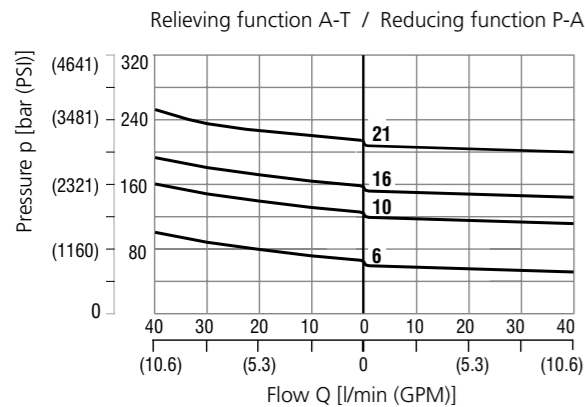
Technical Data

Valve size / Cartridge cavity		M22x1.5 / QF3
Max. flow	l/min (GPM)	40 (10.6)
Max. operating pressure	bar (PSI)	320 (4640)
Max. pressure (T port)	bar (PSI)	160 (2320)
Fluid temperature range (NBR)	°C (°F)	-30 ... +100 (-22 ... 212)
Fluid temperature range (FPM)	°C (°F)	-20 ... +120 (-4 ... 248)
Mass	kg (lbs)	0.22 (0.49)

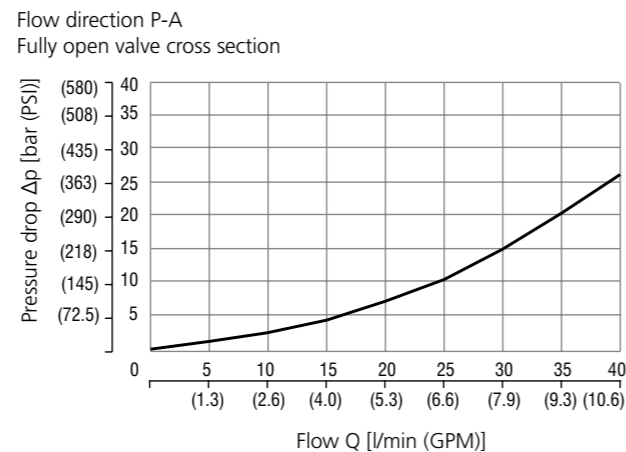
		Datasheet	Type
General information		GI_0060	Products and operating conditions
Valve bodies	In-line mounted	SB_0018	SB-QF3*
	Sandwich mounted	SB-04(06)_0028	SB-04(06)-QF3*
Cavity details		SMT_0029	SMT-QF3*
Spare parts		SP_8010	

Characteristics measured at v = 32 mm²/s (156 SUS)

Reducing - relieving pressure related to flow rate

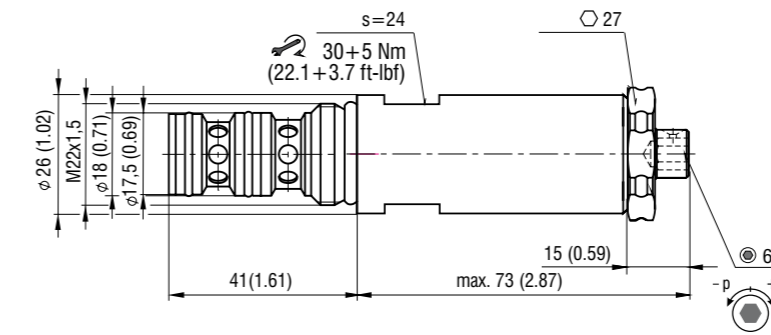


Pressure drop related to flow rate

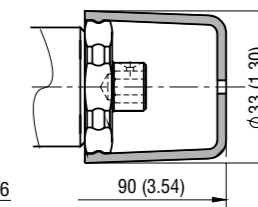


Dimensions in millimeters (inches)

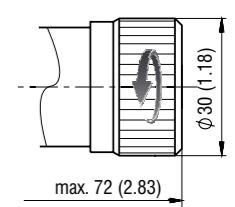
Model S



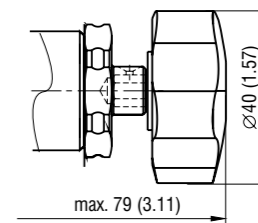
Model T



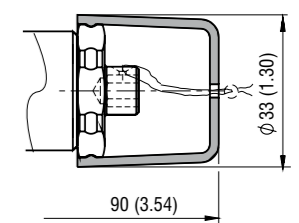
Model RS



Model RP



Model L



Ordering Code

VRN2-06 / S - [] [] [] - []

Pressure reducing - relieving valve, spool type, pilot operated M22x1.5

Surface treatment
A zinc-coated (ZnCr-3), ISO 9227 (240 h)
B zinc-coated (ZnNi), ISO 9227 (520 h)

Model
 screw-in cartridge

Seals
No designation NBR
V FPM (Viton)

Pressure range

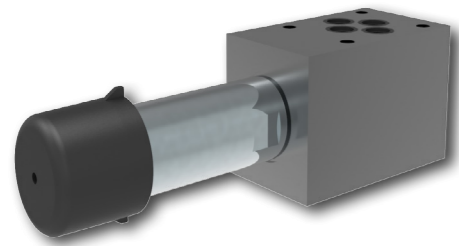
up to 63 bar (910 PSI)	6
up to 100 bar (1450 PSI)	10
up to 160 bar (2320 PSI)	16
up to 210 bar (3045 PSI)	21

Adjustment option
S allen key (hex. 6), without protective cap
T allen key (hex. 6), with protective cap
RS hand screw, metal
RP hand screw, plastic
L allen key (hex. 6), with protective cap, sealable (lockwire holes)

Pressure Reducing - Relieving Valve, Spool Type, Pilot Operated, Modular

VRN2-06/M(R)

Size 06 (D03) • Q_{max} 40 l/min (11 GPM) • p_{max} 320 bar (4600 PSI)



Technical Features

- › Pressure reducing - relieving valve, spool type, pilot operated with mounting interface acc. to ISO 4401, DIN 24340 (CETOP 03)
- › Excellent stability throughout flow range with rapid response to dynamic pressure changes
- › Low hysteresis, accurate pressure control and low pressure drop
- › Reverse relief protection
- › Wide pressure range up to 320 bar
- › High flow capacity
- › Hardened precision parts
- › Adjustable by allen key or hand screw, optionally sealable (lockwire holes)
- › In the standard version, the valve housing is phosphated and steel parts are zinc-coated for 240 h protection acc. to ISO 9227

Functional Description

This pilot operated pressure reducing valve is designed to reduce the system pressure at the consumer port. Its 3 way design provides reverse relief protection of the secondary circuit to the tank port. The pressure can be set by an adjustment screw and the valve is optionally equipped with lockwire holes for sealing. Valve bodies for vertical stacking assemblies are available with pressure reduction in ports A and P. Check valves incorporated into the valve bodies MA(B) enable the reverse flow to pass freely through the valve.

Model MA, MB, MC

In models MA and MB, the flow enters the valve through port A1 (B1). The input pressure is reduced and routed to port A2 (B2). In model MB the reverse flow passes through a check valve. The MC type is identical to the MB type, but without the bypass check valve.

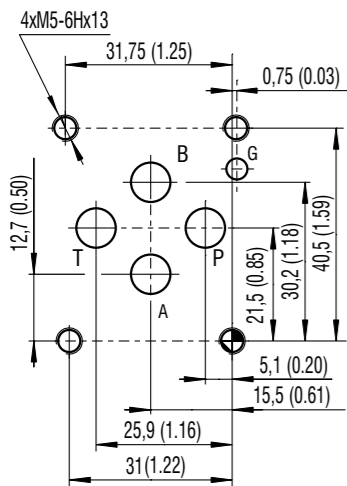
Model MP

In model MP, the pressure is reduced from port P2 to port P1. All models support the connection of a pressure gauge to port M (thread G 1/4).

Technical Data

Valve size / Cartridge cavity		Size 06 / QF3
Max. flow	l/min (GPM)	40 (10.6)
Max. operating pressure (ports P, A, B)	bar (PSI)	320 (4640)
Max. operating pressure (port T)	bar (PSI)	160 (2320)
Fluid temperature range (NBR)	°C (°F)	-30 ... +100 (-22 ... 212)
Fluid temperature range (FPM)	°C (°F)	-20 ... +120 (-4 ... 248)
Mass - models MA, MB	kg (lbs)	1.20 (2.65)
- models MC, MP		1.10 (2.43)
- model RA1		1.10 (2.43)
	Datasheet	Type
General information	GI_0060	Products and operating conditions
Mounting interface / tolerances	SMT_0019	ISO 4401-03-02-0-05 DIN 24340 (CETOP 03)
Spare parts	SP_8010	

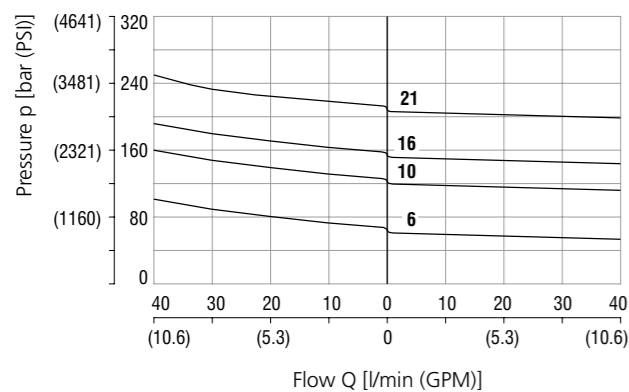
ISO 4401-03-02-0-05



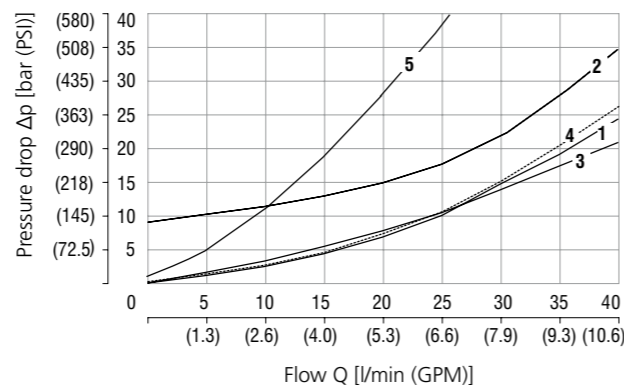
Ports P, A, B, T - max. Ø7.5 mm (0.29 in)

Characteristics measured at v = 32 mm³/s (156 SUS)

Reducing - relieving pressure related to flow rate
Relieving function A-T / Reducing function P-A



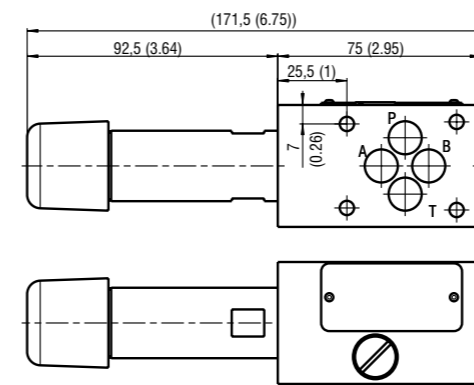
Pressure drop related to flow rate
Flow direction P-A Fully open valve through section



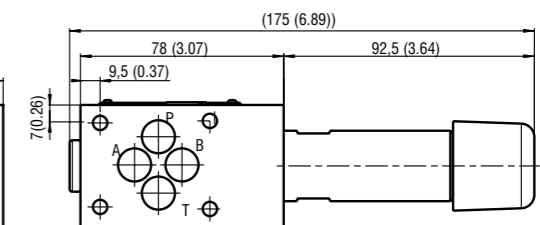
Flow direction	1	2	3	4	5
	A1-A2 B1-B2	A2-T B2-T	A2-A1 B2-B1	P2-P1	A2-A1 B2-B1
			flow through check valve and fully opened main spool		flow through check valve only

Dimensions in millimeters (inches)

Model MA

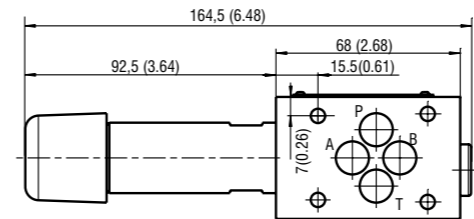


Models MB, MC

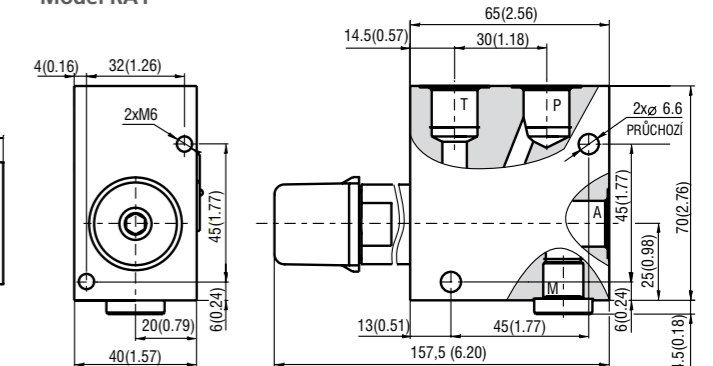


Dimensions in mm (in)				
Port	A	P	T	M
Thread	G 3/8			G 1/4
Depth of thread	12 (0.47)			12 (0.47)
Counterbore	Ø23			Ø20
Depth of counterbore	1	1	1	1

Model MP

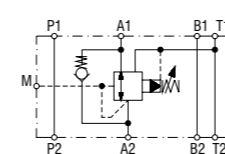


Model RA1

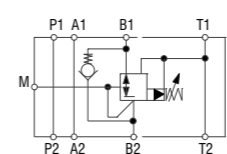


Functional Symbols

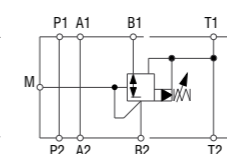
VRN2-06/MA



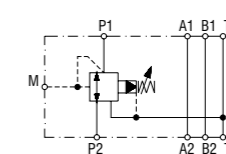
VRN2-06/MB



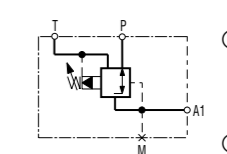
VRN2-06/MC



VRN2-06/MP



VRN2-06/RA1



- ① valve side
- ② subplate or manifold side

Notice: The orientation of the symbol on the name plate corresponds with the valve function.

Ordering Code

VRN2-06/ [] - [] [] [] - []

Pressure reducing - relieving valve, spool type, pilot operated, modular

Valve size
ISO 4401-03-02-0-05, DIN 24340 (CETOP 03), size 06

Model **Pressure reduction**

modular valve, on port A2 (with by-pass check valve)	MA
modular valve, on port B2 (with by-pass check valve)	MB
modular valve, on port B2 (without by-pass check valve)	MC
modular valve, on port P1	MP
in-line valve, three ports, thread G 3/8 (P, T, A)	RA1

Pressure range

up to 63 bar (913 PSI)	6
up to 100 bar (1450 PSI)	10
up to 160 bar (2321 PSI)	16
up to 210 bar (3045 PSI)	21

Surface treatment

No designation	body phosphated, steel parts zinc-coated (ZnCr-3), ISO 9227 (240 h)
A	zinc-coated (ZnCr-3), ISO 9227 (240 h)
B	zinc-coated (ZnNi), ISO 9227 (520 h)

Seals

No designation	NBR
V	FPM (Viton)

Adjustment option*

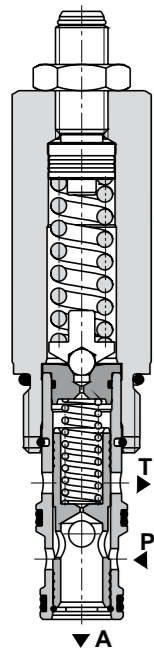
S	allen key (hex. 6), without protective cap
T	allen key (hex. 6), with protective cap
RS	hand screw, metal
RP	hand screw, plastic
L	allen key (hex. 6), with protective cap, sealable (lockwire holes)

*for dimensions of adjustment options see data sheet No.5153

Pressure Reducing Valve, Spool Type, Pilot Operated

SP4A-B3

7/8-14 UNF • Q_{max} 60 l/min (16 GPM) • p_{max} 350 bar (5100 PSI)

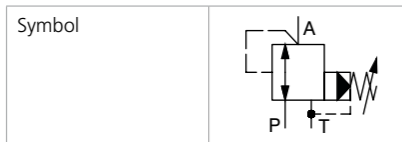


Technical Features

- › Excellent stability throughout flow range with rapid response to dynamic pressure changes
- › Low hysteresis, accurate pressure control and low pressure drop by CFD optimized flow path
- › Reverse relief protection
- › Wide pressure range up to 350 bar
- › High flow capacity
- › Hardened precision parts
- › Adjustable by allen key or hand screw
- › In the standard version, the valve is zinc-coated for 240 h protection acc. to ISO 9227

Functional Description

This 3 way pilot operated pressure reducing valve is designed to reduce the system pressure at the consumer port. Due to its 3 way design the valve provides reverse relief protection of the secondary circuit to the tank port. The pressure can be set by an adjustment screw (by allen key or by hand screw).



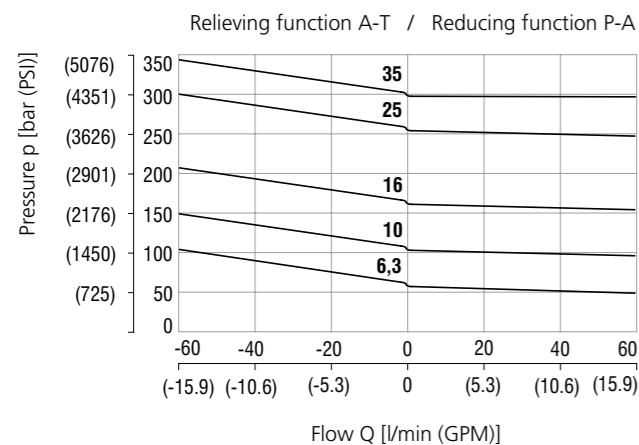
Technical Data

Valve size / Cartridge cavity		7/8-14 UNF-2A / B3
Max. flow	l/min (GPM)	60 (15.9)
Max. operating pressure	bar (PSI)	350 (5080)
Max. pressure (port T)	bar (PSI)	100 (1450)
Fluid temperature range (NBR)	°C (°F)	-30 ... +100 (-22 ... 212)
Fluid temperature range (FPM)	°C (°F)	-20 ... +120 (-4 ... 248)
Mass	kg (lbs)	0.24 (0.53)

	Datasheet	Type
General information	GI_0060	Products and operating conditions
Valve bodies	In-line mounted	SB_0018
	Sandwich mounted	SB-04(06)_0028
Cavity details / Form tools	SMT_0019	SMT-B3*
Spare parts	SP_8010	

Characteristics measured at $v = 32 \text{ mm}^2/\text{s}$ (156 SUS)

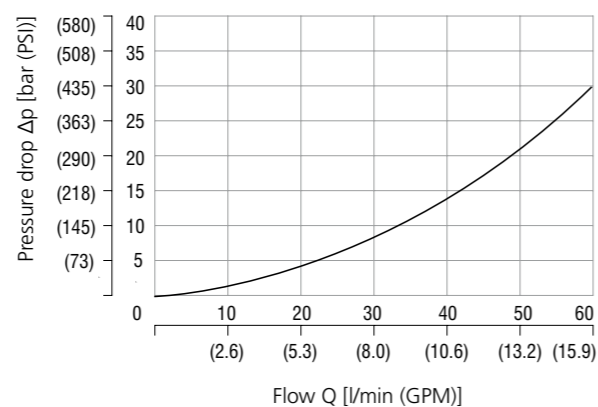
Reducing - relieving pressure related to flow rate



Pressure drop related to flow rate

Flow direction P - A

Fully open valve cross section

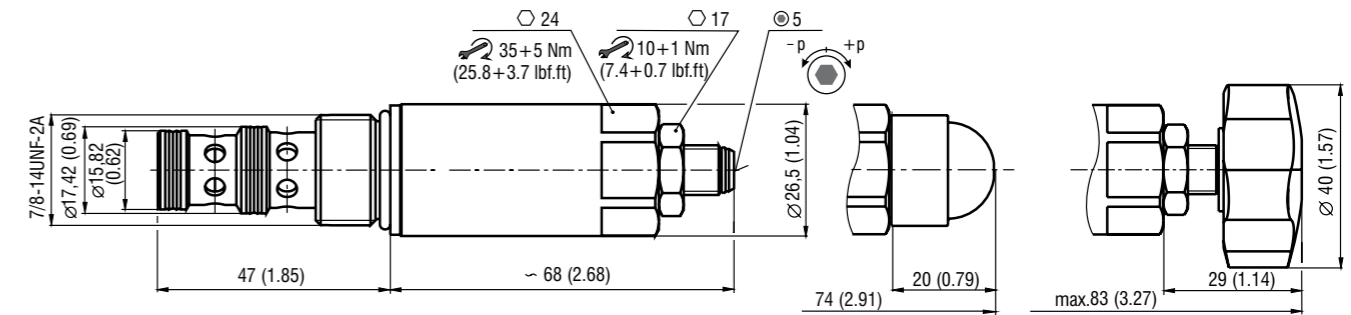


Dimensions in millimeters (inches)

Model S

Model T

Model RP



Ordering Code

SP4A-B3 / [] [] [] [] - []

Pressure reducing - relieving valve, spool type, pilot operated 7/8-14 UNF

Model
High performance **H**

Pressure range
up to 63 bar (910 PSI) **6**
up to 100 bar (1450 PSI) **10**
up to 160 bar (2320 PSI) **16**
up to 250 bar (3630 PSI) **25**
up to 350 bar (5080 PSI) **35**

Surface treatment
A zinc-coated (ZnCr-3), ISO 9227 (240 h)
B zinc-coated (ZnNi), ISO 9227 (520 h)

Seals
NBR
FPM (Viton)

Adjustment option
S allen key (hex. 5), without protective cap
T allen key (hex. 5), with protective cap
RP hand screw, plastic

No designation
V

Pressure Reducing - Relieving Valve, Spool Type, Pilot Operated

VRN2-10/S

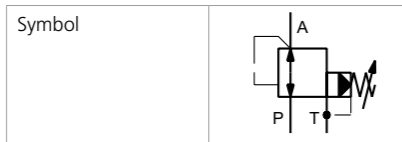
M27x2 • Q_{max} 150 l/min (40 GPM) • p_{max} 320 bar (4600 PSI)

Technical Features

- › Excellent stability throughout flow range with rapid response to dynamic pressure changes
- › Low hysteresis, accurate pressure control and low pressure drop
- › Reverse relief protection
- › Wide pressure range up to 320 bar
- › High flow capacity
- › Hardened precision parts
- › Adjustable by allen key or hand screw, optionally sealable (lockwire holes)
- › In the standard version, the valve is zinc-coated for 240 h protection acc. to ISO 9227

Functional Description

This 3 way pilot operated pressure reducing valve is designed to reduce the system pressure at consumer port. Due to its 3 way design the valve provides reverse relief protection of the secondary circuit to the tank port. The pressure can be set by an adjustment screw (by allen wrench or by hand) and the valve is optionally equipped with lockwire holes for sealing.



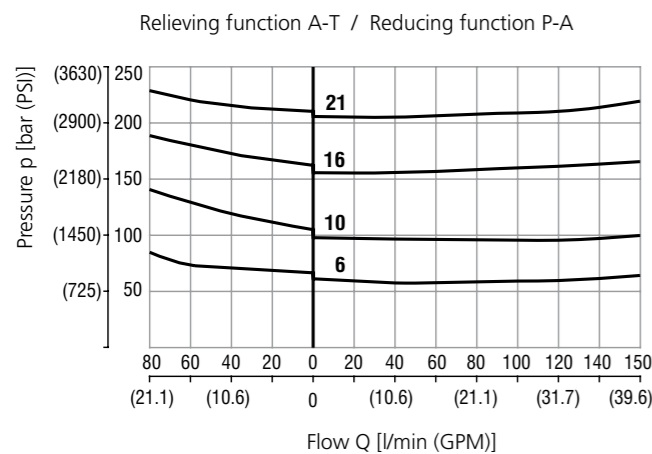
Technical Data

Valve size / Cartridge cavity		M27x2 / K3
Max. flow	l/min (GPM)	150 (39.6)
Max. operating pressure	bar (PSI)	320 (4640)
Max. pressure (port T)	bar (PSI)	160 (2320)
Fluid temperature range (NBR)	°C (°F)	-30 ... +100 (-22 ... 212)
Fluid temperature range (FPM)	°C (°F)	-20 ... +120 (-4 ... 248)
Mass	kg (lbs)	0.35 (0.77)

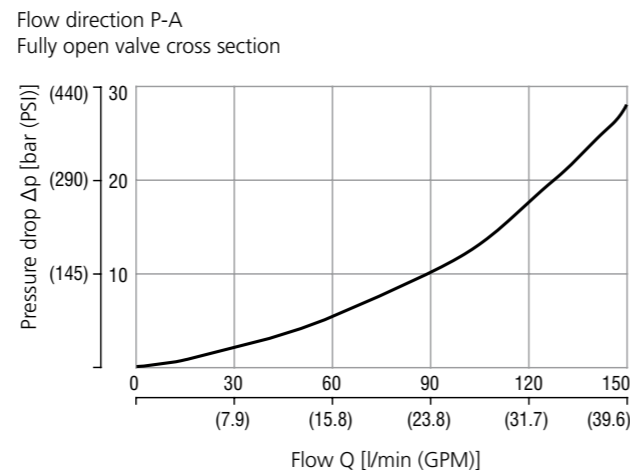
		Datasheet	Type
General information		GI_0060	Products and operating conditions
Valve bodies	In-line mounted	SB_0018	SB-K3*
	Sandwich mounted	SB-04(06)_0028	SB-04(06)-K3*
Cavity details		SMT_0029	SMT-K3*
Spare parts		SP_8010	

Characteristics measured at $v = 32 \text{ mm}^2/\text{s}$ (156 SUS)

Reducing - relieving pressure related to flow rate

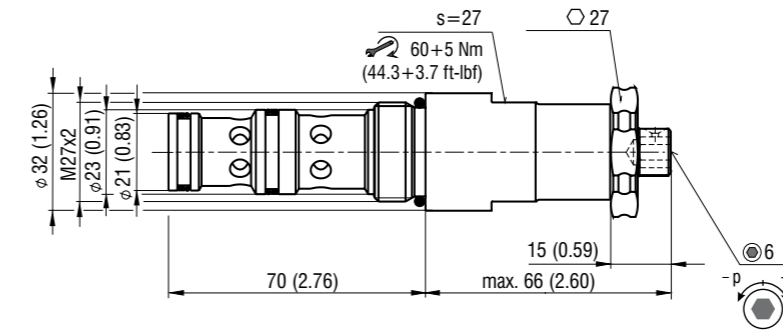


Pressure drop related to flow rate

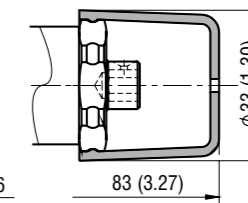


Dimensions in millimeters (inches)

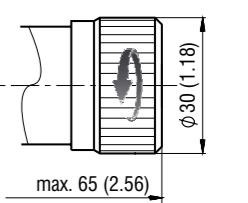
Model S



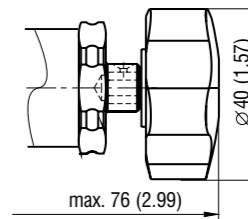
Model T



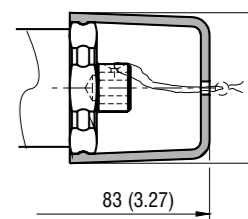
Model RS



Model RP



Model L



Ordering Code

VRN2-10 / S - [] [] [] - []

Pressure reducing - relieving valve, spool type, pilot operated M27x2

Surface treatment
A zinc-coated (ZnCr-3), ISO 9227 (240 h)
B zinc-coated (ZnNi), ISO 9227 (520 h)

Model
screw-in cartridge

No designation
V

Seals
NBR
FPM (Viton)

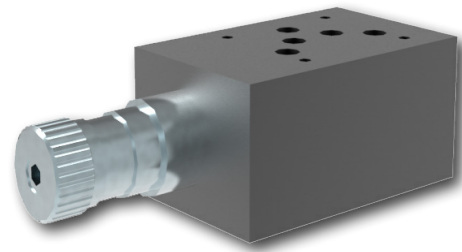
Adjustment option
S allen key (hex. 6), without protective cap
T allen key (hex. 6), with protective cap
RS hand screw, metal
RP hand screw, plastic
L allen key (hex. 6), with protective cap, sealable (lockwire holes)

Pressure range
up to 63 bar (910 PSI) 6
up to 100 bar (1450 PSI) 10
up to 160 bar (2320 PSI) 16
up to 210 bar (3045 PSI) 21

Pressure Reducing - Relieving Valve, Spool Type, Pilot Operated, Modular

VRN2-10/M(R)

Size 10 (D05) • Q_{max} 150 l/min (40 GPM) • p_{max} 320 bar (4600 PSI)



Technical Features

- › Pressure reducing - relieving valve, spool type, pilot operated with mounting interface acc. to ISO 4401, DIN 24340 (CETOP 05) or in-line design
- › Excellent stability throughout flow range with rapid response to dynamic pressure changes
- › Low hysteresis, accurate pressure control and low pressure drop
- › Reverse relief protectionw
- › Wide pressure range up to 320 bar
- › High flow capacity
- › Hardened precision parts
- › Adjustable by allen key or hand screw, optionally sealable (lockwire holes)
- › In the standard version, the valve housing is phosphated and steel parts are zinc-coated for 240 h protection acc. to ISO 9227

Functional Description

This pilot operated pressure reducing valve is designed to reduce the system pressure at the consumer port. Its 3 way design provides reverse relief protection of the secondary circuit to the tank port. The pressure can be set by an adjustment screw and the valve is optionally equipped with lockwire holes for sealing. Valve bodies for vertical stacking assemblies are available with pressure reduction in ports A and P. Check valves incorporated into the valve bodies MA(B) enable the reverse flow to pass through the valve.

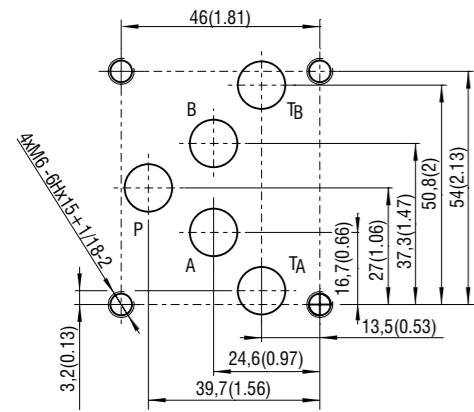
Model MA, MB

In models MA and MB, the flow enters the valve through port A1 (B1). The input pressure is reduced and routed to port A2 (B2). In model MB the reverse flow passes through a check valve.

Model MP

In model MP, the pressure is reduced from port P2 to port P1. All models support the connection of a pressure gauge to port M (thread G 1/4).

ISO 4401-05-04-0-05



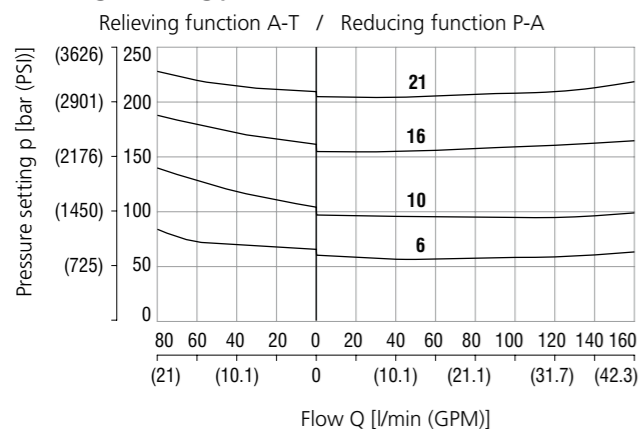
Ports P, A, B, T - max. Ø11.2 mm (0.44 in)

Technical Data

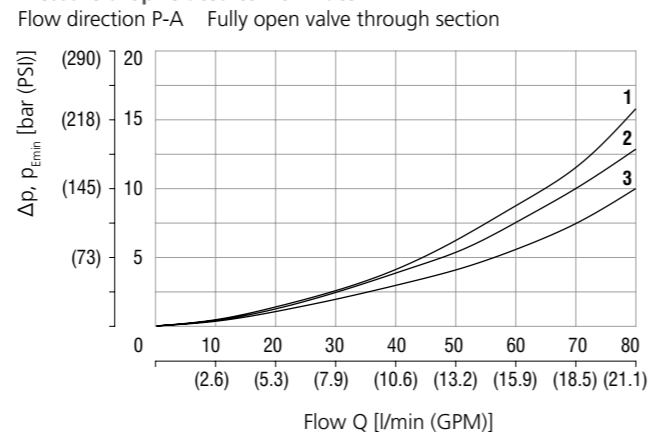
Valve size / Cartridge cavity		Size 10 / K3
Max. flow	l/min (GPM)	150 (40)
Max. operating pressure (ports P, A, B)	bar (PSI)	320 (4640)
Max. operating pressure (port T)	bar (PSI)	160 (2320)
Fluid temperature range (NBR)	°C (°F)	-30 ... +100 (-22 ... 212)
Fluid temperature range (FPM)	°C (°F)	-20 ... +120 (-4 ... 248)
Mass - models MA, MB	kg (lbs)	3.20 (7.05)
- model MP		2.85 (6.28)
- model RA1		2.20 (4.85)
General information		Datasheet Type
Mounting interface		GI_0060 Products and operating conditions
Spare parts		ISO 4401-05-04-0-05 DIN 24340 (CETOP 05)
		SMT_0019
		SP_8010

Characteristics measured at v = 32 mm³/s (156 SUS)

Reducing - relieving pressure related to flow rate



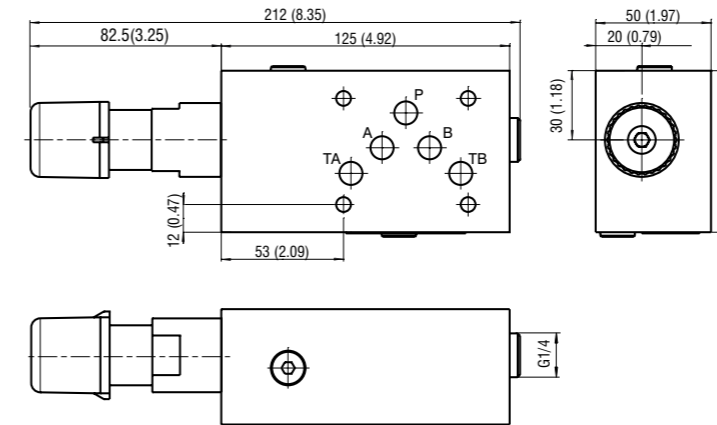
Pressure drop related to flow rate



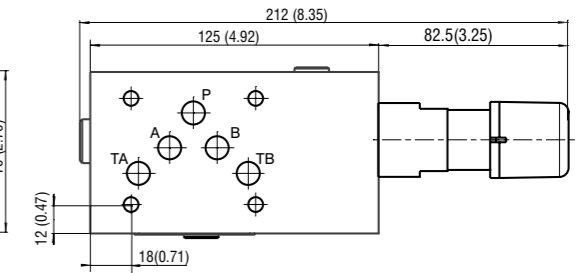
	Models	Directions
1	MA, MB	A-B, B1-B2
2	MP	P2-P1
3	MA, MB	A2-A1, B2-B1

Dimensions in millimeters (inches)

Model MA

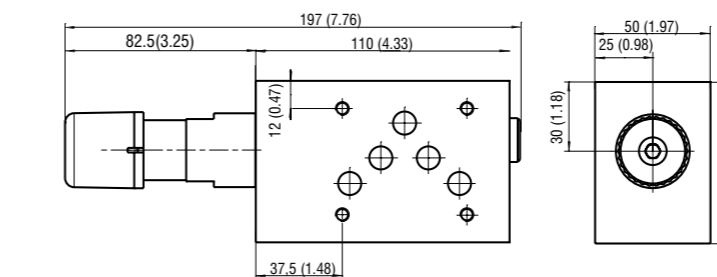


Model MB

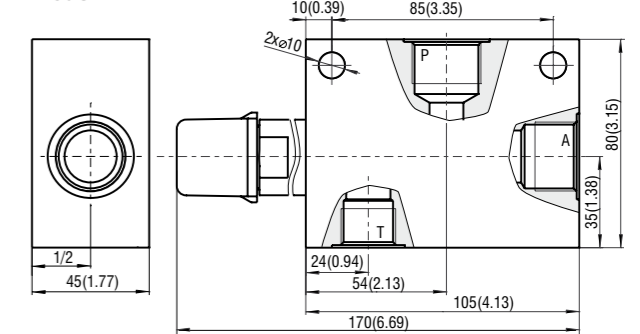


Dimensions in mm (in)			
Port	A	P	T
Thread	M27x2	G3/4	G1/2
Depth of thread	19 (0.75)	16 (0.63)	14 (0.55)
Counterbore	Ø40	Ø33	Ø28
Depth of counterbore	1 (0.04)	1 (0.04)	1 (0.04)

Model MP

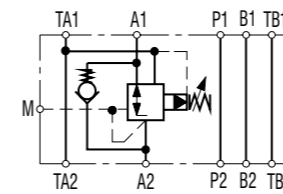


Model RA1

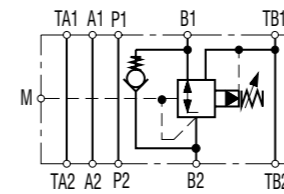


Functional Symbols

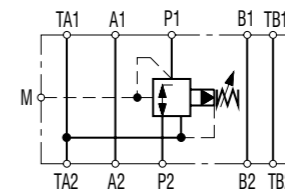
VRN2-10/MA



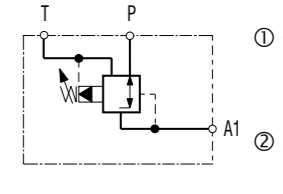
VRN2-10/MB



VRN2-10/MP



VRN2-10/RA1



- ① valve side
- ② subplate or manifold side

Notice: The orientation of the symbol on the name plate corresponds with the valve function.

Ordering Code

VRN2-10/ [] - [] - [] - []

Pressure reducing - relieving valve, spool type, pilot operated, modular

Valve size
ISO 4401-05-04-0-05, DIN 24340 (CETOP 05), size 10

Model **Pressure reduction**

modular valve, on port A2 (with by-pass check valve)	MA
modular valve, on port B2 (with by-pass check valve)	MB
modular valve, on port P1	MP
in-line valve, three ports, thread G 3/4 (P), G 1/2 (T)	RA1

Pressure range

up to 63 bar (913 PSI)	6
up to 100 bar (1450 PSI)	10
up to 160 bar (2321 PSI)	16
up to 210 bar (3045 PSI)	21

Surface treatment

No designation	body phosphated, steel parts
A	zinc-coated (ZnCr-3), ISO 9227 (240 h)
B	zinc-coated (ZnCr-3), ISO 9227 (240 h)
	zinc-coated (ZnNi), ISO 9227 (520 h)

Seals

No designation	NBR
V	FPM (Viton)

Adjustment option*

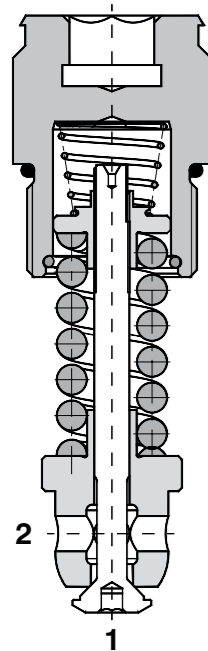
S	allen key (hex. 6), without protective cap
T	allen key (hex. 6), with protective cap
RS	hand screw, metal
RP	hand screw, plastic
L	allen key (hex. 6), with protective cap, sealable (lockwire holes)

*for dimensions of adjustment options see data sheet No.5154

Pressure Relief Valve with Reverse Flow Check, Poppet Type, Not Adjustable

DBV3

M24x1.5 • Q_{max} 200 l/min (53 GPM) • p_{max} 480 bar (7000 PSI)

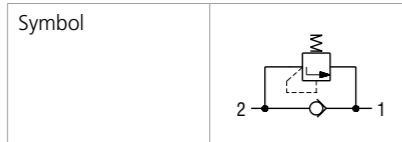


Technical Features

- › Excellent stability throughout flow range with rapid response to dynamic pressure changes
- › Low hysteresis, accurate pressure control and low pressure drop through CFD optimized flow paths
- › Adjustable pressure range 160-480 bar
- › Factory pre-set, not adjustable version only
- › Hardened precision parts
- › Sharp-edged steel seats for dirt-tolerant performance
- › Leak-free closing, suitable for fast cycling with long life
- › One-way bypass valve with suction function
- › In the standard version, the valve is zinc-coated for 240 h protection acc. to ISO 9227

Functional Description

A direct acting, poppet type hydraulic relief valve in the form of a screw-in cartridge with reverse flow check intended for use as a pressure limiting and anti-cavitation device for common hydraulic circuit protection. The spring acts on the poppet and presses it on the valve seat. If the hydraulic pressure is below the pre-set value, the valve is closed. If the hydraulic force exceeds the pre-set value, the valve opens and flow passes to the tank port until the system pressure drops below the spring pre-set value and the valve closes again.



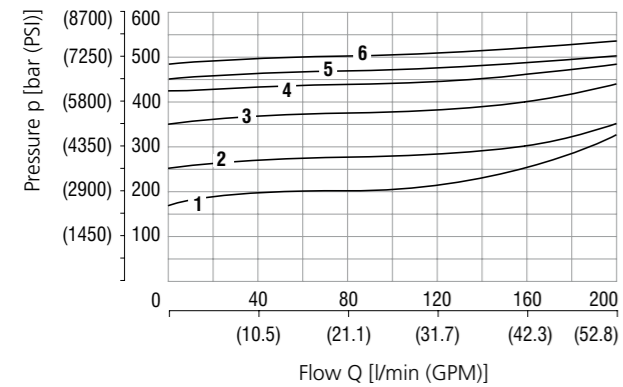
Technical Data

Valve size / Cartridge cavity		M24 x 1.5 / QH2
Max. flow	l/min (GPM)	200 (52.8)
Max. operating pressure	bar (PSI)	480 (6960)
Fluid temperature range (NBR)	°C (°F)	-30... + 100 (-22 ... +212)
Fluid temperature range (FPM)	°C (°F)	-20 ... +120 (-4 ... +248)
Mass	kg (lbs)	0.16 (0.36)
	Datasheet	Type
General information	GI_0060	Products and operating conditions
Cavity details	SMT_0019	SMT-QH2*
Spare parts	SP_8010	

Characteristics measured at v = 32 mm²/s (156 SUS)

Relief pressure related to flow rate

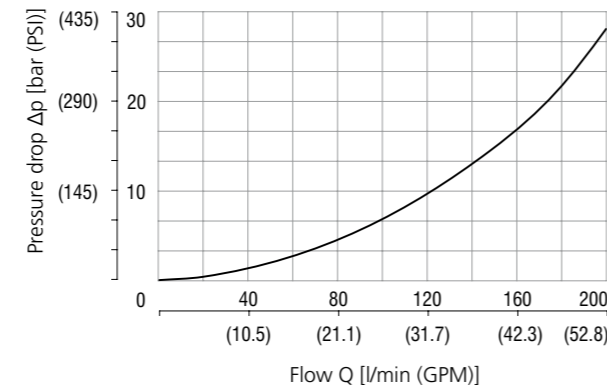
Pressure relief function, flow direction 2 - 1



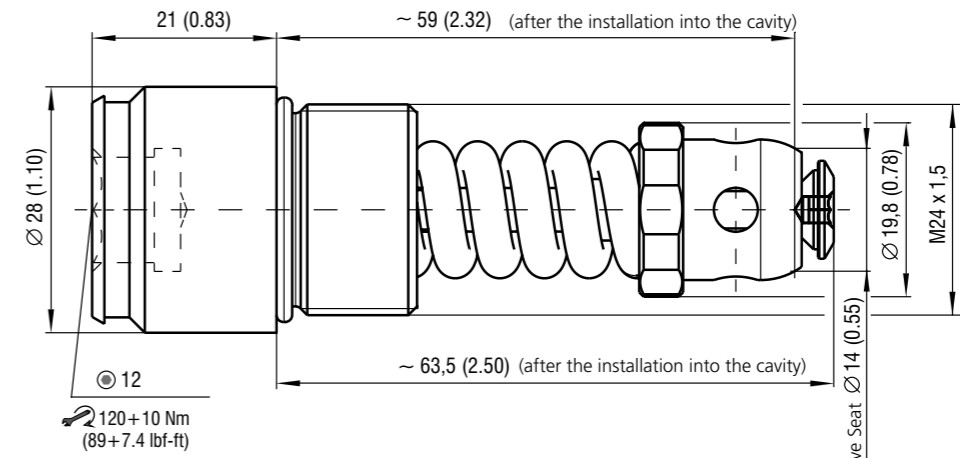
Pressure settings					
1	2	3	4	5	6
160	250	350	420	450	480

Pressure drop related to flow rate

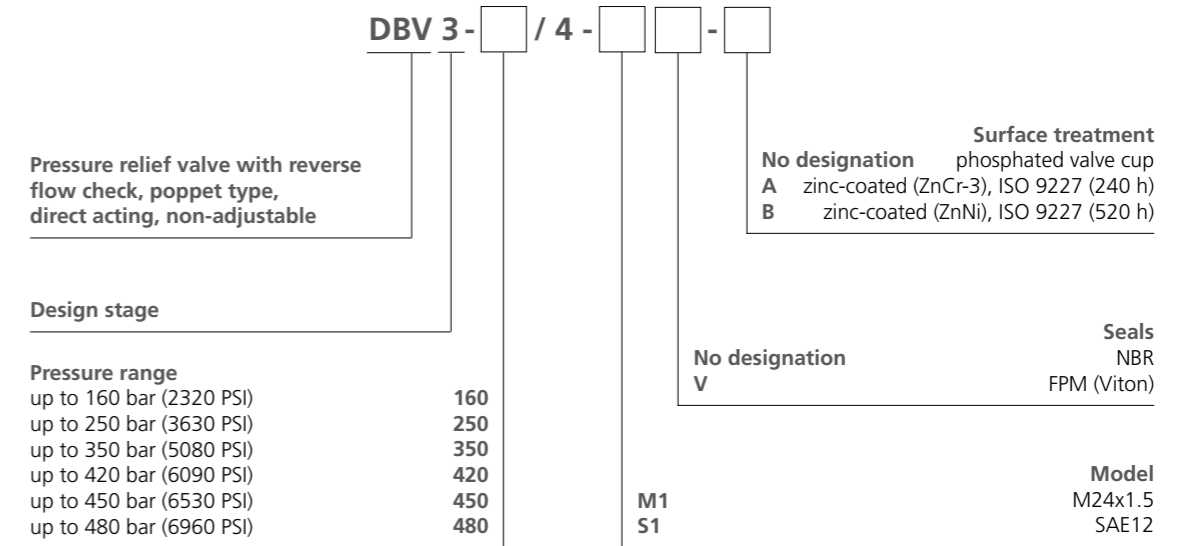
Check valve function, flow direction 1 - 2



Dimensions in millimeters (inches)



Ordering Code

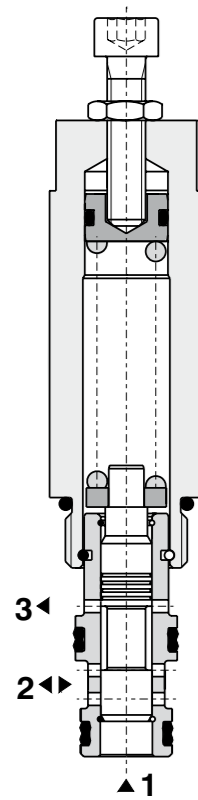


*All standard valves settings are at flow 4 l/min (1.06 GPM)

Sequence Valve, Internal Pilot and Drain, Spool Type, Direct Acting

SS4A-A3

3/4-16 UNF • Q_{max} 30 l/min (8 GPM) • p_{max} 350 bar (5100 PSI)

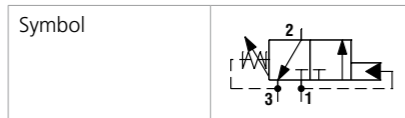


Technical Features

- › Excellent stability throughout flow range with rapid response to dynamic pressure changes
- › Low hysteresis, accurate pressure control and low pressure drop
- › Pressure range up to 350 bar
- › Hardened precision parts
- › Adjustable by allen key
- › In the standard version, the valve is zinc-coated for 240 h protection acc. to ISO 9227

Functional Description

A direct acting, spool type hydraulic sequence valve in the form of a screw-in cartridge with internal pilot and spring chamber drain. The valve directs the fluid to the secondary circuit when the input pressure exceeds the pre-set pressure. In the neutral position, the valve blocks flow at port 1 (inlet), while allowing flow to pass from port 2 to 3 (tank). When the pressure on port 1 reaches the pre-set pressure, the cartridge opens the connection between port 1 to 2. Back pressure on port 3 adds to the pressure pre-set by the spring.



Technical Data

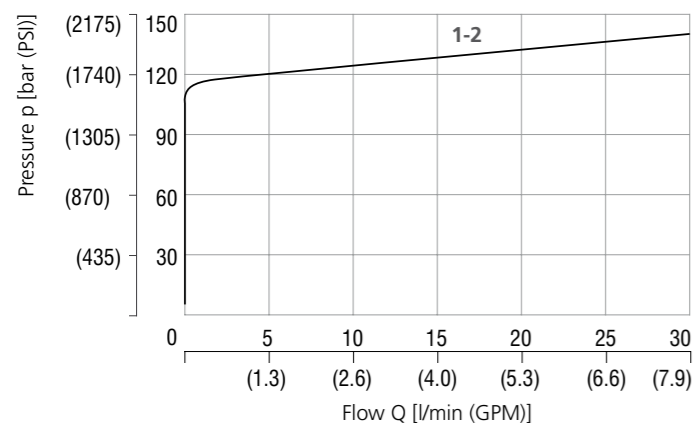
Valve size / Cartridge cavity		3/4-16 UNF-2A / A3
Max. flow	l/min (GPM)	30 (7.9)
Max. operating pressure	bar (PSI)	350 (5080)
Max. preset pressure	bar (PSI)	240 (3480)
Fluid temperature range (NBR)	°C (°F)	-30 ... +100 (-22 ... 212)
Fluid temperature range (FPM)	°C (°F)	-20 ... +120 (-4 ... 248)
Mass	kg (lbs)	0.23 (0.51)

		Datasheet	Type
General information		GI_0060	Products and operating conditions
Valve bodies	In-line mounted	SB_0018	SB-A3*
	Sandwich mounted	SB-04(06)_0028	SB-*A3*
Cavity details / Form tools		SMT_0019	SMT-A3*
Spare parts		SP_8010	

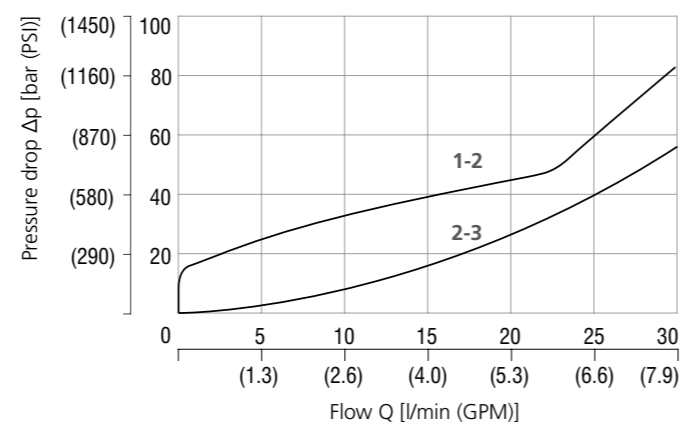
Characteristics measured at v = 32 mm²/s (156 SUS)

Relief pressure related to flow rate

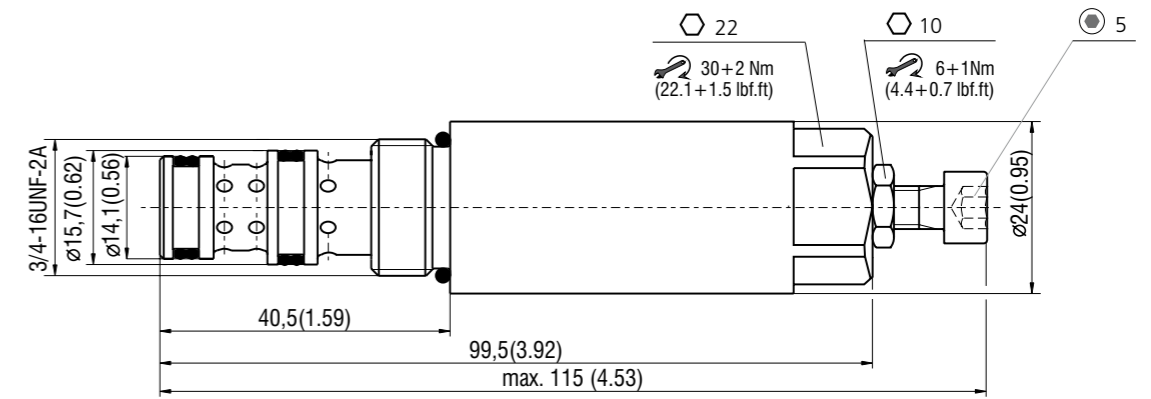
Example of factory preset valve, at 120 bar (1740 PSI), 5 l/min (1.3 GPM)



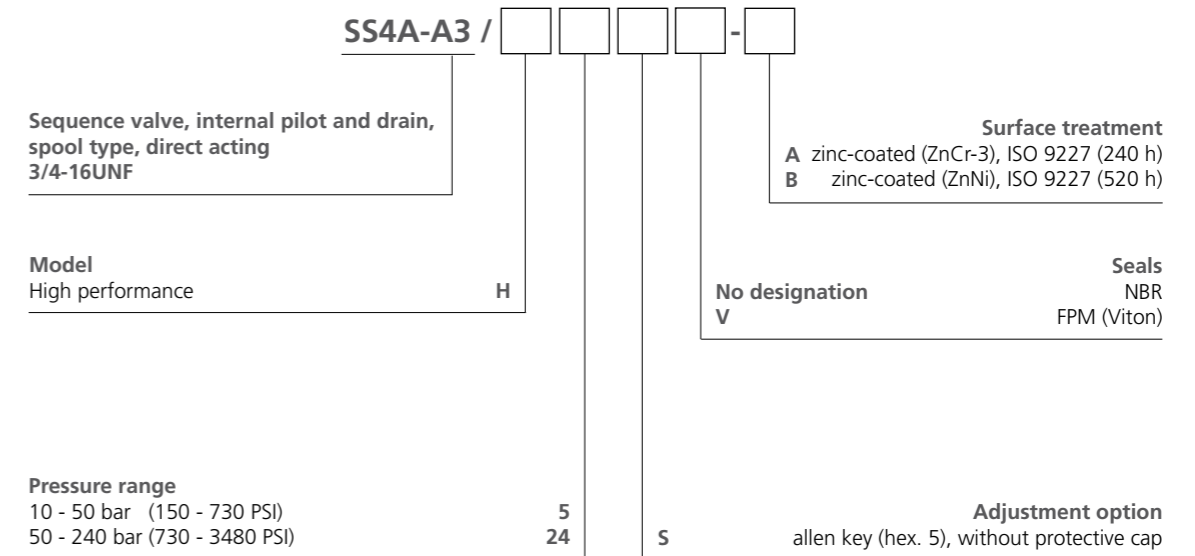
Pressure drop related to flow rate



Dimensions in millimeters (inches)



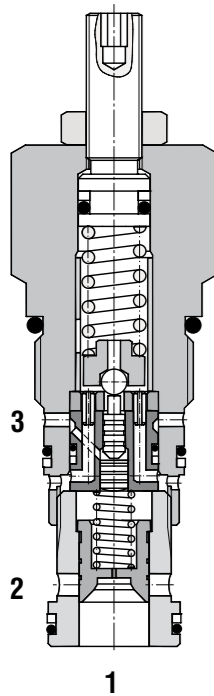
Ordering Code



Unloading Valve, Internal Drain, Spool Type, Pilot Operated

SU6A-U3/I

1-1/8-12 UNF • Q_{max} 60 l/min (16 GPM) • p_{max} 350 bar (5100 PSI)

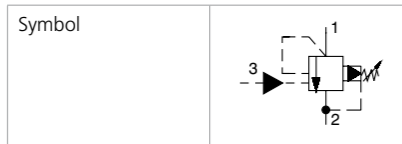


Technical Features

- › Accumulator charging valve / low pressure pump unloading valve to tank in double pump systems
- › Excellent stability throughout flow range with rapid response to dynamic pressure changes
- › Low hysteresis, accurate pressure control and low pressure drop
- › Wide pressure range up to 350 bar
- › Hardened precision parts
- › Sharp-edged steel seats for dirt-tolerant performance
- › Leak-free closing, suitable for fast cycling with long life
- › Adjustable by allen key
- › In the standard version, the valve is zinc-coated for 240 h protection acc. to ISO 9227

Functional Description

Input pressure acts on port 1 of the valve and system pressure operates on the pilot port 3. When the pressure at port 1 rises to the valve setting, the relief section opens and the system pressure acts on the pilot piston to hold the valve in the open position. The ratio between the pilot piston diameter and the seat diameter of the relief valve pilot section ensures that the valve remains in the fully open position until the system pressure drops to approximately 85% of the unload pressure.



Technical Data

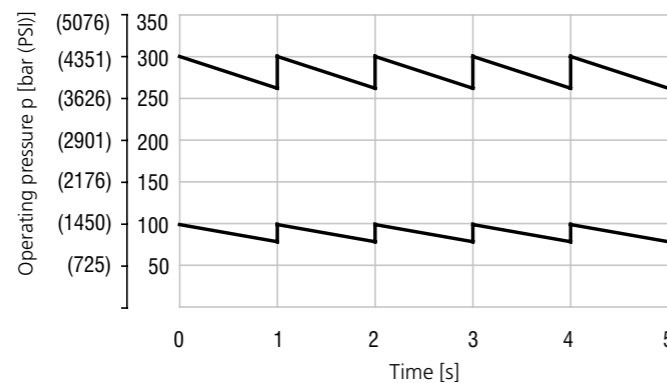
Valve size / Cartridge cavity		1-1/8-12 UNF-2A / U3
Max. flow	l/min (GPM)	60 (15.9)
Max. operating pressure	bar (PSI)	350 (5080)
Differential unload/reload	%	10 - 15
Fluid temperature range (NBR)	°C (°F)	-20... + 90 (-4 ... +194)
Max. leakage	ml/min	35
Mass	kg (lbs)	0.46 (1.01)

	Datasheet	Type
General information	GI_0060	Products and operating conditions
Valve bodies	In-line mounted SB_0018	SB-U3*
Cavity details	SMT_0019	SMT-U3*
Spare parts	SP_8010	

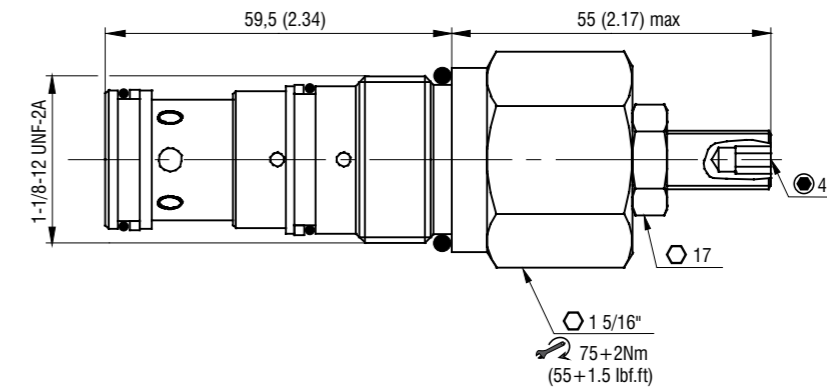
Characteristics measured at v = 32 mm²/s (156 SUS)

Typical valve performance

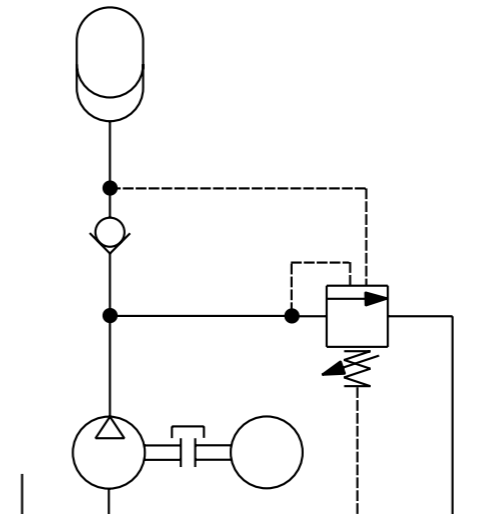
Pump unload to tank



Dimensions in millimeters (inches)



Application Example



The valve is used to unload a pump to the tank when the pressure in a separate part of the circuit reaches a pre-set value. The valve closes when the pressure has dropped to approximately 85% of the unload pressure, causing the circuit to reload. The most common application is to maintain the pressure in an accumulator, which may be used in an emergency to operate critical hydraulic functions.

Ordering Code

SU6A-U3/I

Unloading valve, internal drain,
spool type, pilot operated
1-1/8-12 UNF

Pressure range
40 - 100 bar (580 - 1450 PSI), standard setting 75 bar 10
70 - 200 bar (1020 - 2900 PSI), standard setting 100 bar 20
150 - 350 bar (2180 - 5080 PSI), standard setting 200 bar 35

Factory setting [bar @ l/min]
75/4,8 75 bar at 4.8 l/min
100/4,8 100 bar at 4.8 l/min
200/4,8 200 bar at 4.8 l/min

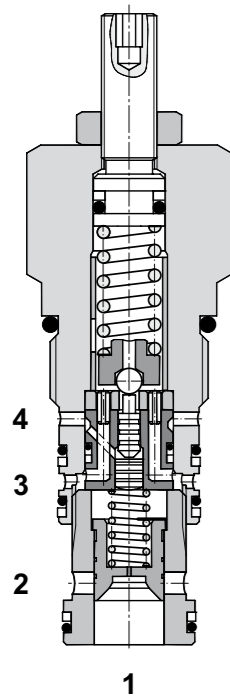
Surface treatment
A zinc-coated (ZnCr-3), ISO 9227 (240 h)

Seals
No designation NBR

Unloading Valve, External Drain, Spool Type, Pilot Operated

SUD6A-U4/I

1-1/8-12 UNF • Q_{max} 60 l/min (16 GPM) • p_{max} 350 bar (5100 PSI)

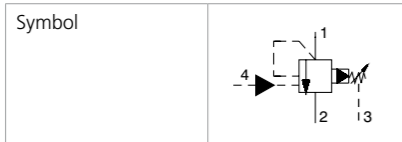


Technical Features

- › Accumulator charging valve / low pressure pump unloading valve to tank in double pump systems
- › Excellent stability throughout flow range with rapid response to dynamic pressure changes
- › Low hysteresis, accurate pressure control and low pressure drop
- › Wide pressure range up to 350 bar
- › Hardened precision parts
- › Sharp-edged steel seats for dirt-tolerant performance
- › Leak-free closing, suitable for fast cycling with long life
- › Adjustable by allen key
- › In the standard version, the valve is zinc-coated for 240 h protection acc. to ISO 9227

Functional Description

Input pressure acts on port 1 of the valve and system pressure operates on the pilot port 4. When the pressure at port 1 rises to the valve setting, the relief section opens and the system pressure acts on the pilot piston to hold the valve in the open position. The ratio between the pilot piston diameter and the seat diameter of the relief valve pilot section ensures that the valve remains in the fully open position until the system pressure drops to approximately 85 % of the unload pressure. The valve has a drain port (3) which allows unused by-pass oil to be used for a secondary circuit.



Technical Data

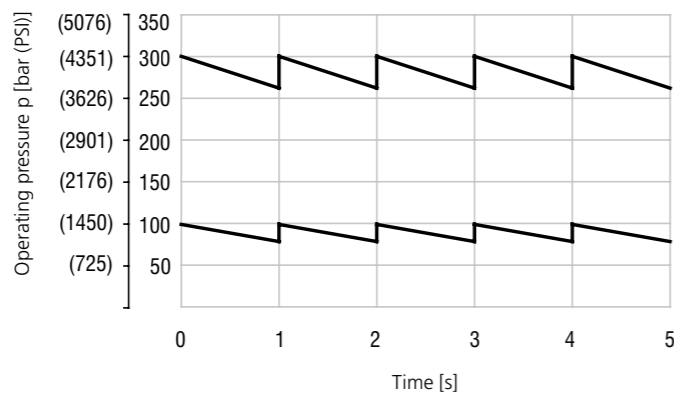
Valve size / Cartridge cavity		1-1/8-12 UNF-2A / U4
Max. flow	l/min (GPM)	60 (15.9)
Max. input pressure	bar (PSI)	350 (5080)
Differential unload/reload	%	10 - 15
Fluid temperature range (NBR)	°C (°F)	-20... + 90 (-4 ... +194)
Max. leakage	ml/min	35
Mass	kg (lbs)	0.46 (1.01)

	Datasheet	Type
General information	GI_0060	Products and operating conditions
Cavity details	SMT_0019	SMT-U4*
Spare parts	SP_8010	

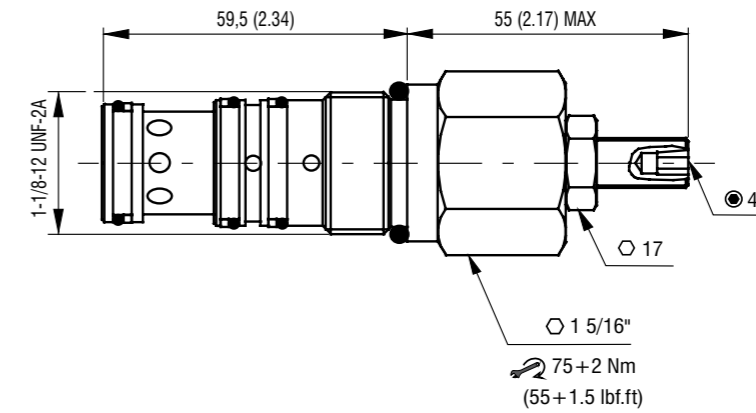
Characteristics measured at v = 32 mm²/s (156 SUS)

Typical valve performance

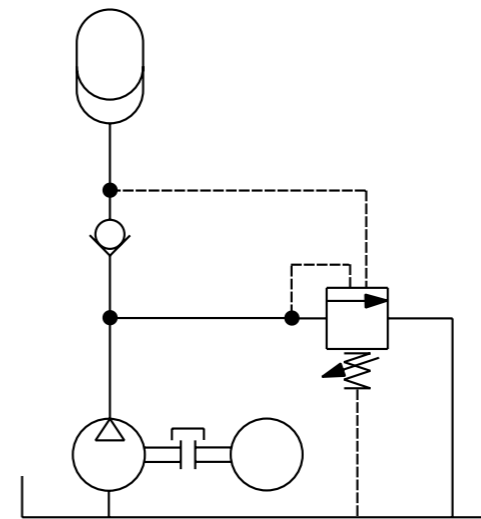
Pump unload to tank



Dimensions in millimeters (inches)



Application Example



The valve is used to unload a pump to the tank when the pressure in a separate part of the circuit reaches a pre-set value. The valve closes when the pressure has dropped to approximately 85% of the unload pressure, causing the circuit to reload. The most common application is to maintain the pressure in an accumulator, which may be used in an emergency to operate critical hydraulic functions.

Ordering Code

SUD6A-U4/I [] - [] - []

Unloading valve, external drain, spool type, pilot operated 1-1/8-12 UNF

Pressure range

40 - 100 bar (580 - 1450 PSI), standard setting 75 bar	10
70 - 200 bar (1020 - 2900 PSI), standard setting 100 bar	20
150 - 350 bar (2180 - 5080 PSI), standard setting 200 bar	35

Factory setting [bar @ l/min]

75/4,8	75 bar at 4.8 l/min
100/4,8	100 bar at 4.8 l/min
200/4,8	200 bar at 4.8 l/min

Surface treatment

A zinc-coated (ZnCr-3), ISO 9227 (240 h)

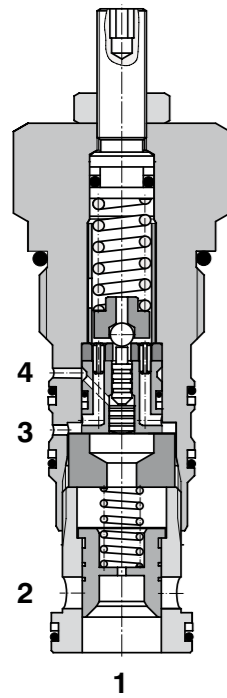
Seals

No designation NBR

Unloading Valve, External Drain, Spool Type, Pilot Operated

SUD6A-V4/I

1-5/16-12 UNF • Q_{max} 200 l/min (53 GPM) • p_{max} 350 bar (5100 PSI)

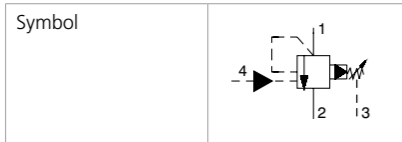


Technical Features

- › Accumulator charging valve / low pressure pump unloading valve to tank in double pump systems
- › Excellent stability throughout flow range with rapid response to dynamic pressure changes
- › Low hysteresis, accurate pressure control and low pressure drop
- › Wide pressure range up to 350 bar
- › Hardened precision parts
- › Sharp-edged steel seats for dirt-tolerant performance
- › Leak-free closing, suitable for fast cycling with long life
- › Adjustable by allen key
- › In the standard version, the valve is zinc-coated for 240 h protection acc. to ISO 9227

Functional Description

Input pressure acts on port 1 of the valve and system pressure operates on the pilot port 4. When the pressure at port 1 rises to the valve setting, the relief section opens and the system pressure acts on the pilot piston to hold the valve in the open position. The ratio between the pilot piston diameter and the seat diameter of the relief valve pilot section ensures that the valve remains in the fully open position until the system pressure drops to approximately 85 % of the unload pressure. The valve has a drain port (3) which allows unused by-pass oil to be used for a secondary circuit.



Technical Data

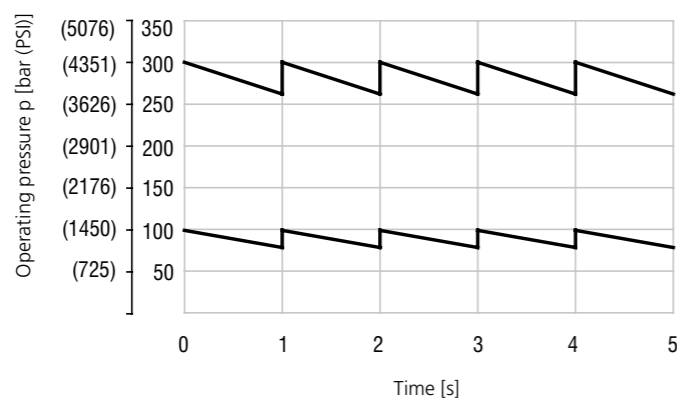
Valve size / Cartridge cavity		1-5/16-12 UNF-2A / V4
Max. flow	l/min (GPM)	200 (52.8)
Max. operating pressure	bar (PSI)	350 (5080)
Differential unload/reload	%	10 - 15
Fluid temperature range (NBR)	°C (°F)	-20... + 90 (-4 ... +194)
Max. leakage	ml/min	35
Mass	kg (lbs)	0.74 (1.63)

	Datasheet	Type
General information	GI_0060	Products and operating conditions
Cavity details	SMT_0019	SMT-V4*
Spare parts	SP_8010	

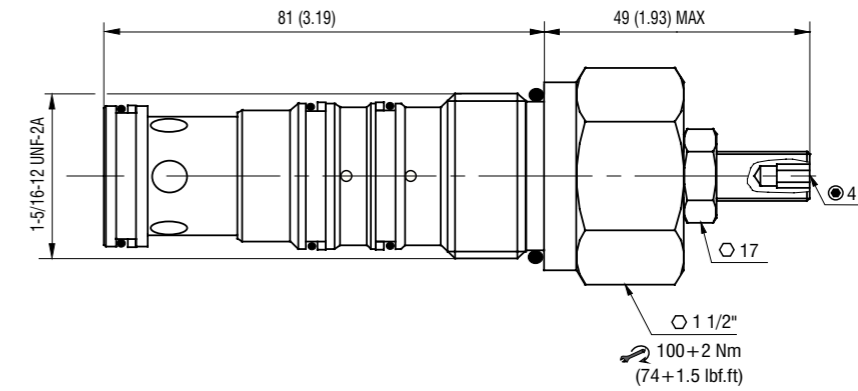
Characteristics measured at $v = 32 \text{ mm}^2/\text{s}$ (156 SUS)

Typical valve performance

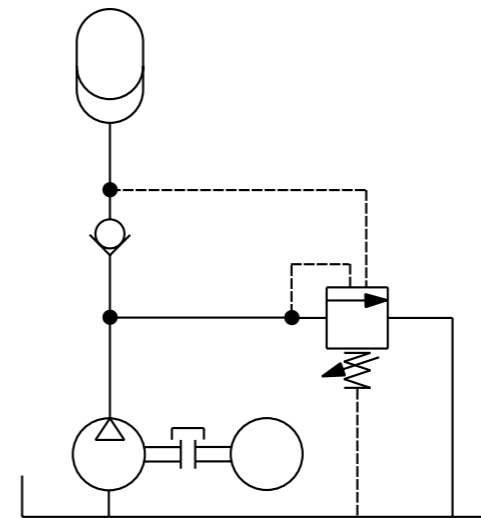
Pump unload to tank



Dimensions in millimeters (inches)



Application Example



The valve is used to unload a pump to the tank when the pressure in a separate part of the circuit reaches a pre-set value. The valve closes when the pressure has dropped to approximately 85 % of the unload pressure, causing the circuit to reload. The most common application is to maintain the pressure in an accumulator, which may be used in an emergency to operate critical hydraulic functions.

Ordering Code

SUD6A-V4/I [] - [] - [] - []

Unloading valve, external drain, spool type, pilot operated
1-5/16-12 UNF


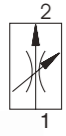
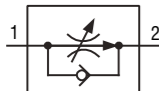
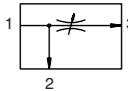
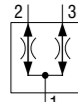
Pressure range
30 - 210 bar (435 - 2900 PSI), standard setting 100 bar **20**
50 - 350 bar (725 - 5080 PSI), standard setting 200 bar **35**

Factory setting [bar @ l/min]
100/4,8 100 bar at 4.8 l/min
200/4,8 200 bar at 4.8 l/min

Surface treatment
A zinc-coated (ZnCr-3), ISO 9227 (240 h)

No designation **Seals**
NBR

Content

Symbol Example	Flow l/min (GPM)	Pressure bar (PSI)	Type Code	Cartridge			Line Mounted	Page	Data Sheet
				Size 04; D02	Size 06; D03	Size 10; D05			
Needle - Restrictor Valves and Valves with Reverse Flow Check									
	20 (5)	320 (4600)	VSV2	X				266	HA 5132
	20 (5)	320 (4600)	ST21A-A2	X	(X)		(X)	268	HA 5133
	20 (5)	100 (1500)	VSO1-04/R				X	270	HA 5054
	140 (37)	350 (5100)	ST21A-B2	X	(X)			272	HA 5134
	25 (7)	320 (4600)	VSO1-04/M		X			274	HA 5053
	25 (7)	320 (4600)	2VS3-06			X		276	HA 5051
	160 (42)	350 (5100)	VSO3-10/M				X	278	HA 5076
2 Way Flow Regulators									
	10 (3)	320 (4600)	VSK				X	280	HA 5121
	16 (4)	350 (5100)	SF22A-A2/H	X	(X)		(X)	282	HA 5060
	45 (12)	320 (4600)	VSS3-062/S	X				284	HA 5057
	45 (12)	320 (4600)	VSS3-062/M			X		286	HA 5050
	40 (11)	350 (5100)	SF22A-B2/H	X	(X)		(X)	288	HA 5067
2 Way Flow Regulators with Reverse Flow Check									
	22 (6)	320 (4600)	VSS1-206			X		290	HA 5032
	32 (8)	320 (4600)	VSS2-206			X		292	HA 5041
	60 (16)	350 (5100)	SF2C2A-K2/I	X			(X)	294	HA 5236
3 Way Flow Regulators									
	16 (4)	320 (4600)	VSS1-306			X		296	HA 5033
	30 (8)	350 (5100)	SF32A-B3/H	X	(X)		(X)	298	HA 5070
	60 (16)	350 (5100)	SF32A-K3/I	X			(X)	300	HA 5227
Flow Divider - Combiner Valves									
	40 (11)	350 (5100)	SFD2F-B4/I	X			(X)	302	HA 5234
	150 (40)	350 (5100)	SFD2F-D4/I	X			(X)	304	HA 5235

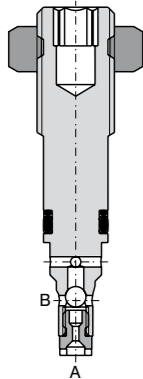
Notes

Needle - Restrictor Valve with Reverse Flow Check, Fine Adjustable

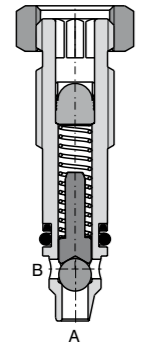
VSV2

M12x1 • Q_{max} 20 l/min (5 GPM) • p_{max} 320 bar (4600 PSI)

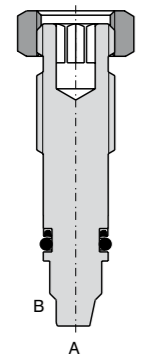
VSV2-QC2/J2



VSV2-QC2/J1



VSV2-QC2/1



Technical Features

- › Reverse flow check option
- › Hardened precision parts
- › Fine low-torque adjustment
- › Linear adjustment and positive seat overlap
- › Optionally adjustable by allen key or hand screw
- › Desired settings may be locked down
- › In the standard version, the valve is zinc-coated for 240 h protection acc. to ISO 9227

Functional Description

A hydraulic flow restrictor valve in the form of a screw-in cartridge with an optional by-pass check valve. After loosening the lock nut the valve may be unscrewed up to the red marked safety notch. Beyond the marking, the valve may get completely unscrewed, leading to leakage.

Model Code	VSV2-QC2/1	VSV2-QC2/J1	VSV2-QC2/J2
Symbol			

Technical Data

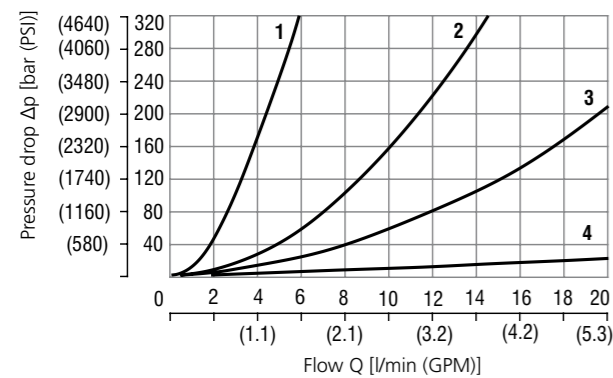
Valve size / Cartridge cavity		M12x1 / QC2
Max. flow	l/min (GPM)	20 (5.3)
Max. operating pressure	bar (PSI)	320 (4640)
Fluid temperature range (NBR)	°C (°F)	-30 ... +100 (-22 ... +212)
Mass	kg (lbs)	0.11 (0.24)

	Datasheet	Type
General information	GI_0060	Products and operating conditions
Cavity details	SMT_0019	SMT-QC2*
Spare parts	SP_8010	

Characteristics measured at v = 32 mm²/s (156 SUS)

Pressure drop related to flow rate

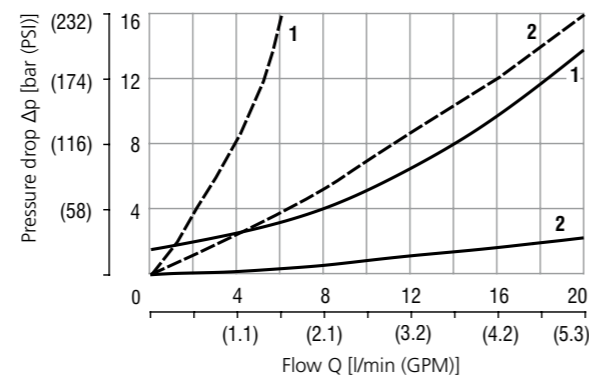
Flow direction B→A VSV2-QC2/1, VSV2-QC2/J1
Flow direction A→B VSV2-QC2/1, VSV2-QC2/J2



Number of turns of the adjustment screw			
1	2	3	4

Pressure drop related to flow rate

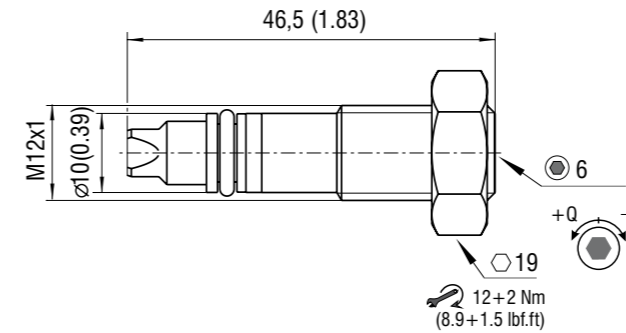
Flow direction A→B (free flow) VSV2-QC2/J1
Flow direction B→A VSV2-QC2/J2



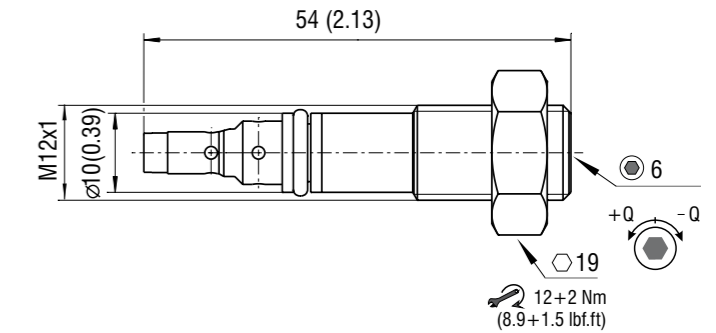
Throttle valve closed		Throttle valve opened	
1		2	

Dimensions in millimeters (inches)

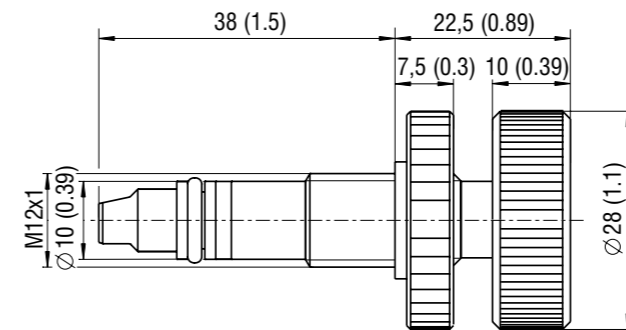
Models S: VSV2-QC2/1, VSV2-QC2/J1



Model S: VSV2-QC2/J2



Model RS: VSV2-QC2/1, VSV2-QC2/J1, VSV2-QC2/J2



Ordering Code

VSV2 - QC2 / [] [] [] - []

Needle - restrictor valve with reverse flow check, fine adjustable M12x1

Model
without check valve 1
with check valve, unregulated flow A → B J1
with check valve, unregulated flow B → A J2

Surface treatment
No designation without surface treatment
A zinc-coated (ZnCr-3), ISO 9227 (240h)
B zinc-coated (ZnNi), ISO 9227 (520h)

Seals
No designation NBR

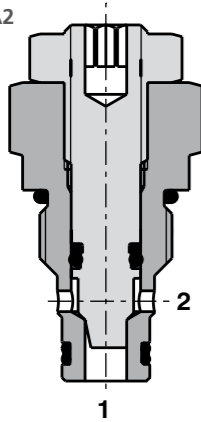
Adjustment option
S allen key (hex. 6), without protective cap
RS hand screw, metal

Needle - Restrictor Valve with Reverse Flow Check, Fine Adjustable

ST2C1A-A2

3/4-16 UNF • Q_{max} 20 l/min (5 GPM) • p_{max} 320 bar (4600 PSI)

ST21A-A2



Technical Features

- › Reverse flow check option
- › Hardened precision parts
- › Fine low-torque adjustment
- › Linear adjustment and positive seat overlap
- › Optionally adjustable by allen key or hand screw
- › Desired settings may be locked down
- › In the standard version, the valve is zinc-coated for 240 h protection acc. to ISO 9227

Functional Description

A hydraulic flow restrictor valve in the form of a screw-in cartridge with an optional by-pass check valve. After loosening the lock nut the valve may be unscrewed up to the red marked safety notch. Beyond the marking, the valve may get completely unscrewed, leading to leakage.

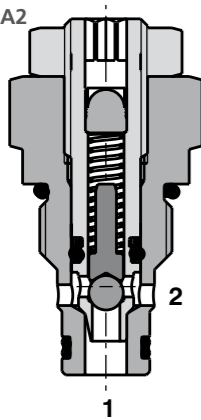
Model Code	ST21A-A2	ST2C1A-A2
Symbol		

Technical Data

Valve size / Cartridge cavity		3/4-16 UNF-2A / A2
Max. flow	l/min (GPM)	20 (5.3)
Max. operating pressure	bar (PSI)	320 (4600)
Fluid temperature range (NBR)	°C (°F)	-30 ... +100 (-22 ... +212)
Mass	kg (lbs)	0.2 (0.44)

	Datasheet	Type
General information	GI_0060	Products and operating conditions
Valve bodies	In-line mounted	SB_0018
	Sandwich mounted	SB-04(06)_0028
Cavity details / Form tools	SMT_0019	SMT-A2*
Spare parts	SP_8010	

ST2C1A-A2

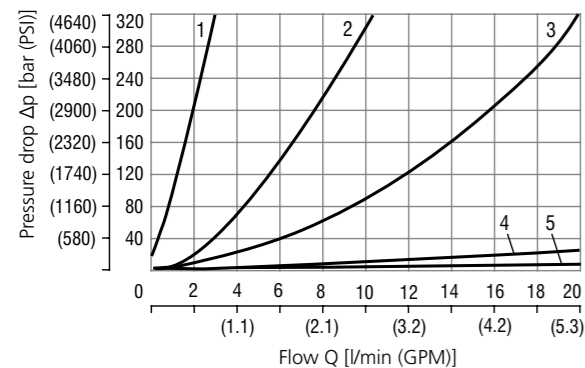


Characteristics measured at $v = 32 \text{ mm}^2/\text{s}$ (156 SUS)

Pressure drop related to flow rate

Flow direction 2→1

ST21A-A2/L20*, ST2C1A-A2/L20*

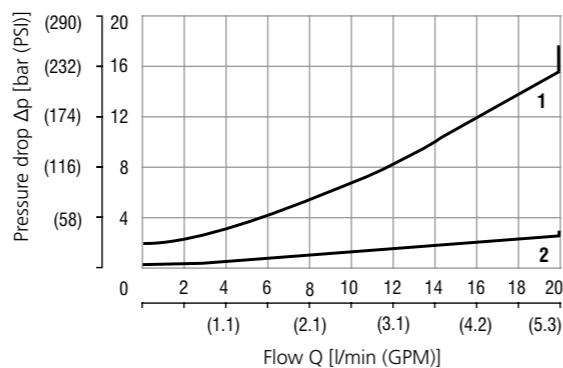


Number of turns of the adjustment screw				
1	2	3	4	5

Check valve pressure drop related to flow rate

Flow direction 1→2

ST2C1A-A2/L20*

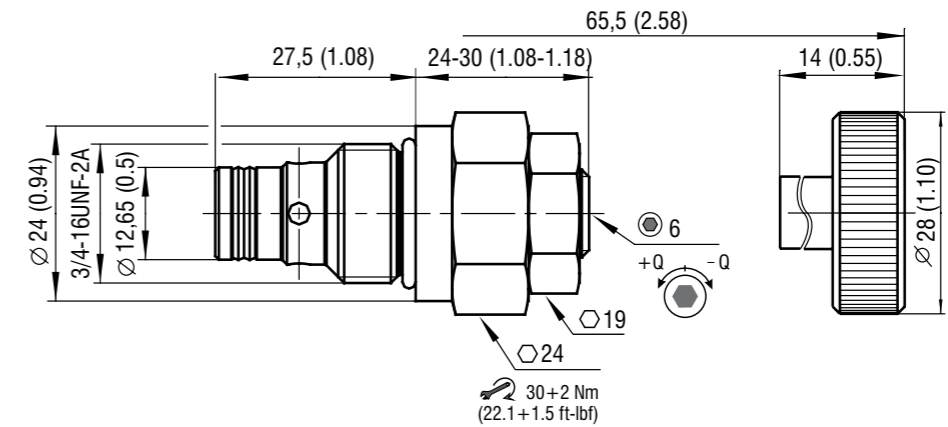


Trottle valve closed	Trottle valve opened
1	2

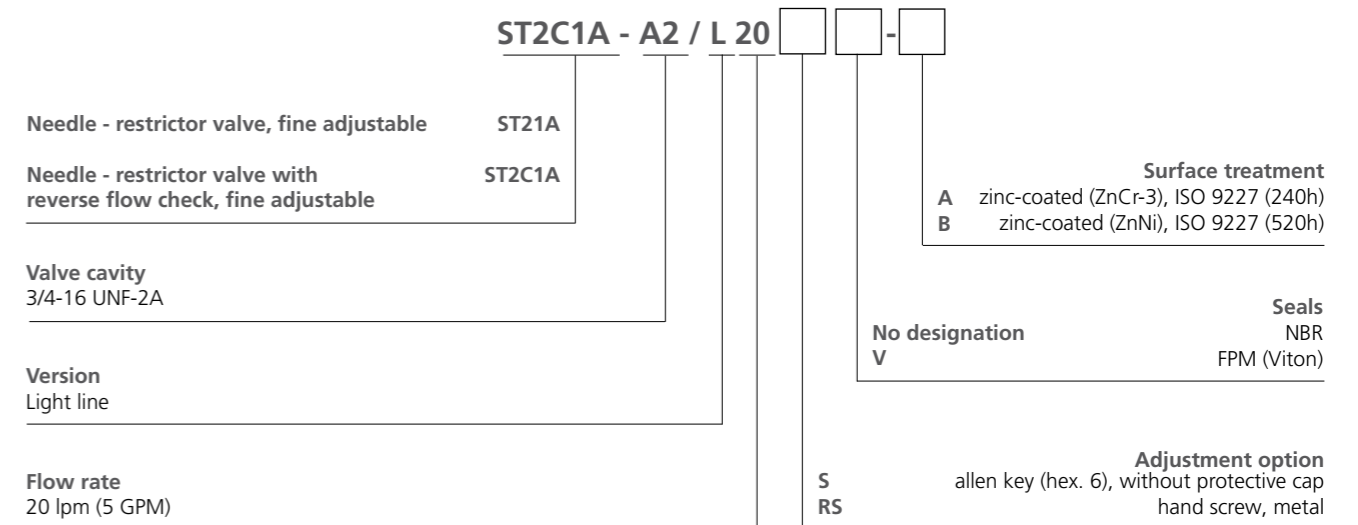
Dimensions in millimeters (inches)

Model S

Model RS



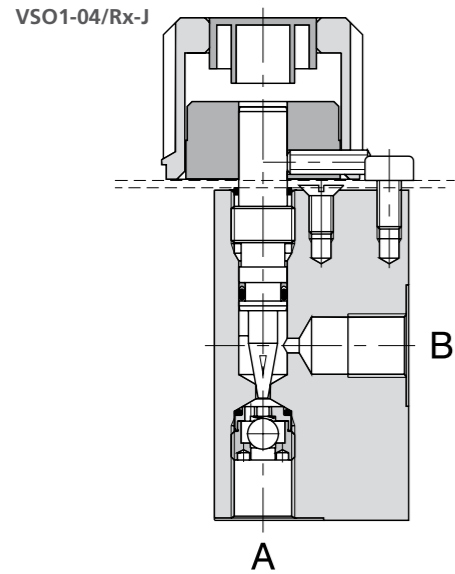
Ordering Code



Needle - Restrictor Valve with Reverse Flow Check, Fine Adjustable, In-Line

VSO1-04/R

In-line G1/4 • Q_{max} 20 l/min (5 GPM) • p_{max} 100 bar (1500 PSI)

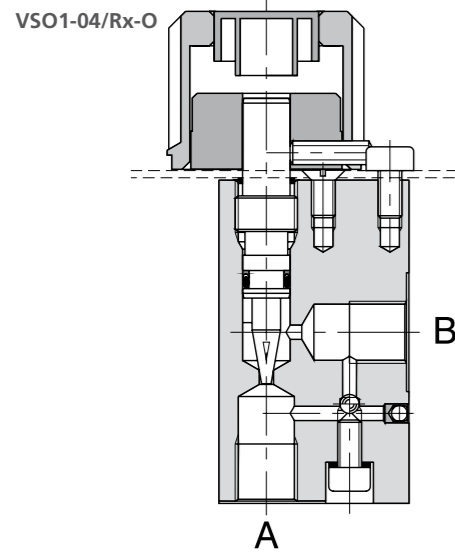


Technical Features

- › Reverse flow check option
- › Hardened precision parts
- › Fine low-torque adjustment
- › Linear adjustment and positive seat overlap
- › In the standard version, the valve body is made of aluminum, all parts are without surface treatment.

Functional Description

Hydraulic flow restrictor valve with optional by-pass or serial check valve. The adjustment sensitivity of the flow rate is determined by the selected respective seat diameter in the range between 2 and 3.5 mm. The rotation of the hand screw is limited to just under one revolution by the hard stop on the mounting bolt. The flow rate can be adjusted within that range of rotation. The simple fine throttle valve can be fitted with a check valve VJO1-06/SG (see data sheet 5004) installed in series. For a more unobstructed reverse flow through the valve, the model VSO1-04/Rx-O with a parallel ball valve may be used. The connection threads in the valve body support installation in line or hose assemblies. The valve is designed to be attached on the back side of a control panel by two M6 bolts. The outer bolt with the cylindrical head functions at the same time as the hard stop for the hand screw. The attached plate for panel installation can be removed by first de-assembling the hand screw.

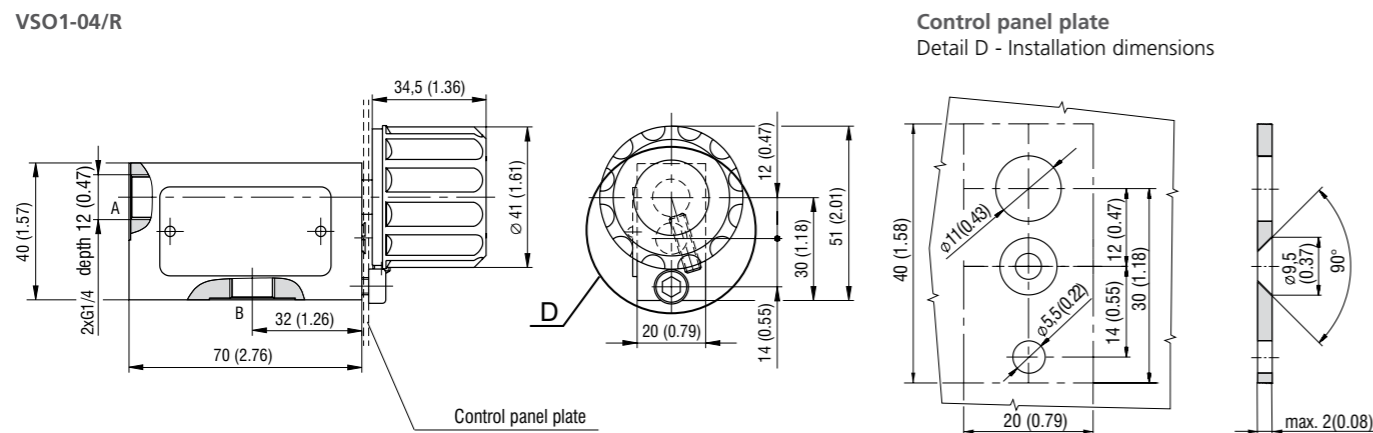


Model Code	VSO1-04/Rx	VSO1-04/Rx-J	VSO1-04/Rx-O
Symbol			

Technical Data

Valve size	In-line 04	
Max. flow	l/min (GPM)	20 (5.3)
Max. operating pressure	bar (PSI)	100 (1450)
Fluid temperature range (NBR)	°C (°F)	-30 ... +100 (-22 ... +212)
Mass	kg (lbs)	0.22 (0.49)
Datasheet		Type
General information	GI_0060	Products and operating conditions
Spare parts	SP_8010	

Dimensions in millimeters (inches)

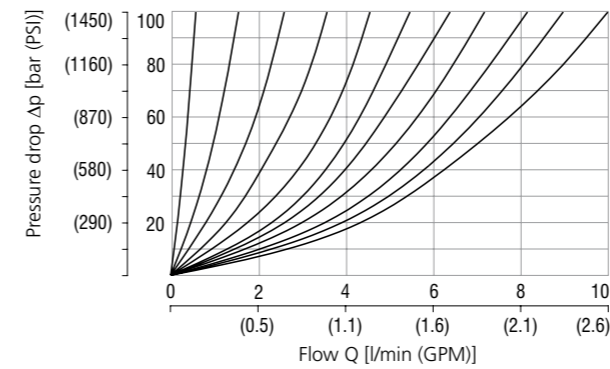


Control panel plate
Detail D - Installation dimensions

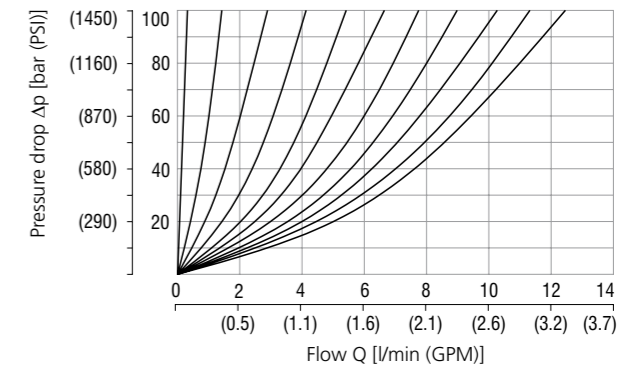
Characteristics measured at v = 32 mm²/s (156 SUS)

Pressure drop related to flow rate
The characteristics were measured at the hand screw set to 30°.

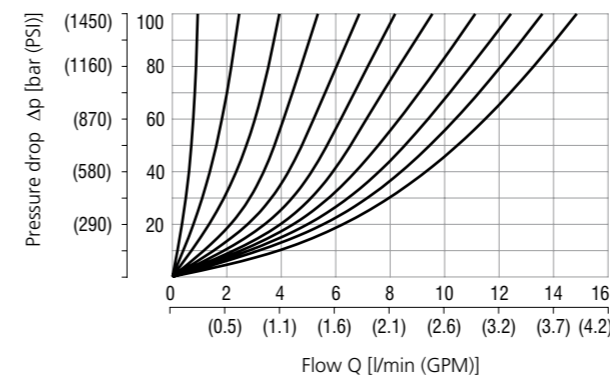
Seat diameter 2 mm (0.08 in)



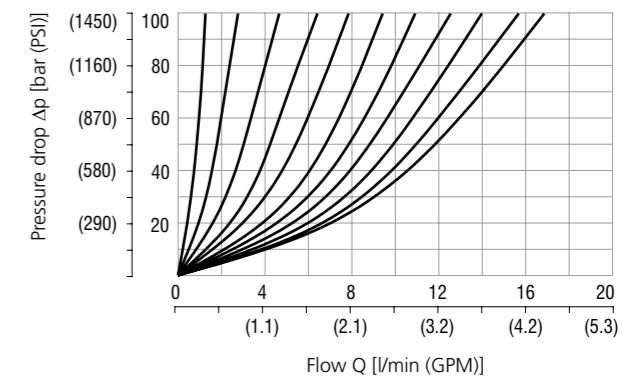
Seat diameter 2.5 mm (0.10 in)



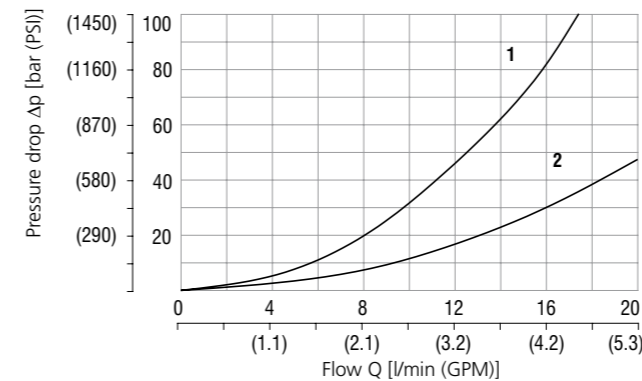
Seat diameter 3 mm (0.12 in)



Seat diameter 3.5 mm (0.14 in)



Model VSO1-04/R2-O, direction B - A (free flow)



1	Throttle valve closed
2	Throttle valve open

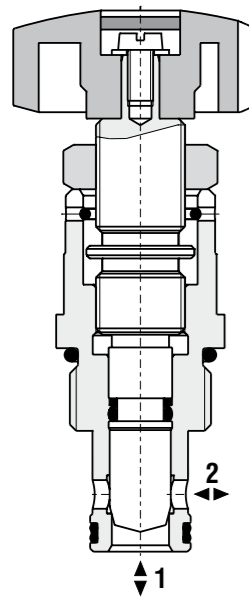
Ordering Code

VSO1-04 / R					
Needle - restrictor valve with reverse flow check, fine adjustable					Seals standard NBR
In-line design					Connecting threads G thread, G1/4 SAE thread, SAE 6
Seat diameter					Model
2.0 mm (0.08 in)			2		without check valve
2.5 mm (0.10 in)			2.5		with check valve in series
3.0 mm (0.12 in)			3		with check valve in parallel
3.5 mm (0.14 in)			3.5		
Other seat diameters upon request.					
					No designation
					No designation
					No designation

Needle - Restrictor Valve

ST21A-B2

7/8-14 UNF • Q_{max} 140 l/min (37 GPM) • p_{max} 350 bar (5100 PSI)



Technical Features

- › Hardened precision parts
- › Fine low-torque adjustment
- › Linear adjustment and positive seat overlap
- › Optionally adjustable by hand screw
- › Desired settings may be locked down
- › In the standard version, the valve is zinc-coated for 240 h protection acc. to ISO 9227

Functional Description

A hydraulic flow restrictor valve in the form of a screw-in cartridge. The valve restricts flow in both directions, making it ideal for fine control of an uncompensated system or for use as a shut-off valve.

Model Code	ST21A-B2
Symbol	

Technical Data

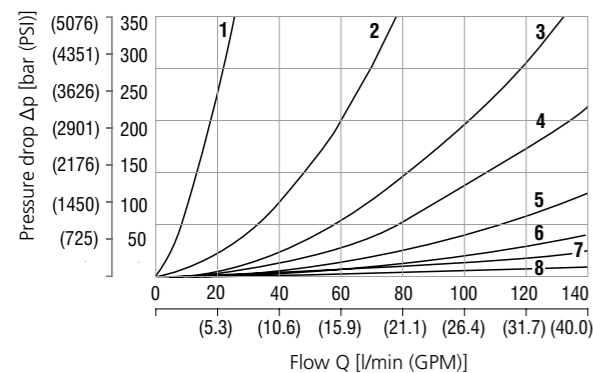
Valve size / Cartridge cavity	7/8-14 UNF / B2	
Max. flow	l/min (GPM)	140 (37)
Max. operating pressure	bar (PSI)	350 (5076)
Fluid temperature range (NBR)	°C (°F)	-30 ... +100 (-22 ... +212)
Mass	kg (lbs)	0.3 (0.66)

	Datasheet	Type
General information	GI_0060	Products and operating conditions
Valve bodies	In-line mounted	SB_0018
	Sandwich mounted	SB-04(06)_0028
Cavity details / Form tools	SMT_0019	SMT-B2*
Spare parts	SP_8010	

Characteristics measured at v = 32 mm²/s (156 SUS)

Pressure drop related to flow rate

Flow direction 1 - 2

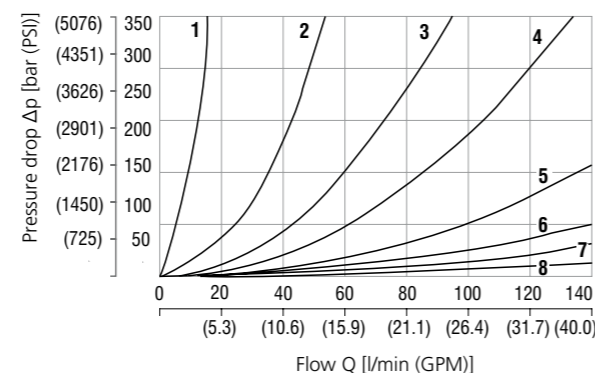


Number of half turns (180°) of the adjust. screw

1	2	3	4	5	6	7	8
---	---	---	---	---	---	---	---

Pressure drop related to flow rate

Flow direction 2 - 1



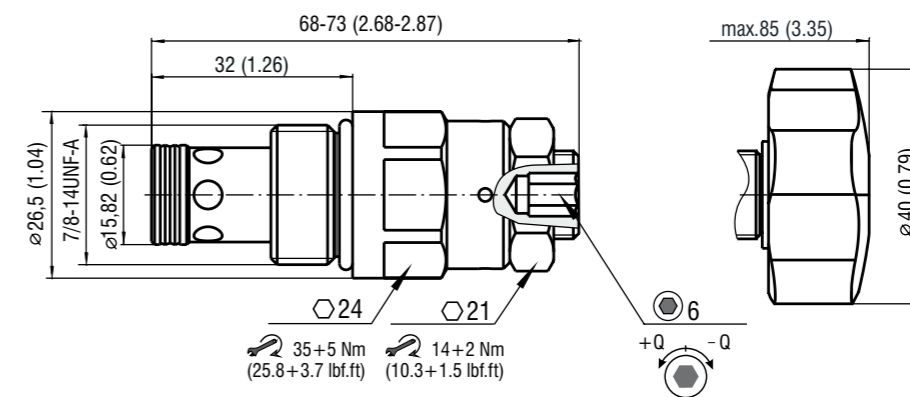
Number of half turns (180°) of the adjust. screw

1	2	3	4	5	6	7	8
---	---	---	---	---	---	---	---

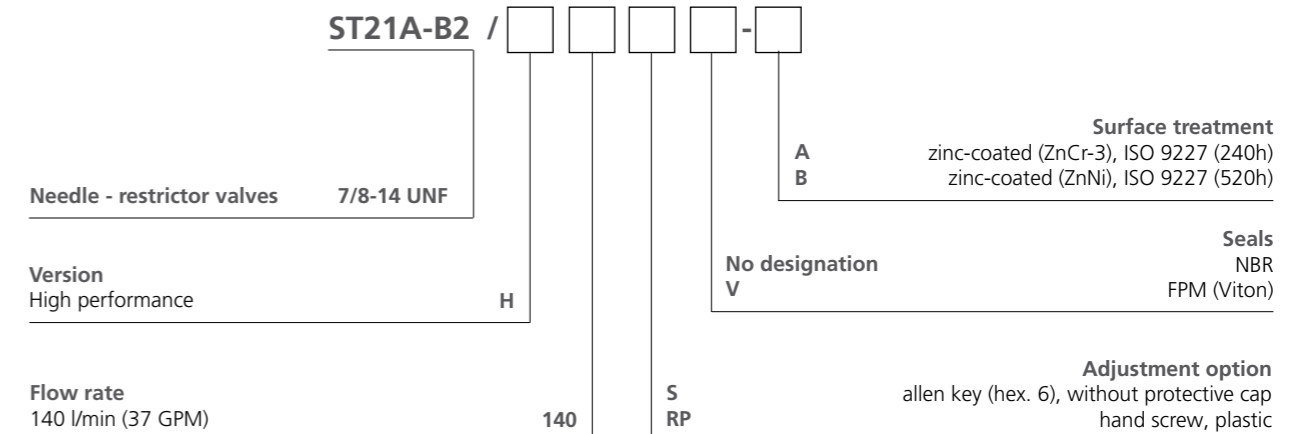
Dimensions in millimeters (inches)

Model S

Model RP



Ordering Code



Restrictor Valve with Reverse Flow Check, Modular

VSO1-04/M

Size 04 (D02) • Q_{max} 25 l/min (7 GPM) • p_{max} 320 bar (4600 PSI)



Technical Features

- › Restrictor valve with reverse flow check, mounting interface acc. to ISO 4401, DIN 24340 (CETOP 02)
- › Meter-in or meter-out flow control
- › Leak-free closing in one or two service ports
- › Linear adjustment and positive seat overlap
- › Desired settings may be locked down
- › Optionally adjustable by allen key, with protective cap
- › In the standard version, the valve is zinc-coated for 240 h protection acc. to ISO 9227 and the valve body is phosphated

Functional Description

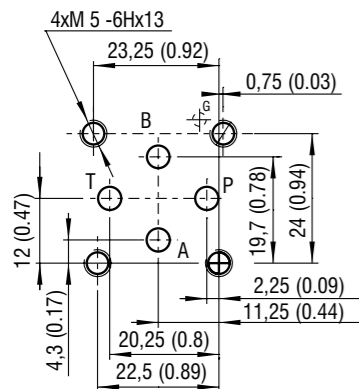
Dual hydraulic flow restrictor valves with optional by-pass check valves are used to control flow rates in two separate lines (A, B) of a hydraulic circuit. The modular design provides six functional versions. The valve restricts the fluid flow in one direction while providing unobstructed reverse flow in the opposite direction. The throttling is adjusted by a set screw, which can be operated by a key. The sandwich design supports stacking with other components of the same size. Depending on the valve installation it functions as a meter-in or meter-out flow control device. The orientation of the check valve(s) in the valve body corresponds with the symbol on the nameplate.

Technical Data

Valve size	04 (D02)	
Max. flow	l/min (GPM)	25 (6.6)
Max. operating pressure	bar (PSI)	320 (4640)
Fluid temperature range (NBR)	°C (°F)	-30 ... +100 (-22 ... +212)
Fluid temperature range (FPM)	°C (°F)	-20 ... +120 (-4 ... +248)
Mass	kg (lbs)	0.8 (1.76)

	Datasheet	Type
General information	GI_0060	Products and operating conditions
Mounting interface / tolerances	SMT_0019	Size 04
Spare parts	SP_8010	

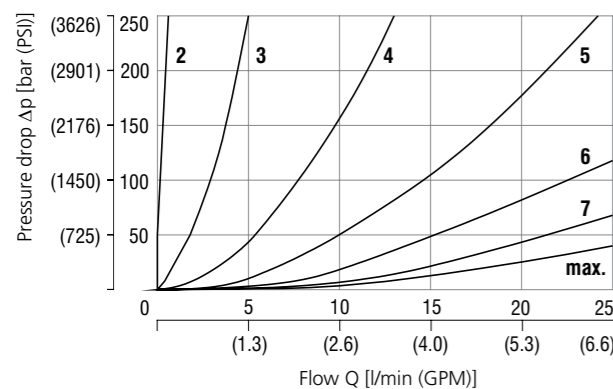
ISO 4401-02-01-0-05



Ports P, A, B, T - max. \varnothing 4.5 mm (0.18 in)

Characteristics measured at $v = 32 \text{ mm}^2/\text{s}$ (156 SUS)

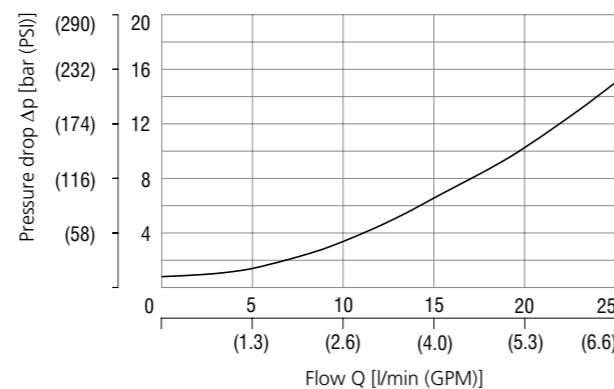
Pressure drop related to flow rate



Number of turns of the adjustment screw						
2	3	4	5	6	7	max.

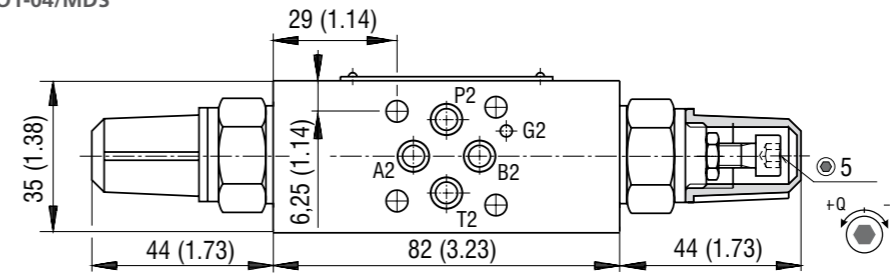
Check valve pressure drop related to flow rate

Throttle valve closed



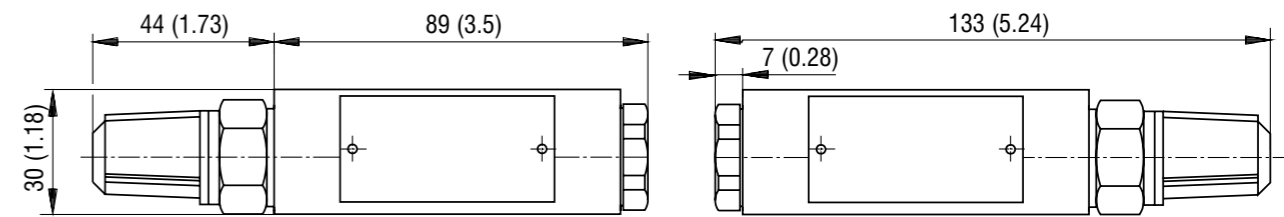
Dimensions in millimeters (inches)

Model
VSO1-04/MCS
VSO1-04/MDS



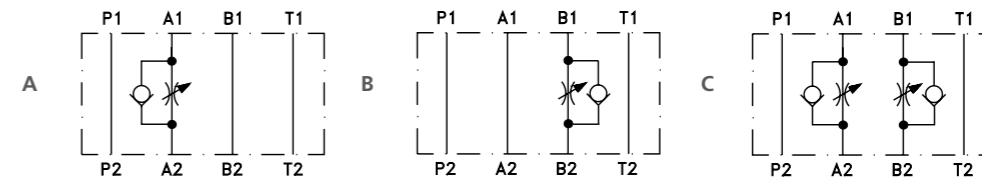
Model
VSO1-04/MAS
VSO1-04/MES

Model
VSO1-04/MBS
VSO1-04/MFS

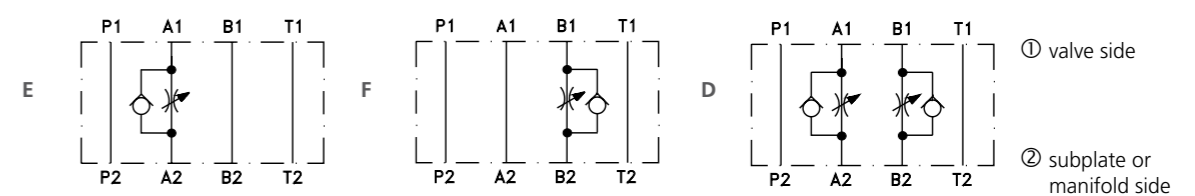


Functional Symbols

Meter-in control

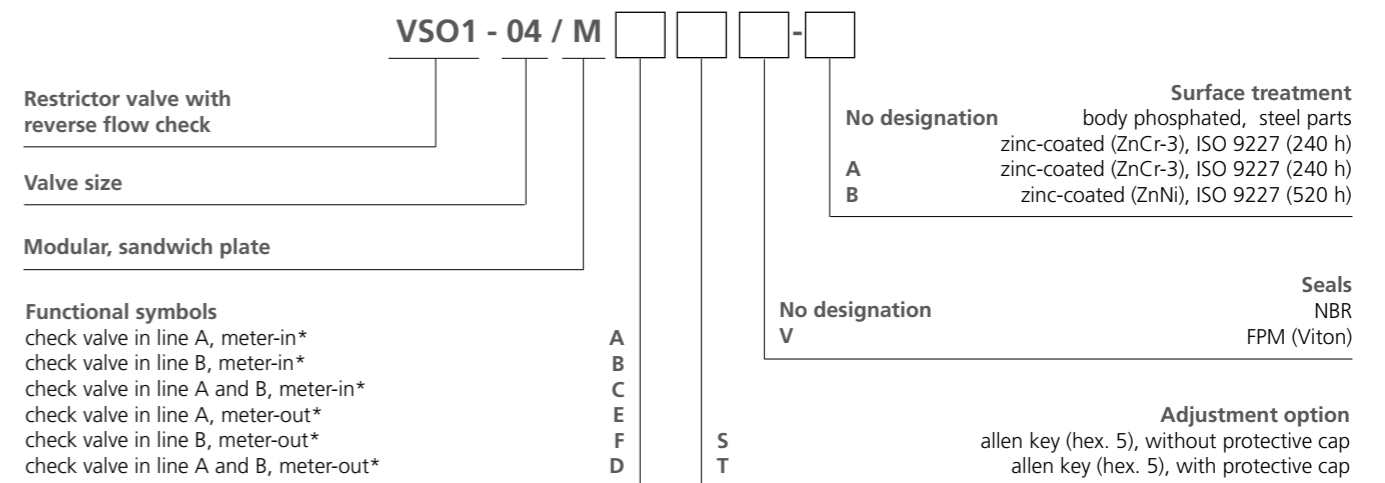


Meter-out control



Notice: The orientation of the symbol on the name plate corresponds with the valve function.

Ordering Code



*see table of functional symbols

Restrictor Valve with Reverse Flow Check, Modular

2VS3-06

Size 06 (D03) • Q_{max} 80 l/min (21 GPM) • p_{max} 320 bar (4600 PSI)



Technical Features

- › Restrictor valve with reverse flow check, mounting interface acc. to ISO 4401, DIN 24340 (CETOP 03)
- › Meter-in or meter-out flow control
- › Leak-free closing in one or two service ports
- › Linear adjustment and positive seat overlap
- › Desired settings may be locked down
- › Optionally adjustable by allen key with protective cap, or by hand screw
- › In the standard version, the valve is zinc-coated for 240 h protection acc. to ISO 9227 and the valve body is phosphated

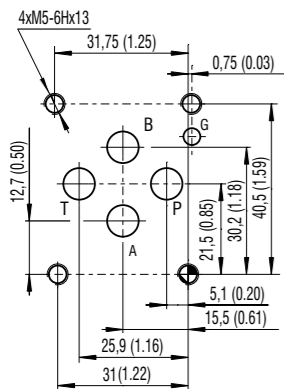
Functional Description

Dual hydraulic flow restrictor valves with an optional by-pass check valve are used to control flow rates in two separate lines (A, B) of a hydraulic circuit. The modular design provides six functional versions. The valve restricts the fluid flow in one direction while providing free reverse flow in the opposite direction. The throttle is adjusted by a set screw, which can be operated by a key, a hand screw, or a hand screw with key lock. The sandwich design supports stacking with other components of the same size. The separate O-ring plate provides sealing of the valve on a connecting surface. Depending on the valve installation it functions as a meter-in or meter-out flow control device. Changing the valve from meter-in to meter-out mode can be done by turning the valve by 180° around its horizontal. The orientation of the throttle check valve(s) in the valve body corresponds with the symbol on the nameplate.

Technical Data

Valve size		06 (D03)
Max. flow	l/min (GPM)	80 (21.1)
Max. operating pressure	bar (PSI)	320 (4640)
Fluid temperature range (NBR)	°C (°F)	-30 ... +100 (-22 ... 212)
Fluid temperature range (FPM)	°C (°F)	-20 ... +120 (-4 ... 248)
Mass	kg (lbs)	1.2 (2.65)
	Datasheet	Type
General information	GI_0060	Products and operating conditions
Mounting interface	SMT_0019	Size 06
Spare parts	SP_8010	

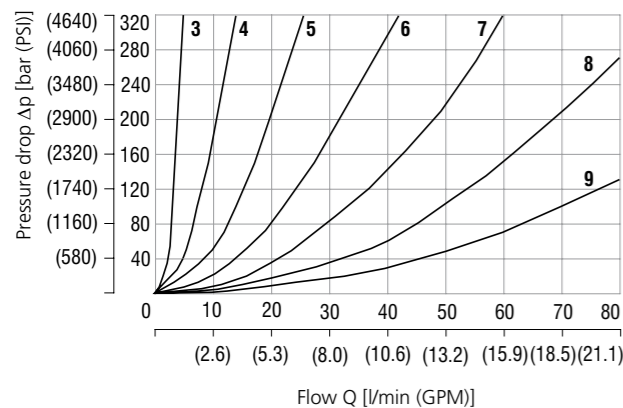
ISO 4401-03-02-0-05



Ports P, A, B, T - max Ø 7.5 mm (0.29 in)

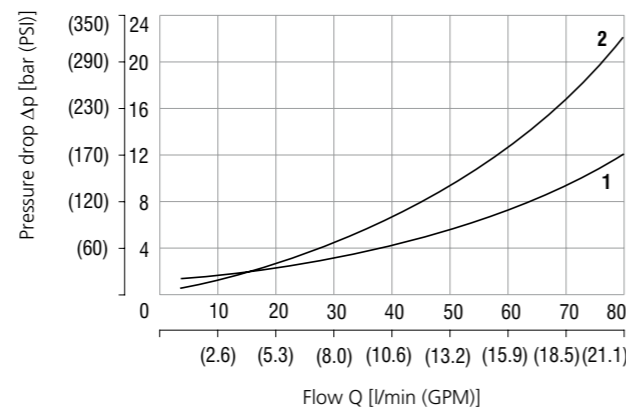
Characteristics measured at v = 32 mm²/s (156 SUS)

Pressure drop related to flow rate



Number of turns of the adjustment screw						
3	4	5	6	7	8	9

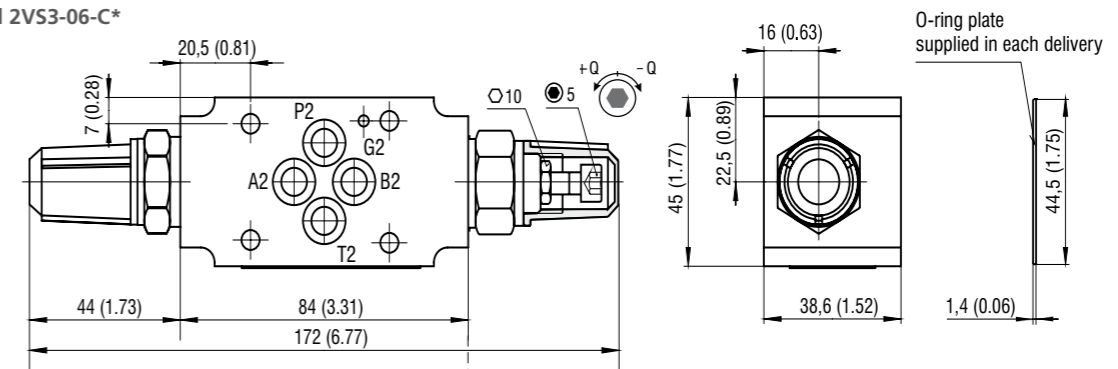
Check valve pressure drop related to flow rate



Throttle valve closed	Throttle fully open
1	2

Dimensions in millimeters (inches)

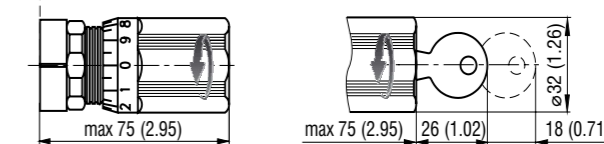
Model 2VS3-06-C*



O-ring plate supplied in each delivery

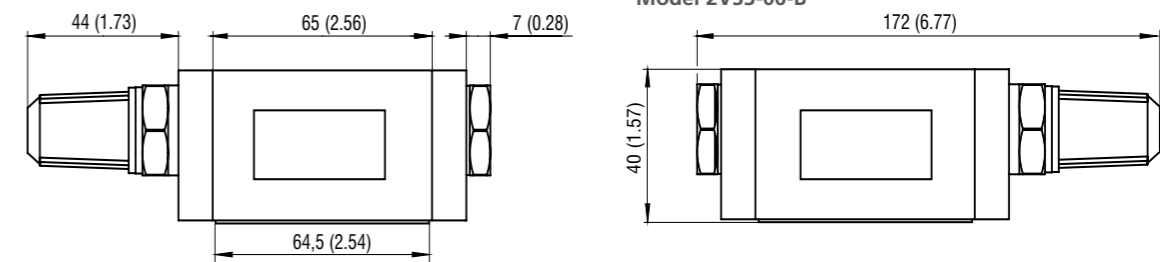
Model O

Model Z

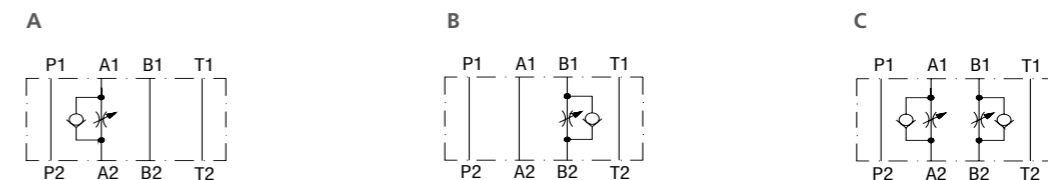


Model 2VS3-06-A*

Model 2VS3-06-B*



Functional Symbols



Notice: The orientation of the symbol on the name plate corresponds with the valve function. With the separate O-ring plate the valve body may be mounted 180° rotated, which changes the valve function from meter-in to meter-out.

Ordering Code

2VS3 - 06 - [] [] [] - []

Restrictor valve with reverse flow check, modular

Valve size

Functional symbols
 check valve in line A, meter-in* A
 check valve in line B, meter-in* B
 check valve in line A and B, meter-in* C

Surface treatment
 No designation body phosphated, steel parts
 A zinc-coated (ZnCr-3), ISO 9227 (240 h)
 B zinc-coated (ZnCr-3), ISO 9227 (240 h)
 zinc-coated (ZnNi), ISO 9227 (520 h)

Seals
 No designation NBR
 V FPM (Viton)

Adjustment option
 S allen key (hex. 5), without protective cap
 T allen key (hex. 5), with protective cap
 O non-lockable cylindrical hand screw
 Z lockable cylindrical hand screw

*see table of functional symbols

Changing the valve's function from meter-in to meter-out is accomplished by mounting the valve rotated 180° around its horizontal axis.

Restrictor Valve with Reverse Flow Check, Modular

VSO3-10/M

Size 10 (D05) • Q_{max} 160 l/min (42 GPM) • p_{max} 350 bar (5100 PSI)



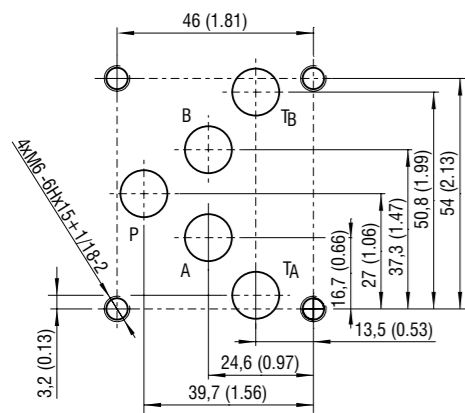
Technical Features

- › Restrictor valve with reverse flow check with subplate mounting surface acc. to ISO 4401, DIN 24340 (CETOP 05) standards
- › Meter-in or meter-out flow control
- › Leak-free closure in one or two service ports
- › Linear adjustment and positive seat closing
- › Desired settings may be locked down
- › Adjustment option with allen head and protective cup
- › In the standard version, the valve is zinc coated for 240 h protection acc. to ISO 9227 and valve body is phosphated

Functional Description

Dual hydraulic flow restrictor valve with by pass check valve option are used to control flow rates in two separate lines (A,B) of a hydraulic circuit. The modular design provides six functional versions. The valve restricts the fluid flow in one direction while providing reverse free-flow in the opposite direction. The throttling is adjusted by means of a set screw. The sandwich design enables simple stacking with other components of the same size. The separate o-ring plate provides sealing of the valve connecting surface. According to the valve arrangement, the meter-in or meter-out control is provided. Changing the meter-in mode into the meter-out mode can be done by turning the valve by 180° around its x-axis. The orientation of the throttle check valves in the valve body corresponds with the symbols shown on the nameplate. The set screw can be operated by a key, handknob or by a handknob with key lock.

ISO 4401-05-04-0-05



Ports P, A, B, T - max Ø11.2 mm (0.44 in)

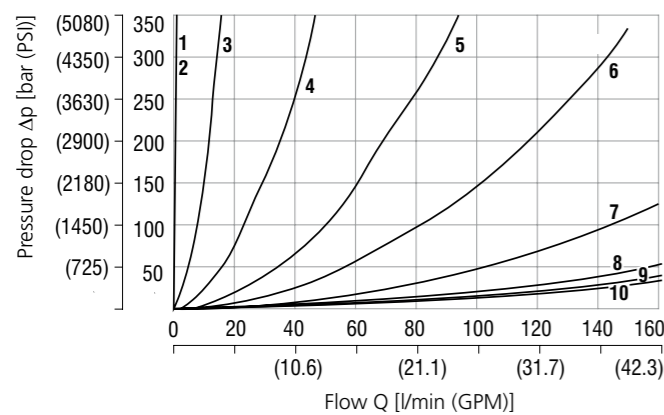
Technical Data

Valve size		10 (D05)
Max. flow	l/min (GPM)	160 (42)
Max. operating pressure	bar (PSI)	350 (5080)
Fluid temperature range (NBR)	°C (°F)	-30 +100 (-22 ... +212)
Fluid temperature range (FPM)	°C (°F)	-20 +120 (-4 ... +248)
Weight	kg (lbs)	2.15 (4.74)

	Datasheet	Type
General information	GI_0060	products and operating conditions
Mounting interface	SMT_0019	Size 06
Spare parts	SP_8010	

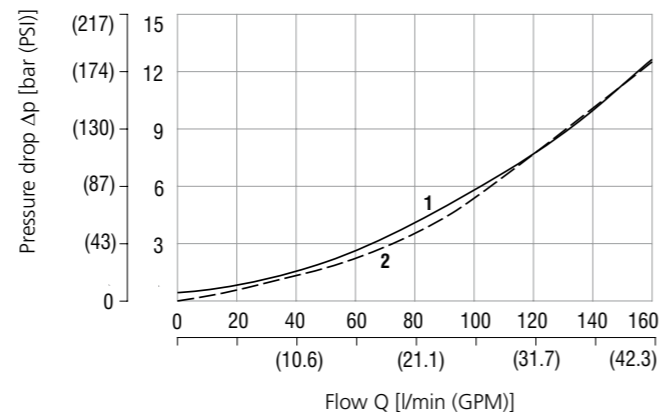
Characteristics measured at v = 32 mm²/s (156 SUS)

Pressure drop related to flow rate



Number of turns the screw										
2	3	4	5	6	7	8	9	10	11	

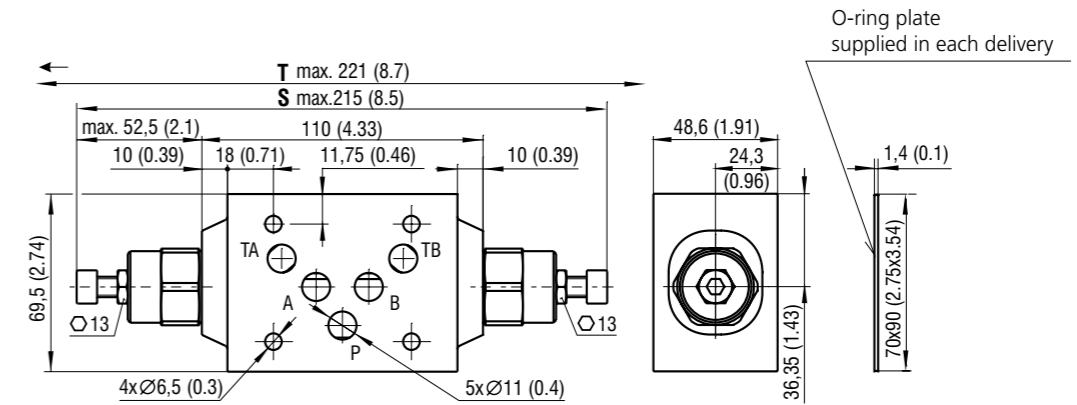
Check valve pressure drop related to flow rate



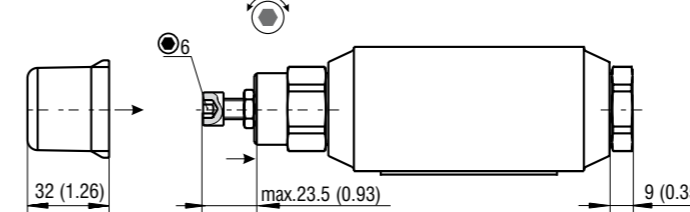
Throttle valve closed	Throttle fully open
1	2

Dimensions in millimeters (inches)

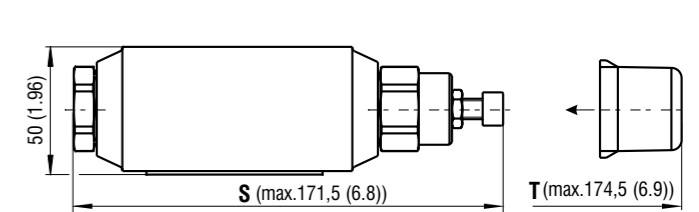
Model "C,,



Model "A,,

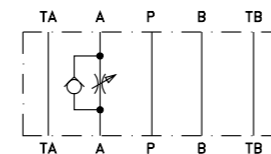


Model "B,,

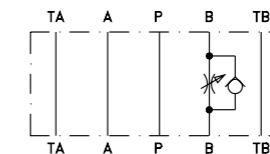


Functional symbols

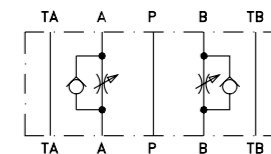
VSO3-10/MA



VSO3-10/MB



VSO3-10/MC



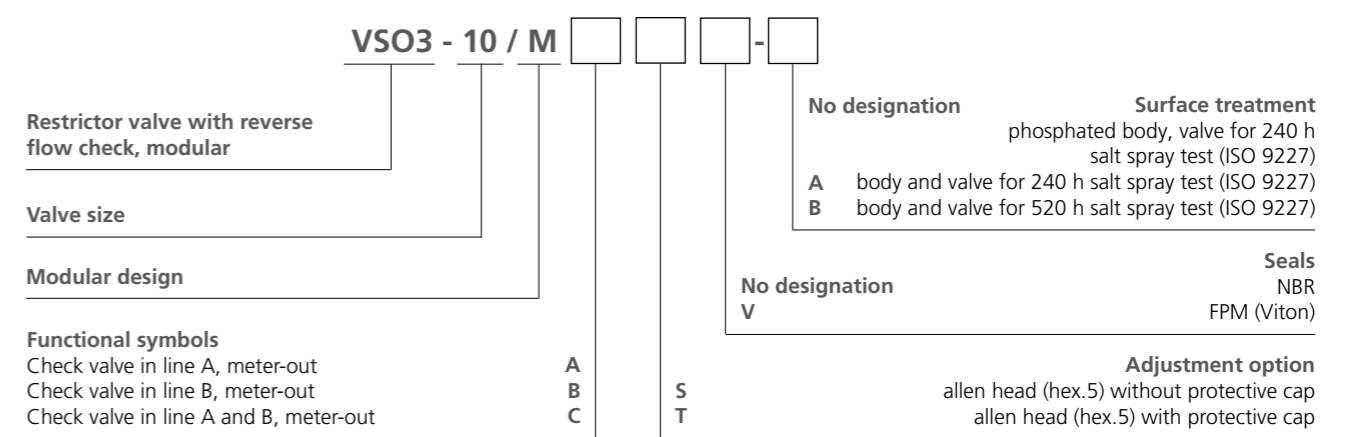
Caution!

The orientation of the symbol shown on the name plate corresponds with the function of the valve. The separate o-ring plate allows to turn around the body. The meter-out throttling can be changed to the meter-in throttling by simple rotating the plate only at MC type. At the types MA and MB, the valve position in channels A and B is changed due to the one axis symmetry of the mounting interface of modular plate. This can be solved by ordering the opposite type (see table below) or by additional changing the valve and end plug positions each other.

Recommended types depending on valve position and throttling mode:

Type / valve in channel	Meter-out throttling	Meter-in throttling
MA / A	VSO3-10/MA	VSO3-10/MB, turn the plate
MB / B	VSO3-10/MB	VSO3-10/MA, turn the plate
MC / A, B	VSO3-10/MC	VSO3-10/MC, turn the plate

Ordering Code



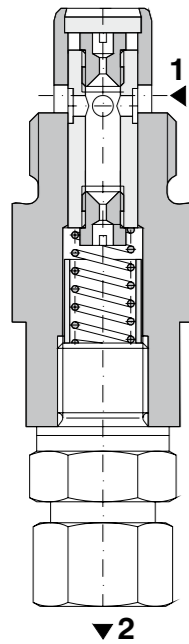
The valves are assembled in meter-out version. To get meter-in version for variant MC with valves in both channels, just turn it. Remember: the channels A and B are changed in meter-in version. It is important when meter-in is required for variant MA or MB.

2-Way Flow Regulator, Pressure Compensated, Not Adjustable

VSK

M18x1.5 / M22x1.5 / G 3/8 • Q_{max} 10 l/min (3 GPM) • p_{max} 320 bar (4600 PSI)

VSK4

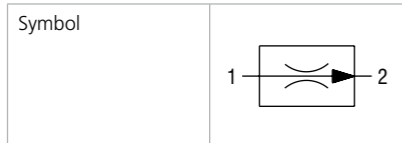


Technical Features

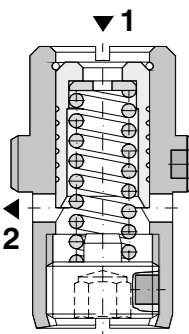
- › Set flow rate independent of load pressure and temperature changes
- › Adjusted flow rate depends on the orifice area
- › Hardened precision parts
- › Quiet and modulated response to load changes
- › Used in meter-in, meter out, or bleed-off applications
- › Two design models for in-block installation
- › Wide selection of throttling orifices
- › The housing of the VSK2 valve is without surface treatment, the VSK4 housing is phosphated. All the other parts are zinc-coated.

Functional Description

The pressure compensated flow control valves VSK are designed to control flow rates independently of pressure and temperature, especially in systems where only small movements due to load changes are required. The flow rate stabilization is provided by a pressure compensator in the direction from 1 to 2. In the direction 2 - 1, the valve works as an ordinary throttle valve without pressure compensation. The set flow rate is constant and depends on the orifice area – see the respective characteristics.



VSK2



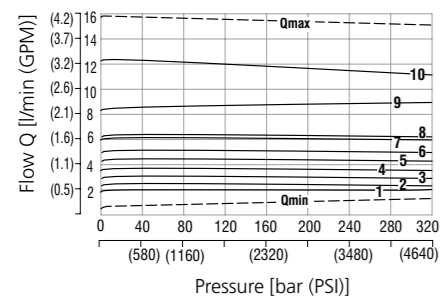
Technical Data

Valve size	M18x1.5 / M22x1.5 / G3/8	
Max. flow	l/min (GPM)	10 (2.6)
Max. operating pressure	bar (PSI)	320 (4640)
Fluid temperature range (NBR)	°C (°F)	-30... + 100 (-22 ... +212)
Fluid temperature range (FPM)	°C (°F)	-20 ... +120 (-4 ... +248)
Mass	kg (lbs)	0.01 (0.022)
General information		Type
Datasheet		GI_0060
Spare parts		SP_8010
General information		Products and operating conditions

Characteristics measured at v = 32 mm²/s (156 SUS)

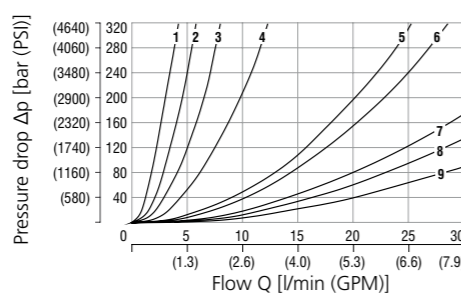
Regulated flow related to input pressure

Flow direction 1 - 2 (regulated flow)
VSK2 + VSK4



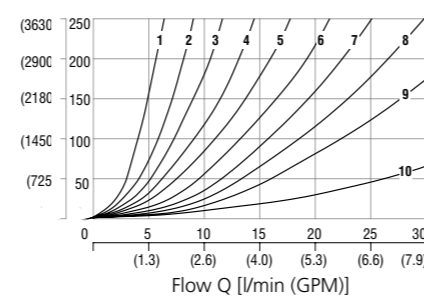
Pressure drop related to flow rate

Flow direction 2 - 1
(throttling without compensation)
VSK4 (orifice diameter (mm/100))



Pressure drop related to flow rate

Flow direction 2 - 1
(throttling without compensation)
VSK2 (orifice diameter (mm/100))



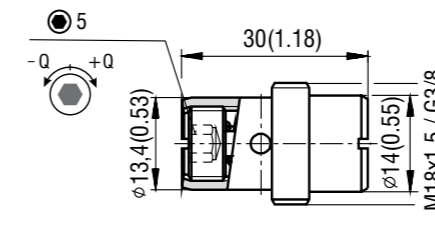
1 → 2	
VSK2 + VSK4	Orifice diameter (mm/100)
Q _{min}	
No.	1 2 3 4 5 6 7 8 9 10
∅ orifice	100 110 120 130 140 150 160 180 200 250

2 → 1		Orifice diameter (mm/100)				
No.	1	2	3	4	5	
∅ orifice	55	80	100	120	160	
No.	6	7	8	9		
∅ orifice	180	210	230	260		

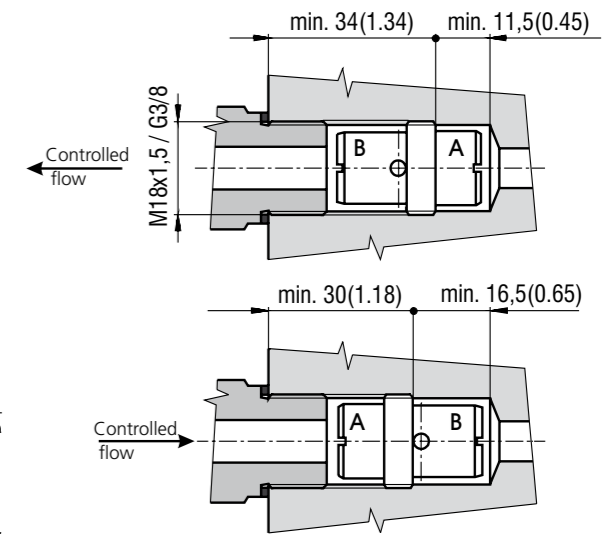
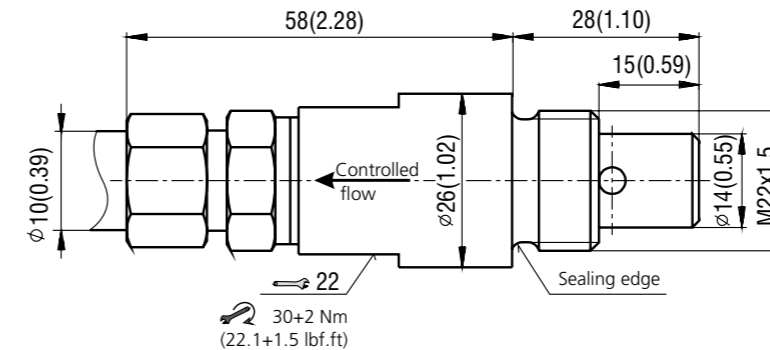
2 → 1		Orifice diameter (mm/100)				
No.	1	2	3	4	5	
∅ orifice	100	110	120	130	140	
No.	6	7	8	9	10	
∅ orifice	150	160	180	200	250	

Dimensions in millimeters (inches)

VSK2-M4-x



VSK4-M4-x



Approximate Flow Rates Corresponding to Orifice Diameter

VSK2		VSK4	
Orifice diameter [mm/100]	Flow range l/min (GPM) at 32 bar (464 PSI) adjusted to customer spec. at manufacturer	Orifice diameter [mm/100]	Flow range l/min (GPM) at input pressure 32 bar (464 PSI)
55	0.3 - 0.6 (0.08 - 0.16)	100	2.1 (0.56)
80	1.4 - 1.7 (0.37 - 0.45)	110	2.4 (0.63)
100	1.8 - 2.4 (0.48 - 0.63)	120	3.0 (0.79)
120	3.1 - 4.0 (0.82 - 1.06)	130	3.8 (1.01)
160	5.5 - 6.5 (1.46 - 1.72)	140	4.3 (1.14)
180	5.6 - 7.1 (1.48 - 1.88)	150	4.9 (1.30)
210	8.5 - 10.8 (2.25 - 2.86)	160	6.3 (1.67)
230	10.7 - 13.3 (2.83 - 3.52)	180	6.6 (1.75)
260	12.0 - 16.4 (3.17 - 4.34)	200	8.7 (2.30)
		250	12.5 (3.31)

Ordering Code

VSK [] - [] - [] / [] - []

2-Way flow regulator, pressure compensated, not adjustable

Model
screw-in cartridge 2
pipe mounted / screw-in cartridge 4

Surface treatment
No designation VSK2 housing without surface treatment
VSK4 housing is phosphated
steel parts zinc-coated (ZnCr-3), ISO 9227 (240 h)
A* zinc-coated (ZnCr-3), ISO 9227 (240 h)
B* zinc-coated (ZnNi), ISO 9227 (520 h)
*only for VSK2

Connection threads
metric thread (M18x1.5 for VSK2) M2
metric thread (M22x1.5 for VSK4) M4
pipe thread (G 3/8 only for VSK2) G4

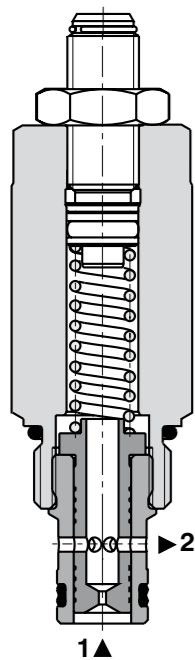
Seals
No designation V
NBR
FPM (Viton)

VSK2	055	080	100	-	120	-	-	-	160	180	-	210	230	-	260
VSK4	-	-	100	110	120	130	140	150	160	180	200	-	-	250	-

2-Way Flow Regulator, Pressure Compensated

SF22A-A2/H

3/4-16 UNF • Q_{max} 21 l/min (6 GPM) • p_{max} 350 bar (5100 PSI)



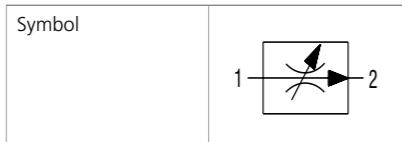
Technical Features

- › Set flow rate independent of load pressure and temperature changes
- › Adjusted flow rate depends on the orifice area and adjusted differential pressure
- › Hardened precision parts
- › High flow capacity
- › Quiet and modulated response to load changes
- › Used in meter-in, meter-out, or bleed-off applications
- › Wide range of flow rate options
- › Adjustable by allen key or hand screw, optionally sealable (lockwire holes)
- › In the standard version, the valve is zinc-coated for 240 h protection acc. to ISO 9227

Functional Description

This pressure compensated, hydraulic flow regulator in the form of a screw-in cartridge with fixed orifice and variable spring setting is designed to control flow rates independently of pressure and temperature, especially in systems where only small movements due to load changes are required. The flow rate stabilization is provided by a pressure compensator in the direction from 1 to 2. The valve will maintain the set flow regardless of pressure variations on the regulated or inlet port.

In flow direction 2 - 1, the valve works as an ordinary throttle valve without pressure compensation. The regulated flow increases with clockwise rotation of the adjustment screw and decreases with counter-clockwise rotation. The desired settings can be locked down.



Technical Data

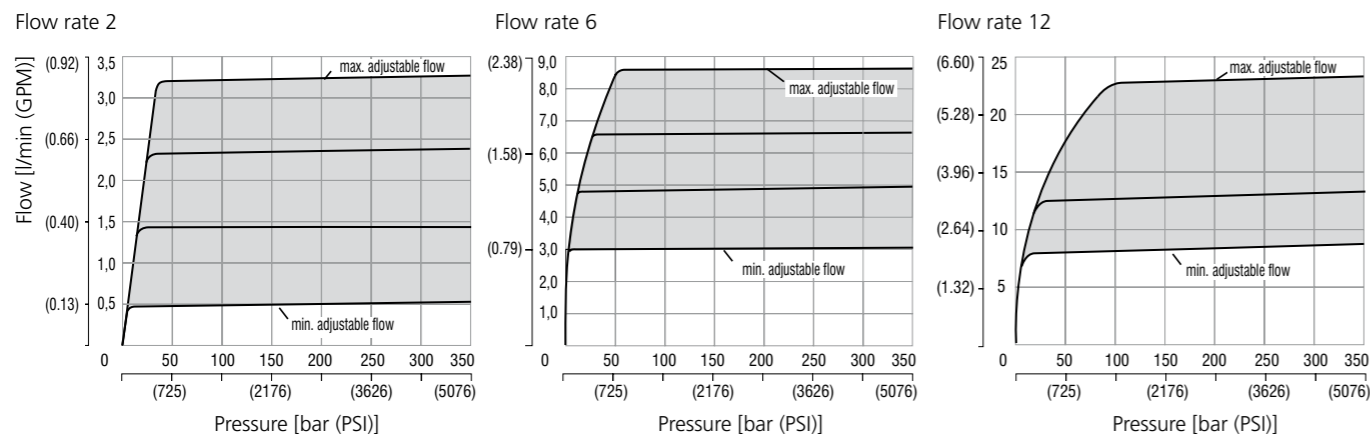
Valve size / Cartridge cavity		3/4-16 UNF-2A / A2		
Nominal flow rates		2	6	12
Adjustment range	l/min (GPM)	0.5-3.2 (0.1-0.8)	3-8.5 (0.8-2.3)	8-21 (2.1-5.6)
Max. operating pressure	bar (PSI)	350 (5080)		
Fluid temperature range (NBR)	°C (°F)	-30 ... +100 (-22 ... +212)		
Fluid temperature range (FPM)	°C (°F)	-20 ... +120 (-4 ... +248)		
Mass	kg (lbs)	0.19 (0.42)		

		Datasheet	Type
General information		GI_0060	Products and operating conditions
Valve bodies	In-line mounted	SB_0018	SB-A2-*
	Sandwich mounted	SB-04(06)_0028	SB-*A2*
Cavity details / Form tools		SMT_0019	SMT-A2*
Spare parts		SP_8010	

Characteristics measured at v = 32 mm²/s (156 SUS)

Regulated flow related to input pressure

Flow direction 1 - 2 (regulated flow)

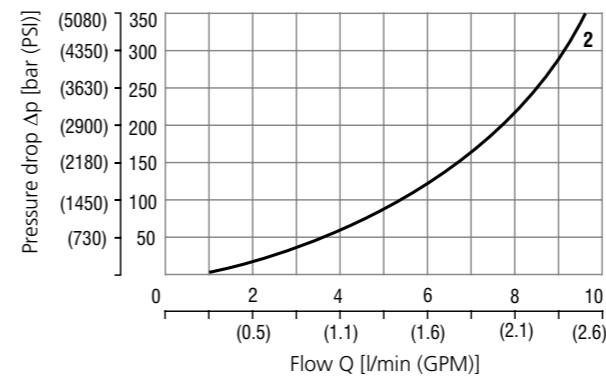


Characteristics measured at v = 32 mm²/s (156 SUS)

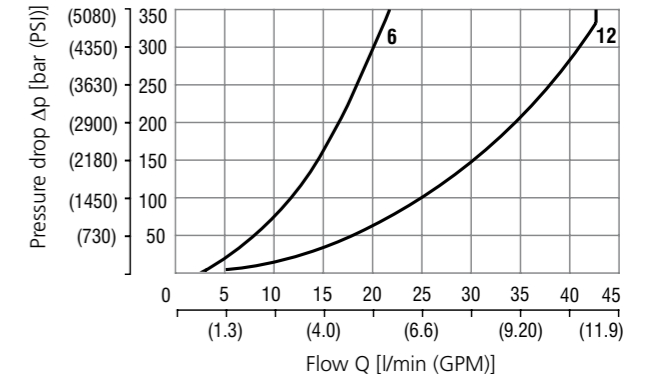
Pressure drop related to flow rate

Flow direction 2 - 1 (throttling without compensation)

Flow rate 2

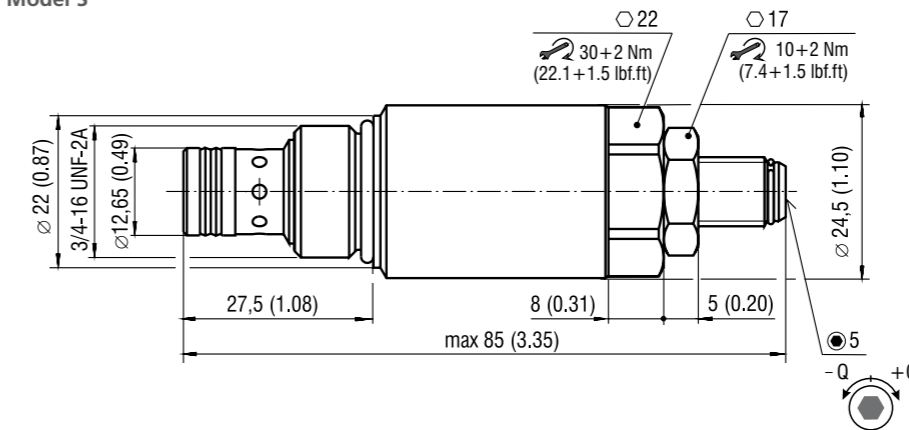


Flow rates 6, 12

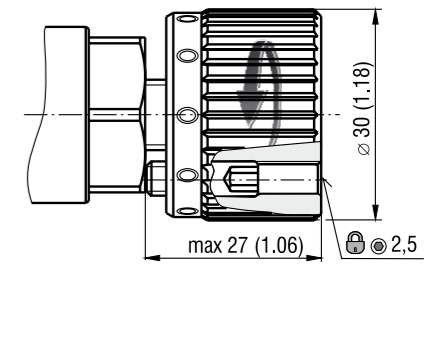


Dimensions in millimeters (inches)

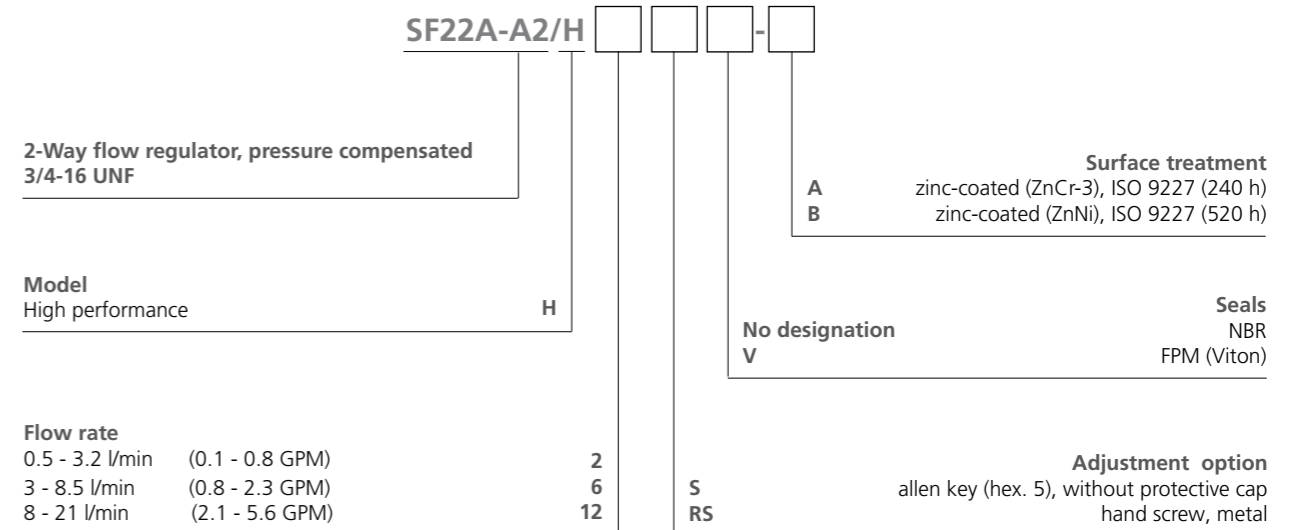
Model S



Model RS



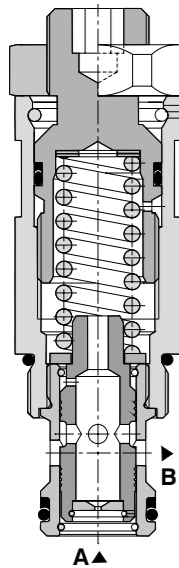
Ordering Code



2-Way Flow Regulator, Pressure Compensated

VSS3-062/S

M22x1.5 • Q_{max} 40 l/min (11 GPM) • p_{max} 320 bar (4600 PSI)

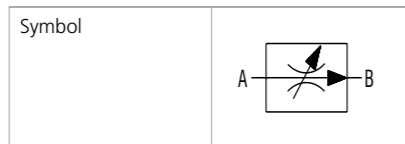


Technical Features

- › Set flow rate independent of load pressure and temperature changes
- › Adjusted flow rate depends on the orifice area and set differential pressure
- › Hardened precision parts
- › High flow capacity
- › Quiet and modulated response to load changes
- › Used in meter-in, meter-out, or bleed-off applications
- › Wide range of flow rate options
- › Adjustable by allen key or hand screw
- › In the standard version, the valve is zinc-coated for 240 h protection acc. to ISO 9227

Functional Description

This pressure compensated, hydraulic flow regulator in the form of a screw-in cartridge with fixed orifice and variable spring setting is designed to control flow rates independently of pressure and temperature, especially in systems where only small movements due to load changes are required. The flow rate stabilization is provided by a pressure compensator in the direction from A to B. The valve will maintain the set flow regardless of pressure variations on the regulated or inlet port. In flow direction B - A, the valve works as an ordinary throttle valve without pressure compensation. The regulated flow increases with clockwise rotation of the adjustment screw and decreases with counter-clockwise rotation. The desired settings can be locked down. The valve will maintain the set flow regardless of pressure variations on the regulated or inlet port.



Technical Data

Valve size / Cartridge cavity		M22x1.5 / QG2							
Nominal flow rates	l/min (GPM)	1.6 (0.4)	2.5 (0.7)	4 (1.1)	6.3 (1.7)	10 (2.6)	16 (4.2)	20 (5.3)	
Max. operating pressure	bar (PSI)	320 (4640)							
Fluid temperature range (NBR)	°C (°F)	-30 ... +80 (-22 ... +176)							
Fluid temperature range (FPM)	°C (°F)	-20 ... +80 (-4 ... +176)							
Mass	kg (lbs)	0.19 (0.42)							

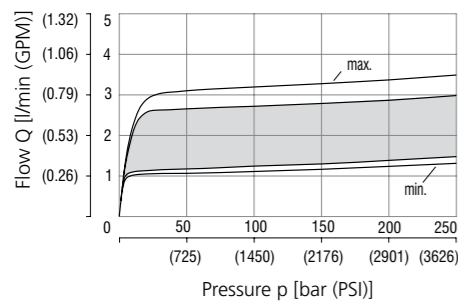
General information		Datasheet	Type
General information		GI_0060	Products and operating conditions
Valve bodies	In-line mounted	SB_0018	SB-QG2-*
	Sandwich mounted	SB-04(06)_0028	SB-*QG2*
Cavity details / Form tools		SMT_0019	SMT-QG2*
Spare parts		SP_8010	

Characteristics measured at v = 32 mm²/s (156 SUS)

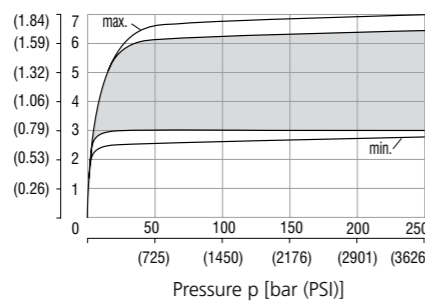
Regulated flow related to input pressure

Flow direction A - B (regulated flow)

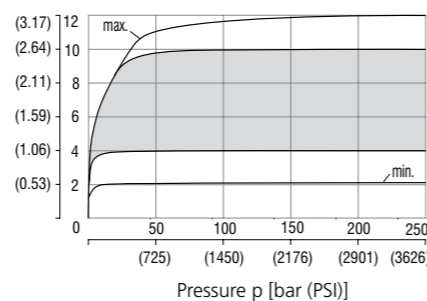
Flow rate 1.6



Flow rate 2.5



Flow rate 4

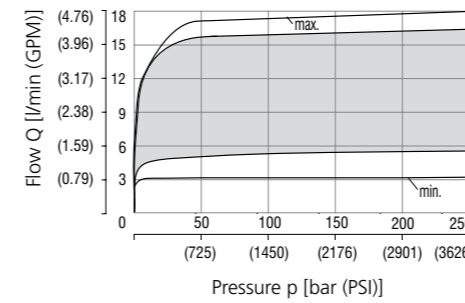


Characteristics measured at v = 32 mm²/s (156 SUS)

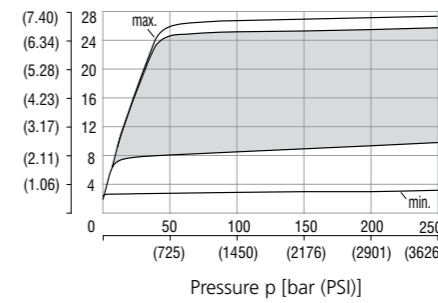
Regulated flow related to input pressure

Flow direction A - B (regulated flow)

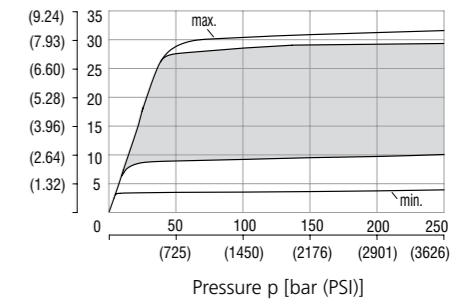
Flow rate 6.3



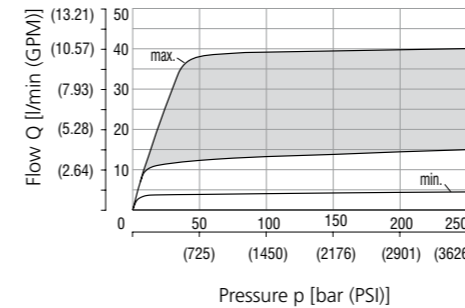
Flow rate 10



Flow rate 16

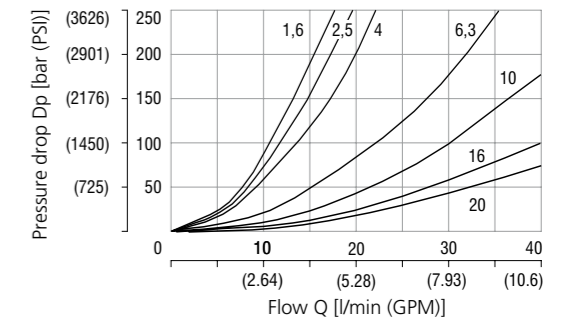


Flow rate 20



Pressure drop related to flow rate

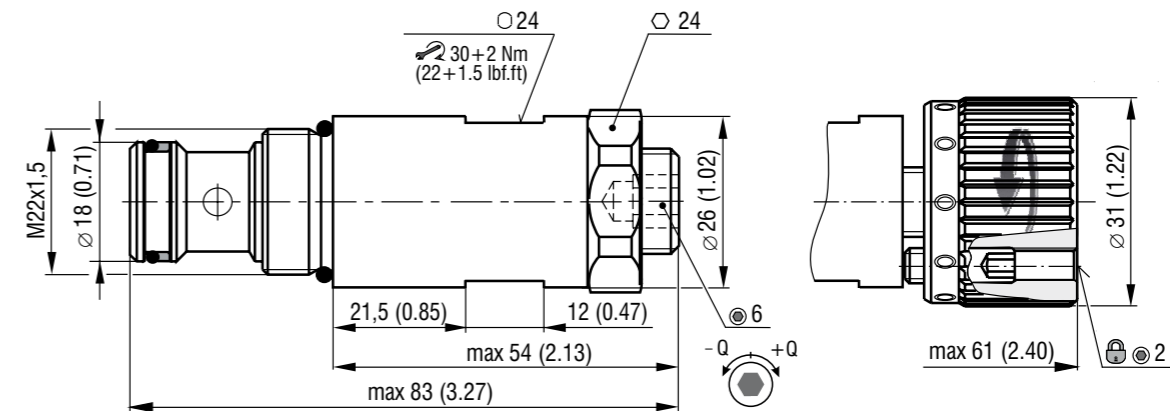
Flow direction B - A (throttling without compensation)



Dimensions in millimeters (inches)

Model S

Model RS



Ordering Code

VSS3-062/S-□□□-□

2-Way flow regulator, pressure compensated M22x1.5

Model screw-in cartridge

Flow rate		
1.4 - 2.7 l/min	(0.4 - 0.7 GPM)	1.6
3 - 6 l/min	(0.8 - 1.6 GPM)	2.5
4 - 10 l/min	(1.1 - 2.6 GPM)	4
5 - 16 l/min	(1.3 - 4.2 GPM)	6.3
8 - 25 l/min	(2.1 - 6.6 GPM)	10
9 - 28 l/min	(2.4 - 7.4 GPM)	16
12 - 40 l/min	(3.2 - 10.6 GPM)	20

Surface treatment
A zinc-coated (ZnCr-3), ISO 9227 (240 h)
B zinc-coated (ZnNi), ISO 9227 (520 h)

Seals
NBR
FPM (Viton)

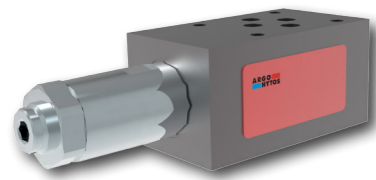
No designation V

Adjustment option
S allen key (hex. 6), without protective cap
RS hand screw, metal-short

2-Way Flow Regulator, Pressure Compensated, Modular

VSS3-062/M

Size 06 (D03) • Q_{max} 40 l/min (11 GPM) • p_{max} 320 bar (4600 PSI)



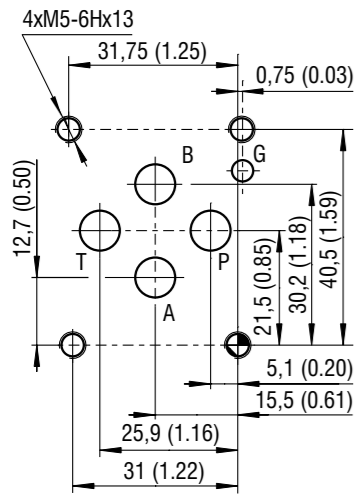
Technical Features

- › 2-Way flow regulator, pressure compensated, with mounting interface acc. to ISO 4401, DIN 24340 (CETOP 03)
- › Set flow rate independent of load pressure and temperature changes
- › Adjusted flow rate depends on the orifice area and set differential pressure
- › Hardened precision parts
- › High flow capacity
- › Quiet and modulated response to load changes
- › Used in meter-in, meter-out, or bleed-off applications
- › Wide range of flow rate options
- › Adjustable by allen key or hand screw
- › In the standard version, the valve is zinc coated for 240 h protection acc. to ISO 9227 and the valve body is phosphated

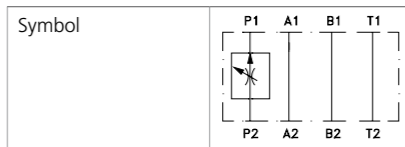
Functional Description

This pressure compensated, hydraulic flow regulator in the form of a sandwich plate with fixed orifice and variable spring setting is designed to control flow rates independently of pressure and temperature, especially in systems where only small movements due to load changes are required. The flow rate stabilization is provided by a pressure compensator in the direction from P2 to P1. The valve will maintain the set flow regardless of pressure variations on the regulated or inlet port. The regulated flow increases with clockwise rotation of the adjustment screw, the counter-clockwise rotation decreases the flow rate. Desired settings can be locked down.

ISO 4401-03-02-0-05



Ports P, A, B, T max Ø 7.5 mm (0.29 in)



Technical Data

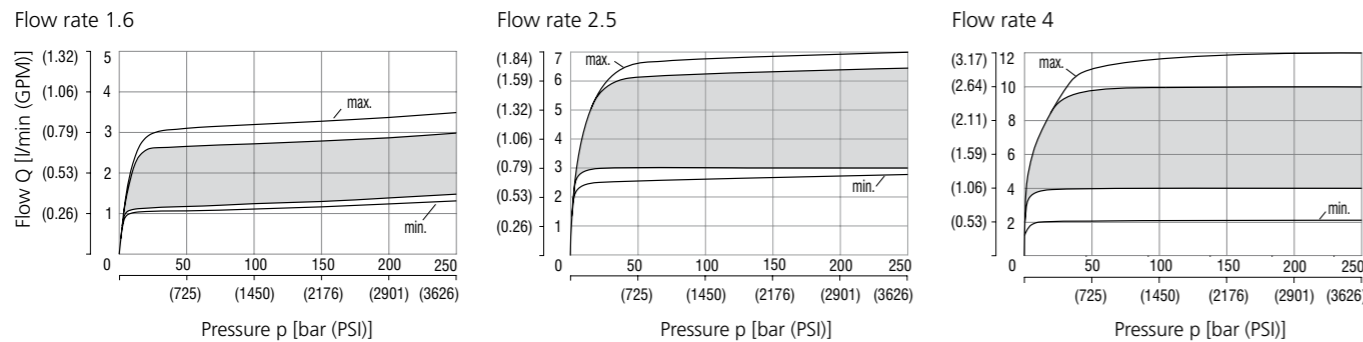
Valve size	06 (D03)							
Max. flow	40 (11) l/min (GPM)							
Max. operating pressure	320 (4640) bar (PSI)							
Nominal flow rates	l/min (GPM)	1.6 (0.4)	2.5 (0.7)	4 (1.1)	6.3 (1.7)	10 (2.6)	16 (4.2)	20 (5.3)
Fluid temperature range (NBR)	°C (°F)	-30 ... +100 (-22 ... +212)						
Fluid temperature range (FPM)	°C (°F)	-20 ... +120 (-4 ... +248)						
Mass - model MP06	kg (lbs)	1.12 (2.46)						

	Datasheet	Type
General information	GI_0060	Products and operating conditions
Mounting interface	SMT_0019	Size 06
Spare parts	SP_8010	

Characteristics measured at v = 32 mm²/s (156 SUS)

Regulated flow related to input pressure

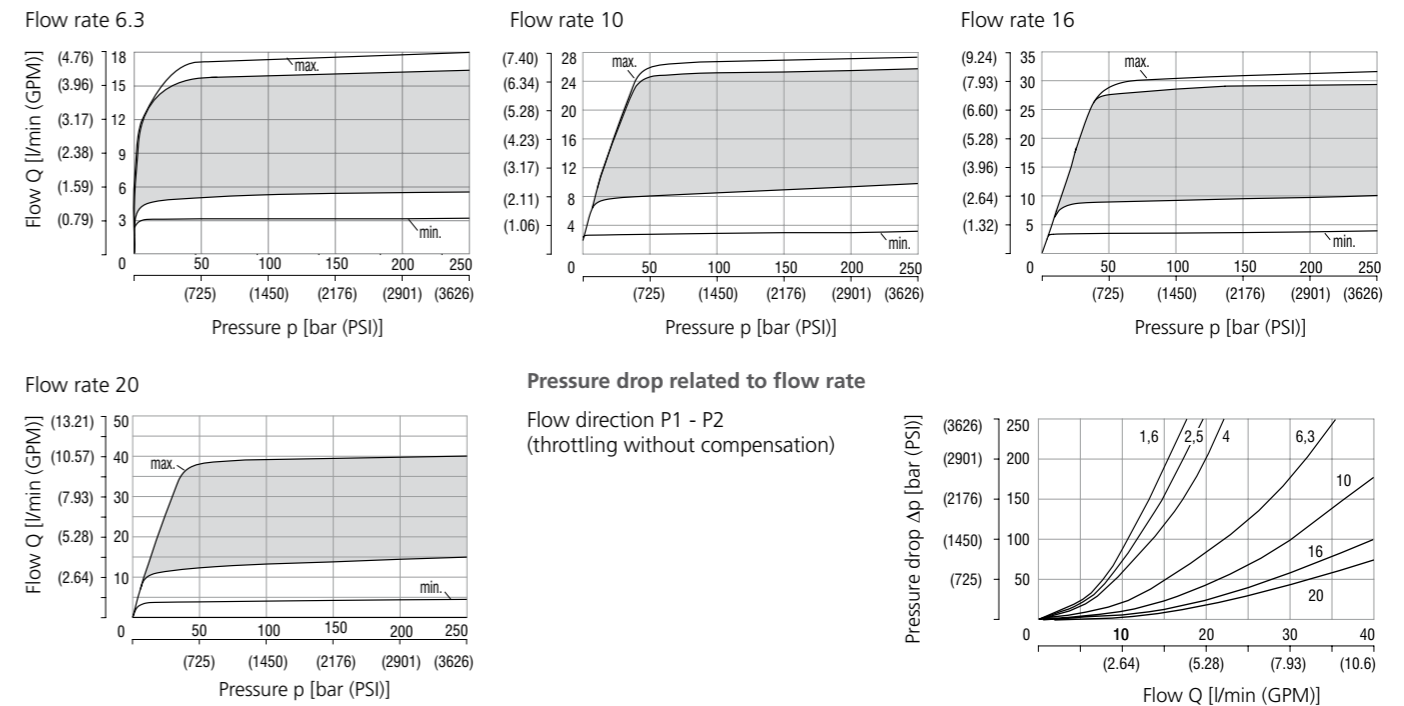
Flow direction P2 - P1 (regulated flow)



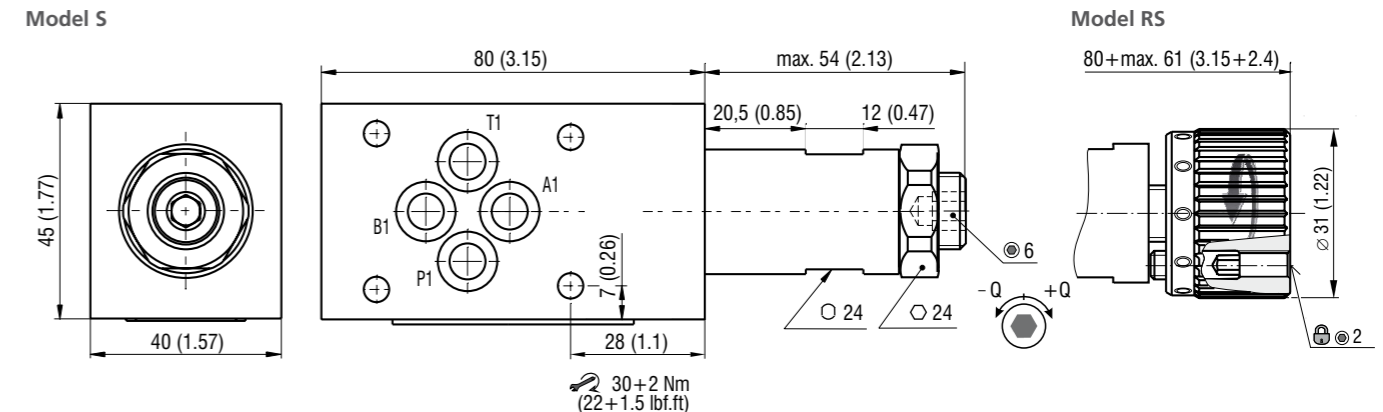
Characteristics measured at v = 32 mm²/s (156 SUS)

Regulated flow related to input pressure

Flow direction P2 - P1 (regulated flow)



Dimensions in millimeters (inches)



Ordering Code

VSS3-062 / MP06 - [] - [] - [] - []

2-Way flow regulator, pressure compensated M22x1.5

Model
modular, valve function from P2 to P1

Flow rate
1.4 - 2.7 l/min (0.4 - 0.7 GPM) 1.6
3 - 6 l/min (0.8 - 1.6 GPM) 2.5
4 - 10 l/min (1.1 - 2.6 GPM) 4
5 - 16 l/min (1.3 - 4.2 GPM) 6.3
8 - 25 l/min (2.1 - 6.6 GPM) 10
9 - 28 l/min (2.4 - 7.4 GPM) 16
12 - 40 l/min (3.2 - 10.6 GPM) 20

Surface treatment
No des. body phosphated, steel parts
zinc-coated (ZnCr-3), ISO 9227 (240 h)
A zinc-coated (ZnCr-3), ISO 9227 (240 h)
B zinc-coated (ZnNi), ISO 9227 (520 h)

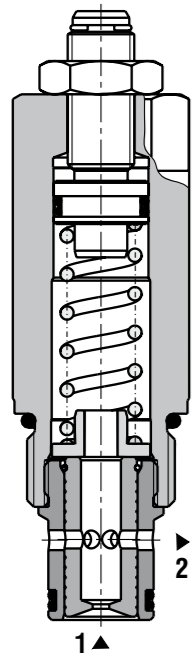
Seals
No designation NBR
V FPM (Viton)

Adjustment option
S allen key (hex. 6), without protective cap
RS hand screw, metal-short

2-Way Flow Regulator, Pressure Compensated

SF22A-B2/H

7/8-14 UNF • Q_{max} 40 l/min (11 GPM) • p_{max} 350 bar (5100 PSI)



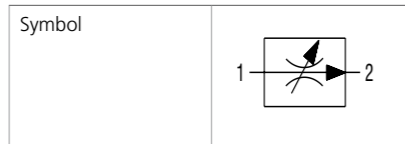
Technical Features

- › Set flow rate independent of load pressure and temperature changes
- › Adjusted flow rate depends on the orifice area and adjusted differential pressure
- › Hardened precision parts
- › High flow capacity
- › Quiet and modulated response to load changes
- › Used in meter-in, meter-out, or bleed-off applications
- › Wide range of flow rate options
- › Adjustable by allen key or hand screw, optionally sealable (lockwire holes)
- › In the standard version, the valve is zinc-coated for 240 h protection acc. to ISO 9227

Functional Description

This pressure compensated, hydraulic flow regulator in the form of a screw-in cartridge with fixed orifice and variable spring setting is designed to control flow rates independently of pressure and temperature, especially in systems where only small movements due to load changes are required. The flow rate stabilization is provided by a pressure compensator in the direction from 1 to 2. The valve will maintain the set flow regardless of pressure variations on the regulated or inlet port.

In flow direction 2 - 1, the valve works as an ordinary throttle valve without pressure compensation. The regulated flow increases with clockwise rotation of the adjustment screw and decreases with counter-clockwise rotation. The desired settings can be locked down.



Technical Data

Valve size / Cartridge cavity		7/8-14 UNF-2A / B2		
Nominal flow rates		12	20	40
Adjustment range	l/min (GPM)	3.2-12 (0.8-3.2)	5.1-20 (1.4-5.3)	5.0-41 (1.3-10.8)
Max. operating pressure	bar (PSI)	350 (5080)		
Fluid temperature range (NBR)	°C (°F)	-30 ... +100 (-22 ... +212)		
Fluid temperature range (FPM)	°C (°F)	-20 ... +120 (-4 ... +248)		
Mass	kg (lbs)	0.22 (0.49)		

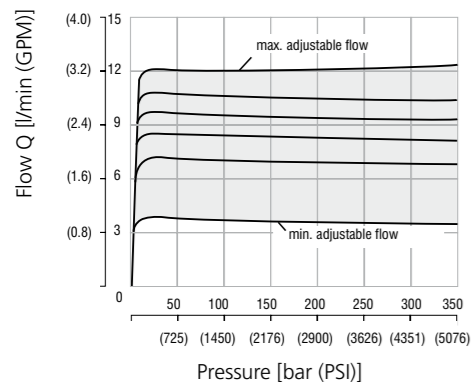
		Datasheet	Type
General information		GI_0060	Products and operating conditions
Valve bodies	In-line mounted	SB_0018	SB-B2-*
	Sandwich mounted	SB-04(06)_0028	SB-*B2*
Cavity details / Form tools		SMT_0019	SMT-B2*
Spare parts		SP_8010	

Characteristics measured at v = 32 mm²/s (156 SUS)

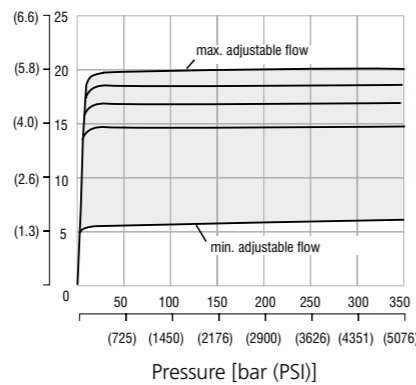
Regulated flow related to input pressure

Flow direction 1 - 2 (regulated flow)

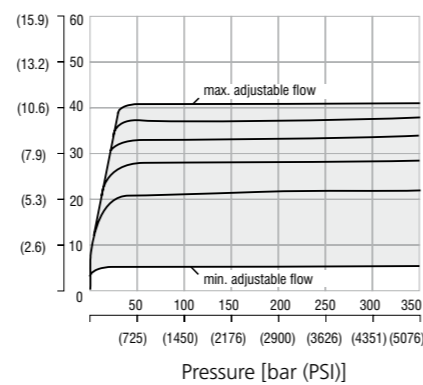
Flow rate 12



Flow rate 20



Flow rate 40

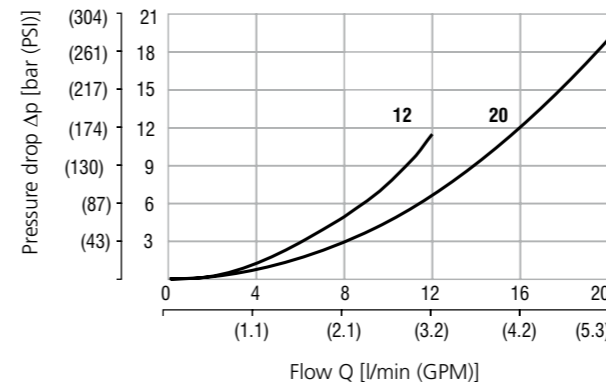


Characteristics measured at v = 32 mm²/s (156 SUS)

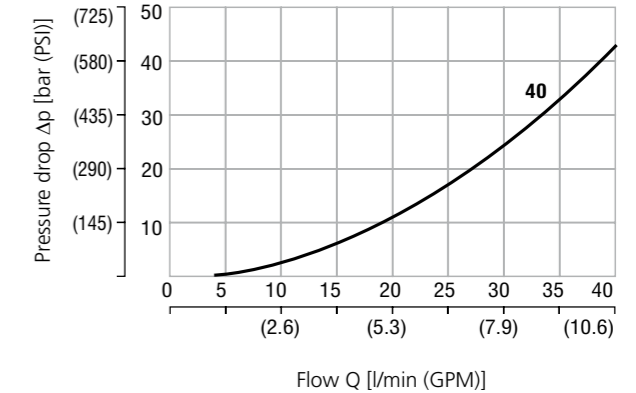
Pressure drop related to flow rate

Flow direction 2 - 1 (throttling without compensation)

Flow rates 12, 20

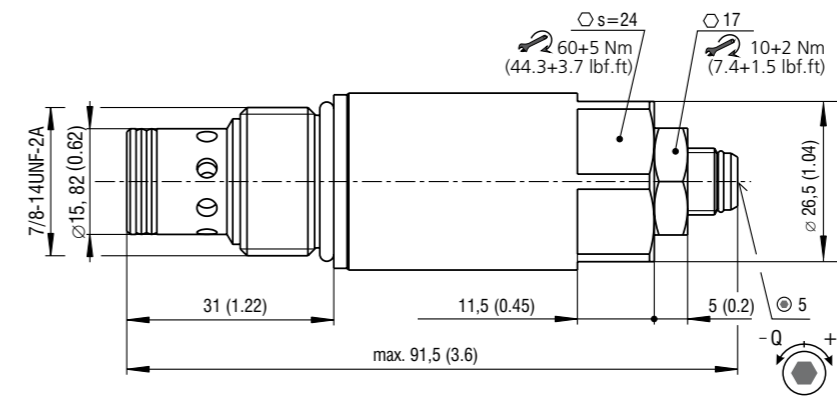


Flow rate 40

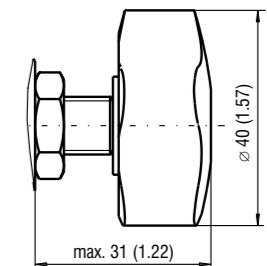


Dimensions in millimeters (inches)

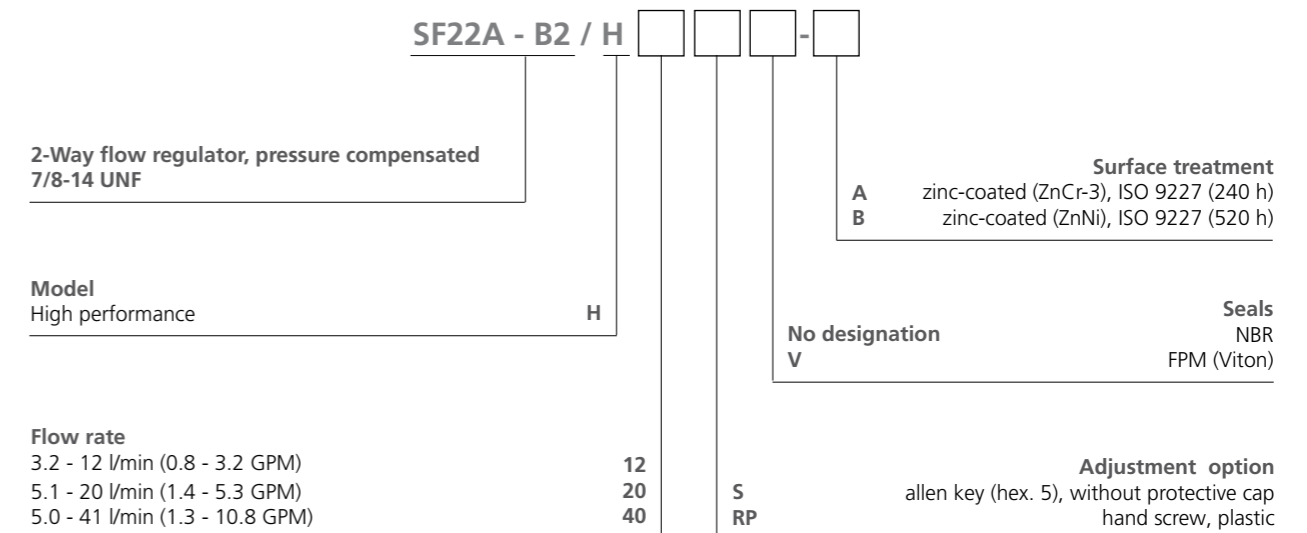
Model S



Model RP



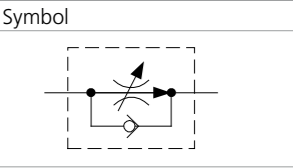
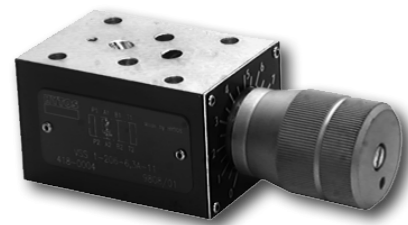
Ordering Code



2-Way Flow Regulator with Reverse Flow Check, Pressure Compensated, Modular

VSS1-206

Size 06 (D03) • Q_{max} 22 l/min (6 GPM) • p_{max} 320 bar (4600 PSI)



Technical Features

- › Mounting interface acc. to ISO 4401, DIN 24340 (CETOP 03) for use in vertical stacking assemblies
- › Set flow rate independent of load pressure and temperature changes
- › Meter-in, meter-out or bleed-off flow control
- › Integrated reverse flow check valve
- › Adjusted flow rate depends on the orifice area and adjusted differential pressure
- › Wide range of flow rate options
- › Quiet and modulated response to load changes
- › Adjustable by metallic hand screw
- › Fine low-torque adjustment
- › In the standard version, the steel parts are zinc-coated for 240 h protection acc. to ISO 9227 and the valve body is phosphated

Functional Description

Pressure compensated flow control valves are designed to provide adjustable controlled flow rates independently of changes in inlet and/or outlet pressure. 2-Way valves are used in meter-in, meter-out or bleed-off applications or in parallel arrangement. The flow control valve consists of a housing, a throttling spool, an internal spring, the pressure compensator and a hand screw for adjustment.

Flow control valve VSS1-206-A

Provides regulated flow from the pump inlet to the consumer. Version A* is delivered without reverse free flow check valve. The version is available as a vertical stack close-off valve or as a sandwich plate.

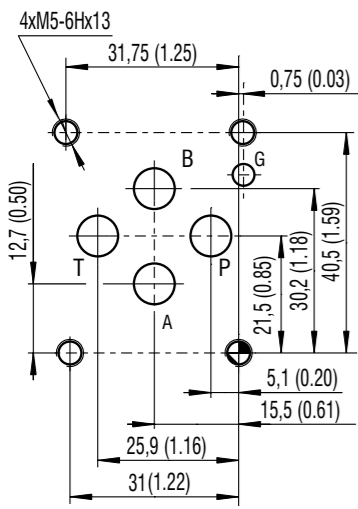
Flow control valve VSS1-206-B

This valve functions on the same principle as the previous one, however, reverse free flow from port A2 to port A1 is provided by the built-in check valve.

Flow control valve VSS1-206-C

This valve functions as the valve described above, the only difference being the changed flow direction. The flow is controlled in the direction of A2 to A1 and free flow in the direction A1 to A2.

ISO 4401-03-02-0-05



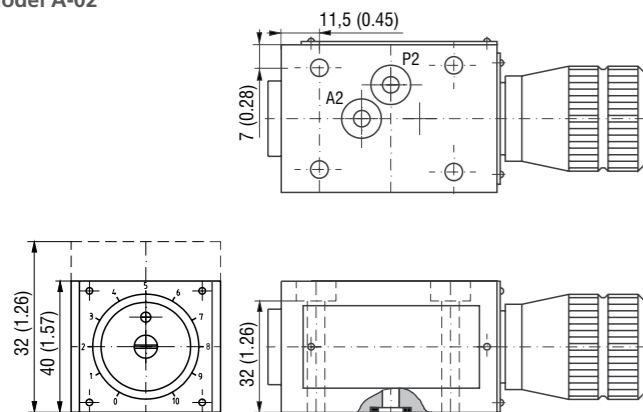
Ports P, A, B, T - max. \varnothing 7.5 mm (0.29 in)

Technical Data

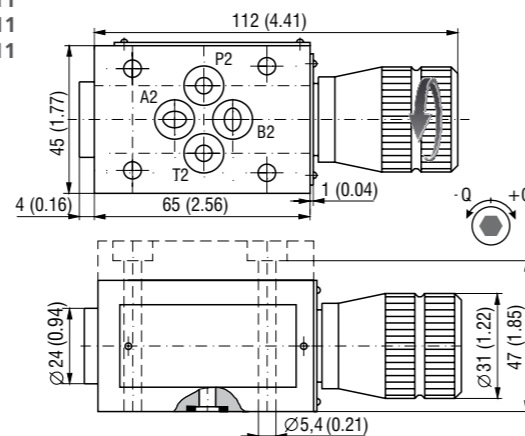
Valve size	06 (D03)	
Max. flow	l/min (GPM)	22 (5.8)
Max. operating pressure	bar (PSI)	320 (4640)
Nominal flow rates	l/min (GPM)	6.3 (1.7) 12 (3.2) 22 (5.8)
Min. flow rates	cm ³ (inch ³)/min	60 (3.7)
Fluid temperature range (NBR)	°C (°F)	-30 ... +100 (-22 ... +212)
Fluid temperature range (FPM)	°C (°F)	-20 ... +120 (-4 ... +248)
Maximum degree of fluid contamination	for $Q \leq 1$ l/min for $Q > 1$ l/min	Class 20/17/14 according to ISO 4406 Class 21/18/15 according to ISO 4406
Max. flow rate variation at pressure change (for $Q > 2.5 Q_{min}$ and $p = 6 \dots 100\% p_{max}$)	%	± 5
Mass	kg (lbs)	0.8 (1.76)
General information	Datasheet	Type
Mounting interface	GI_0060	Products and operating conditions
Spare parts	SMT_0019	ISO 4401-03-02-0-05 DIN 2430 (CETOP 03)

Dimensions in millimeters (inches)

Model A-02

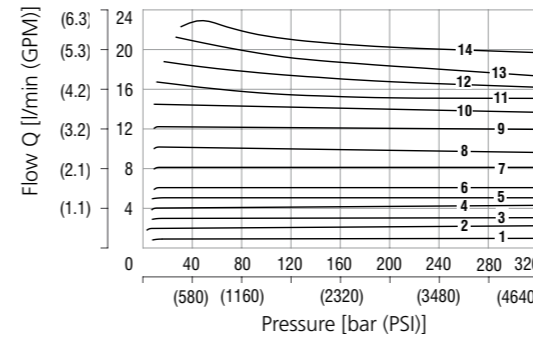


Models A-11
B-11
C-11



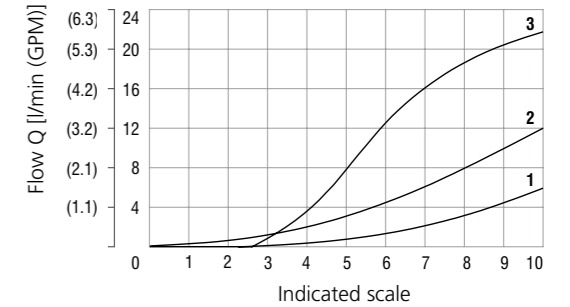
Characteristics measured at $v = 32 \text{ mm}^2/\text{s}$ (156 SUS)

Regulated flow related to input pressure



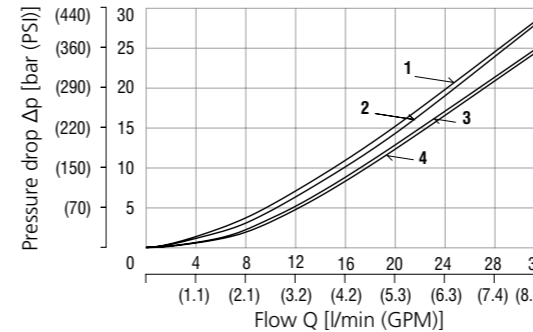
No.	Flow rate
1	6.3
2	6.3 12 22
3	6.3
4	6.3 12 22
5	6.3
6	6.3 12 22
7	12 22
8	12 22
9	12 22
10	12 22
11	12 22
12	12 22
13	12 22
14	12 22

Flow rate related to indicated scale



No.	Model	Flow control P → A
1	VSS1-206-6.3x-xx	
2	VSS1-206-12x-xx	
3	VSS1-206-22x-xx	

Pressure drop related to flow rate

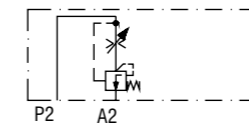


No.	Flow rate	Flow orifice closed	Flow orifice open
1			
2	6.3		
3	12		
4	22		

Functional Symbols

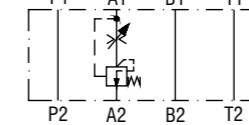
Model

A-02



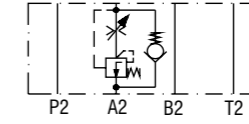
A - without check valve

A-11



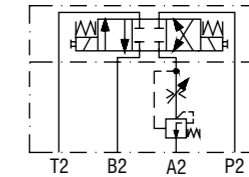
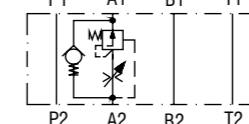
B - with check valve, meter-in mode

B-11



C - with check valve, meter-out mode

C-11



Typical application of the valve in a stacking assembly*

*Directional valve must be ordered separately.

Ordering Code

VSS1-2 06 - [] [] RS [] - []

2-Way flow regulator with reverse flow check, pressure compensated, modular

Valve size

Flow rate
6.3 l/min (1.7 GPM)
12 l/min (3.2 GPM)
22 l/min (5.8 GPM)

Model

subplate mounted - without check valve
sandwich plate - without check valve
sandwich plate - with check valve, meter-in mode
sandwich plate - with check valve, meter-out mode

6.3
12
22

A-02
A-11
B-11
C-11

Surface treatment
No designation body phosphated, steel parts
A zinc-coated (ZnCr-3), ISO 9227 (240 h)
B zinc-coated (ZnNi), ISO 9227 (520 h)

Seals
No designation NBR
V FPM (Viton)

Adjustment option
hand screw, metal

2-Way Flow Regulator with Reverse Flow Check, Pressure Compensated, Subplate Mounted

VSS2-206

Size 06 (D03) • Q_{max} 32 l/min (9 GPM) • p_{max} 320 bar (4600 PSI)



Technical Features

- Subplate mounting interface acc. to ISO 4401, DIN 24340 (CETOP 03)
- Set flow rate independent of load pressure and temperature changes
- Meter-in, meter-out or bleed-off flow control
- Externally or internally piloted pressure compensator
- Adjusted flow rate depends on the orifice area and adjusted differential pressure
- Wide range of flow rate options
- Quiet and modulated response to load changes
- Adjustment option with non-lockable or lockable cylindrical
- Fine low-torque adjustment
- In the standard version, the steel parts are zinc-coated for 240 h protection acc. to ISO 9227 and the valve body is phosphated

Functional Description

Pressure compensated flow control valves **VSS2-206** are designed to provide adjustable, controlled flow rate independently of changes in pressure and temperature. The flow control valve consists of a housing, a throttling spool, an internal spring, the pressure compensator and a hand screw for adjustment.

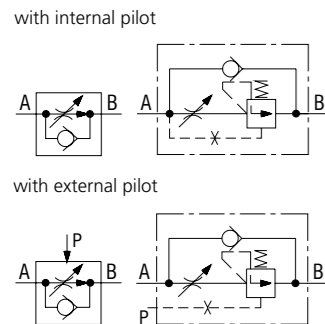
Flow control valve **VSS2-206-xxQ/JxO** - internally piloted pressure compensator: The valve senses load pressure inside the valve. Flow throttling in direction A to B can be adjusted by the hand screw. To ensure flow rate stability in port B, a pressure compensator is located behind the throttling area.

Flow control valve **VSS2-206-xxQ/JxA** - externally piloted pressure compensator: The mounting surface area of the valve is connected to an external load sensing port P. This arrangement enables external piloting of the pressure compensator. The function is described by the circuit diagram shown.

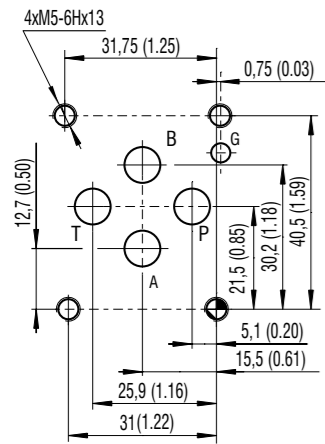
Technical Data

Valve size	06 (D03)					
Max. flow	l/min (GPM) 32 (8.5)					
Max. operating pressure	bar (PSI) 320 (4640)					
Nominal flow rates	0.6 (0.2)	1.6 (0.4)	3.2 (0.8)	6.3 (1.7)	16 (4.2)	32 (8.5)
Min. flow rates	10 (0.6)	15 (0.9)	20 (1.2)	25 (1.5)	60 (3.7)	250 (15.3)
Fluid temperature range (NBR)	°C (°F) -30 ... +100 (-22 ... +212)					
Fluid temperature range (FPM)	°C (°F) -20 ... +120 (-4 ... +248)					
Maximum degree of fluid contamination	for $Q \leq 1$ l/min Class 20/17/14 according to ISO 4406 for $Q > 1$ l/min Class 21/18/15 according to ISO 4406					
Max. flow rate variation at pressure change (for $Q > 2.5 Q_{min}$ and $p = 6 \dots 100\% p_{max}$)	%					
Mass	kg (lbs) 1.1 (2.43)					

General information	Datasheet GI_0060	Type Products and operating conditions
Mounting interface / tolerances	SMT_0019	ISO 4401-03-02-0-05 DIN 2430 (CETOP 03)
Spare parts	SP_8010	



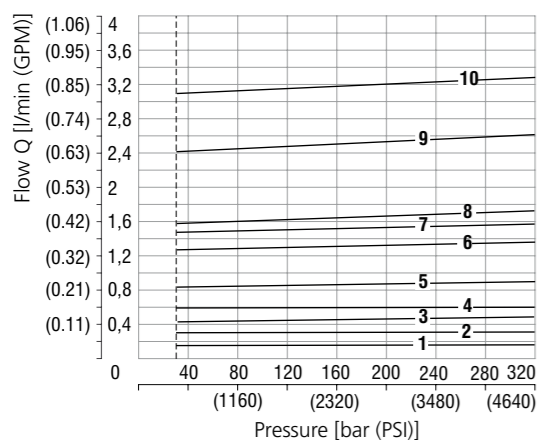
ISO 4401-03-02-0-05



Ports P, A, B, T max. \varnothing 7.5 mm (0.29 in)

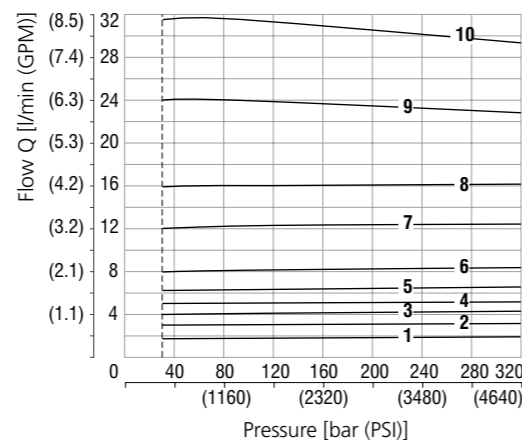
Characteristics measured at $v = 32$ mm²/s (156 SUS)

Regulated flow related to input pressure



No.	Model
1	0.6Q
2	0.6Q
3	1.6Q
4	0.6Q
5	1.6Q
6	1.6Q
7	3.2Q
8	1.6Q
9	3.2Q
10	3.2Q

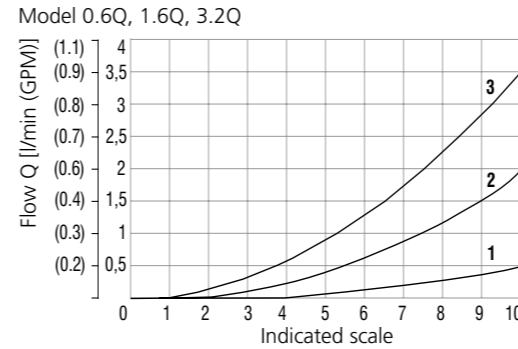
Model 6.3Q, 16Q, 32Q



No.	Model
1	6.3Q
2	6.3Q
3	16Q
4	6.3Q
5	6.3Q
6	16Q
7	16Q
8	16Q
9	32Q
10	32Q

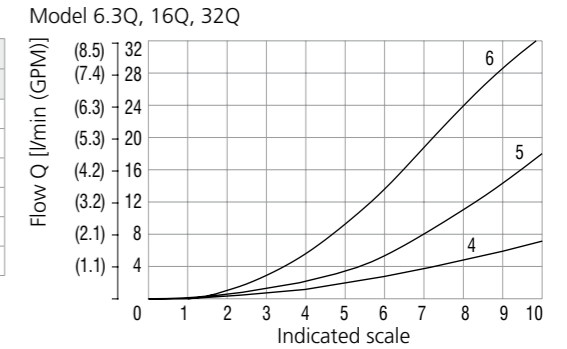
Characteristics measured at $v = 32$ mm²/s (156 SUS)

Flow rate related to indicated scale

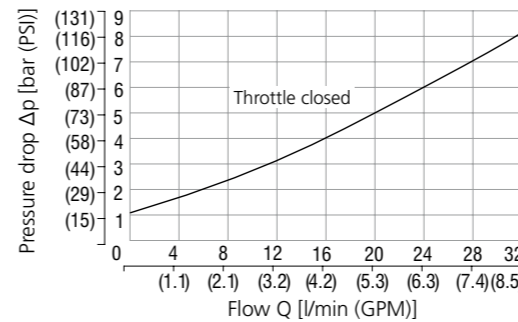


Flow direction A → B

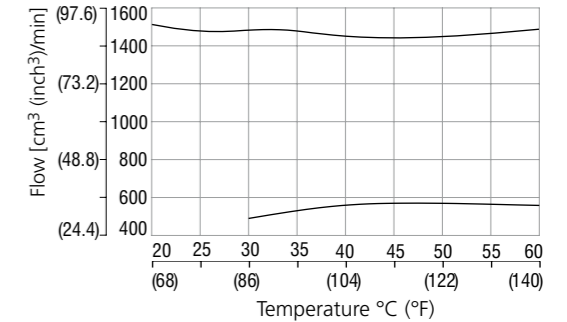
No.	Model
1	VSS2-206-0.6Q-xx
2	VSS2-206-1.6Q-xx
3	VSS2-206-3.2Q-xx
4	VSS2-206-6.3Q-xx
5	VSS2-206-16Q-xx
6	VSS2-206-32Q-xx



Pressure drop related to flow rate Free flow check valve B → A

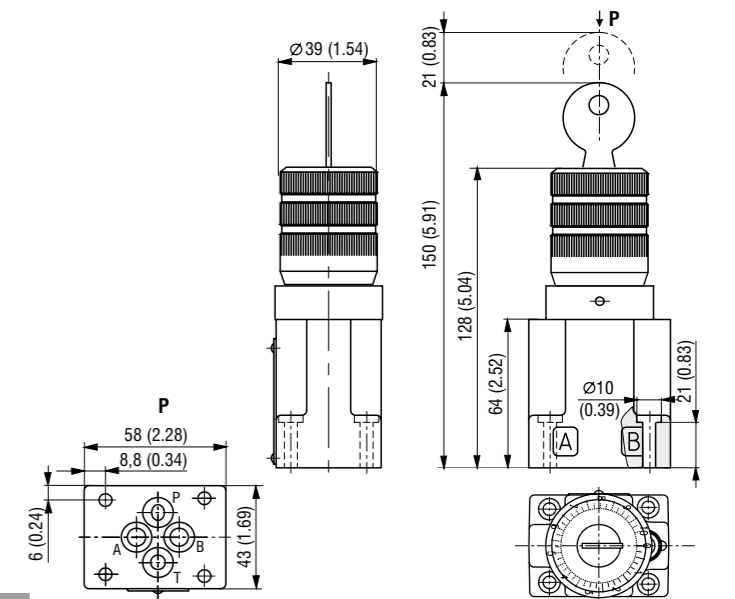
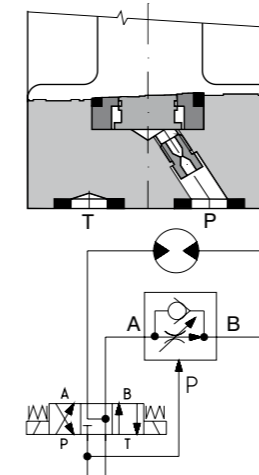


Set flow difference related to temperature



Dimensions in millimeters (inches)

Flow control valve **VSS2-206-x/JxAx-x** with externally piloted pressure compensator



Ordering Code

VSS2-2 06 - [] / [] [] [] [] - []

2-Way flow regulator with reverse flow check, pressure compensated, subplate mounted

Valve size
0.6Q
1.6Q
3.2Q
6.3Q
16Q
32Q

Flow rate
0.6 l/min (0.2 GPM)
1.6 l/min (0.4 GPM)
3.2 l/min (0.9 GPM)
6.3 l/min (1.7 GPM)
16 l/min (4.2 GPM)
32 l/min (8.6 GPM)

Model
subplate mounted - without check valve O
subplate mounted - with check valve J

Surface treatment
No designation body phosphated, steel parts
A zinc-coated (ZnCr-3), ISO 9227 (240 h)
B zinc-coated (ZnNi), ISO 9227 (520 h)

Seals
No designation NBR
V FPM (Viton)

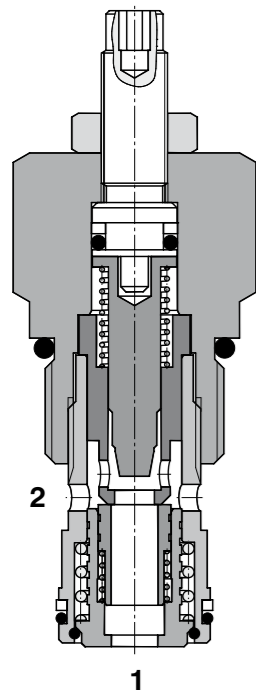
Pressure compensator pilot design
A external pilot
O internal pilot

Adjustment option
non-lockable cylindrical hand screw
lockable cylindrical hand screw

2-Way Flow Regulator with Reverse Flow Check, Pressure Compensated

SF2C2A-K2/I

M27x2 • Q_{max} 60 l/min (16 GPM) • p_{max} 350 bar (5100 PSI)

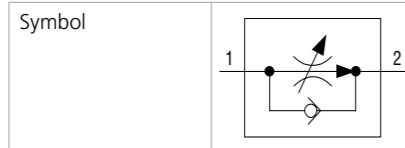


Technical Features

- › Set flow rate independent of load pressure and temperature changes
- › Adjusted flow rate depends on the orifice area and adjusted differential pressure
- › Integrated reverse flow check valve
- › Hardened precision parts
- › High flow capacity
- › Quiet and modulated response to load changes
- › Used in meter-in, meter-out or bleed-off applications
- › Wide range of flow rate options
- › In the standard version, the valve is zinc-coated for 240 h protection acc. to ISO 9227

Functional Description

This pressure compensated hydraulic flow regulating valve with fixed orifice and variable spring setting are designed to control flow rates independently of pressure and temperature changes, especially in systems where only small movements due to load changing are required. The flow rate stabilization is provided by a pressure compensator in the direction from P1 to P2. The regulated flow decreases with clockwise rotation of the adjustment screw, and increases with counter-clockwise rotation. The desired setting can be locked down. The valve will maintain the set flow regardless of pressure variations on the regulated or inlet port.

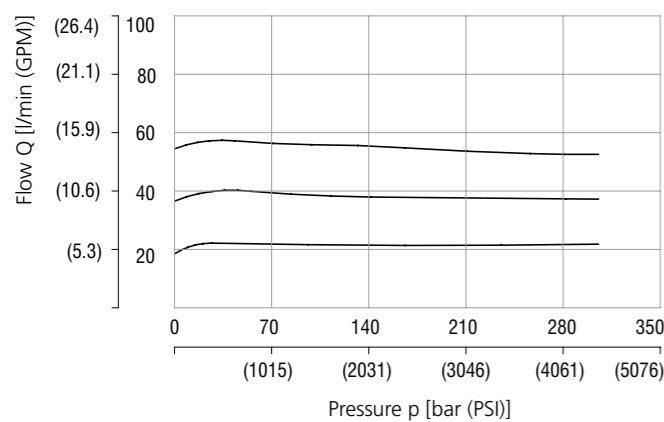


Technical Data

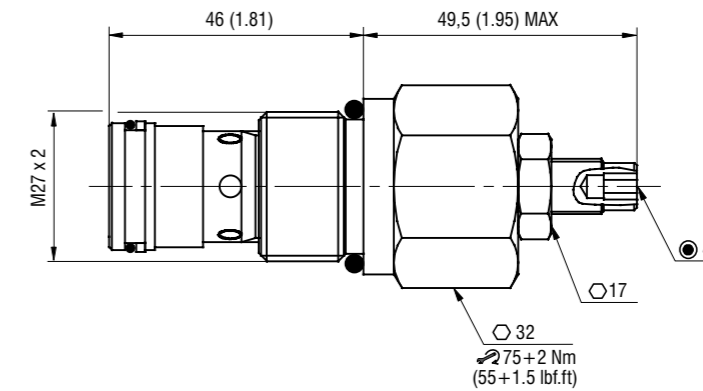
Valve size / Cartridge cavity		M27x2 / K2	
Nominal flow rates		4	6
Adjustment range	l/min (GPM)	4 - 40 (1.06 - 10.57)	6 - 60 (1.59 - 15.85)
Max. operating pressure	bar (PSI)	350 (5080)	
Fluid temperature range (NBR)	°C (°F)	-20 +90 (-4 ... +194)	
Mass	kg (lbs)	0.3 (0.66)	
General information		Type	
Datashet		GI_0060	
Products and operating conditions		SB-K2*	
Valve bodies	In-line mounted	SB_0018	
Cavity details	SMT_0019	SMT-K2*	
Spare parts	SP_8010		

Characteristics measured at v = 40 mm²/s (195 SUS)

Regulated flow related to input pressure
Flow direction 1 - 2 (regulated flow)



Dimensions in millimeters (inches)



Ordering Code

SF2C2A-K2/I **S** -

2-Way flow regulator with reverse flow check, pressure compensated **M27x2**

Surface treatment
A zinc-coated (ZnCr-3), ISO 9227 (240 h)

Seals
No designation V
NBR
FPM (Viton)

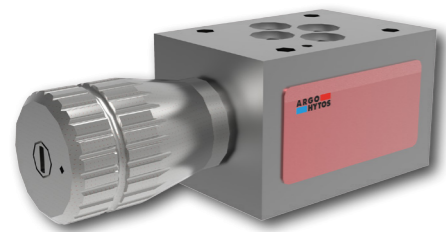
Adjustable flow range
4 - 40 l/min (1.06 - 10.57 GPM) **4**
6 - 60 l/min (1.59 - 15.85 GPM) **6**

Adjustment option
allen key (hex. 4), without protective cap

3-Way Flow Regulator, Pressure Compensated, Modular

VSS1-306

Size 06 (D03) • Q_{max} 16 l/min (4 GPM) • p_{max} 320 bar (4600 PSI)

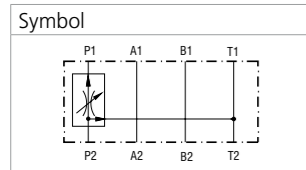


Technical Features

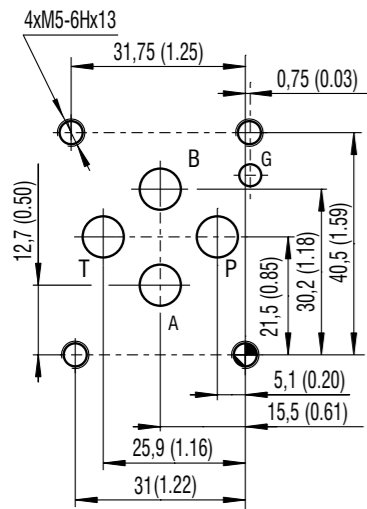
- Subplate mounting interface acc. to ISO 4401, DIN 24340 (CETOP 03) for use in vertical stacking assemblies
- Set flow rate independent of load pressure and temperature changes
- Meter-in flow control
- Adjusted flow rate depends on the orifice area and adjusted differential pressure
- Quiet and modulated response to load changes
- Adjustable by metallic hand screw
- Fine low-torque adjustment
- In the standard version, the steel parts are zinc-coated for 240 h protection acc. to ISO 9227 and the valve body is phosphated

Functional Description

3-Way pressure compensated flow control valves are designed to provide adjustable, controlled flow rates independently of changes in system pressure. The priority flow supplies the consumer port and excessive flow returns to the tank port. The flow control valve consists of a housing, a throttling spool, a pressure compensator, an internal spring and a hand screw to adjust the flow setting.



ISO 4401-03-02-0-05



Ports P, A, B, T - max \varnothing 7.5 mm (0.29 in)

Technical Data

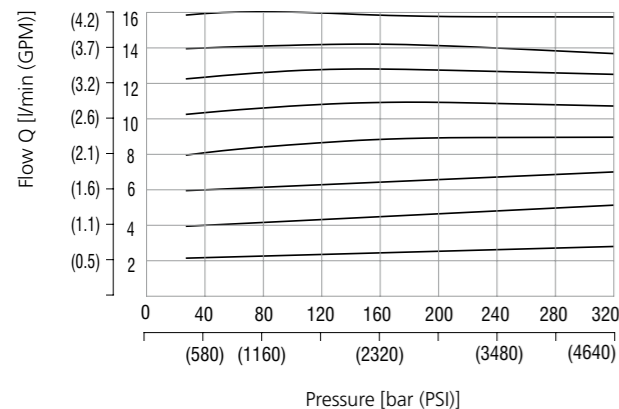
Valve size		06 (D03)	
Max. flow	l/min (GPM)	16 (4)	
Max. operating pressure	bar (PSI)	320 (4640)	
Nominal flow rates	l/min (GPM)	16 (4.2)	20 (5.3)
Min. flow rates	cm ³ (inch ³)/min	60 (3.7)	
Fluid temperature range (NBR)	°C (°F)	-30 ... +100 (-22 ... +212)	
Fluid temperature range (FPM)	°C (°F)	-20 ... +120 (-4 ... +248)	
Maximum degree of fluid contamination	for $Q \leq (1 \text{ l/min})$ for $Q > (1 \text{ l/min})$	Class 20/17/14 according to ISO 4406 Class 21/18/15 according to ISO 4406	
Max. flow rate variation at pressure change (for $Q > 2.5 Q_{min}$ and $p = 6 \dots 100\% p_{max}$)	%	± 10	
Mass	kg (lbs)	0.8 (1.76)	

	Datasheet	Type
General information	GI_0060	Products and operating conditions
Mounting interface	SMT_0019	ISO 4401-03-02-0-05 DIN 24340 (CETOP 03)
Spare parts	SP_8010	

Characteristics measured at $v = 32 \text{ mm}^2/\text{s}$ (156 SUS)

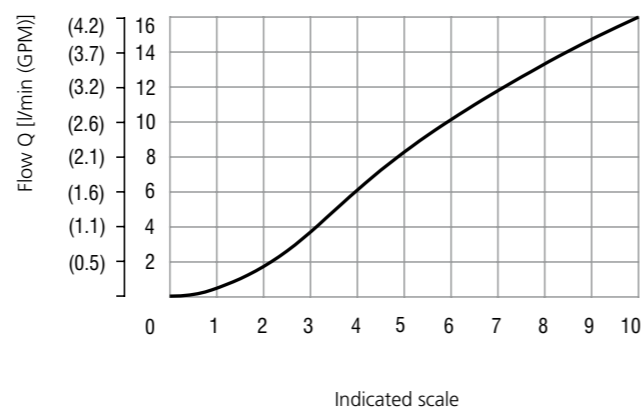
Regulated flow related to input pressure

Flow direction P2 - P1

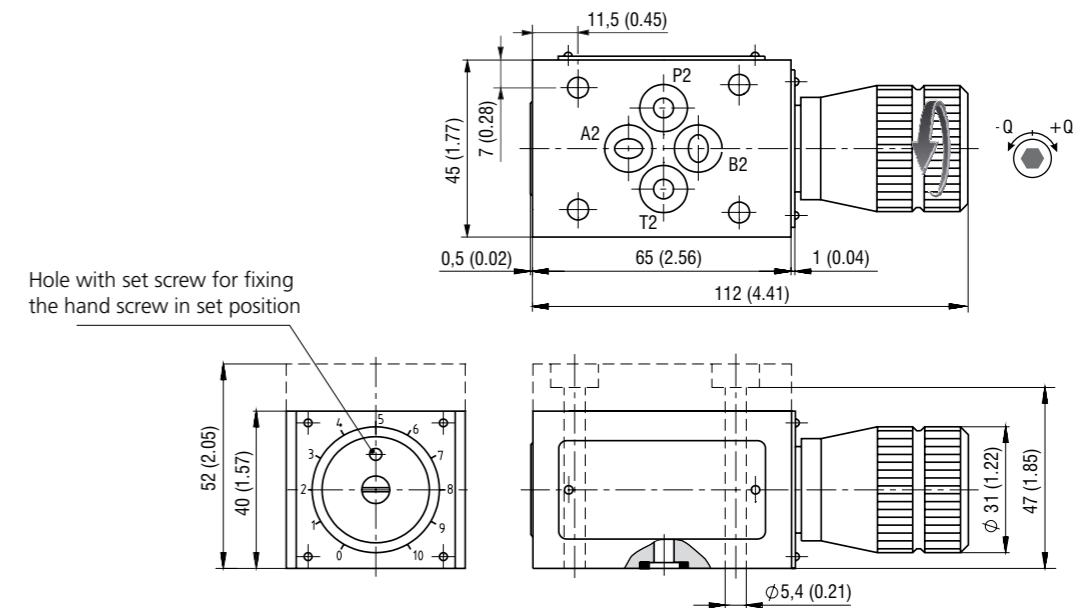


Flow rate related to indicated scale

Flow direction P2 - P1

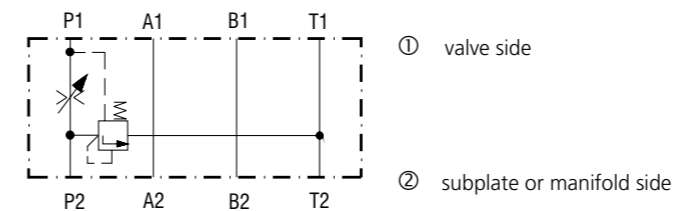


Dimensions in millimeters (inches)

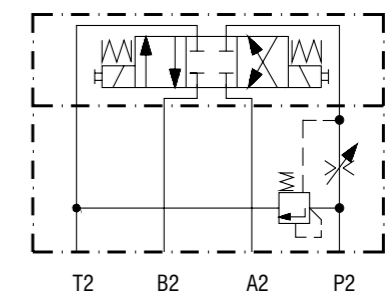


Functional symbols

Functional symbol of the valve



Typical application of the valve in stacking assembly*



* Directional valve must be ordered separately.

Ordering Code

VSS1-3 06 - 11 RS -

3-Way flow regulator, pressure compensated, modular

Valve size

Flow rate
16 l/min (4.2 GPM) **16**
20 l/min (5.3 GPM) **20**

Model
sandwich plate - without blanking plate

Surface treatment
No designation body phosphated, steel parts
A zinc-coated (ZnCr-3), ISO 9227 (240 h)
B zinc-coated (ZnCr-3), ISO 9227 (240 h)
zinc-coated (ZnNi), ISO 9227 (520 h)

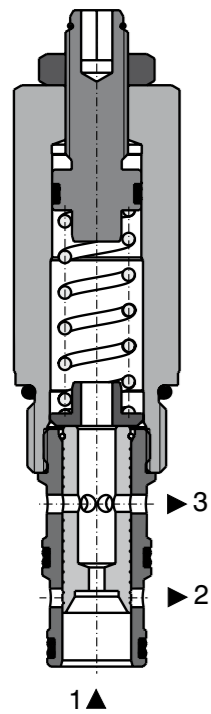
Seals
No designation NBR
V FPM (Viton)

Adjustment option
hand screw, metal

3-Way Flow Regulator, Pressure Compensated

SF32A-B3/H

7/8-14 UNF • Q_{max} 50 l/min (13 GPM) • p_{max} 350 bar (5100 PSI)

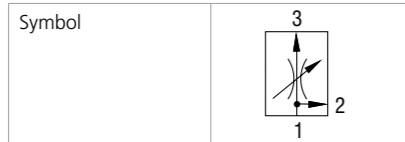


Technical Features

- By-pass flow regulator, set flow rate independent of load pressure and temperature changes
- Adjusted flow rate depends on the orifice area and adjusted differential pressure
- Hardened precision parts
- High flow capacity
- Quiet and modulated responded to load changes
- Used in meter-in applications
- Wide range of flow rate options
- Adjustable by allen key or hand screw, optionally sealable (lockwire holes)
- In the standard version, the valve is zinc-coated for 240 h protection acc. to ISO 9227

Functional Description

A fixed-orifice, pressure compensated hydraulic flow regulating valve in the form of a screw-in cartridge with variable spring setting. It can be used as a priority flow regulator or a 2-way flow regulator when the by-pass port (2) is blocked. This valve maintains a constant priority flow from port 1 to port 3 based on the adjustment, regardless of pressure changes downstream on port 3. Excessive flow is directed to port 2.



Technical Data

Valve size / Cartridge cavity		7/8-14 UNF-2A / B3			
Max. inlet flow (port 1)	l/min (GPM)	50 (13.2)			
Nominal flow rates		10	14	22	30
Adjustment range	l/min (GPM)	5 - 10 (1.2 - 2.6)	6 - 14 (1.6 - 3.7)	11 - 22 (2.9 - 5.8)	17 - 30 (4.5 - 7.9)
Max. operating pressure	bar (PSI)	350 (5080)			
Fluid temperature range (NBR)	°C (°F)	-30... +100 (-22 ... +212)			
Fluid temperature range (FPM)	°C (°F)	-20 ... +120 (-4 ... +248)			
Mass	kg (lbs)	0.24 (0.52)			

General Information		Datasheet	Type
		GI_0060	Products operating conditions
Valve bodies	In-line mounted	SB_0018	SB-B3*
	Sandwich mounted	SB-04(06)_0028	SB-*B3*
Cavity details / Form tools		SMT_0019	SMT-B3*
Spare parts		SP_8010	

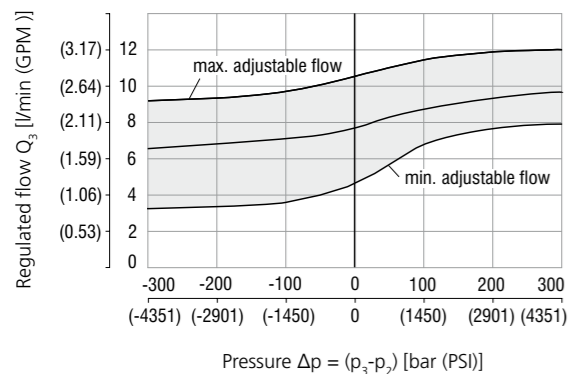
Characteristics measured at $v = 32 \text{ mm}^2/\text{s}$ (156 SUS)

Regulated flow related to input pressure

Measured at constant inlet flow $Q_1 = 50 \text{ l/min}$ (13.21 GPM)

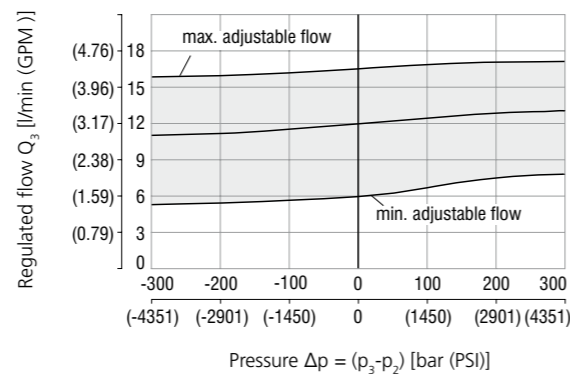
Flow rate 10

By-pass pressure higher than regulated pressure $p_2 > p_3$ | Regulated pressure higher than by-pass pressure $p_3 > p_2$



Flow rate 14

By-pass pressure higher than regulated pressure $p_2 > p_3$ | Regulated pressure higher than by-pass pressure $p_3 > p_2$



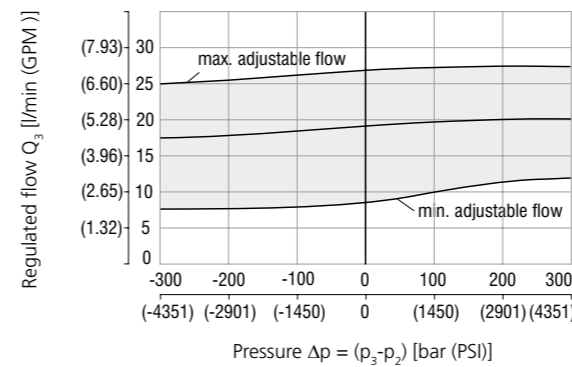
Characteristics measured at $v = 32 \text{ mm}^2/\text{s}$ (156 SUS)

Regulated flow related to input pressure

Measured at constant inlet flow $Q_1 = 50 \text{ l/min}$ (13.21 GPM)

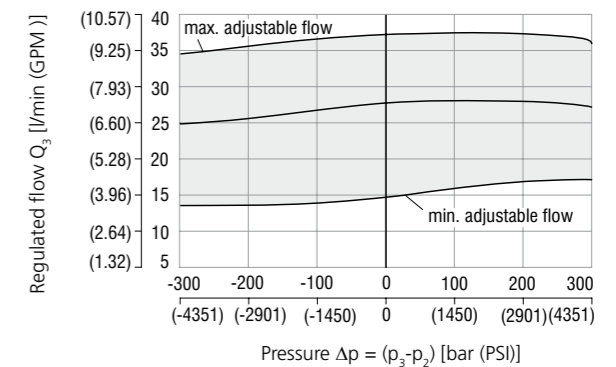
Flow rate 22

By-pass pressure higher than regulated pressure $p_2 > p_3$ | Regulated pressure higher than by-pass pressure $p_3 > p_2$



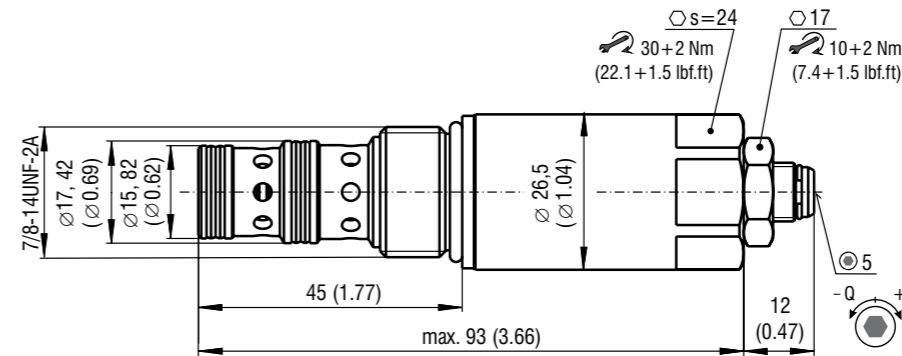
Flow rate 30

By-pass pressure higher than regulated pressure $p_2 > p_3$ | Regulated pressure higher than by-pass pressure $p_3 > p_2$

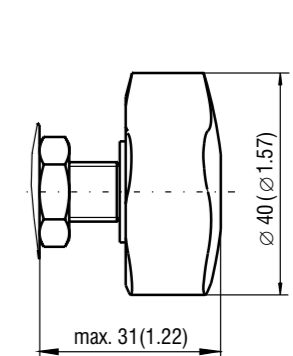


Dimensions in millimeters (inches)

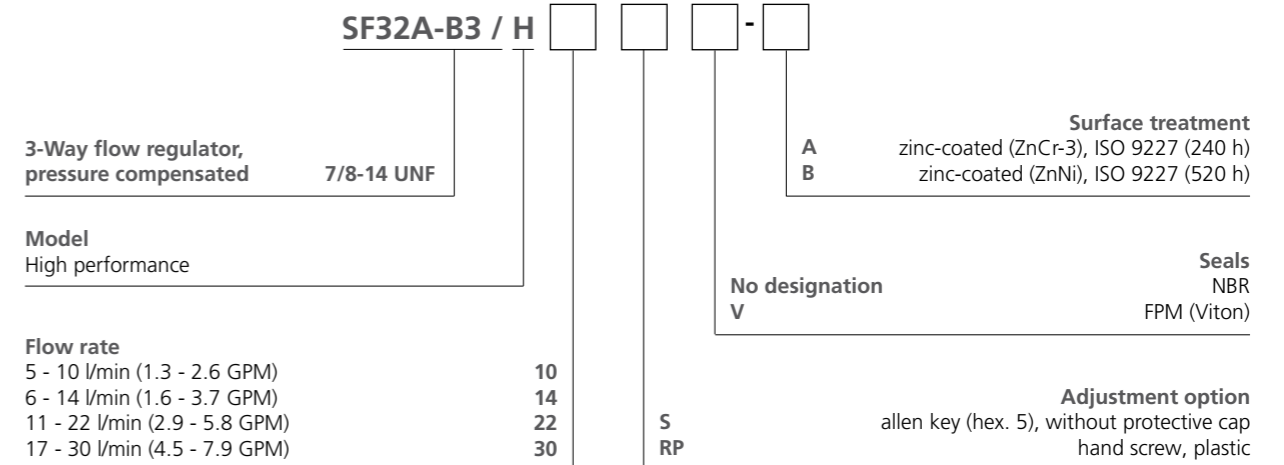
Model S



Model RP



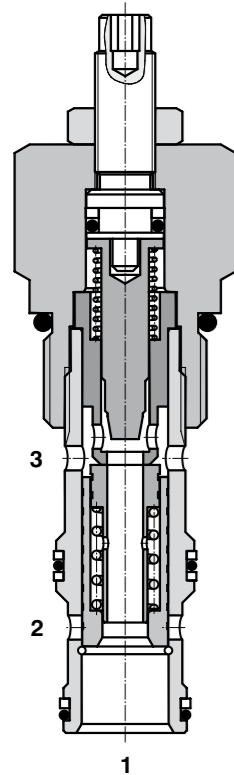
Ordering Code



3-Way Flow Regulator, Pressure Compensated

SF32A-K3/I

M27x2 • Q_{max} 90 l/min (24 GPM) • p_{max} 350 bar (5100 PSI)

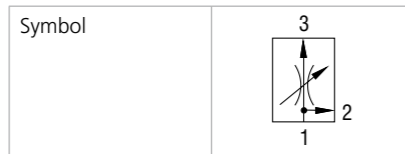


Technical Features

- > By-pass flow regulator, set flow rate independent of load pressure and temperature changes
- > Adjusted flow rate depends on the orifice area and adjusted differential pressure
- > Hardened precision parts
- > High flow capacity
- > Quiet and modulated response to load changes
- > Used in meter-in applications
- > Wide range of flow rate options
- > In the standard version, the valve is zinc-coated for 240 h protection acc. to ISO 9227

Functional Description

A fixed-orifice, pressure compensated hydraulic flow regulating valve in the form of a screw-in cartridge with variable spring setting. It can be used as a priority flow regulator or a 2-way flow regulator when the by-pass port (2) is blocked. This valve maintains a constant priority flow from port 1 to port 3 based on the adjustment, regardless of pressure changes downstream on port 3. Excessive flow is directed to port 2.



Technical Data

Valve size / Cartridge cavity		M27x2 / K3	
Max. inlet flow (port 1)	l/min (GPM)	90 (23.78)	
Nominal flow rates		4	6
Adjustment range	l/min (GPM)	4 - 40 (1.06 - 10.57)	6 - 60 (1.59 - 15.85)
Max. operating pressure	bar (PSI)	350 (5080)	
Fluid temperature range (NBR)	°C (°F)	-20 ... +90 (-4 ... +194)	
Mass	kg (lbs)	0.16 (0.35)	

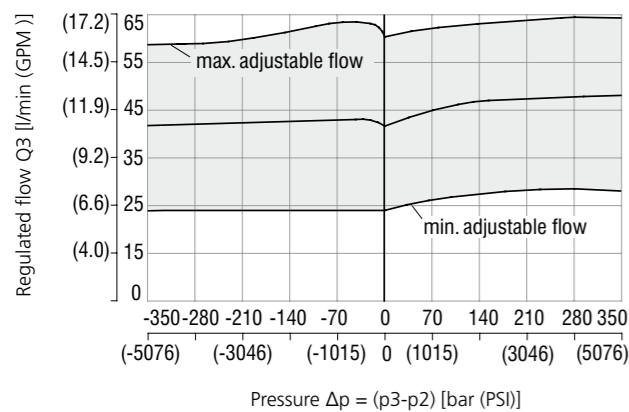
	Datasheet	Type
General information	GI_0060	Products and operating conditions
Valve bodies	In-line mounted SB_0018	SB-K3*
Cavity details	SMT_0019	SMT-K3*
Spare parts	SP_8010	

Characteristics measured at $v = 40 \text{ mm}^2/\text{s}$ (195 SUS)

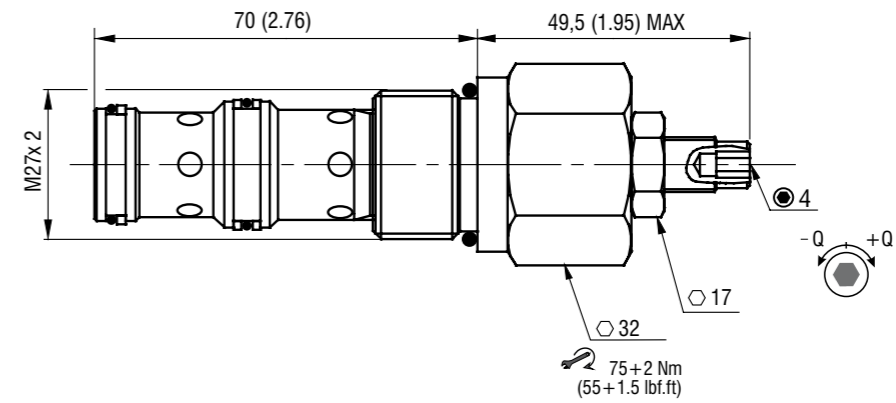
Regulated flow related to input pressure

Measured at constant inlet flow $Q_1 = 50 \text{ l/min}$ (13.21 GPM)

By-pass pressure higher than regulated pressure $p_2 > p_3$ | Regulated pressure higher than by-pass pressure $p_3 > p_2$



Dimensions in millimeters (inches)



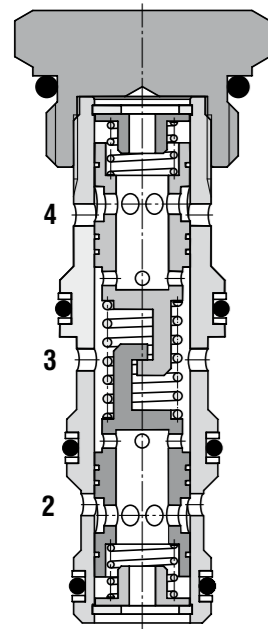
Ordering Code

SF32A-K3/I	<input type="checkbox"/>	S	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3-Way flow regulator, pressure compensated	M27x2		A	B	V
			Surface treatment A zinc-coated (ZnCr-3), ISO 9227 (240 h) B zinc-coated (ZnNi), ISO 9227 (520 h)		Seals NBR FPM (Viton)
					Adjustment option allen key (hex. 4), without protective cap
Adjustable flow range					
4 - 40 l/min (1.06 - 10.57 GPM)					4
6 - 60 l/min (1.59 - 15.85 GPM)					6

Flow Divider - Combiner Valve

SFD2F-B4/I

7/8-14 UNF • Q_{max} 40 l/min (11 GPM) • p_{max} 350 bar (5100 PSI)

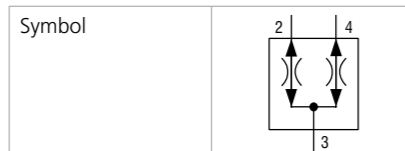


Technical Features

- › Divides pump flow to operate two actuators under different load conditions
- › Re-combines the return flows to synchronize actuator movement
- › Division and combination of flows largely independent of the load
- › Used for synchronisation controls and differential lock
- › High accuracy under load and pressure imbalance
- › High flow capacity
- › Flow variation $\pm 10\%$ with the maximum variation of pressure and inlet flow
- › In the standard version, the valve is zinc-coated for 240 h protection acc. to ISO 9227

Functional Description

The inlet flow passes through the two orifices in the valve housing, then through the spools and out of the radial holes in the sleeve. The matched orifices and compensating springs ensure that the flow is divided equally, excess flow in either direction causes the spool to move and close the radial holes in the sleeve until pressure balance is restored. In the reverse direction the spools shift closer together and regulate the inflow through the radial ports.



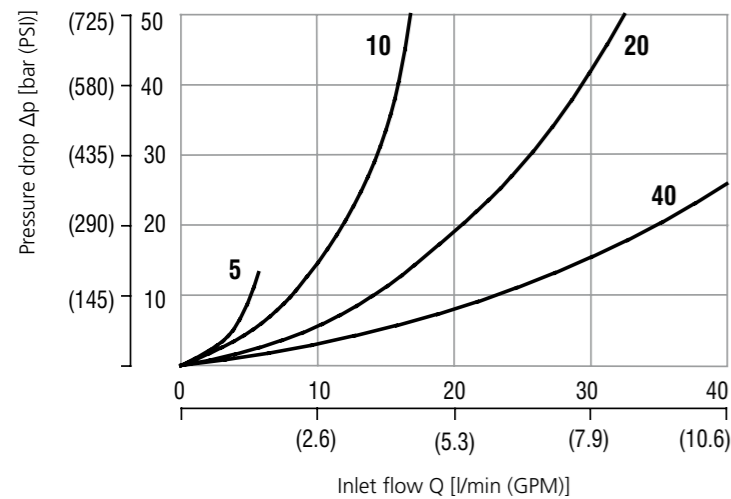
Technical Data

Valve size / Cartridge cavity		7/8-14 UNF-2A / B4
Max. flow	l/min (GPM)	40 (10.6)
Max. operating pressure	bar (PSI)	350 (5080)
Fluid temperature range (NBR)	°C (°F)	-20 ... +90 (-4 ... +194)
Division ratio	%	50 / 50 standard
Max. flow variation	%	± 10
Mass	kg (lbs)	0.10 (0.22)

		Datasheet	Type
General information		GI_0060	Products and operating conditions
Valve bodies	In-line mounted	SB_0018	SB-B4*
	Sandwich mounted	SB-04(06)_0028	SB-*B4*
Cavity details / Form tools		SMT_0019	SMT-B4*
Spare Parts		SP_8010	

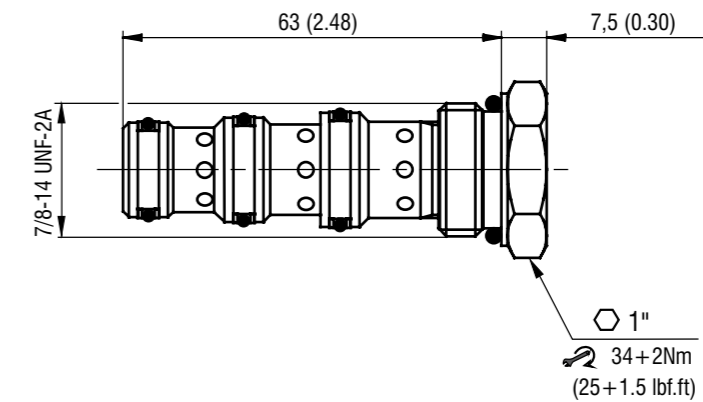
Characteristics measured at $v = 40 \text{ mm}^2/\text{s}$ (195 SUS)

Pressure drop related to inlet flow rate



Notice: When used in cylinders select the size to suite the return flow rate. Blocking one leg will result in a large reduction in flow from the other. Valves with higher working pressures are available. Contact the main office for details.

Dimensions in millimeters (inches)



Ordering Code

SFD2F-B4 / I

Flow divider - combiner valve
7/8-14 UNF

Surface treatment
A zinc-coated (ZnCr-3), ISO 9227 (240 h)

Flow rate (inlet flow)

2 - 5 l/min	(0.5 - 1.3 GPM)	5
3.3 - 10 l/min	(0.9 - 2.6 GPM)	10
7 - 20 l/min	(1.9 - 5.3 GPM)	20
15 - 40 l/min	(4.0 - 10.6 GPM)	40

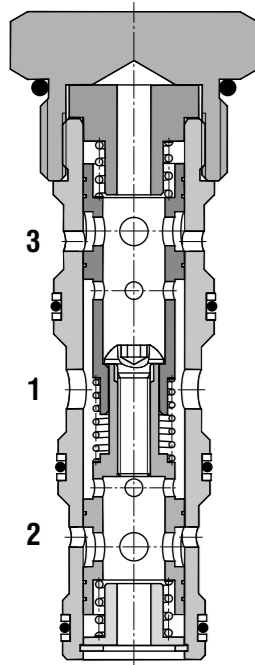
No designation
V

Seals
NBR
FPM (Viton)

Flow Divider - Combiner Valve

SFD2F-D4/I

1-5/16-12 UN • Q_{max} 150 l/min (40 GPM) • p_{max} 350 bar (5100 PSI)

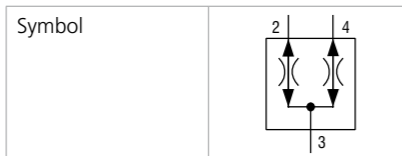


Technical Features

- › Divides pump flow to operate two actuators under different load conditions
- › Re-combines the return flows to synchronize actuator movement
- › Division and combination of flows largely independent of the load
- › Used for synchronisation controls and differential lock
- › High accuracy under load and pressure imbalance
- › High flow capacity
- › Flow variation $\pm 10\%$ with the maximum variation of pressure and inlet flow
- › In the standard version, the valve is zinc-coated for 240 h protection acc. to ISO 9227

Functional Description

The inlet flow passes through the two orifices in the valve housing, then through the spools and out of the radial holes in the sleeve. The matched orifices and compensating springs ensure that the flow is divided equally, excess flow in either direction causes the spool to move and close the radial holes in the sleeve until pressure balance is restored. In the reverse direction the spools shift closer together and regulate the inflow through the radial ports.



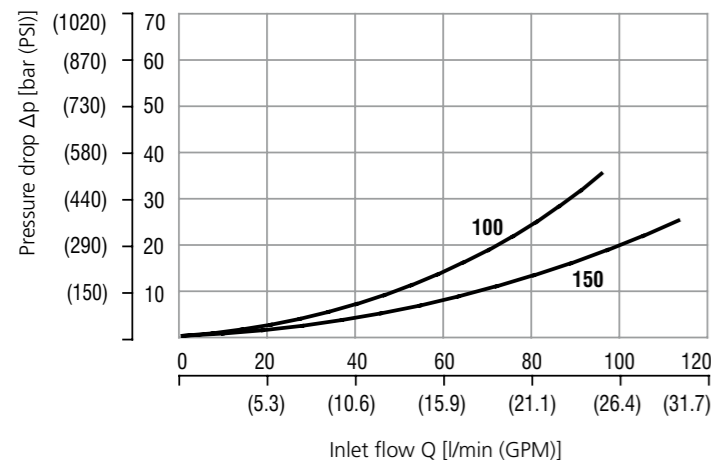
Technical Data

Valve size / Cartridge cavity		1-5/16-12 UN-2A / D4
Max. flow	l/min (GPM)	150 (39.6)
Max. operating pressure	bar (PSI)	350 (5080)
Fluid temperature range (NBR)	°C (°F)	-20 ... +90 (-4 ... +194)
Division ratio	%	50 / 50 standard
Max. flow variation	%	± 10
Mass	kg (lbs)	0.36 (0.79)

		Datasheet	Type
General information		GI_0060	Products and operating conditions
Valve bodies	In-line mounted	SB_0018	SB-D4*
Cavity details		SMT_0019	SMT-D4*
Spare parts		SP_8010	

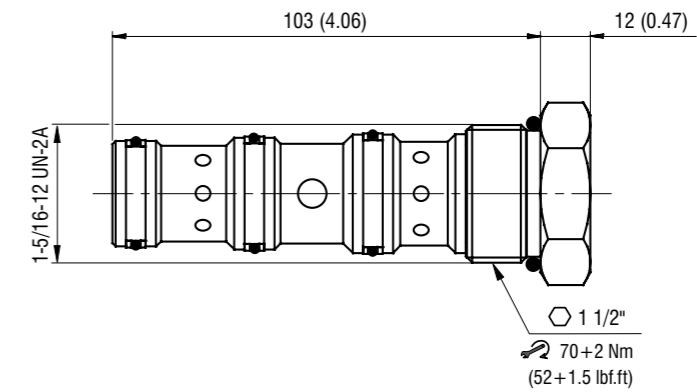
Characteristics measured at $v = 40 \text{ mm}^2/\text{s}$ (195 SUS)

Pressure drop related to inlet flow rate

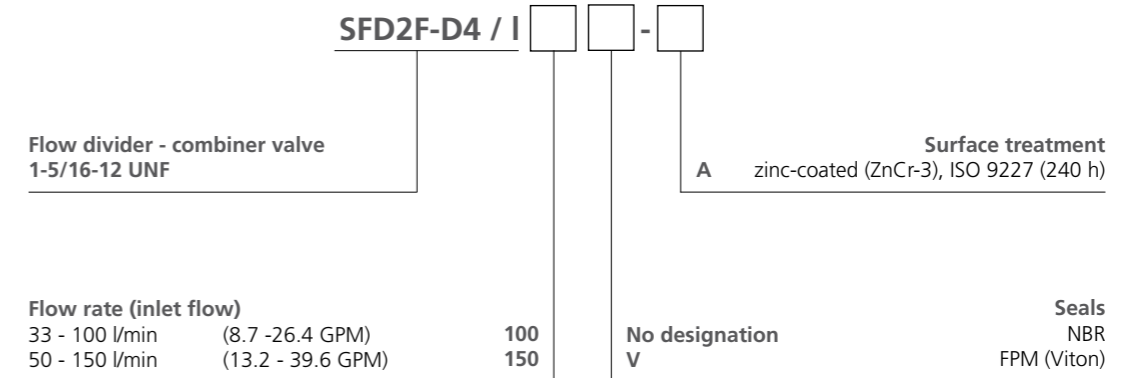


Notice: When used in cylinders select the size to suite the return flow rate. Blocking one leg will result in a large reduction in flow from the other. Valves with higher working pressures are available. Contact the main office for details.

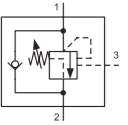
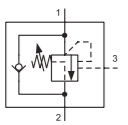
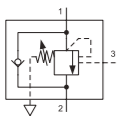
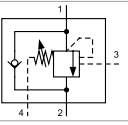
Dimensions in millimeters (inches)



Ordering Code



Content

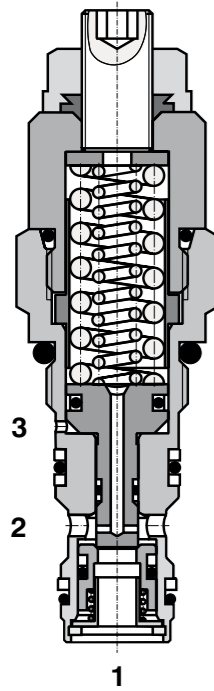
Symbol Example	Flow l/min (GPM)	Pressure bar (PSI)	Type Code	Cartridge			Line Mounted	Page	Data Sheet
				Size 04; D02	Size 06; D03	Size 10; D05			
Overcentre Valves									
	30 (8)	350 (5100)	SO5A-Q3/I	X			(X)	308	HA 5200
	90 (24)	350 (5100)	SO5A-R3/I	X			(X)	310	HA 5205
	140 (37)	420 (6100)	SO5A-T3/I	X			(X)	312	HA 5214
Overcentre Valves Part Balanced									
	30 (8)	350 (5100)	SOP5A-Q3/I	X			(X)	314	HA 5201
	90 (24)	350 (5100)	SOP5A-R3/I	X			(X)	316	HA 5206
	140 (37)	420 (6100)	SOP5A-T3/I	X			(X)	318	HA 5215
Overcentre Valves Fully Balanced									
	30 (8)	350 (5100)	SOB5A-Q3/I	X			(X)	320	HA 5202
	90 (24)	350 (5100)	SOB5A-R3/I	X			(X)	322	HA 5207
	120 (32)	350 (5100)	SOB5A-S3/I	X			(X)	324	HA 5211
Overcentre Valves Fully Balanced - Internal Drainage									
	90 (24)	350 (5100)	SOBD5A-R4/I	X			(X)	326	HA 5208
	180 (48)	400 (5800)	SOBD5A-S4/I	X			(X)	328	HA 5212

Notes

Overcentre Valve

SO5A-Q3/I

M20x1.5 • Q_{max} 30 l/min (8 GPM) • p_{max} 350 bar (5100 PSI)

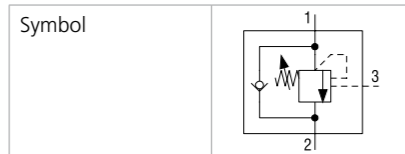


Technical Features

- › The valve prevents runaway ahead of the pump in the event of a negative load
- › Load-holding with leak-free closing poppet when the directional valve is in neutral position
- › Pressure relief function protecting the actuator against overload and pressure peaks
- › Integrated check valve acting as an anti-cavitation valve
- › When installed into an actuator the valve can be used as a hose burst valve
- › In the standard version, the valve is zinc-coated for 240 h protection acc. to ISO 9227

Functional Description

Poppet type, screw-in motion control valve designed to control the runaway of a negative load. The built-in check valve allows reverse flow into the actuator, which is protected by the internal pressure relief function.



Technical Data

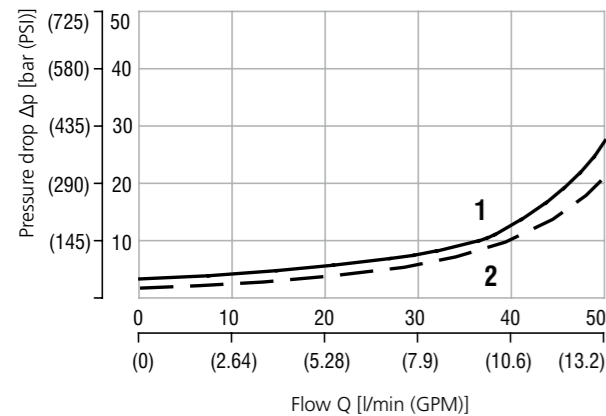
Valve size / Cartridge cavity		M20x1.5 / Q3
Max. flow	l/min (GPM)	30 (7.9)
Max. load induced pressure	bar (PSI)	270 (3920)
Max. relief pressure	bar (PSI)	350 (5080)
Fluid temperature range	°C (°F)	-20 ... +90 (-4 ... +194)
Pilot ratio		2.5:1, 5:1, 10:1
Internal Leakage	ml/min	0.3 nominal (5 drops per min)
Max. degree of fluid contamination	ISO 4406	Class 21/18/13
Mass	kg (lbs)	0.15 (0.33)

		Datasheet	Type
General information		GI_0060	Products and operating conditions
Valve bodies	In-line mounted	SB_0018	SB-Q3*
	Sandwich mounted	SB-04(06)_0028	SB-*Q3*
Cavity details		SMT_0019	SMT-Q3*
Spare parts		SP_8010	

Characteristics measured at v = 40 mm²/s (195 SUS)

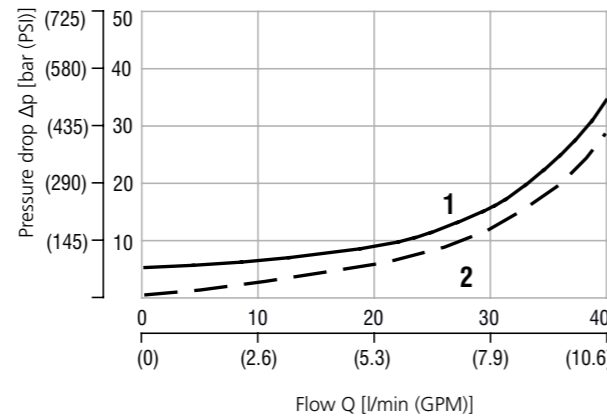
Pressure drop related to flow rate

Pilot ratio 2.5 : 1 and 5 : 1

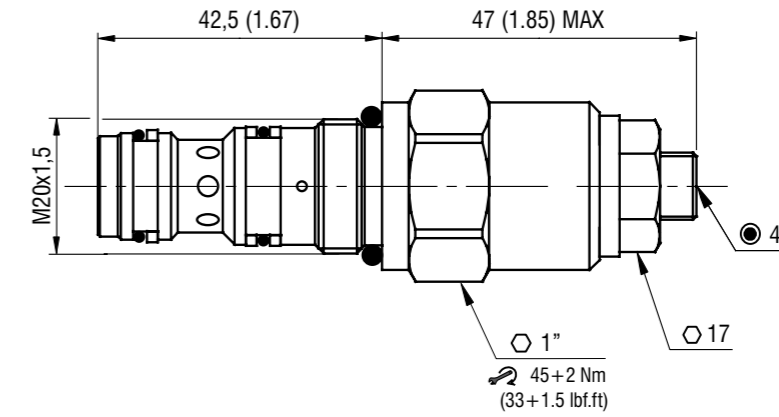


Pressure drop related to flow rate

Pilot ratio 10 : 1



Dimensions in millimeters (inches)



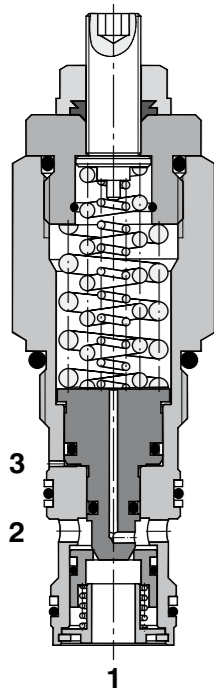
Ordering Code

SO5A-Q3 / I		-		-		-		-	
Overcentre valve	M20x1.5							210/4,8	Factory setting [bar @ l/min] 210 bar at 4.8 l/min
Pilot ratio	2.5:1	2							Surface treatment zinc-coated (ZnCr-3), ISO 9227 (240 h)
	standard 5:1	5							
	10:1	10							
Relief pressure range	100 - 350 bar (1450 - 5080 PSI)	2.5:1, 5:1							Seals NBR FPM (Viton)
	120 - 350 bar (1740 - 5080 PSI)	10:1	35					No designation V	

Overcentre Valve

SO5A-R3/I

M27x1.5 • Q_{max} 90 l/min (24 GPM) • p_{max} 350 bar (5100 PSI)

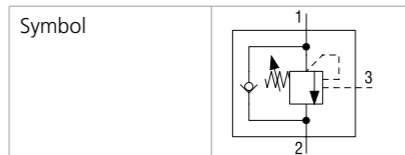


Technical Features

- › The valve prevents runaway ahead of the pump in the event of a negative load
- › Load-holding with leak-free closing poppet when directional valve is in neutral position
- › Pressure relief function protecting the actuator against overload and pressure peaks
- › Integrated check valve acting as an anti-cavitation valve
- › When installed into an actuator the valve can be used as a hose burst valve
- › In the standard version, the valve is zinc-coated for 240 h protection acc. to ISO 9227

Functional Description

Poppet type, screw-in motion control valve designed to control the runaway of a negative load. The built-in check valve allows reverse flow into the actuator, which is protected by the internal pressure relief function.



Technical Data

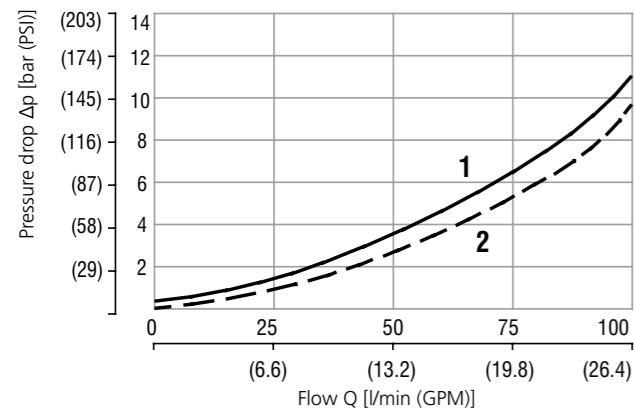
Valve size / Cartridge cavity	M27x1.5 / R3	
Max. flow	l/min (GPM)	90 (23.8)
Max. load induced pressure	bar (PSI)	270 (3920)
Max. relief pressure	bar (PSI)	350 (5080)
Fluid temperature range	°C (°F)	-20 +90 (-4 ... +194)
Pilot ratio		4:1, 8:1
Internal Leakage	mil/min	0.3 nominal (5 drops per min)
Max. degree of fluid contamination	ISO 4406	Class 21/18/13
Mass	kg (lbs)	0.29 (0.64)

	Datasheet	Type
General information	GI_0060	Products and operating conditions
Valve bodies	In-line mounted SB_0018	SB-R3*
Cavity details	SMT_0019	SMT-R3*
Spare parts	SP_8010	

Characteristics measured at v = 40 mm²/s (195 SUS)

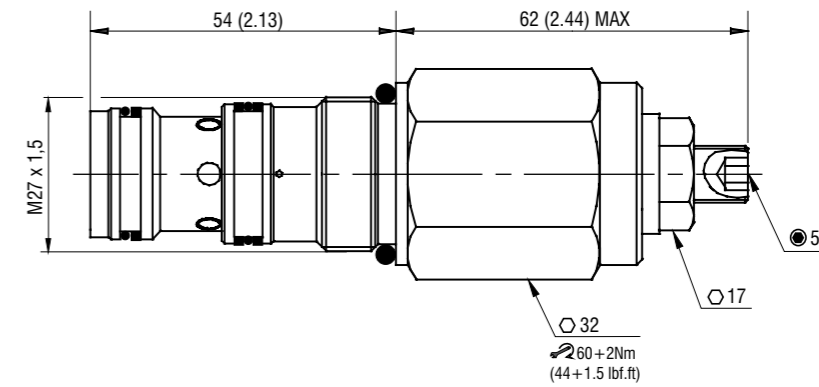
Pressure drop related to flow rate

Pilot ratio 4:1 and 8:1



Flow	Description
1	free flow (2→1)
2	pilot open (1→2)

Dimensions in millimeters (inches)



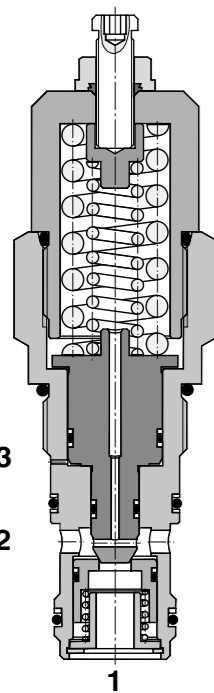
Ordering Code

SO5A-R3 / I									
Overcentre valve	M27x1.5								
Pilot ratio	standard	4:1	8:1	4	8				
Relief pressure range	200 - 350 bar (2900 - 5080 PSI)					35			
							No designation		
							V		
								Factory setting [bar @ l/min]	
								210/4,8	210 bar at 4.8 l/min
								A	Surface treatment
									zinc-coated (ZnCr-3), ISO 9227 (240 h)
									Seals
									NBR
									FPM (Viton)

Overcentre Valve

SO5A-T3/I

M38x2 • Q_{max} 140 l/min (37 GPM) • p_{max} 420 bar (6100 PSI)

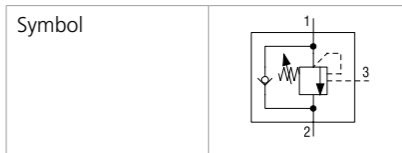


Technical Features

- › The valve prevents runaway ahead of the pump in the event of a negative load
- › Load-holding with leak-free closing poppet when directional valve is in neutral position
- › Pressure relief function protecting the actuator against overload and pressure peaks
- › Integrated check valve acting as an anti-cavitation valve
- › When installed into an actuator the valve can be used as a hose burst valve
- › In the standard version, the valve is zinc-coated for 240 h protection acc. to ISO 9227

Functional Description

Poppet type, screw-in motion control valve designed to control the runaway of a negative load. The built-in check valve allows reverse flow into the actuator, which is protected by the internal pressure relief function.



Technical Data

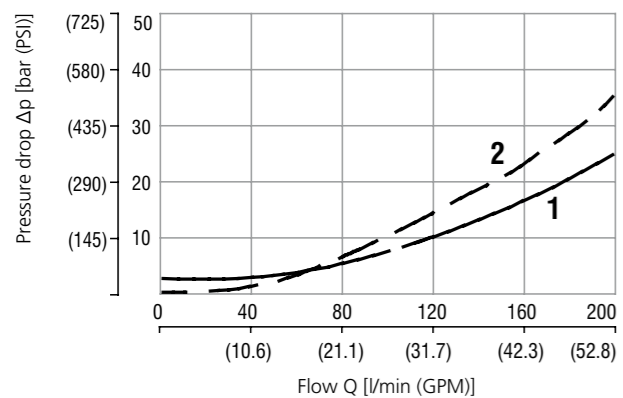
Valve size / Cartridge cavity		M38x2 / T3
Max. flow	l/min (GPM)	140 (37)
Max. load induced pressure	bar (PSI)	340 (4930)
Max. relief pressure	bar (PSI)	420 (6090)
Fluid temperature range	°C (°F)	-20 +90 (-4 ... +194)
Pilot ratio		4:1, 6:1
Internal Leakage	ml/min	0.3 nominal (5 drops per min)
Max. degree of fluid contamination	ISO 4406	Class 21/18/13
Mass	kg (lbs)	1.20 (2.65)

	Datasheet	Type
General information	GI_0060	Products and operating conditions
Valve bodies	In-line mounted SB_0018	SB-T3*
Cavity details	SMT_0019	SMT-T3*
Spare parts	SP_8010	

Characteristics measured at v = 40 mm²/s (195 SUS)

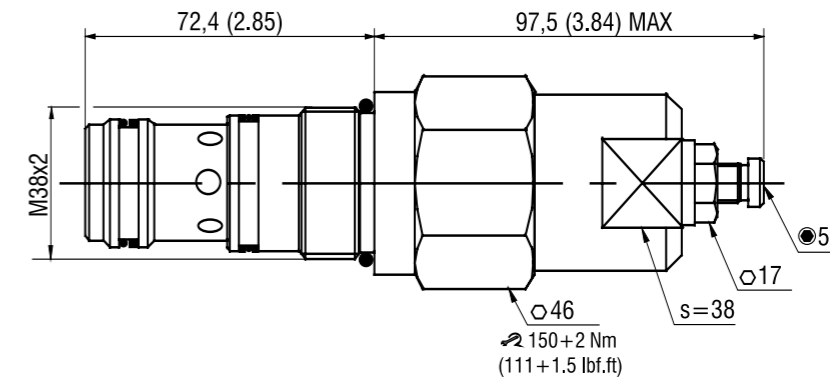
Pressure drop related to flow rate

Pilot ratio 4:1 and 6:1

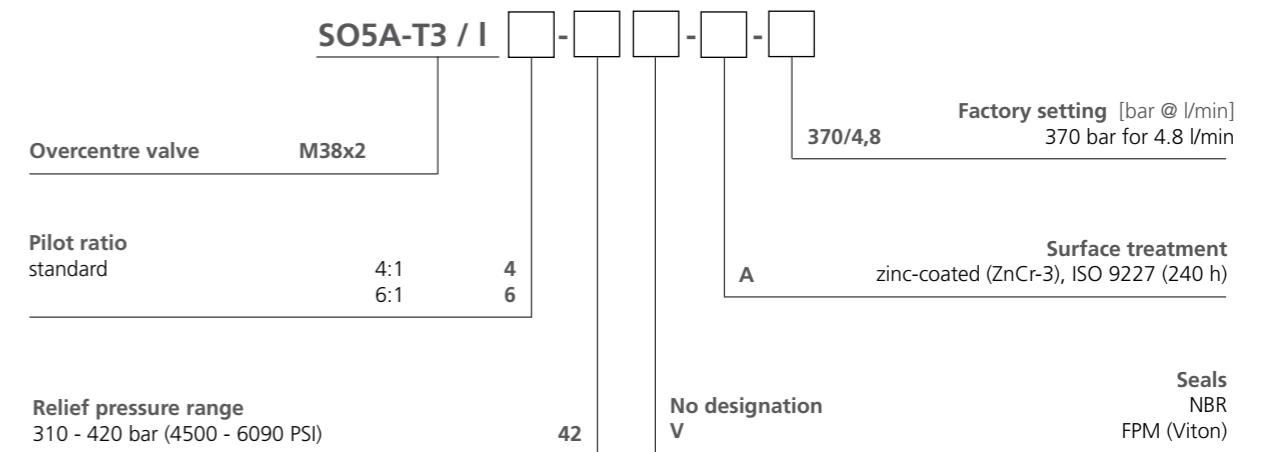


Flow	
1	Free flow (2→1)
2	Pilot open (1→2)

Dimensions in millimeters (inches)



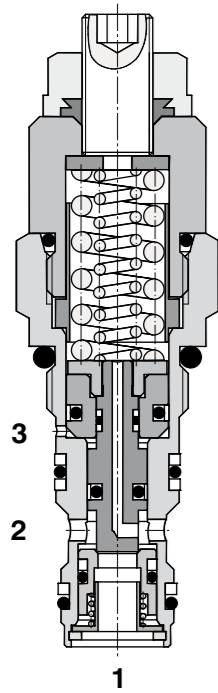
Ordering Code



Overcentre Valve, Partially Balanced

SOP5A-Q3/I

M20x1.5 • Q_{max} 30 l/min (8 GPM) • p_{max} 350 bar (5100 PSI)

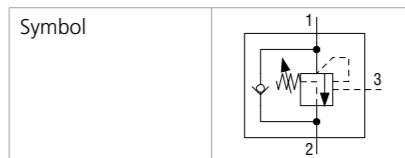


Technical Features

- › The valve prevents runaway ahead of the pump in the event of a negative load
- › Load-holding with leak-free closing poppet when directional valve is in neutral position
- › Pressure relief function protecting the actuator against overload and pressure peaks
- › Integrated check valve acting as an anti-cavitation valve
- › When installed into an actuator the valve can be used as a hose burst valve
- › Pressure relief section of the valve is not affected by back pressure
- › In the standard version, the valve is zinc coated for 240 h protection acc. to ISO 9227

Functional Description

Poppet type, screw-in motion control valve designed to control the runaway of a negative load. The built-in check valve allows reverse flow into the actuator, which is protected by the internal pressure relief function. Back pressure at port 2 do not affect the pressure relief setting.



Technical Data

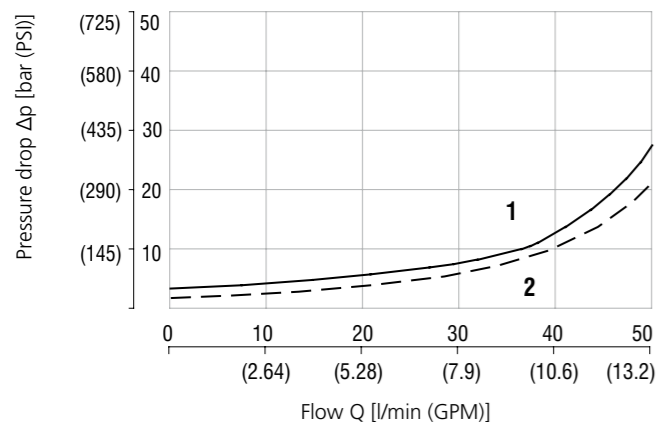
Valve size / Cartridge cavity		M20x1.5 / Q3
Max. flow	l/min (GPM)	30 (7.9)
Max. load induced pressure	bar (PSI)	270 (3920)
Max. relief pressure	bar (PSI)	350 (5080)
Fluid temperature range	°C (°F)	-20 ... +90 (-4 ... +194)
Pilot ratio		4:1
Internal Leakage	ml/min	0.3 nominal (5 drops per min)
Max. degree of fluid contamination	ISO 4406	Class 21/18/13
Mass	kg (lbs)	0.15 (0.33)

		Datasheet	Type
General information		GI_0060	Products and operating conditions
Valve bodies	In-line mounted	SB_0018	SB-Q3*
	Sandwich mounted	SB-04(06)_0028	SB-*Q3*
Cavity details		SMT_0019	SMT-Q3*
Spare parts		SP_8010	

Characteristics measured at v = 40 mm²/s (195 SUS)

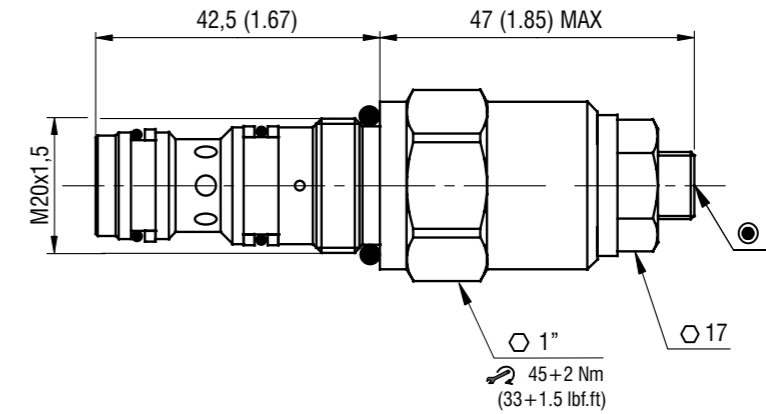
Pressure drop related to flow rate

Pilot ratio 4:1

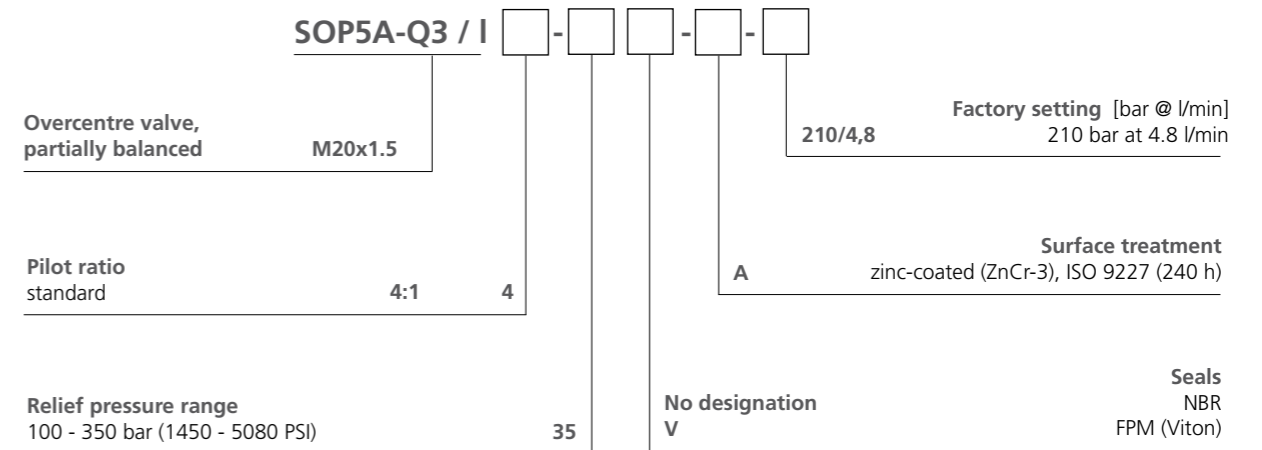


Flow	Description
1	free flow (2→1)
2	pilot open (1→2)

Dimensions in millimeters (inches)



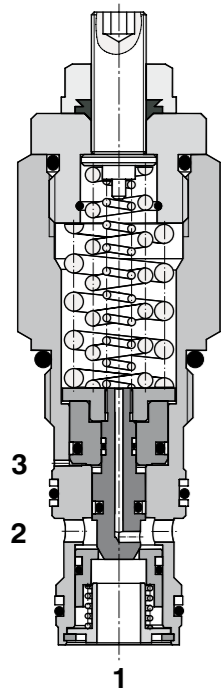
Ordering Code



Overcentre Valve, Partially Balanced

SOP5A-R3/I

M27x1.5 • Q_{max} 90 l/min (24 GPM) • p_{max} 350 bar (5100 PSI)

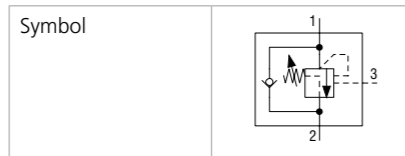


Technical Features

- › The valve prevents runaway ahead of the pump in the event of a negative load
- › Load-holding with leak-free closing poppet when directional valve is in neutral position
- › Pressure relief function protecting the actuator against overload and pressure peaks
- › Integrated check valve acting as an anti-cavitation valve
- › When installed into an actuator the valve can be used as a hose burst valve
- › Pressure relief section of the valve is not affected by back pressure
- › In the standard version, the valve is zinc coated for 240 h protection acc. to ISO 9227

Functional Description

Poppet type, screw-in motion control valve designed to control the runaway of a negative load. The built-in check valve allows reverse flow into the actuator, which is protected by the internal pressure relief function. Back pressure at port 2 do not affect the pressure relief setting.



Technical Data

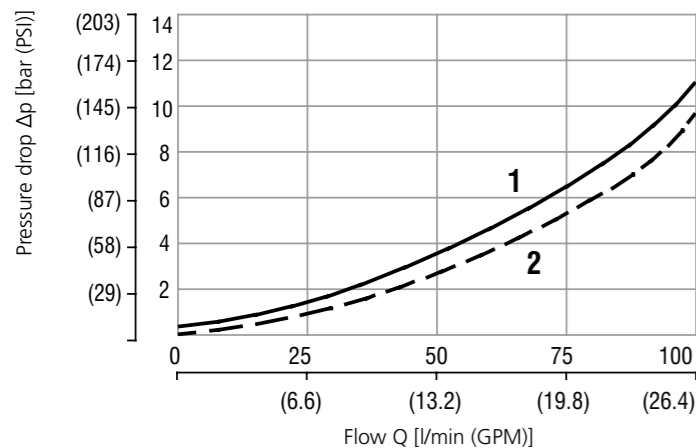
Valve size / Cartridge cavity		M27x1.5 / R3
Max. flow	l/min (GPM)	90 (23.8)
Max. load induced pressure	bar (PSI)	270 (3920)
Max. relief pressure	bar (PSI)	350 (5080)
Fluid temperature range	°C (°F)	-20 +90 (-4 ... +194)
Pilot ratio		4:1
Internal Leakage	ml/min	0.3 nominal (5 drops per min)
Max. degree of fluid contamination	ISO 4406	Class 21/18/13
Mass	kg (lbs)	0.29 (0.64)

		Datasheet	Type
General information		GI_0060	Products and operating conditions
Valve bodies	In-line mounted	SB_0018	SB-R3*
Cavity details		SMT_0019	SMT-R3*
Spare parts		SP_8010	

Characteristics measured at v = 40 mm²/s (195 SUS)

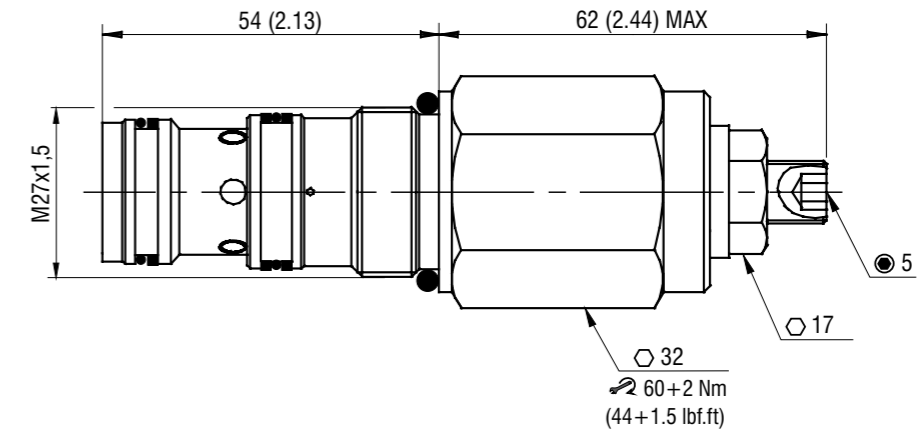
Pressure drop related to flow rate

Pilot ratio 4:1

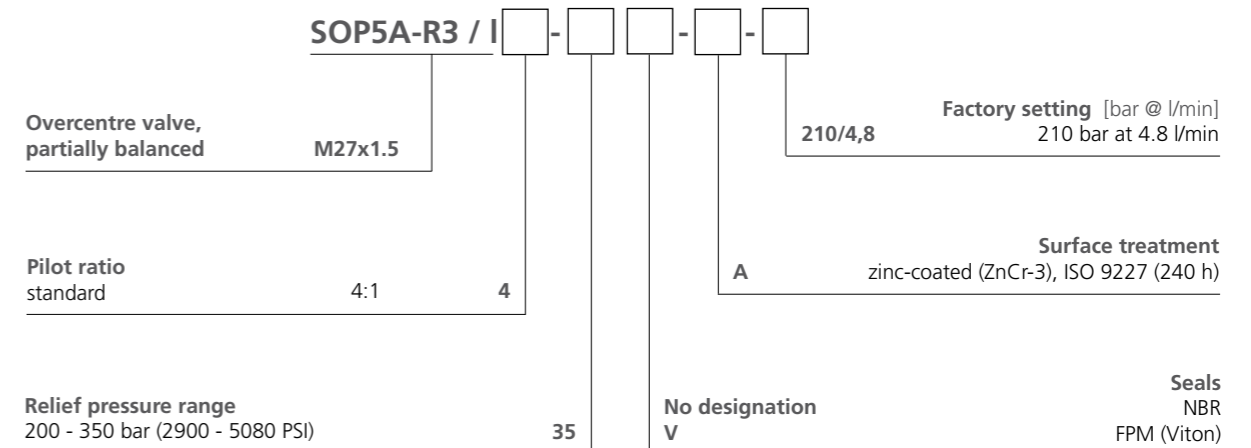


Flow	Description
1	free flow (2→1)
2	pilot open (1→2)

Dimensions in millimeters (inches)



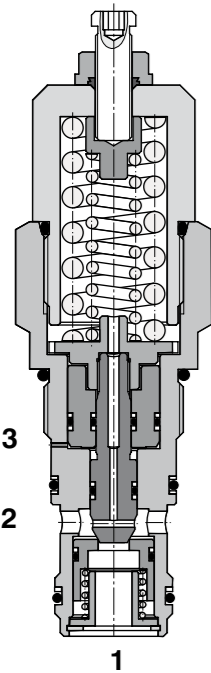
Ordering Code



Overcentre Valve, Partially Balanced

SOP5A-T3/I

M38x2 • Q_{max} 140 l/min (37 GPM) • p_{max} 420 bar (6100 PSI)

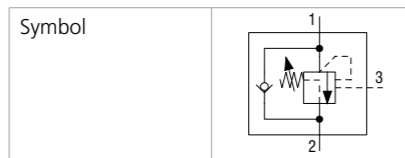


Technical Features

- › The valve prevents runaway ahead of the pump in the event of a negative load
- › Load-holding with leak-free closing poppet when directional valve is in neutral position
- › Pressure relief function protecting the actuator against overload and pressure peaks
- › Integrated check valve acting as an anti-cavitation valve
- › When installed into an actuator the valve can be used as a hose burst valve
- › Pressure relief section of the valve is not affected by back pressure
- › In the standard version, the valve is zinc-coated for 240 h protection acc. to ISO 9227

Functional Description

Poppet type, screw-in motion control valve designed to control the runaway of a negative load. The built-in check valve allows reverse flow into the actuator, which is protected by the internal pressure relief function. Back pressure at port 2 do not affect the pressure relief setting.



Technical Data

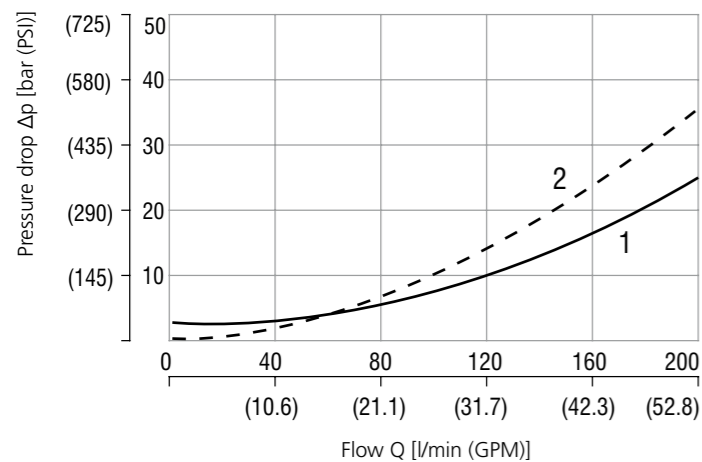
Valve size / Cartridge cavity		M38x2 / T3
Max. flow	l/min (GPM)	140 (37)
Max. load induced pressure	bar (PSI)	340 (4930)
Max. relief pressure	bar (PSI)	420 (6090)
Fluid temperature range	°C (°F)	-20 +90 (-4 ... +194)
Pilot ratio		4:1, 6:1
Internal Leakage	mil/min	0.3 nominal (5 drops per min)
Max. degree of fluid contamination	ISO 4406	Class 21/18/13
Mass	kg (lbs)	1.20 (2.65)

	Datasheet	Type
General information	GI_0060	Products and operating conditions
Valve bodies	In-line mounted SB_0018	SB-T3*
Cavity details	SMT_0019	SMT-T3*
Spare parts	SP_8010	

Characteristics measured at v = 40 mm²/s (195 SUS)

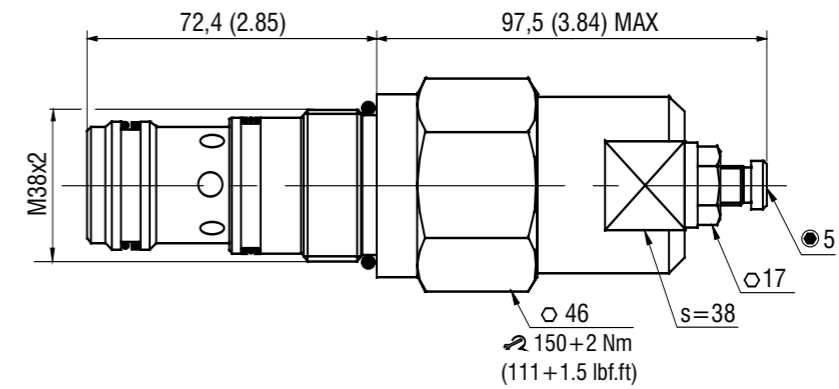
Pressure drop related to flow rate

Pilot ratio 4:1 and 6:1

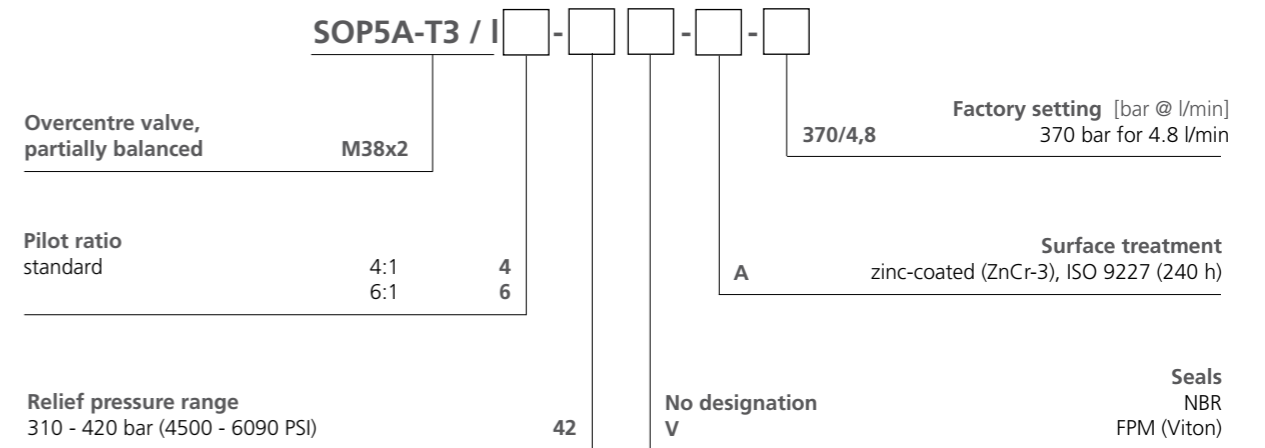


Flow	Description
1	free flow (2→1)
2	pilot open (1→2)

Dimensions in millimeters (inches)



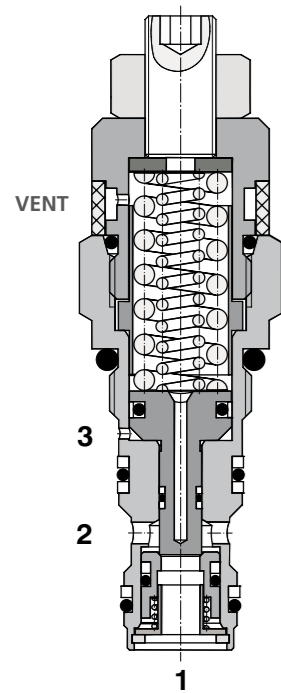
Ordering Code



Overcentre Valve, Fully Balanced, Atmospheric Vent

SOB5A-Q3/I

M20x1.5 • Q_{max} 30 l/min (8 GPM) • p_{max} 350 bar (5100 PSI)

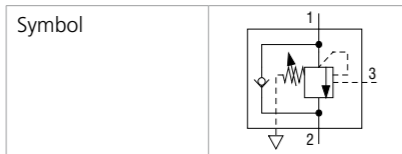


Technical Features

- › The valve prevents runaway ahead of the pump in the event of a negative load
- › Load-holding with leak-free closing poppet when directional valve is in neutral position
- › Pressure relief function protecting the actuator against overload and pressure peaks
- › Integrated check valve acting as an anti-cavitation valve
- › When installed into an actuator the valve can be used as a hose burst valve
- › Back pressure neither affects the relief setting nor the required pilot pressure
- › In the standard version, the valve is zinc-coated for 240 h protection acc. to ISO 9227

Functional Description

Poppet type, screw-in motion control valve designed to control the runaway of a negative load. The built-in check valve allows reverse flow into the actuator, which is protected by the internal pressure relief function. Back pressure at port 2 does neither affect the pressure relief setting nor the required pilot pressure.



Technical Data

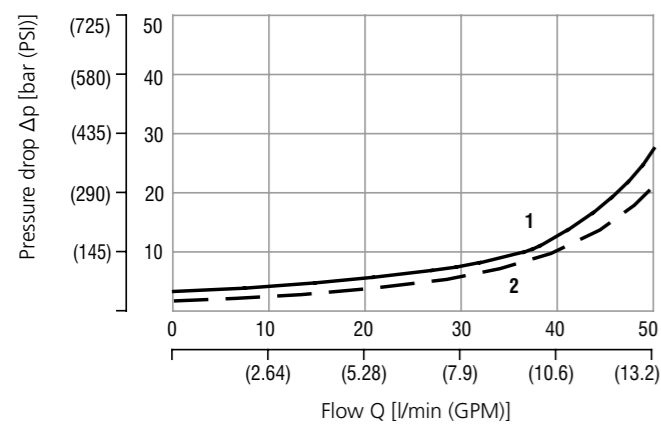
Valve size / Cartridge cavity		M20x1.5 / Q3
Max. flow	l/min (GPM)	30 (7.9)
Max. load induced pressure	bar (PSI)	270 (3920)
Max. relief pressure	bar (PSI)	350 (5080)
Fluid temperature range	°C (°F)	-20 ... +90 (-4 ... +194)
Pilot ratio		5:1
Internal Leakage	mil/min	0.3 nominal (5 drops per min)
Max. degree of fluid contamination	ISO 4406	Class 21/18/13
Mass	kg (lbs)	0.15 (0.33)

		Datasheet	Type
General information		GI_0060	Products and operating conditions
Valve bodies	In-line mounted	SB_0018	SB-Q3*
	Sandwich mounted	SB-04(06)_0028	SB-*Q3*
Cavity details		SMT_0019	SMT-Q3*
Spare parts		SP_8010	

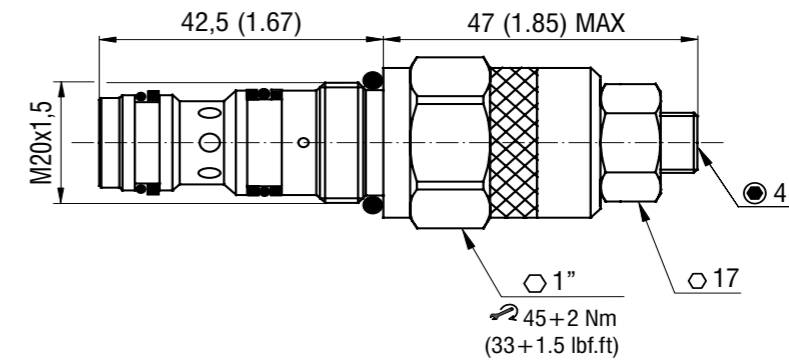
Characteristics measured at v = 40 mm²/s (195 SUS)

Pressure drop related to flow rate

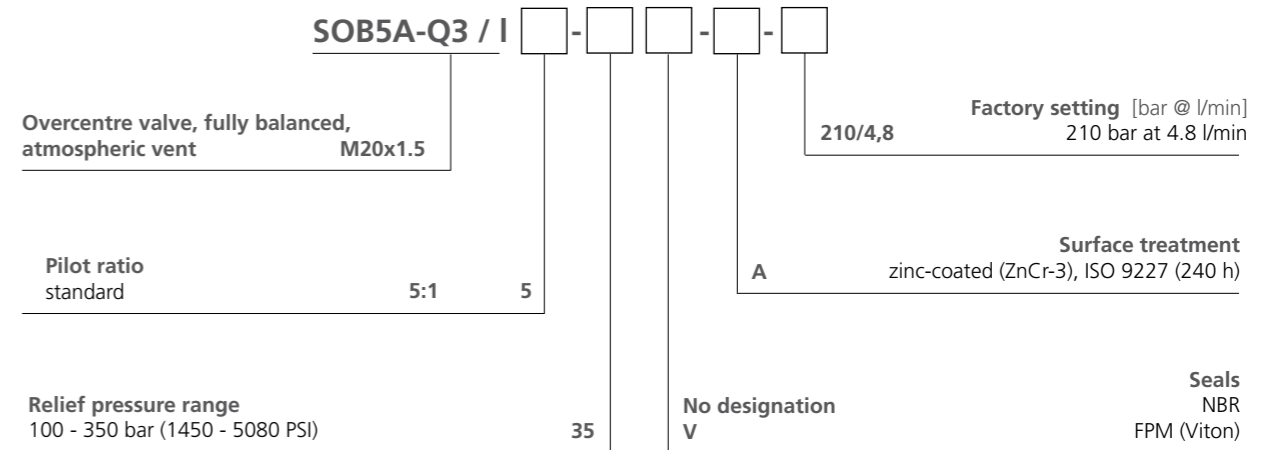
Pilot ratio 5:1



Dimensions in millimeters (inches)



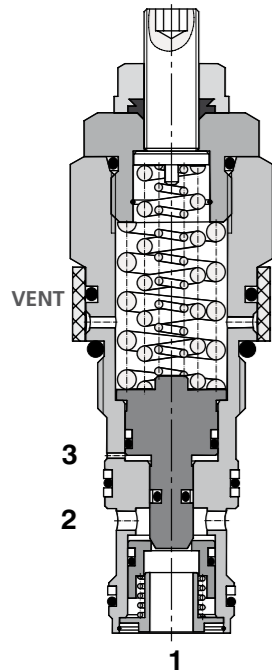
Ordering Code



Overcentre Valve, Fully Balanced, Atmospheric Vent

SOB5A-R3/I

M27x1.5 • Q_{max} 90 l/min (24 GPM) • p_{max} 350 bar (5100 PSI)

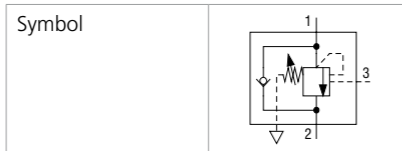


Technical Features

- › The valve prevents runaway ahead of the pump in the event of a negative load
- › Load-holding with leak-free closing poppet when directional valve is in neutral position
- › Pressure relief function protecting the actuator against overload and pressure peaks
- › Integrated check valve acting as an anti-cavitation valve
- › When installed into an actuator the valve can be used as a hose burst valve
- › Back pressure neither affects the relief setting nor the required pilot pressure
- › In the standard version, the valve is zinc-coated for 240 h protection acc. to ISO 9227

Functional Description

Poppet type, screw-in motion control valve designed to control the runaway of a negative load. The built-in check valve allows reverse flow into the actuator, which is protected by the internal pressure relief function. Back pressure at port 2 does neither affect the pressure relief setting nor the required pilot pressure.



Technical Data

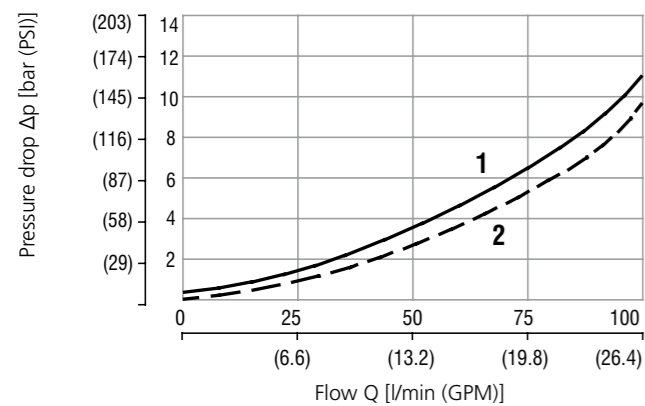
Valve size / Cartridge cavity		M27x1.5 / R3
Max. flow	l/min (GPM)	90 (23.8)
Max. load induced pressure	bar (PSI)	270 (3920)
Max. operating pressure	bar (PSI)	350 (5080)
Fluid temperature range	°C (°F)	-20 ... +90 (-4 ... +194)
Pilot ratio		4:1
Mass	kg (lbs)	0.29 (0.64)

	Datasheet	Type
General information	GI_0060	Products and operating conditions
Valve bodies	In-line mounted SB_0018	SB-R3*
Cavity details / Form tools	SMT_0019	SMT-R3*
Spare parts	SP_8010	

Characteristics measured at v = 40 mm²/s (195 SUS)

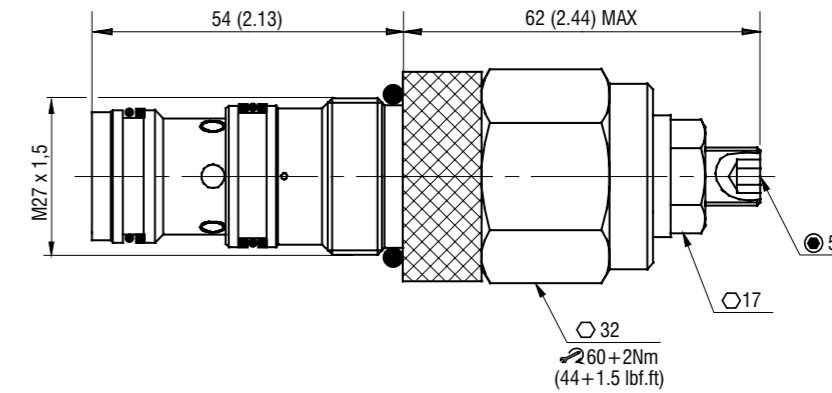
Pressure drop related to flow rate

Pilot ratio 4:1

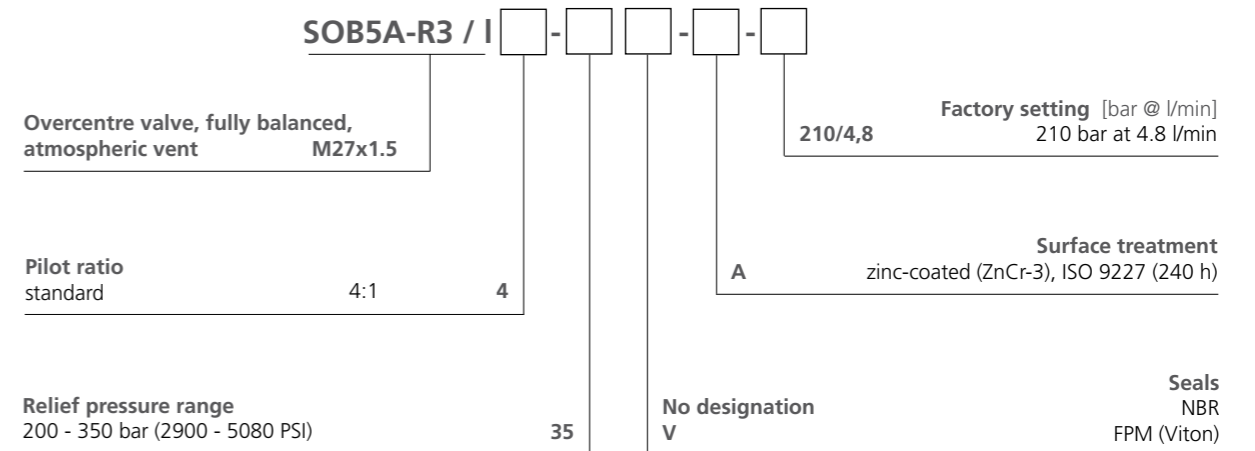


Flow	Description
1	free flow (2→1)
2	pilot open (1→2)

Dimensions in millimeters (inches)



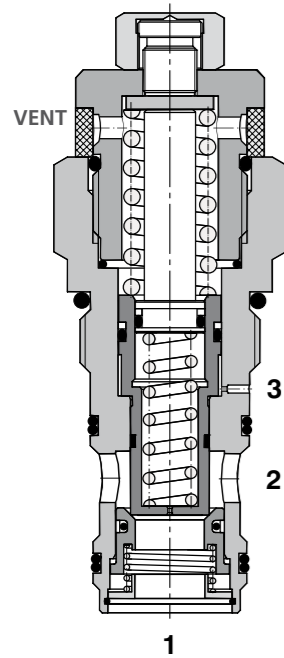
Ordering Code



Overcentre Valve, Fully Balanced, Atmospheric Vent

SOB5A-S3/I

1-5/16-12 UNF • Q_{max} 120 l/min (32 GPM) • p_{max} 350 bar (5100 PSI)

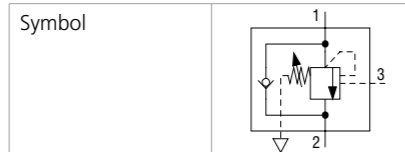


Technical Features

- › The valve prevents runaway ahead of the pump in the event of a negative load
- › Load-holding with leak-free closing poppet when directional valve is in neutral position
- › Pressure relief function protecting the actuator against overload and pressure peaks
- › Integrated check valve acting as an anti-cavitation valve
- › When installed into an actuator the valve can be used as a hose burst valve
- › Back pressure neither affects the relief setting nor the required pilot pressure
- › In the standard version, the valve is zinc-coated for 240 h protection acc. to ISO 9227

Functional Description

Poppet type, screw-in motion control valve designed to control the runaway of a negative load. The built-in check valve allows reverse flow into the actuator, which is protected by the internal pressure relief function. Back pressure at port 2 does neither affect the pressure relief setting nor the required pilot pressure.



Technical Data

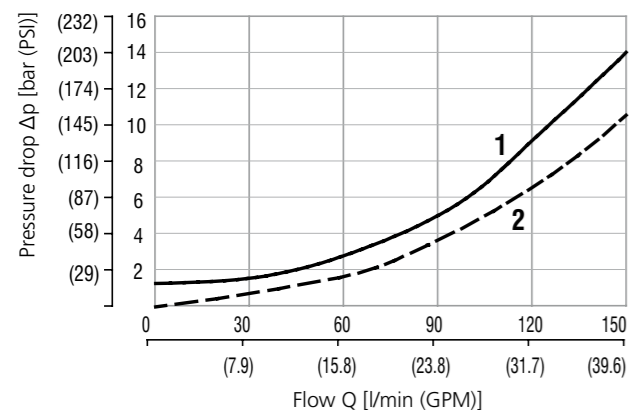
Valve size / Cartridge cavity		1-5/16-12 UNF-2A / S3
Max. flow	l/min (GPM)	120 (31.7)
Max. load induced pressure	bar (PSI)	270 (3920)
Max. relief pressure	bar (PSI)	350 (5080)
Fluid temperature range	°C (°F)	-20 ... +90 (-4 ... +194)
Pilot ratio		3:1
Internal Leakage	ml/min	0.3 nominal (5 drops per min)
Max. degree of fluid contamination	ISO 4406	Class 21/18/13
Mass	kg (lbs)	0.59 (1.30)

	Datasheet	Type
General information	GI_0060	Products and operating conditions
Valve bodies	In-line mounted SB_0018	SB-S3*
Cavity details	SMT_0019	SMT-S3*
Spare parts	SP_8010	

Characteristics measured at v = 40 mm²/s (195 SUS)

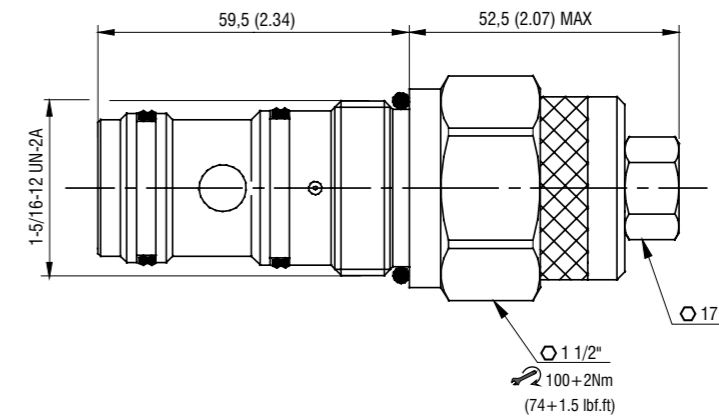
Pressure drop related to flow rate

Pilot ratio 3:1



Flow	Description
1	free flow (2→1)
2	pilot open (1→2)

Dimensions in millimeters (inches)



Ordering Code

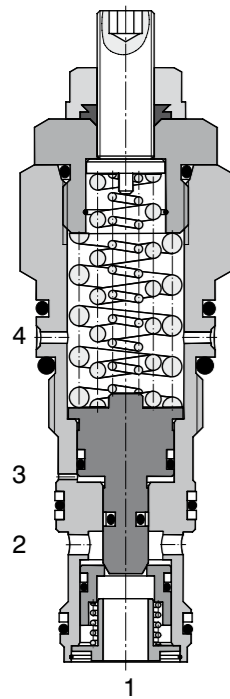
SOB5A-S3 / I [] - [] - [] - [] - []

- Overcentre valve, fully balanced, atmospheric vent** 1-5/16-12 UNF
- Pilot ratio** standard 3:1 3
- Relief pressure range** 70 - 350 bar (1015 - 5080 PSI) 35
- Factory setting** [bar @ l/min] 210/4,8 210 bar at 4.8 l/min
- Surface treatment** A zinc-coated (ZnCr-3), ISO 9227 (240 h)
- No designation** V
- Seals** NBR FPM (Viton)

Overcentre Valve, Fully Balanced, Internal Drain

SOBD5A-R4/I

M27x1.5 • Q_{max} 90 l/min (24 GPM) • p_{max} 350 bar (5100 PSI)

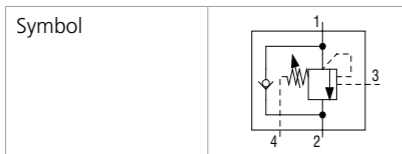


Technical Features

- › The valve prevents runaway ahead of the pump in the event of a negative load
- › Load-holding with leak-free closing poppet when directional valve is in neutral position
- › Pressure relief function protecting the actuator against overload and pressure peaks
- › Integrated check valve acting as an anti-cavitation valve
- › When installed into an actuator the valve can be used as a hose burst valve
- › Back pressure neither affects the relief setting nor the required pilot pressure
- › In the standard version, the valve is zinc-coated for 240 h protection acc. to ISO 9227

Functional Description

Poppet type, screw-in motion control valve designed to control the runaway of a negative load. The built-in check valve allows reverse flow into the actuator, which is protected by the internal pressure relief function. Back pressure at port 2 does neither affect the pressure relief setting nor the required pilot pressure. The spring chamber is drained to port 4.



Technical Data

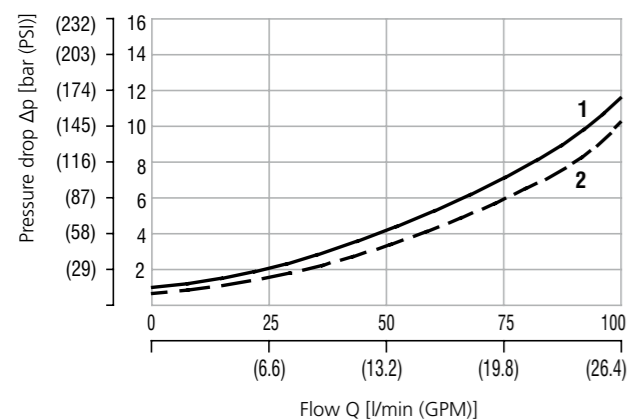
Valve size / Cartridge cavity		M27x1.5 / R4
Max. flow	l/min (GPM)	90 (23.8)
Max. load induced pressure	bar (PSI)	270 (3920)
Max. relief pressure	bar (PSI)	350 (5080)
Fluid temperature range	°C (°F)	-20 ... +90 (-4 ... +194)
Pilot ratio		4:1
Internal Leakage	ml/min	0.3 nominal (5 drops per min)
Max. degree of fluid contamination	ISO 4406	Class 21/18/13
Mass	kg (lbs)	0.29 (0.64)

	Datasheet	Type
General information	GI_0060	Products and operating conditions
Valve bodies	In-line mounted SB_0018	SB-R4*
Cavity details	SMT_0019	SMT-R4*
Spare parts	SP_8010	

Characteristics measured at v = 40 mm²/s (195 SUS)

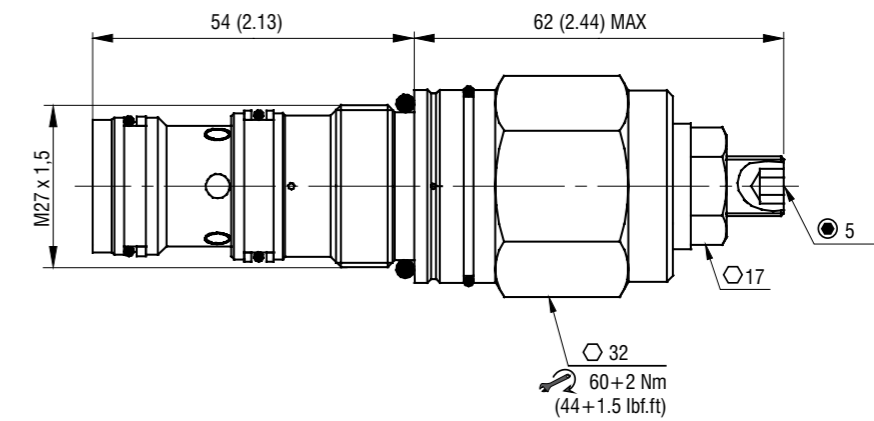
Pressure drop related to flow rate

Pilot ratio 4:1



Flow	Description
1	free flow (2→1)
2	pilot open (1→2)

Dimensions in millimeters (inches)



Ordering Code

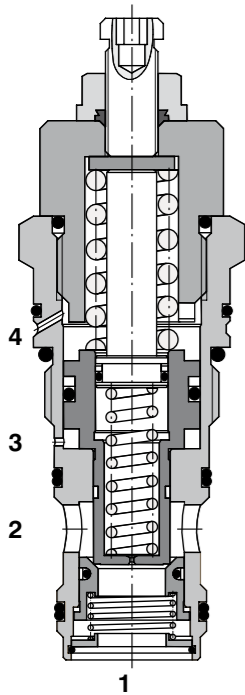
SOBD5A-R4 / I [] - [] - [] - []

- Overcentre valve, fully balanced, internal drain** M27x1.5
- Pilot ratio standard** 4:1 4
- Relief pressure range** 200 - 350 bar (2900 - 5080 PSI) 35
- Factory setting** [bar @ l/min] 210/4,8 210 bar at 4.8 l/min
- Surface treatment** A zinc-coated (ZnCr-3), ISO 9227 (240 h)
- Seals** V No designation NBR FPM (Viton)

Overcentre Valve, Fully Balanced, Internal Drain

SOBD5A-S4/I

1-5/16-12 UNF • Q_{max} 180 l/min (48 GPM) • p_{max} 350 bar (5100 PSI)

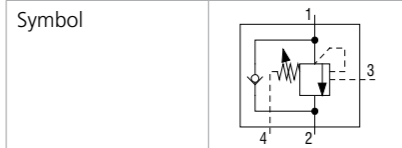


Technical Features

- › The valve prevents runaway ahead of the pump in the event of a negative load
- › Load-holding with leak-free closing poppet when directional valve is in neutral position
- › Pressure relief function protecting the actuator against overload and pressure peaks
- › Integrated check valve acting as an anti-cavitation valve
- › When installed into an actuator the valve can be used as a hose burst valve
- › Back pressure neither affects the relief setting nor the required pilot pressure
- › In the standard version, the valve is zinc-coated for 240 h protection acc. to ISO 9227

Functional Description

Poppet type, screw-in motion control valve designed to control the runaway of a negative load. The built-in check valve allows reverse flow into the actuator, which is protected by the internal pressure relief function. Back pressure at port 2 does neither affect the pressure relief setting nor the required pilot pressure. The spring chamber is drained to port 4.



Technical Data

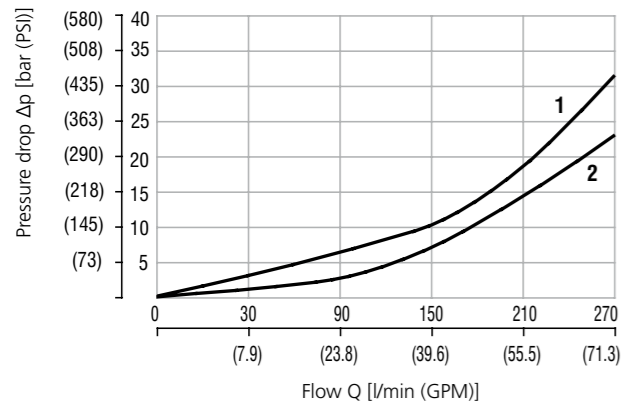
Valve size / Cartridge cavity		1-5/16-12 UNF-2A / S4
Max. flow	l/min (GPM)	180 (47.6)
Max. load induced pressure	bar (PSI)	270 (3920)
Max. relief pressure	bar (PSI)	350 (5080)
Fluid temperature range	°C (°F)	-20 +90 (-4 ... +194)
Pilot ratio		8:1
Internal Leakage	mil/min	0.3 nominal (5 drops per min)
Max. degree of fluid contamination	ISO 4406	Class 21/18/13
Mass	kg (lbs)	0.56 (1.23)

	Datasheet	Type
General information	GI_0060	Products and operating conditions
Valve bodies	In-line mounted	SB-S4*
Cavity details	SMT_0019	SMT-S4*
Spare parts	SP_8010	

Characteristics measured at v = 40 mm³/s (195 SUS)

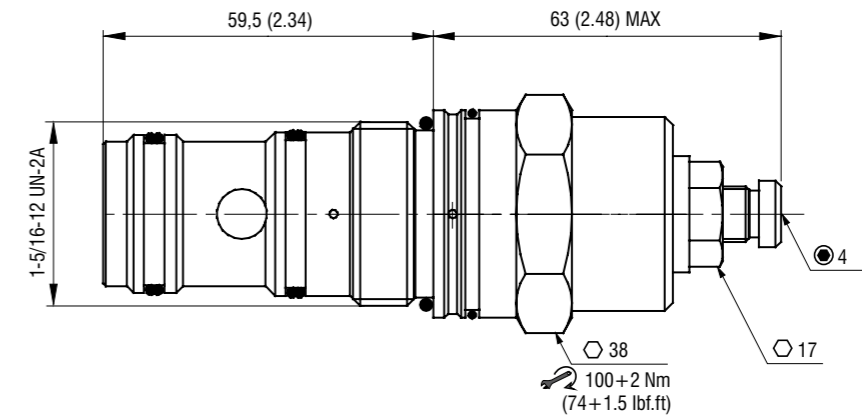
Pressure drop related to flow rate

Pilot ratio 8:1



Flow	Description
1	free flow (2→1)
2	pilot open (1→2)

Dimensions in millimeters (inches)



Ordering Code

SOBD5A-S4 / I - [] - [] - [] - []

- Overcentre valve, fully balanced, internal drain** 1-5/16-12 UNF
- Pilot ratio standard** 8:1 **8**
- Relief pressure range** 70 - 350 bar (1015 - 5080 PSI) **35**
- Factory setting [bar @ l/min]** 210/4,8 **210 bar at 4.8 l/min**
- Surface treatment** A zinc-coated (ZnCr-3), ISO 9227 (240 h)
- Seals** V No designation **NBR** FPM (Viton)

Content

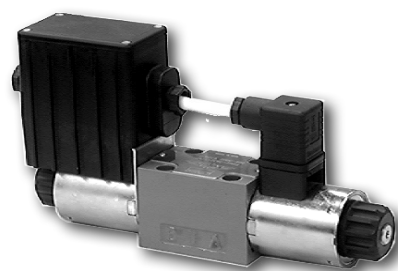
Symbol Example	Flow l/min (GPM)	Pressure bar (PSI)	Type Code	Cartridge	Size 04; D02	Size 06; D03	Size 10; D05	Line Mounted	Page	Data Sheet
Proportional Directional Control Valves										
	20 (5)	320 (4600)	PRM2-04		X				332	HA 5105
	20 (5)	320 (4600)	PRM7-04		X				342	HA 5120
	40 (11)	350 (5100)	PRM2-06			X			348	HA 5104
	40 (11)	350 (5100)	PRM7-06			X			358	HA 5119
	80 (21)	350 (5100)	PRM6-10				X		364	HA 5115
	80 (21)	350 (5100)	PRM7-10				X		374	HA 5116
	140 (37)	350 (5100)	PRM8-06				X		380	HA 5178
Proportional Pressure Control Valves, Relief, Direct Acting										
	2 (0.4)	350 (5100)	SR1P2-A2	X	(X)			(X)	382	HA 5122
	2 (0.4)	350 (5100)	SRN1P1-A2	X	(X)			(X)	384	HA 5137
Proportional Pressure Control Valves, Relief, Pilot Operated										
	60 (16)	350 (5100)	SR4P2-B2	X		(X)		(X)	386	HA 5117
	60 (16)	350 (5100)	SRN4P1-B2	X				(X)	388	HA 5138
Proportional Pressure Control Valves, Reducing - Relieving, Direct Acting										
	20 (5)	50 (700)	PP2P1-W3	X				(X)	390	HA 5125
	30 (8)	50 (700)	PP2P3-W3	X				(X)	392	HA 5147
	20 (5)	50 (700)	PVRM1-063/S	X					394	HA 5108
	40 (11)	50 (700)	PVRM3/10	X					396	HA 5118
Proportional Pressure Control Valves, Reducing - Relieving, Pilot Operated										
	40 (11)	30 (11)	SP4P1-B4	X				(X)	398	HA 5124
	60 (16)	350 (5100)	SP4P2-B3	X		(X)		(X)	400	HA 5123
	60 (16)	350 (5100)	SPN4P1-B3	X		(X)		(X)	402	HA 5139
2 Way Pressure Compensators										
	16 (4)	320 (4600)	TV2-042/M		X				404	HA 5167
	35 (9)	350 (5100)	TV2-062/M			X			406	HA 5166
	80 (21)	350 (5100)	TV2-102/S	X				(X)	408	HA 5179
	80 (21)	350 (5100)	TV2-102/M				X		410	HA 5169

Symbol Example	Flow l/min (GPM)	Pressure bar (PSI)	Type Code	Cartridge	Size 04; D02	Size 06; D03	Size 10; D05	Line Mounted	Page	Data Sheet
3 Way Pressure Compensators										
	40 (11)	350 (5100)	TV2-063/S	X					412	HA 5158
	20 (5)	320 (4600)	TV2-043/M		X				414	HA 5188
	35 (9)	350 (5100)	TV2-063/M			X			416	HA 5168
	80 (21)	350 (5100)	TV2-103/S	X				(X)	418	HA 5180
	80 (21)	350 (5100)	TV2-103/M				X		420	HA 5170
Electronic Controllers for Proportional Valves										
Type Code									Page	Data Sheet
EL3	Analoque amplifier								422	HA 9145
EL4	Amplifier with process, position feedback								428	HA 9140
EL6	Plug in amplifier, open loop								432	HA 9150

Proportional Directional Control Valve, with Analogue Control Electronics

PRM2-04

Size 04 (D02) • Q_{max} 20 l/min (5 GPM) • p_{max} 320 bar (4600 PSI)



Technical Features

- Direct acting, proportional control valve without or with integrated analogue electronic (OBE) with subplate mounting interface acc. to ISO 4401, DIN 24340 (CETOP 02) standards
- Used for directional and speed control of hydraulic actuators
- The valve opening and resulting flow rate can be modulated continuously in proportion to the reference signal
- The valve can be controlled directly by a current control supply unit or by means of the electronic control units to exploit valve performance to the full
- Converter analogue card allow a fine control of the positioning of the valve spool, reducing hysteresis and response time and optimizing the performance of the valve
- Three chamber housing design for production cost saving
- For versions without OBE wide range of solenoid electrical terminal versions available
- Wide range of interchangeable spools and manual overrides available
- The coil is fastened to the core tube with a retaining nut and can be rotated by 360° to suit the available space
- In the standard version, the valve housing is phosphated and steel parts zinc-coated for 240 h salt spray protection acc. to ISO 9227
- Enhanced surface protection for mobile sector available (ISO 9227, 520 h salt spray)

Functional Description

PRM2-04* Versions without on board electronics

The valve can be controlled directly by a current control supply unit or by means of the external electronic card directly mounted to the electrical terminal (see catalogue of EL3E card 9145 and EL6 card 9150). This control card, depending on the number of the controlled solenoids, can be mounted onto either solenoid.

PRM2-04*EK Versions with on board electronics

A control box, which comprises one or two electronic control cards, depending on the number of the controlled solenoids, can be mounted onto either solenoid. With the model with two solenoids, the solenoid mounted opposite the control box is connected with the box by means of a DIN connector, a two-cored cable and a bushing. The connection of the control box with the supply source and with the control signal is realized by means of a 4-pin connector, type M12x1. The electric control unit supplies the solenoid with current, which varies with the control signal.

The electronic control unit provides the following adjustment possibilities:

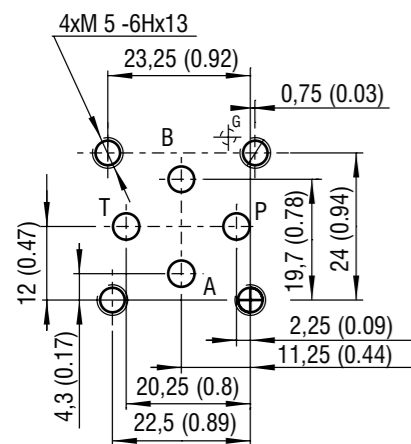
Offset, gain, rise and drop-out time of the ramp generator, frequency (2 frequencies) and amplitude of the dither signal generator. The correct function of the control unit is signaled by LED-diodes. Stabilized voltage +10V (+5V for 12V voltage) is also available for the user.

By the use of this voltage, a voltage control signal can be made by means of a potentiometer ≥ 1kW.

The electronic control card enables voltage or current control to be used, according to the positions of the switches SW1 to SW3.

Technical Data

ISO 4401-02-01-0-05



Ports P, A, B, T - max. Ø 4.5 mm (0.18 in)

Nominal Size	04 (D02)	
Max. operating pressure at port P, A, B	bar (PSI) 320 (4580)	
Max. operating pressure at port T	bar (PSI) 210 (3050)	
Fluid temperature range (NBR)	°C (°F) -30 ... +80 (-22 ... +176)	
Fluid temperature range (FPM)	°C (°F) -20 ... +80 (-4 ... +176)	
Ambient temperature range	°C (°F) -30 ... +50 (-22 ... +122)	
Hysteresis	% ≤ 6	
Nominal flow rate Q _n at Δp=10 bar (145 PSI)	l/min (GPM) 4 (1.1) 8 (2.1) 12 (3.2)	
Protection degree (for version PRM*EK)	IP65	
Mass - valve with 1 solenoid	kg (lbs) 0.9 (1.98)	
- valve with 2 solenoids	1.25 (2.76)	
Technical Data of the Proportional Solenoid		
Nominal supply voltage	V	12 DC 24 DC
Limit current	A	1.7 0.8
Mean resistance value at 20 °C (68 °F)	Ω	5 21
Technical data of the electronics		
Supply voltage range	V	U _{cc} 12V DC U _{cc} 24V DC
Stabilized voltage for control	V	5 DC (R > 1 kΩ) 10 DC (R > 1 kΩ)
Control signal	see table of switches configuration (page 4,5 and 6)	
Maximum output current	A	2.4 for R < 4 Ω 1.5 for R < 10 Ω
Ramp adjustment range	s	0.05... 3
Dither frequency	Hz	90 / 60
Dither amplitude	%	0... 30
	Data Sheet	Type
General information	GI_0060	products and operating conditions
Coil types / Connectors	C_8007 / K_8008	C19B* / K*
Mounting interface	SMT_0019	Size 04
Spare parts	SP_8010	
Subplates	SP_0002	DP*-04

Ordering Code

PRM2-04 / - - - - -

Proportional directional control valve, with analogue control electronics

Valve size

Spool symbols
see table „Spool Symbols“

Nominal flow rate at Δp = 10 bar (145 PSI)

4 l/min (1.05 GPM)	4
8 l/min (2.1 GPM)	8
12 l/min (3.2 GPM)	12

Rated supply voltage of solenoids (at the coil terminal)

12 V DC	12
24 V DC	24

Electronics on board / Position at solenoid
connection by connector M12 x 1 (4-pin connector, supplied with counterpart)

on board electronics (solenoid „a“) EK

on board electronics (solenoid „b“)* EKB

Surface treatment

No designation	standard
A	zinc-coated (ZnCr-3), ISO 9227 (240 h)
B	zinc-coated (ZnNi), ISO 9227 (520 h)

Seals

No designation	NBR
V	FPM (Viton)

Manual override

No designation	standard
N2	protected with rubber boot

Connector
only for version without on board electronic „EK“

E1	EN 175301-803-A
E2	E1 with quenching diode
E3	AMP Junior Timer - axial direction
E4	E3 with quenching diode
E3A	AMP Junior Timer - axial direction (2 pins; male)
E4A	E3A with quenching diode
E8	loose conductors (two insulated wires)
E9	E8 with quenching diode
E12A	deutsch DT04-2P - axial direction (2 pins; male)
E13A	E12A with quenching diode

*For valve versions with one solenoid the designation „B“ with OBE is not shown.

- Valves without integrated control electronics with E1, E2 coils (with connector according to EN 175301-803, form A) are delivered in the standard version with connector sockets.
- For proportional valves with two solenoids, one solenoid must be de-energized before the other solenoid can be charged.
- Mounting bolts M5 x 35 DIN 912-10.9 or studs must be ordered separately. Tightening torque is 5 Nm (3.7 lbf.ft).
- Besides the shown, commonly used valve versions other specialmodels are available.
- Contact our technical support for their identification, feasibility and operating limits.

Spool Symbols

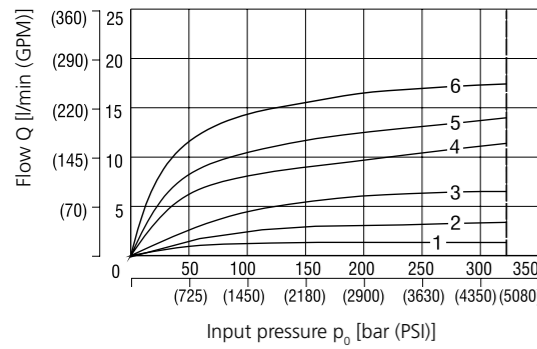
Type	Symbol	Type	Symbol
2Z51		3Z11	
2Z11		3Z12	$\frac{q_A}{q_B} = \frac{1}{2}$
2Y51		3Y11	
2Y11		3Y12	$\frac{q_A}{q_B} = \frac{1}{2}$

*Model for cylinders with asymmetric piston area ratio 1:2

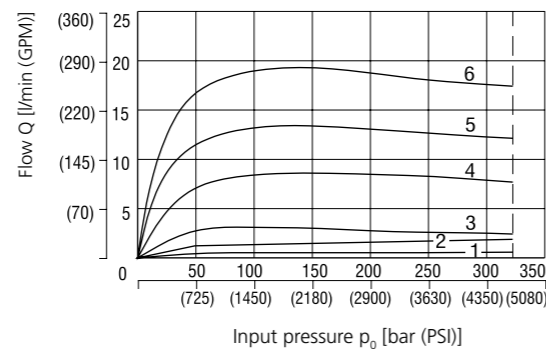
Characteristics measured at $v = 32 \text{ mm}^2/\text{s}$ (156 SUS)

Operating limits: Flow direction $P \rightarrow A / B \rightarrow T$ or $P \rightarrow B / A \rightarrow T$

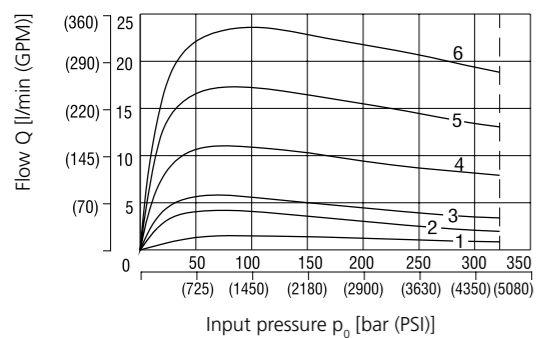
Nominal flow 4 l/min (1.1 GPM)



Nominal flow 8 l/min (2.1 GPM)

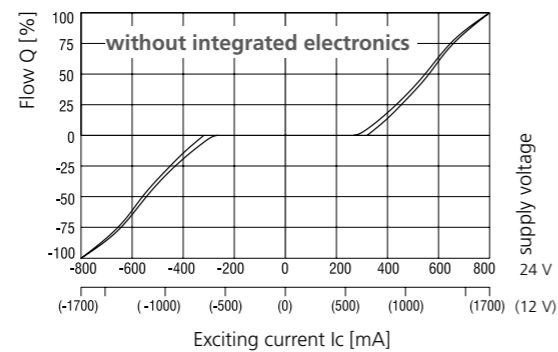
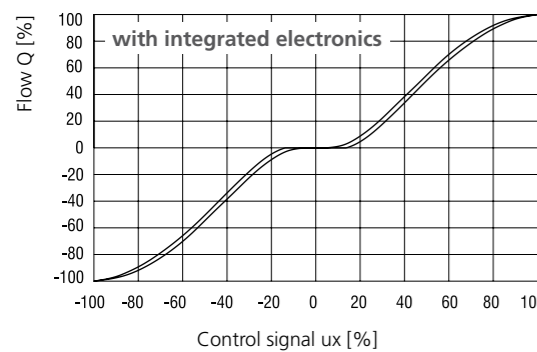


Nominal flow 12 l/min (3.2 GPM)



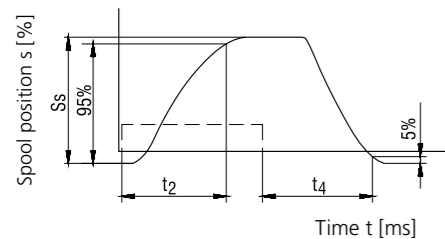
Solenoid current:
1 = 50 %
2 = 60 %
3 = 70 %
4 = 80 %
5 = 90 %
6 = 100 %

Regulated flow related to control signal $\Delta p = 10 \text{ bar}$ (145 PSI)



The coil current which initializes the flow through the proportional directional valve can differ due to the production tolerances about in a range of $\pm 6\%$ of the limit current.

Transient Characteristic measured at $v = 32 \text{ mm}^2/\text{s}$ (156 SUS), $\Delta p = 10 \text{ bar}$ (145 PSI)

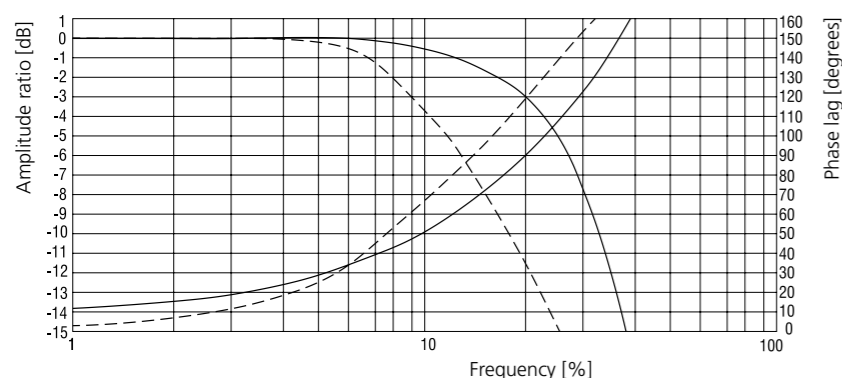


Steady Spool Position S_s [%]	t_2 [ms]	t_4 [ms]
100	85	100
75	70	85
50	55	75
25	45	55

The values in table have only an informative character. The times of the transient characteristics at pressure or flow control will be in a particular hydraulic circuit always longer.

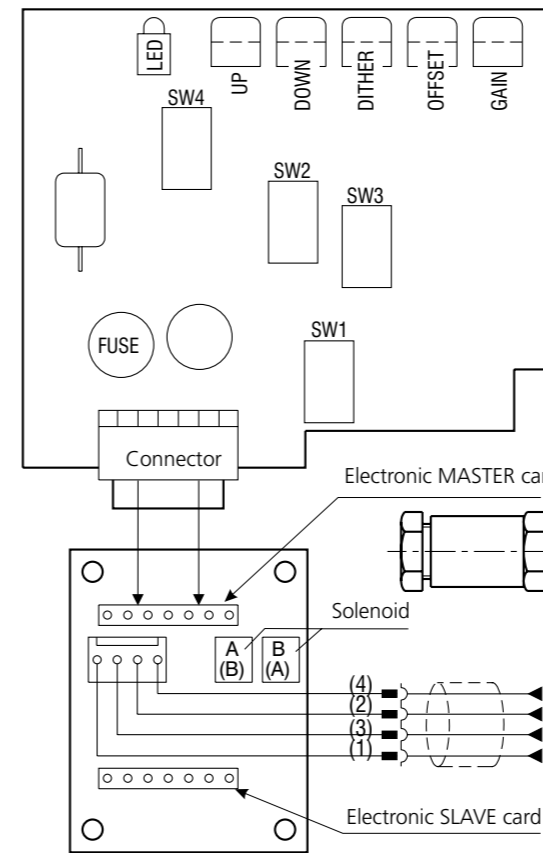
--- the control signal course of the integrated electronics

Frequency Response



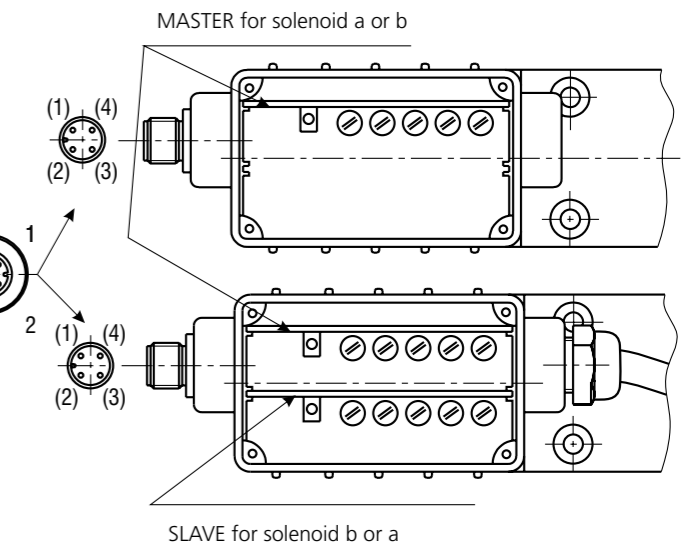
----- signal 90 %
----- signal 25 %

Component Arrangement on the Electronic Card



PIN	Description	Wire Colours	Connection Connector - Electronics
1	+24 V (Ucc) (+12 V)	(1)	brown
2	control	(2)	white
3	0 V	(3)	blue
4	+10 V (+5 V)	(4)	black

SW1 - control signal choice
SW2 - control signal choice
SW3 - control signal choice
SW4 - dither frequency



Attention: The control signal must have the same ground potential as the supply source.

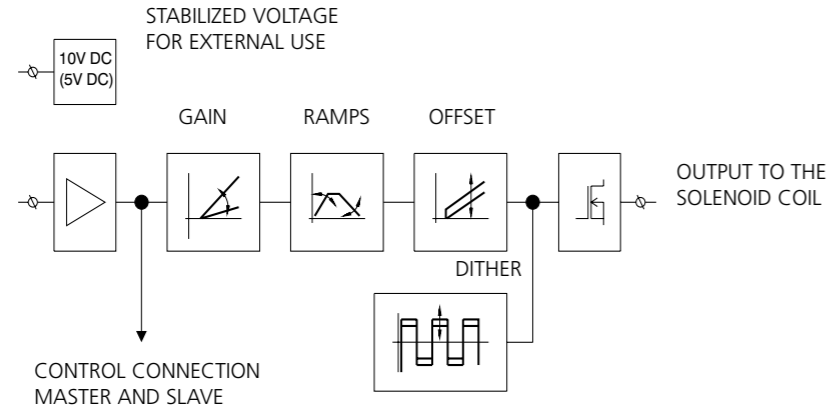
Table of the Switch Configuration for the Control Signal Choices

		PRM2-042				PRM2-043	
		0 ... 5 V	0 ... 10 V (0...5 V)*	0 ... 20 mA	4 ... 20 mA	$U_{cc}/2 \pm 10 \text{ V} (\pm 5 \text{ V})^*$	$\pm 10 \text{ V} (\pm 5 \text{ V})^*$
MASTER M	SW1						
	SW2						
	SW3						
	SW4	90 Hz			60 Hz		
SLAVE S	SW1						
	SW2						
	SW3						
	SW4					90 Hz	60 Hz

Designation of the basic manufacture setting.

The ramp functions are adjusted on their minimum values, the dither is set to the optimal value with respect to hysteresis. Offset and gain are adjusted according to the characteristic on page 3 and 4. The manufacturer does not recommend these adjusted values to be changed.

* Input signal level for the 12 V electronic unit.

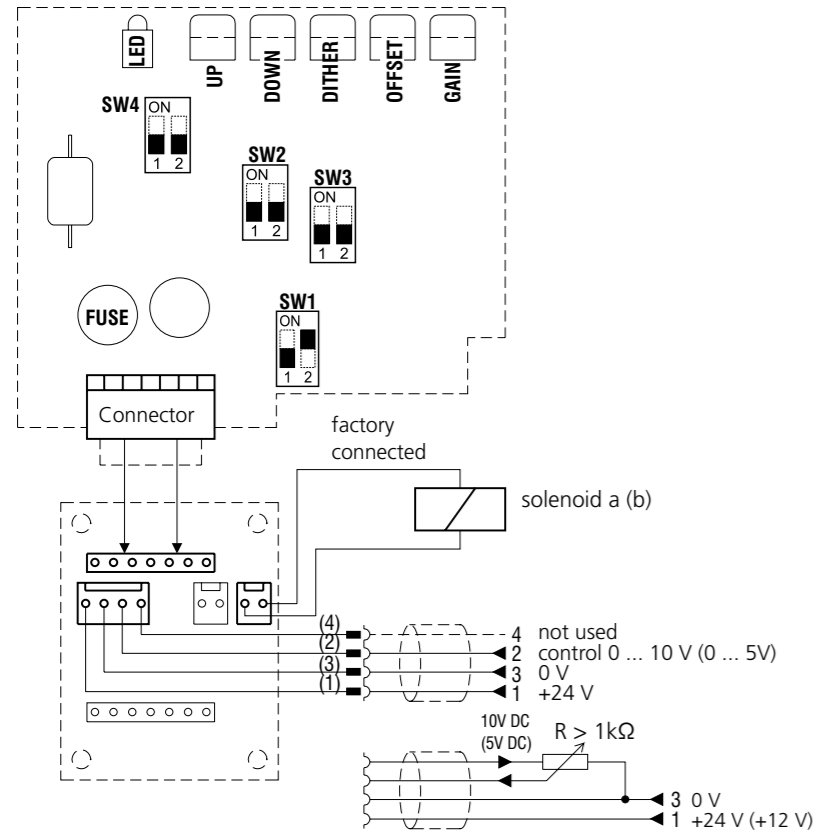


Setting of Control Electronics

Valve PRM2-042*EK (with one solenoid)

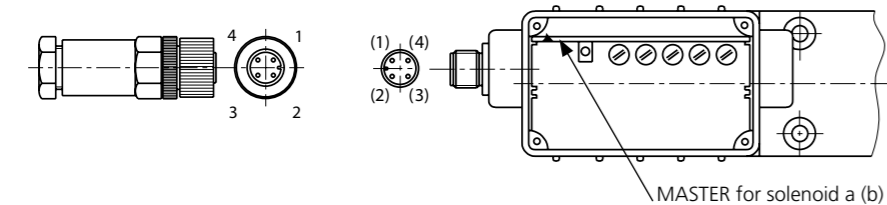
Control with external voltage source 0...10 V, 0 ... 5 V (Factory setting) or with external potentiometer R>1 kΩ

Master card for solenoid a (b)



Factory set values:
Control signal: 0 - 10 V (0 - 5 V)
Dither: frequency 90 Hz
amplitude - optimum
Ramps: 0.05 s
Offset, gain: according to the characteristics on page 3

The control signal must have the same ground potential as the supply source.

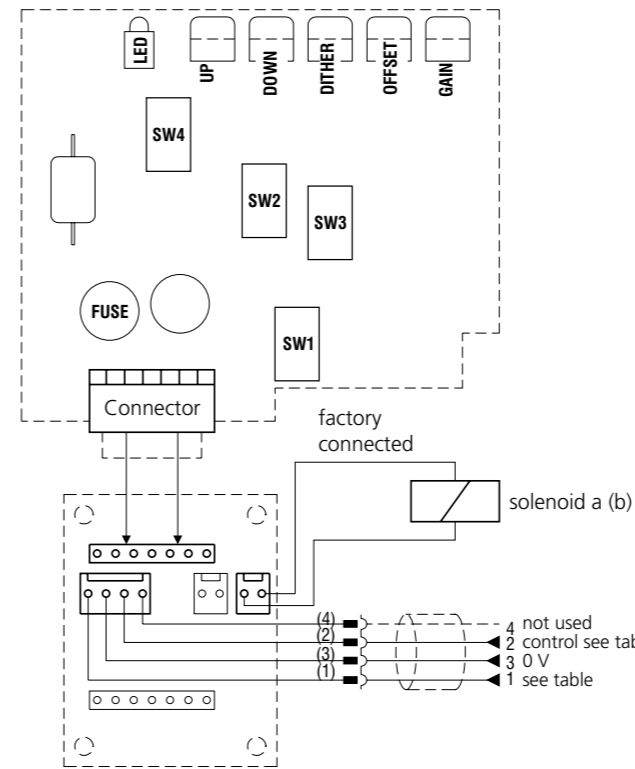


Wire colours (connection connector - electronics)
(1) - brown
(2) - white
(3) - blue
(4) - black

Valve PRM2-042*EK (with one solenoid)

Control with external source 0 ... 5 V, 0 ... 20 mA, 4 ... 20 mA

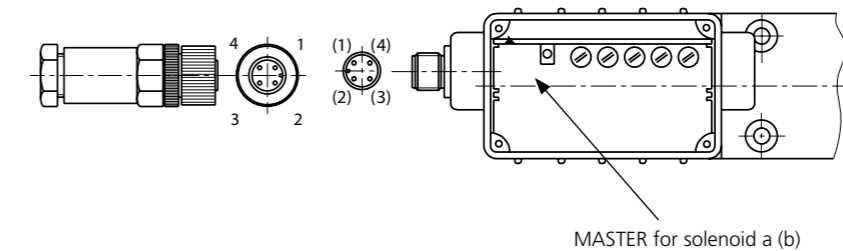
Master card for solenoid a (b)



Control with external source		0 ...5 V	0 ...20 mA	4 ...20 mA
SW1				
SW2				
SW3				
SW4				
PIN 1 (1)		+24 V	+24 V (+12 V)	+24 V (+12 V)
PIN 2 (2)		0 ...5 V	0 ...20 mA	4 ...20 mA

For the other than factory setting modification the following steps are required:

1. Unscrew the electronics cover
2. Carefully remove the master card
3. Flip the switch SW1 (2 or 3) in position shown in the table
4. Put in the master card and fix the electronics cover
5. Connect the voltage +24 V (+12 V) from an external supply source to terminals 1 and 3 of the connector
6. Bring the control voltage (current) from an external source to terminals 2 and 3 of the connector



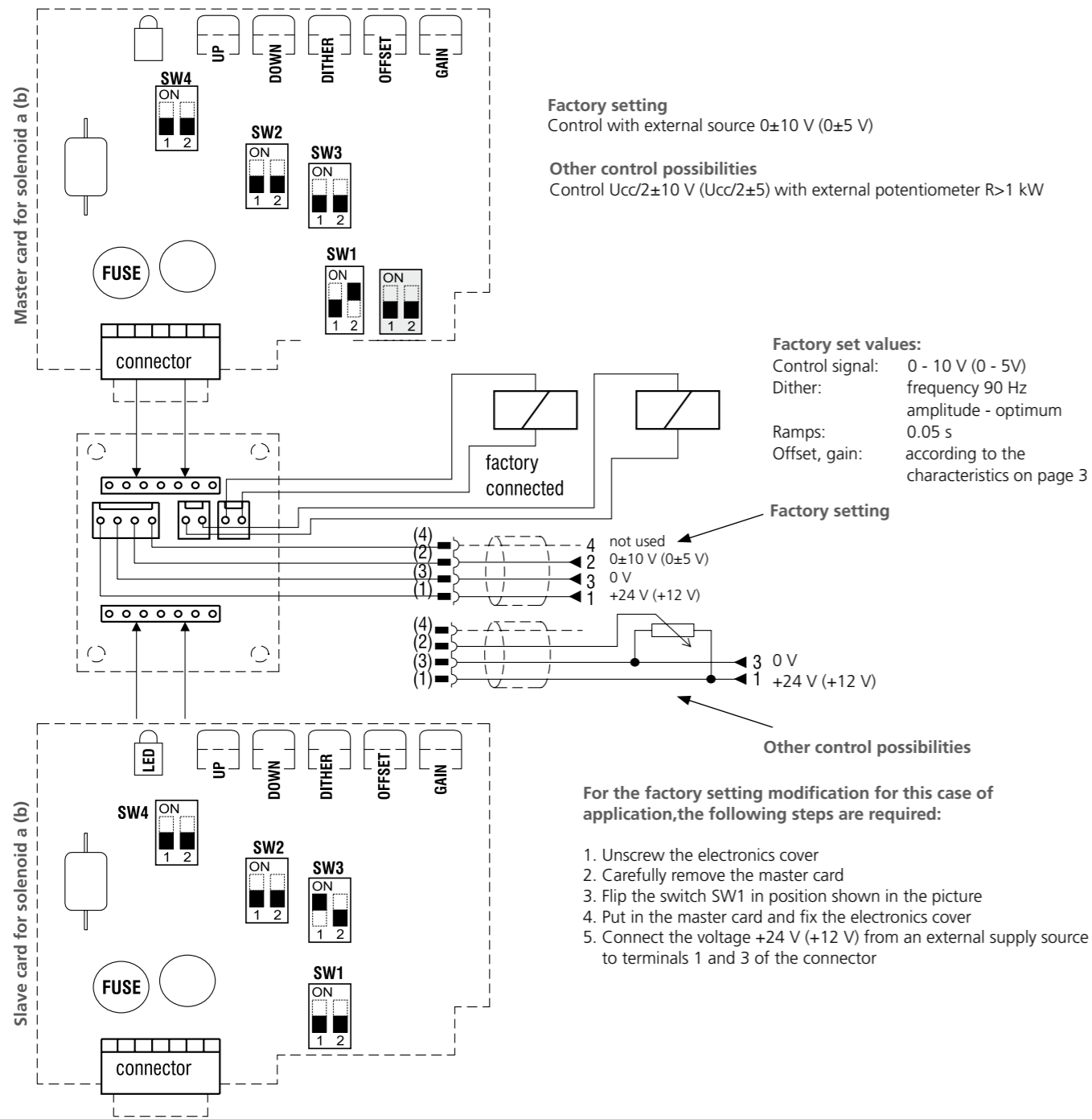
Wire colours (connection connector - electronics)
(1) - brown
(2) - white
(3) - blue
(4) - black

The control signal must have the same ground potential as the supply source.

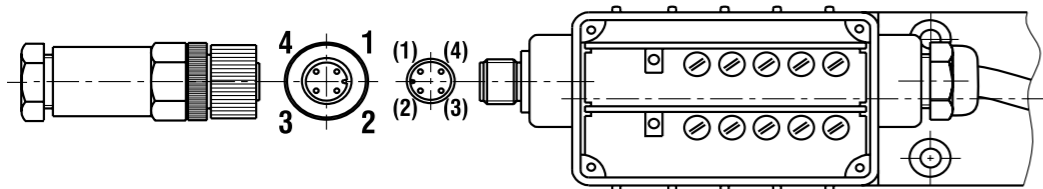
Designation of the basic factory setting.
The ramp functions are adjusted on their minimum values.
The dither is set to the optimal value with respect to hysteresis.
Offset and gain are adjusted according to the characteristic on page 1 and 2.
The manufacturer does not recommend these adjusted values to be changed.

Setting of Control Electronics

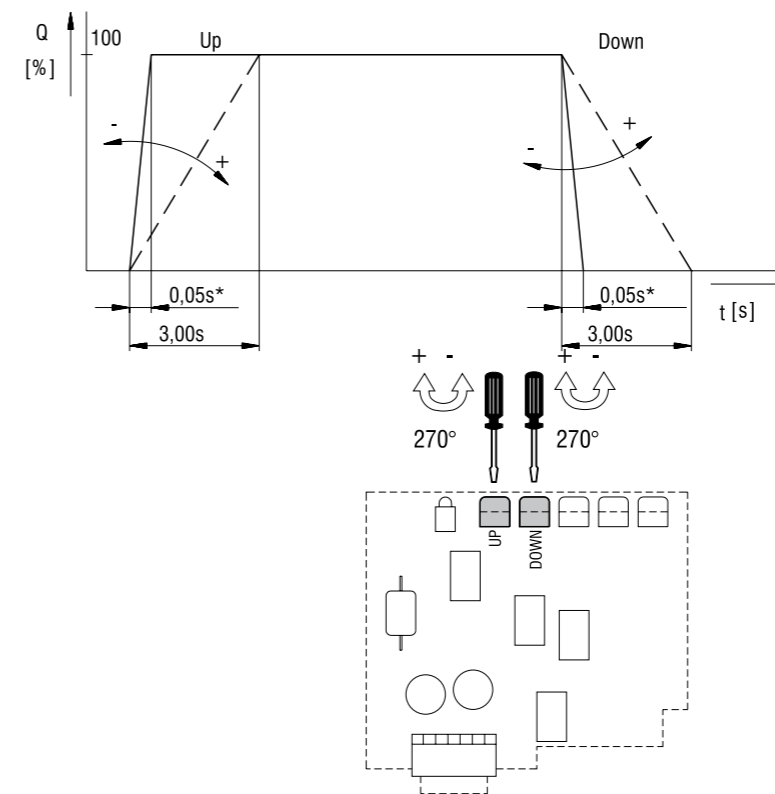
Valve PRM2-043*EK (with two solenoids), factory setting, other control possibilities



The control signal must have the same ground potential as the supply source.



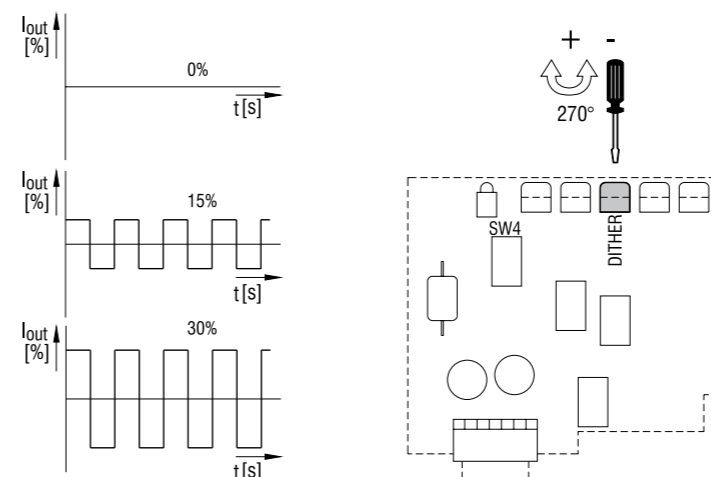
Ramp Adjustment (Up, Down)



The factory setting of the ramp functions is to the minimum values.

Dither Adjustment

Amplitude - potentiometer (dither) (0 - 30 %)

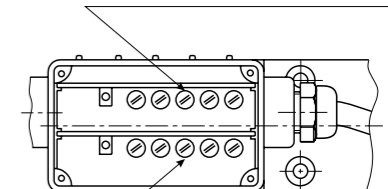


The dither is adjusted with regard to the minimum hysteresis.

Frequency - switch SW4

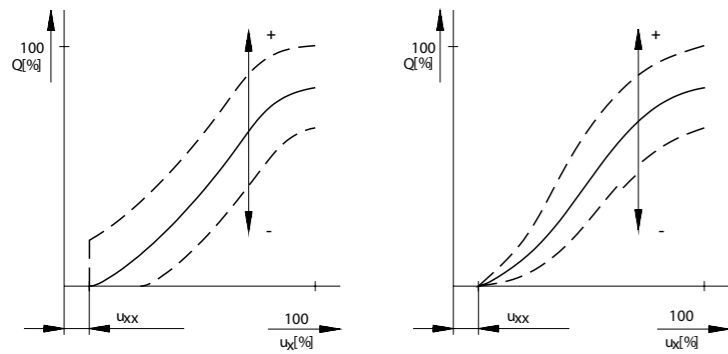


Amplitude adjustment for master solenoid



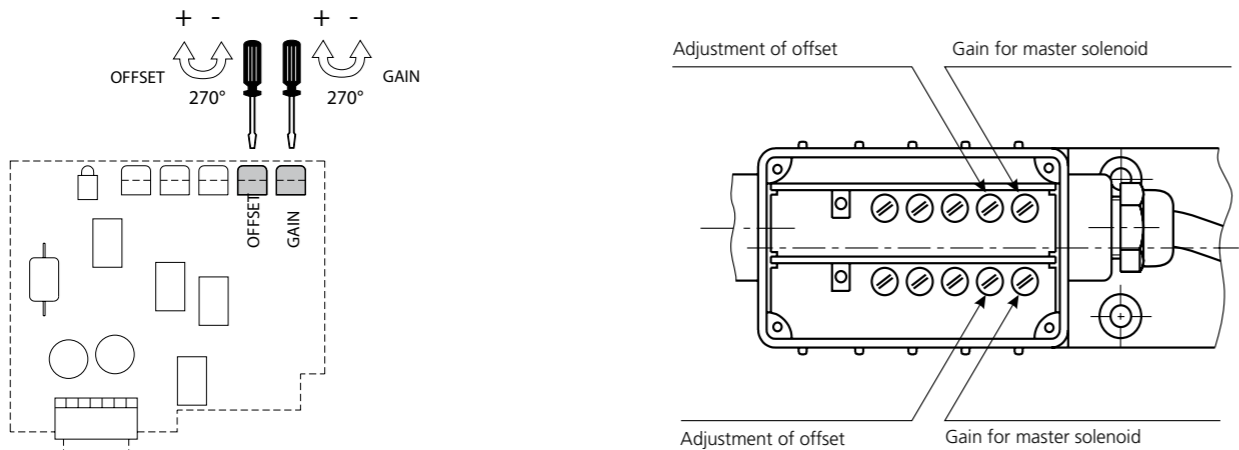
Amplitude adjustment for slave solenoid

Offset, Gain Parameters Adjustment



i The factory setting of the offset and gain parameters is specific for the solenoids used. The manufacturer does not recommend this setting to be changed.

Nominal Supply Voltage of Electronics (V)	Area Insensible to Control Signal u_{xx} (%)
12	1 ... 3
24	0,5 ... 2



Solenoid Coil in millimeters (inches)

E1, E2 Protection Degree IP65	E3, E4 Protection Degree IP67	E3A, E4A Protection Degree IP65	E8, E9 Protection Degree IP65	E12A, E13A Protection Degree IP67 / 69K
<p>Note: A = Standard 300 mm, (11.8 in) other lengths on demand</p>				

The indicated IP protection level is only achieved if the connector is properly mounted.

Manual Override in millimeters (inches)

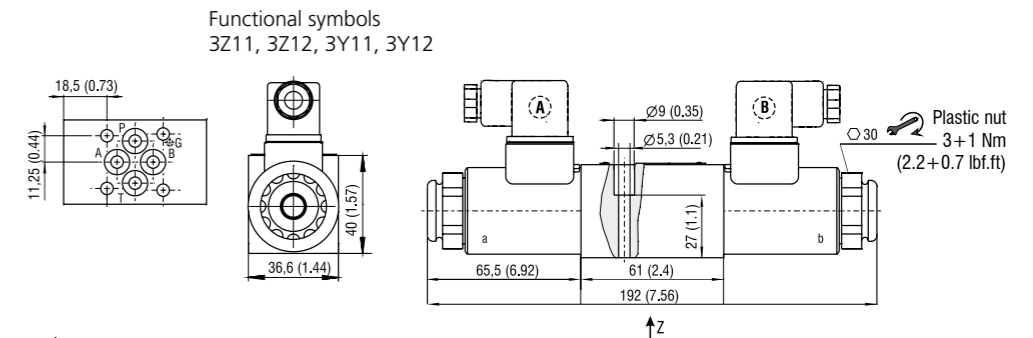
No Designation - Standard	Designation N2 - Rubber Boot Protected

In case of solenoid malfunction or power failure, the spool of the valve can be shifted by manual override as long as the pressure in port T does not exceed 25 bar (363 PSI). For alternative manual overrides contact our technical support.

Dimensions in millimeters (inches)

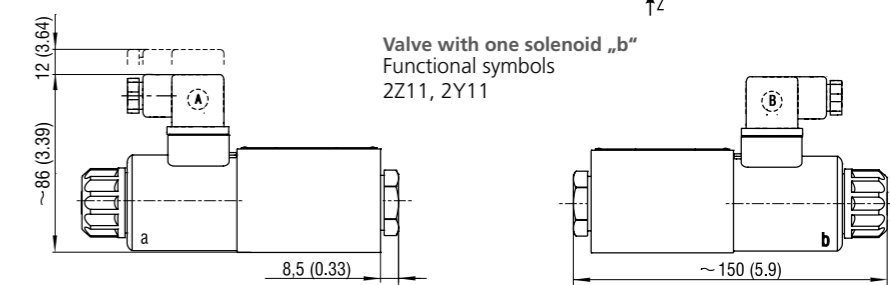
PRM2-043.../...E1

Valve with two solenoids
Example with electrical terminal EN 175301-803-A (E1, E2)



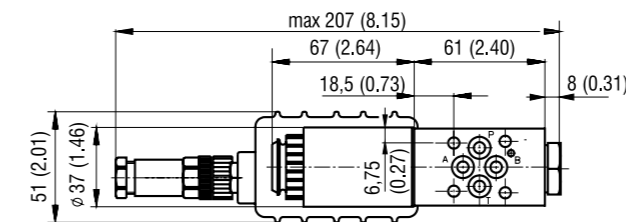
PRM2-042.../...E1

Valve with one solenoid „a“
Functional symbols 2Z51, 2Y51



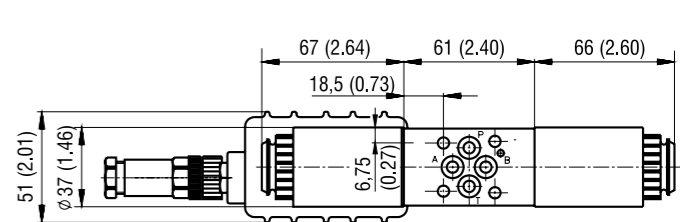
PRM2-043x/xEK*

Valve with one solenoid
OBE on side „a“ version EK



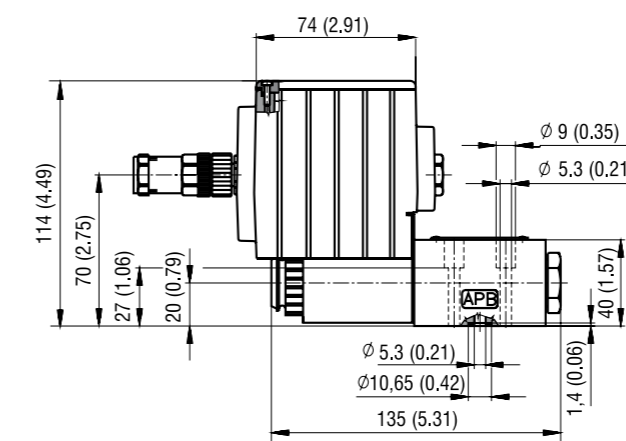
PRM2-043x/xEK*

Valve with two solenoids
OBE on side „a“ version EK



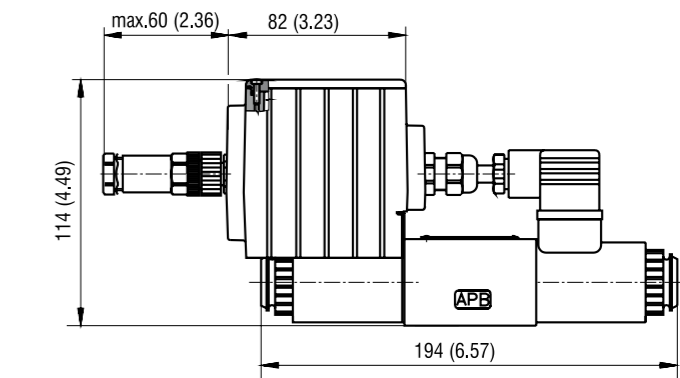
Valve with one solenoid „a“

Spool symbols 2Z51, 2Y51
OBE on side „a“ version EK



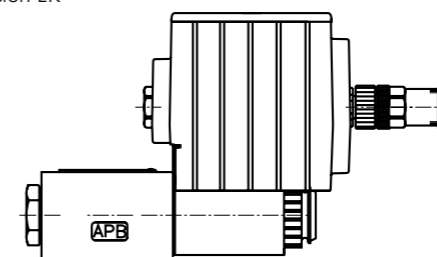
Valve with two solenoids

Spool symbols 3Z11, 3Z12, 3Y11, 3Y12
OBE on side „a“ version EK



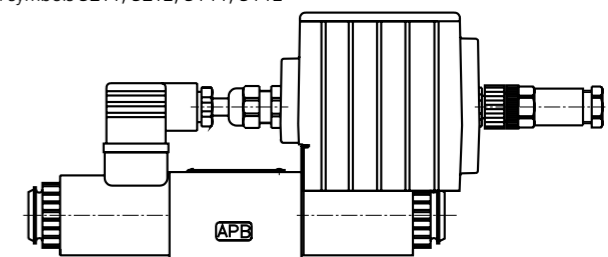
Valve with one solenoid „b“

Spool symbols 2Z11, 2Y11
OBE on side „b“ version EK



Valve with two solenoids

OBE on side „b“ version EKB
Spool symbols 3Z11, 3Z12, 3Y11, 3Y12



Proportional Directional Control Valve, with Digital Control Electronics, Feedback and OBE

PRM7-04

Size 02 (D04) • Q_{max} 20 l/min (5.3 GPM) • p_{max} 320 bar (4600 PSI)

Technical Features

- › Direct acting, proportional control valve with integrated digital electronic (OBE) proportional control, spool and process feedback
- › Control valve with subplate mounting surface acc. to ISO 4401, DIN 24340 (CETOP 02) standards
- › The valve opening and resulting flow rate can be modulated continuously in proportion to the reference signal
- › Digital converter card allows fine control of the valve spool position, reducing hysteresis and response time and optimizing the performance of the valve
- › Various models with or without onboard digital converter card or position sensor feedback available
- › Used for directional and speed control of hydraulic actuators
- › Wide range of interchangeable spools available
- › For versions without OBE wide range of solenoid electrical terminal versions available
- › The driver directly manages digital settings. It's possible to customize the settings for special applications using the optional kit.
- › In the standard version, the valve housing is phosphated and steel parts zinc-coated for 240 h protection acc. to ISO 9227
- › Enhanced surface protection for mobile sector available (ISO 9227, 520 h salt spray)

Functional Description

The proportional directional valve PRM7 consists of a cast iron housing, a special control spool, two centering springs with supporting washers, one or two proportional solenoids, a position sensor or, if desired, of a control box with digital electronics. The measurement system of the position sensor consists of a differential transformer with sensor core and its electronic evaluation unit.

Models without integrated electronic unit OBE

The electrical connection of the solenoids is realized by a variety of connectors. The position sensor output is connected by the G4W1F connector plug. Both connectors are supplied.

In this case the proportional valve can be used as follows:
S01, S02 with the internal feedback from the spool position sensor.

Models with the integrated electronic unit OBE

The model comprises an electronic control box that is mounted together with the position sensor on either of the solenoids. The connection of the position sensor to the control box is provided by a cable. For models with two solenoids, the solenoid mounted opposite the control box is connected to the control box by a EN 175301-803 connector.

The connection of the supply voltage, control signal, program input and external output of the position sensor is implemented in a 5-pin connector (ELKA 5012). The connection of the external feedback is provided by a 5-pin connector, which also has three supply voltages +24 V, +10 V and -5 V for an external sensor available.

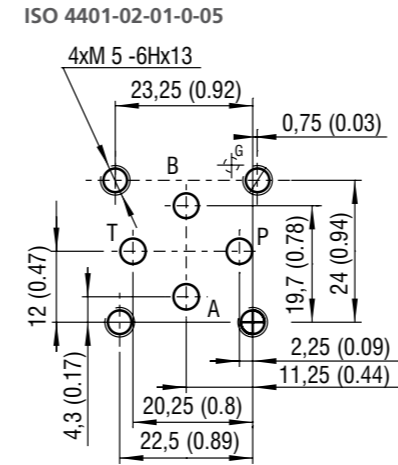
The solenoid coils, including the control box, can be turned in the range of ± 90°. The digital control unit enables the proportional valve to be controlled on the basis of data required from two feedback circuits. In this case the proportional valve can be used as follows:

- E01** Proportional directional valve
- E02*S01** Only with the internal feedback from the spool position sensor.
- E03** Only with the external feedback (pressure sensor, position sensor, etc.).
- E04*S01** With internal and external feedback.

The digital control unit utilizes pulse-width-modulation (PWM) and supplies the solenoids with current proportional to the control signal. The supply current is additionally modulated with a dither frequency. Individual functional parameters are adjusted through software by a special programmer, or by computer through the RS 232 interface. The cable kit must be ordered separately, as detailed on page 4. The correct function of the digital control unit is signaled by a green LED. The incorrect function (failure) is indicated by a red LED. As a standard, the proportional valve is delivered with factory setting.

For a model including an external feedback contact the manufacturer.

Technical Data



Ports P, A, B, T - max Ø4.5 mm (0.18 in)

Valve Size		04 (D02)
Max. operating pressure at ports P, A, B	bar (PSI)	320 (4600)
Max. operating pressure at port T	bar (PSI)	210 (3050)
Fluid temperature range (NBR)	°C (°F)	-30 ... +80 (-22 ... +176)
Fluid temperature range (FPM)	°C (°F)	-20 ... +80 (-4 ... +176)
Ambient temperature max.	°C (°F)	-30 ... +50 (-22 ... +122)
Nominal flow at Δp = 10 bar (145 PSI)	l/min (GPM)	4 (1.1) 8 (2.1) 12 (3.2)
Hysteresis	%	< 6
Hysteresis - closed position loop	%	< 0.5
Protection degree EN 60529		IP65
Mass - valve with 1 solenoid	kg (lbs)	1.5 (3.30)
- valve with 2 solenoids		1.8 (3.96)
	Data Sheet	Type
General information	GI_0060	Products and operating conditions
Coil types / Connectors	C_8007 / K_8008	C19B* / K*
Mounting surface	SMT_0019	Size 04
Spare parts	SP_8010	
Subplates	SP_0002	DP*-04

Ordering Code

PRM7-04 [] / [] - [] [] [] [] - []

Proportional directional control valve, with digital control electronics, feedback and OBE

Valve size

Spool symbols
see the table „Spool symbols“

Nominal flow rate at Δp = 10 bar (145 PSI)
flow 4 l/min (1.1 GPM) **4**
flow 8 l/min (2.1 GPM) **8**
flow 12 l/min (3.2 GPM) **12**

Nominal solenoid supply voltage
12V DC **12**
24V DC **24**

Surface treatment
No designation Standard
A 240 h salt spray test (ISO 9227)
B 520 h salt spray test (ISO 9227)

Seals
No designation NBR
V FPM (Viton)

Installation side of OBE and position transducer
No designation OBE with spool position transducer at side of port A

Model
S01 position sensor with voltage outlet
S02 position sensor with current outlet
E01 proportional directional valve without feedback
E02S01 proportional directional valve with position feedback
E03 proportional directional valve with external feedback
E04S01 proportional directional valve with position and external feedback

- For proportional valves with two solenoids, one solenoid must be de-energized before the other solenoid can be charged.
- Mounting bolts M5x35 DIN 912-10.9 or studs must be ordered separately. Tightening torque is 5 Nm (3.7 lbf.ft).
- Besides the shown, commonly used valve versions other special models are available.
- Contact our technical support for their identification, feasibility and operating limits.

Spool Symbols

Type	Symbol	Type	Symbol
2Z51		3Z11	
2Z11		3Z12	
2Y51		3Y11	
2Y11		3Y12	

*Model for cylinders with asymmetric piston area ratio 1:2

Technical Data of Position Sensor - Voltage Outlet

Operating pressure	bar (PSI)	to 320 (4640), static
Electrical connection * only for S01 model		electrical connector G4W1F Hirschmann*
Contact assignment		1 - Power supply 2 - Command signal 3 - GND 4 - not used
Enclosure protection type according to EN 60529		IP65
Measured distance	mm (in)	8 (0.315)
Operating voltage	V	9.6 ... 30 DC
Linearity error	%	< 1
Current consumption at load current of 2 mA	mA	< 15
Output voltage	V	0 ... 5
Output signal range used:		
0 position	V	2.5
1 solenoid - stroke 1.8 mm (0.07 in)		1.375 ... 2.5
2 solenoids - stroke ±1.8 mm (0.07 in)		1.375 ... 3.625
Max. load current	mA	2
Noise voltage		
- at load current 0	mV _{p-p}	< 20
- at load current of 2 mA		< 15
Additional output signal error at:		
- temperature change between 0 ... 80°C (32... 176 °F)		typical 0.2% / 10K
- between 0... -25 °C (32 ... -13 °F)		max. 0.5 % / 10K
- Load change from 0 to 2 mA		max. 0.5 % / 10K
Input voltage change		
from 9.6 V to 14.4 V	%	< 0.1
from 14.4 V to 30 V		< 0.25
Long-term drift (30 days)	%	< 0.25
Cut-off frequency		
3dB fall in amplitude	Hz	> 600
Frequency 90°		> 600

Technical Data of Position Sensor - Current Outlet

Linearity	%	< 1
Operating pressure	bar (PSI)	to 320 (4640), static
Electrical connection * only for S02 model		electrical connector G4W1F Hirschmann*
Contact assignment		1 - Power supply 2 - Command signal 3 - GND 4 - not used
Enclosure protection type according to EN 60529		IP 65
Operatin voltage	V	20 ... 30 DC
Current	mA	< 35
Output signal range	mA	4 ... 20
Output signal range used:		
0 position	mA	12
1 solenoid - stroke 1.8mm (0.07 in)		8.4 ... 12
2 solenoids - stroke ±1.8 mm (0.07 in)		8.4 ... 15.6
Additional output signal error:		
- at temperature change from +10... 55°C (50... 131°F)		0.2% / 10K
- at impedance change from 50%		≤ 0.1%
- at input voltage change in the range of operating voltage		≤ 0.05%
Impedance	Ω	≤ 500
Output signal ripple	mA R.M.S.	≤ 0.02
Limit frequency at 3 dB amplitude decrease	Hz	≥ 800

Technical Data of Proportional Solenoid

Type of coil	V	12 DC	24 DC
Limiting current	A	1.7	0.8
Resistance at 20° C (68 °F)	Ω	4.9	21

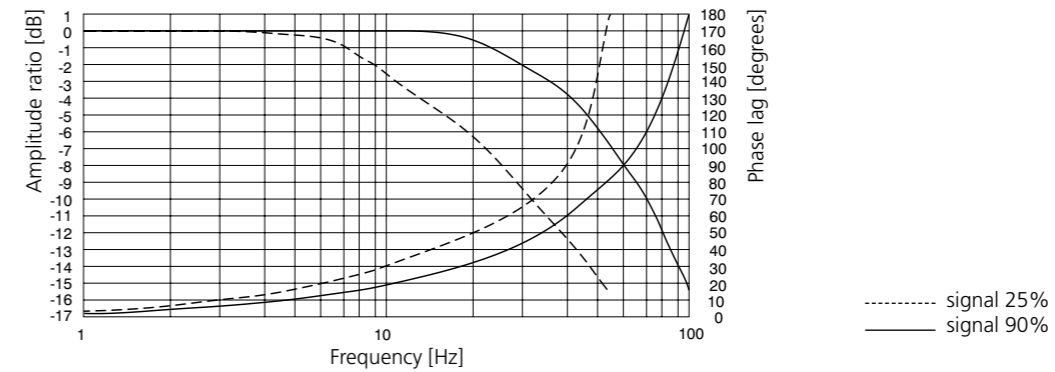
Electronics Data

Supply voltage with polarity inversion protection	V	11.2 ... 28 VDC (residual ripple < 10%)
Input: command signal / according to customer setting		±10 V, 0...10 V, ±10 mA, 4...20 mA, 0...20 mA, 12 mA ±8 mA
Input: spool position sensor signal		0...5V
Input: external feedback signal		0...10 V, 4...20 mA, 0...20 mA
Resolution of the A/D converter		12 bit
Output: solenoids		two PWM output stages up to max. 3.5 A
PWM frequency	kHz	18
Adjustment of parameters	μS	170
EMC		
Interference resistance		61000 - 6 - 2 : 2005
Radiation resistance		55011 : 1998 class A
Parameter setting		Serial port RS 232 (zero modem). 19200 bauds, 8 data bits, 1 stop bit, no parity. Special software PRM7 Conf.

Accessories

Order number	Content
23093400	Connecting cable to PC - length 2 m (6.56 ft), CD-ROM with program PRM7 Conf and user manual
23093500	Connecting cable to PC - length 5 m (16.40 ft), CD-ROM with program PRM7 Conf and user manual
24523400	Connecting cable to PC - length 2 m (6.56 ft)
24523500	Connecting cable to PC - length 5 m (6.56 ft)

Frequency Response closed position loop, for E02S01 model

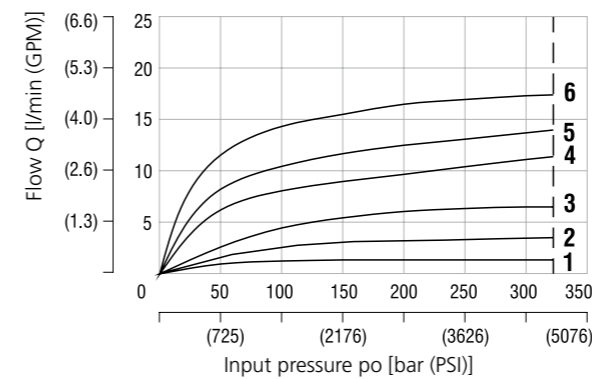


Characteristics measured at v = 32 mm/s (156 SUS)

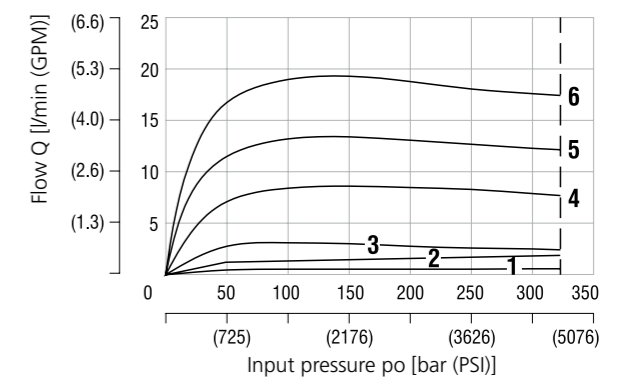
Operating limits: Flow direction P → A / B → T or P → B / A → T

Operating limits only for **E01 model only**

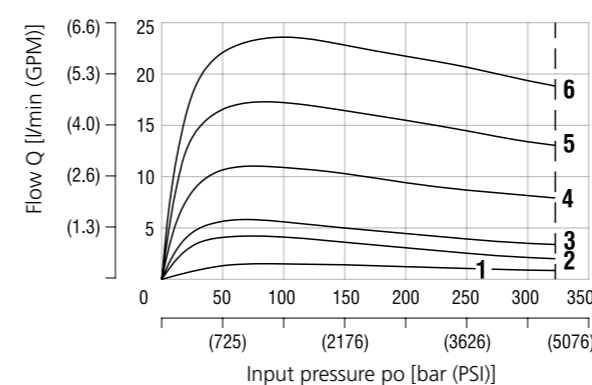
Nominal flow 4 l/min (1.1 GPM)



Nominal flow 8 l/min (2.1 GPM)



Nominal flow 12 l/min (3.2 GPM)

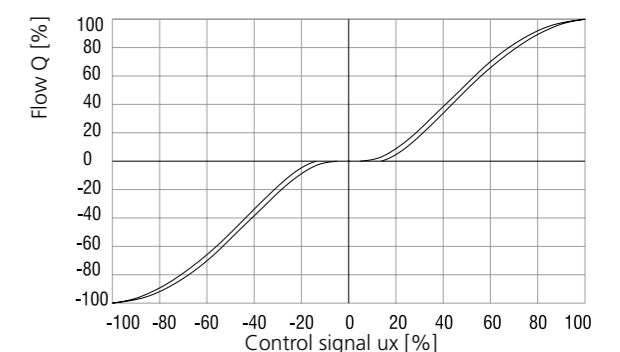


Solenoid current:

- 1 = 50 %
- 2 = 60 %
- 3 = 70 %
- 4 = 80 %
- 5 = 90 %
- 6 = 100 %

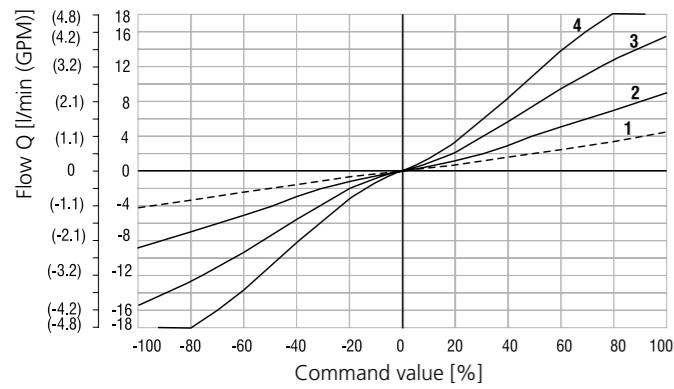
Regulated flow related to control signal

Flow characteristics (**E01 model only**) Δp=10 bar (145 PSI)

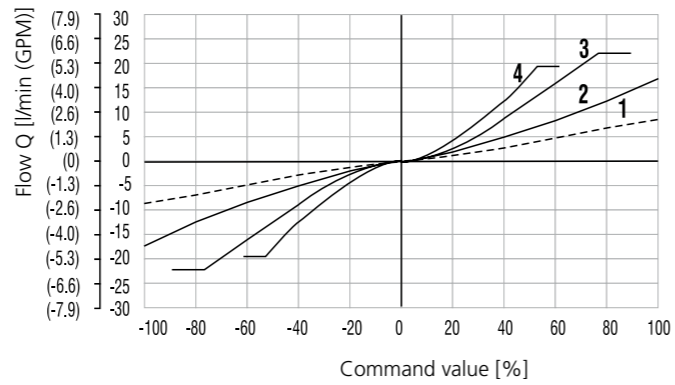


Flow Characteristics measured at $v = 32 \text{ mm}^2/\text{s}$ (156 SUS)

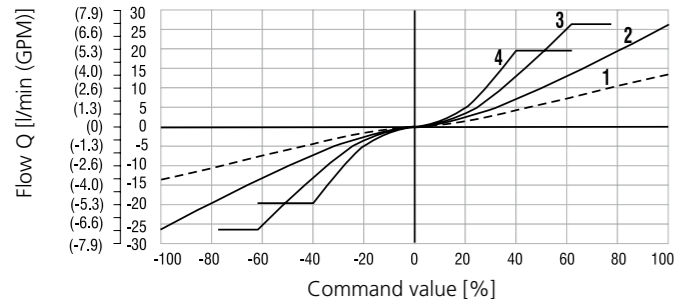
Flow characteristics (E02S01 model only)
 $Q_n = 4 \text{ l/min}$ (1.1 GPM) by $\Delta p = 10 \text{ bar}$ (145 PSI)



$Q_n = 8 \text{ l/min}$ (2.1 GPM) by $\Delta p = 10 \text{ bar}$ (145 PSI)



$Q_n = 12 \text{ l/min}$ (3.2 GPM) by $\Delta p = 10 \text{ bar}$ (145 PSI)



Δp = Valve pressure differential (inlet pressure p_v minus load pressure and return pressure p_r)

Δp_n = Valve pressure differential for nominal flow Q_n

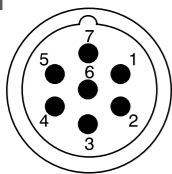
1	$\Delta p_n = 10 \text{ bar}$ (145 PSI)
2	$\Delta p = 50 \text{ bar}$ (725 PSI)
3	$\Delta p = 160 \text{ bar}$ (2321 PSI)
4	$\Delta p = 320 \text{ bar}$ (4641 PSI)

Factory Settings

Item	Model		E01		E02S01		E03		E04S01	
	1 Magnet	2 Magnets	1 Magnet	2 Magnets	1 Magnet	2 Magnets	1 Magnet	2 Magnets	1 Magnet	2 Magnets
Control signal	0 ... 10 V	$\pm 10 \text{ V}$	0 ... 10 V	$\pm 10 \text{ V}$	0 ... 10 V	$\pm 10 \text{ V}$	0 ... 10 V	$\pm 10 \text{ V}$	0 ... 10 V	$\pm 10 \text{ V}$
Signal external feedback	-	-	-	-	0 ... 10 V	-	-	-	-	-
Output position sensor spool	-	-	0 ... 5 V	-	-	-	-	-	0 ... 5 V	-

Connectors

K1



PIN	Technical data
1	* Power supply input
2	* Ground (power supply)
3	Control signal
4	Ground (signal)
5	Power reference signal
6	Control signal of position sensor spool
7	* Protective earth lead (PE)

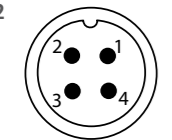
*Recommended min. lead cross section 0,75 mm²

K1 - Main input connector M23 (7PIN)
Cable diameter 8 ... 12 mm (0.31...0.47 in).

K2 - Connection RS232 M12x1 (4 PIN)
To program the electronics.

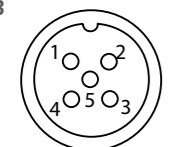
K3 - Conektor M12x1 (5PIN)
External feedback signal (for configurations E03 and E04S01 only).

K2



PIN	Technical data
1	TxD
2	RxD
3	Ground (signal)
4	Not used

K3

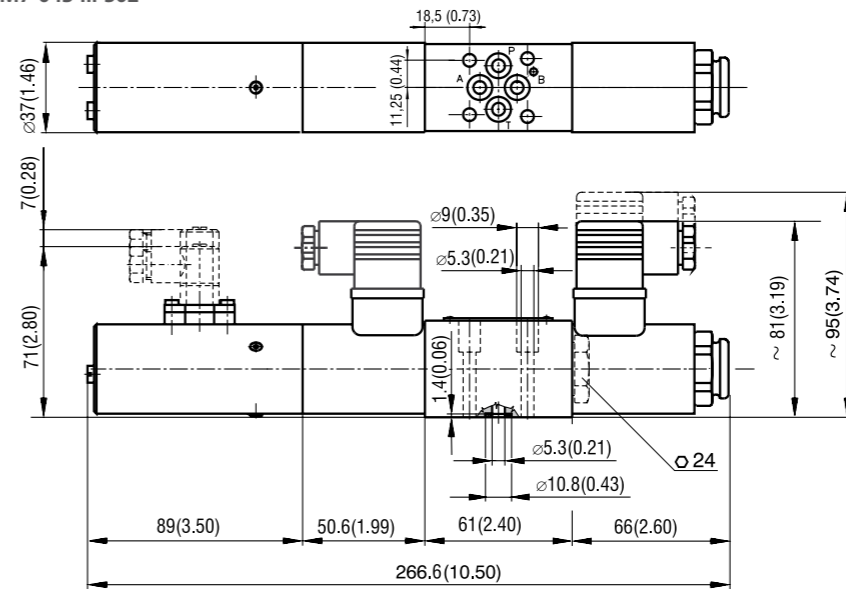


PIN	Technical data
1	Power supply output
2	Signal of external feedback
3	Ground
4	Not used
5	Not used

Dimensions in millimeters (inches)

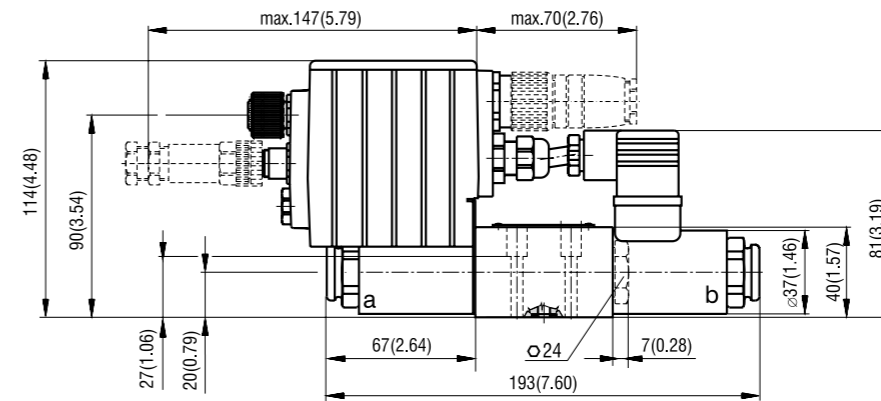
PRM7-043 ... S01

PRM7-043 ... S02



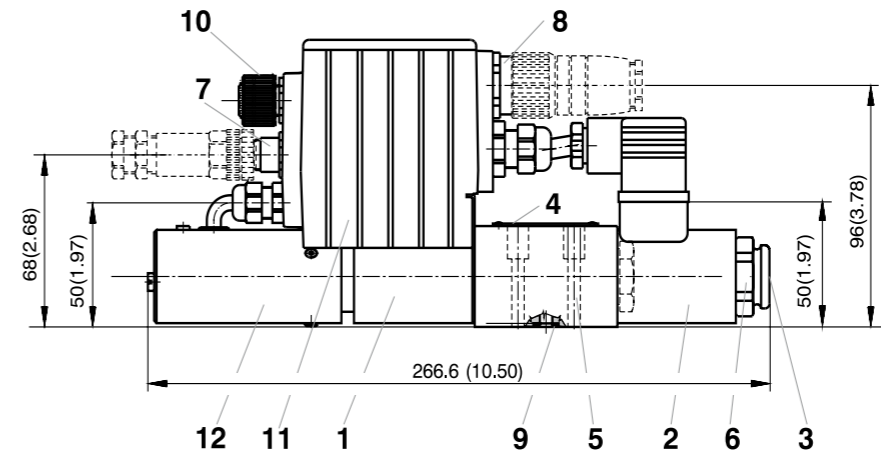
PRM7-043 ... E01 - without connector plug for spool position feedback

PRM7-043 ... E03



PRM7-043 ... E02S01 - without connector plug for spool position feedback

PRM7-043 ... E04S01

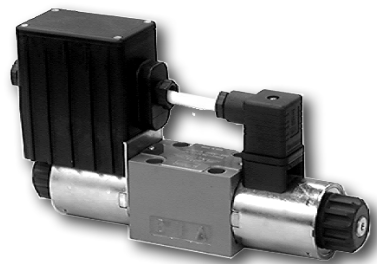


- 1 Solenoid a
- 2 Solenoid b
- 3 Manual override
- 4 Name plate
- 5 4 mounting holes
- 6 Solenoid fixing nut
- 7 Connector M12x1 for connection of external feedback
- 8 Main supply connector M23
- 9 Square ring 7.65 x 1.68 (4 pcs.), supplied in delivery packet
- 10 Cover of connector M12x1 for programming
- 11 Plastic box with integrated electronics
- 12 Position sensor

Proportional Directional Control Valve, with Analog Control Electronics

PRM2-06

Size 06 (D03) • Q_{max} 40 l/min (11 GPM) • p_{max} 350 bar (5100 PSI)



Technical Features

- Direct acting, proportional control valve without or with integrated analog electronic (OBE) with subplate mounting surface acc. to ISO 4401, DIN 24340 (CETOP 03) standards
- Used for directional and speed control of hydraulic actuators
- The valve opening and resulting flow rate can be modulated continuously in proportion to the reference signal
- The valve can be controlled directly by a current control supply unit or by means of the electronic control units to exploit valve performance to the fullest
- Analog converter card allows fine control of the valve spool position, reducing hysteresis and response time and optimizing the valve performance
- Five chambers housing design with reduced hydraulic power dependence on fluid viscosity
- For versions without OBE a wide range of solenoid electrical terminal versions available
- Wide range of interchangeable spools and manual overrides available
- The coil is fastened to the core tube with a retaining nut and can be rotated by 360° to suit the available space
- In the standard version, the valve housing is phosphated and steel parts are zinc-coated for 240 h salt spray protection acc. to ISO 9227
- Enhanced surface protection for mobile sector available (ISO 9227, 520 h salt spray)

Functional Description

PRM2-06* Versions without on board electronics

The valve can be controlled directly by a current control supply unit or by the external electronic card directly mounted to the electrical terminal (see catalog of EL3E card 9145 and EL6 card 9150). This control card, depending on the number of the controlled solenoids, can be mounted onto either solenoid.

PRM2-06*EK Versions with on board electronics

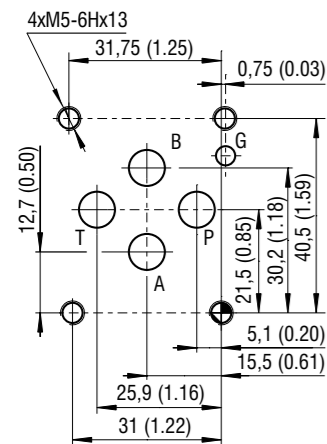
A control box, which comprises one or two electronic control cards, depending on the number of controlled solenoids, can be mounted onto either solenoid. For models with two solenoids, the solenoid mounted opposite the control box is connected to the box by a DIN connector, a two-lead cable and a bushing. The connection of the control box with the supply source and with the control signal is implemented by a 4-pin connector of type M12x1. The electric control unit supplies the solenoid with current, which varies with the control signal.

The electronic control unit provides the following adjustment possibilities:

Offset, gain, rise and drop-out time of the ramp generator, frequency (2 frequencies) and amplitude of the dither signal generator. The correct function of the control unit is signaled by LEDs. Stabilized voltage +10 V (+5 V for 12 V voltage) is also available to the user. Using this voltage and a potentiometer $\geq 1k\Omega$ a voltage control signal can be generated. The electronic control card enables voltage or current control to be used, depending on the position of the switches SW1 to SW3.

Technical Data

ISO 4401-03-02-0-05



Ports P, A, B, T - max $\varnothing 7.5$ mm (0.29 in)

Nominal Size	06 (D03)	
Max. operating pressure at port P, A, B	bar (PSI)	350 (5080)
Max. operating pressure at port T	bar (PSI)	210 (3050)
Fluid temperature range (NBR)	°C (°F)	-30 ... +80 (-22 ... +176)
Fluid temperature range (FPM)	°C (°F)	-20 ... +80 (-4 ... +176)
Ambient temperature range	°C (°F)	-30 ... +50 (-22 ... +122)
Hysteresis	%	≤ 6
Nominal flow rate Q_n at $\Delta p=10$ bar (145 PSI)	l/min (GPM)	5 (1.13) 8 (2.1) 15 (4.0) 30 (7.9)
Protection degree (for version PRM*EK)		IP65
Mass - valve with 1 solenoid	kg (lbs)	1.9 (4.2)
- valve with 2 solenoids		2.4 (5.3)
Technical Data of the Proportional Solenoid		
Nominal supply voltage	V	12 DC 24 DC
Limit current	A	2.5 1.0
- with electronic		1.6 -
Mean resistance value at 20 °C (68 °F)	Ω	2.3 13.4
- with electronic		5.2 -
Technical Data of the Electronics		
Supply voltage range	V	Ucc 12V DC Ucc 24V DC
Stabilized voltage for control	V	11.2... 14.7 20... 30
Control signal		5 DC (R > 1 k Ω) 10 DC (R > 1 k Ω)
Maximum output current	A	see table of switches configuration (page 4, 5 and 6)
Ramp adjustment range	s	2.4 for R < 4 Ω 1.5 for R < 10 Ω
Dither frequency	Hz	0.05... 3
Dither amplitude	%	90 / 60
		0... 30
	Data Sheet	Type
General information	GI_0060	Products and operating conditions
Coil types / Connectors	C_8007 / K_8008	C22B* / K*
Mounting interface / Tolerances	SMT_0019	Size 06
Spare parts	SP_8010	
Subplates	SP_0002	DP*-06

Ordering Code

PRM2-06 / - - - - -

Proportional directional control valve, with analog control electronics

Valve size

Spool symbols
see table „Spool Symbols“

Nominal flow rate at $\Delta p = 10$ bar (145 PSI)

5 l/min (1.3 GPM)	5
8 l/min (2.1 GPM)	8
15 l/min (4.0 GPM)	15
30 l/min (7.9 GPM)	30

Rated supply voltage of solenoids (at the coil terminal)

12 V DC	12
24 V DC	24

Electronics on board / Position at solenoid
connection by connector M12 x 1 (4-pin connector, supplied with counterpart)

on board electronics (solenoid „a“) EK

on board electronics (solenoid „b“)* EKB

Surface treatment

No designation	standard
A	zinc-coated (ZnCr-3), ISO 9227 (240 h)
B	zinc-coated (ZnNi), ISO 9227 (520 h)

Seals

No designation	NBR
V	FPM (Viton)

Manual Override

No designation	standard
N1	protected with cap nut
N2	protected with rubber boot

Connector

E1	only for version without on board electronic „EK“ with terminal for the connector, EN 175301-803-A
E2	E1 with quenching diode
E3A	with AMP-Junior-Timer-connector - Axial direction
E4A	E3A with quenching diode
E8	loose conductors (two insulated wires)
E9	E8 with quenching diode
E12A	with Deutsch DT04-2P
E13A	E12A with quenching diode

*For valve versions with one solenoid the designation „B“ with OBE is not shown.

- For proportional valves with two solenoids, one solenoid must be de-energized before the other solenoid can be charged.
- Mounting bolts M5 x 45 DIN 912-10.9 or studs must be ordered separately. Tightening torque is 8.9 Nm (6.56 ft-lbf)
- Besides the shown, commonly used valve versions other special models are available.
- Contact our technical support for their identification, feasibility and operating limits.

Spool Symbols

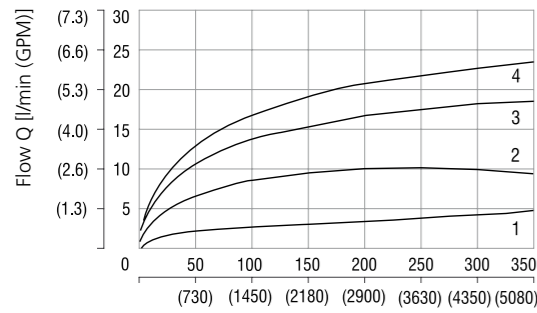
Type	Symbol	Type	Symbol
2Z51		3Z11	
2Z11		3Z12	$\frac{q_A}{q_B} = \frac{1}{2}$
2Y51		3Y11	
2Y11		3Y12	$\frac{q_A}{q_B} = \frac{1}{2}$

*Model for cylinders with asymmetric piston area ratio 1:2

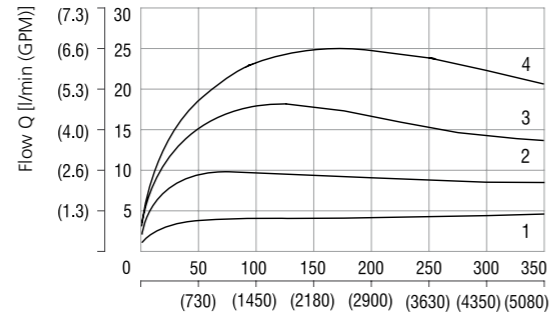
Characteristics measured at $v = 32 \text{ mm}^2/\text{s}$ (156 SUS)

Operating limits: Flow direction $P \rightarrow A / B \rightarrow T$ or $P \rightarrow B / A \rightarrow T$

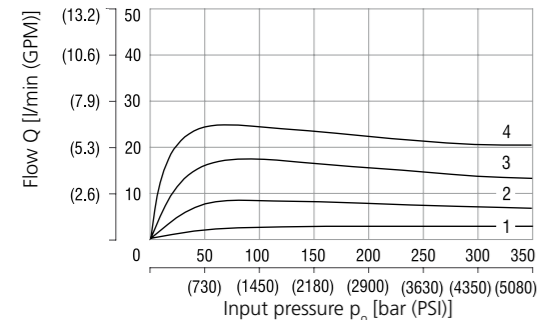
Nominal flow 5 l/min (1.3 GPM)



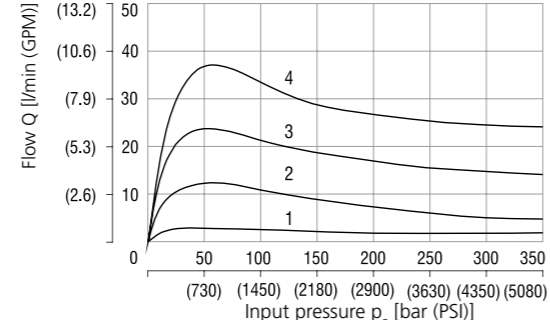
Nominal flow 8 l/min (2.1 GPM)



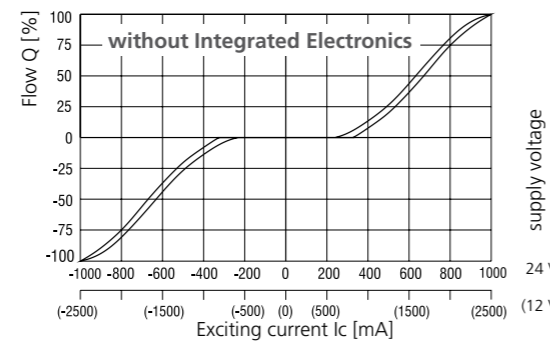
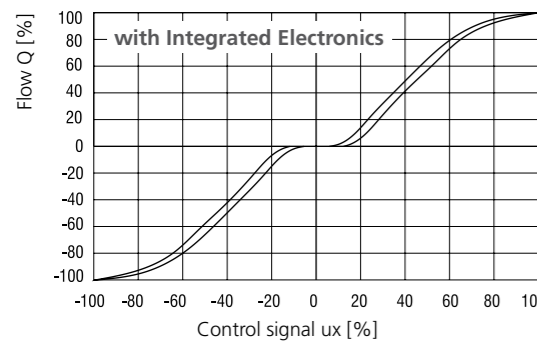
Nominal flow 15 l/min (4.0 GPM)



Nominal flow 30 l/min (7.9 GPM)



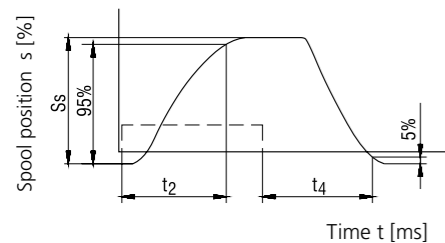
Regulated flow related to control signal
 $\Delta p = 10 \text{ bar}$ (145 PSI)



Solenoid current:
1 = 50 %
2 = 60 %
3 = 70 %
4 = 80 %
5 = 90 %
6 = 100 %

The coil current which initializes the flow through the proportional directional valve can differ due to the production tolerances about in a range of $\pm 6\%$ of the limit current.

Transient Characteristic measured at $v = 32 \text{ mm}^2/\text{s}$ (156 SUS), $\Delta p = 10 \text{ bar}$ (145 PSI)

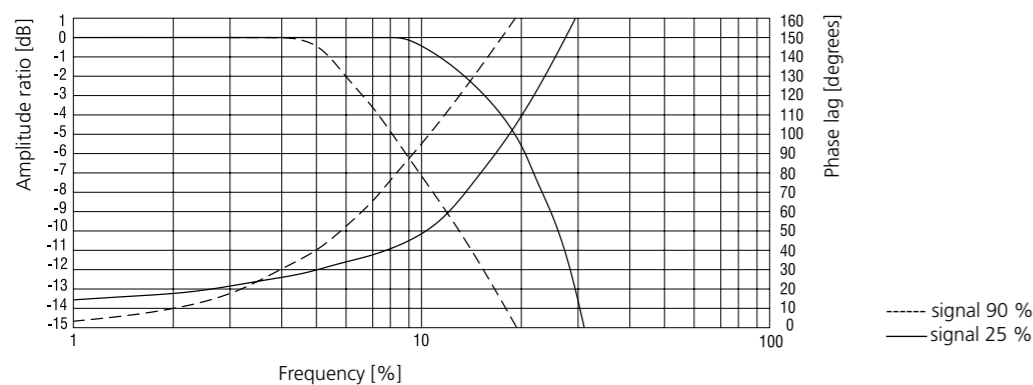


Steady Spool Position S_s [%]	t_2 [ms]	t_4 [ms]
100	85	100
75	70	85
50	55	75
25	45	55

The values in table have only an informative character. The times of the transient characteristics at pressure or flow control will be in a particular hydraulic circuit always longer.

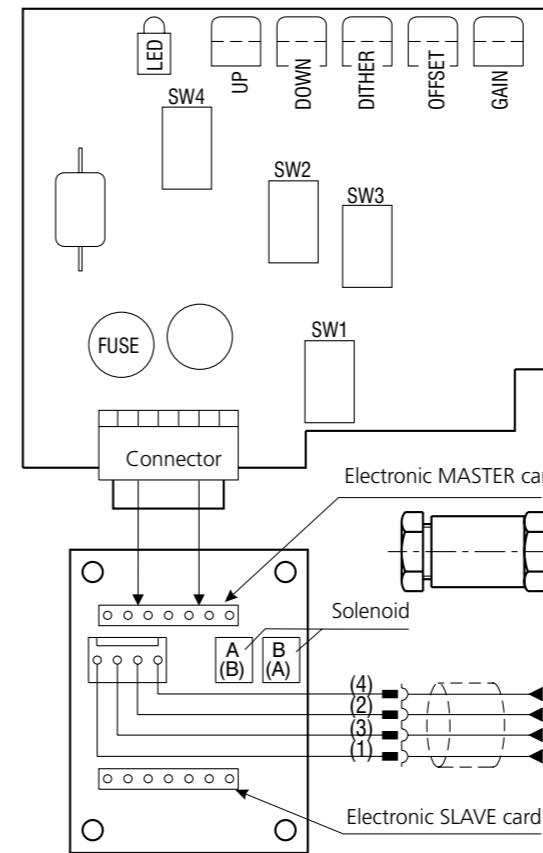
---- the control signal course of the integrated electronics

Frequency Response



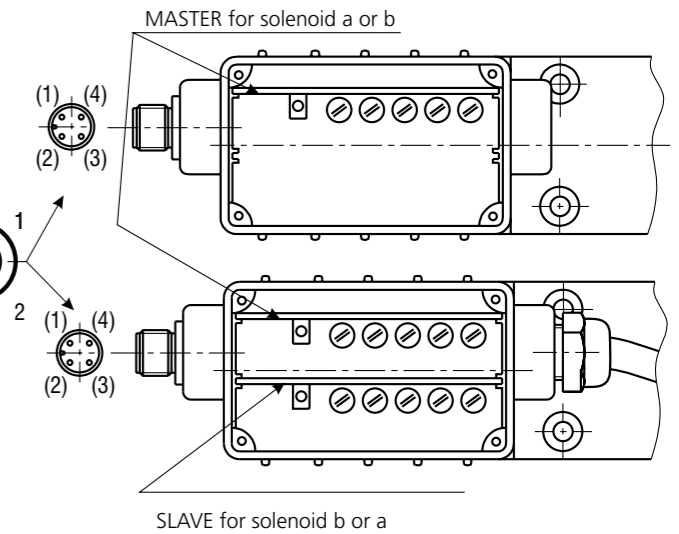
----- signal 90 %
----- signal 25 %

Component Arrangement on the Electronic Card



PIN	Description	Wire Colors, Connection	Connector - Electronics
1	+24 V (Ucc) (+12 V)	(1)	brown
2	control	(2)	white
3	0 V	(3)	blue
4	+10 V (+5 V)	(4)	black

SW1 - control signal choice
SW2 - control signal choice
SW3 - control signal choice
SW4 - dither frequency



Attention: The control signal must have the same ground potential as the supply.

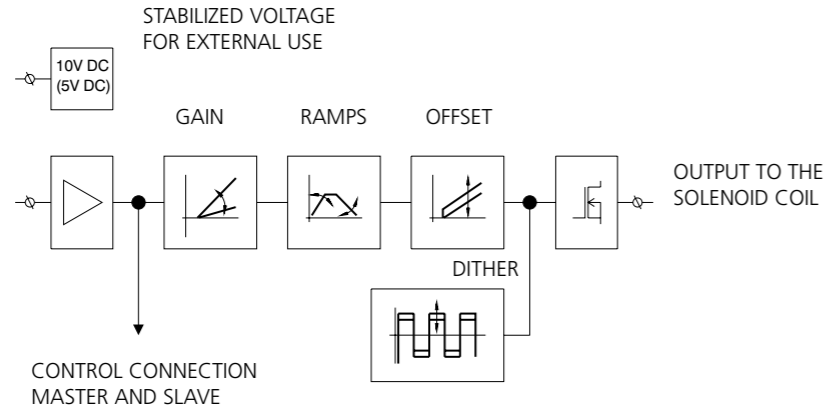
Table of the Switch Configuration for the Control Signal Choices

		PRM2-062				PRM2-063	
		0 ... 5 V	0 ... 10 V (0...5 V)*	0 ... 20 mA	4 ... 20 mA	$U_{cc}/2 \pm 10 \text{ V} (\pm 5 \text{ V})^*$	$\pm 10 \text{ V} (\pm 5 \text{ V})^*$
MASTER M	SW1						
	SW2						
	SW3						
	SW4	90 Hz			60 Hz		
SLAVE S	SW1						
	SW2						
	SW3						
	SW4					90 Hz	60 Hz

Designation of the basic manufacture setting.

The ramp functions are adjusted to their minimum values, the dither is set to the optimal value with respect to hysteresis. Offset and gain are adjusted according to the characteristic on page 3 and 4. The manufacturer does not recommend to change these adjusted values.

* Input signal level for the 12 V electronic unit.

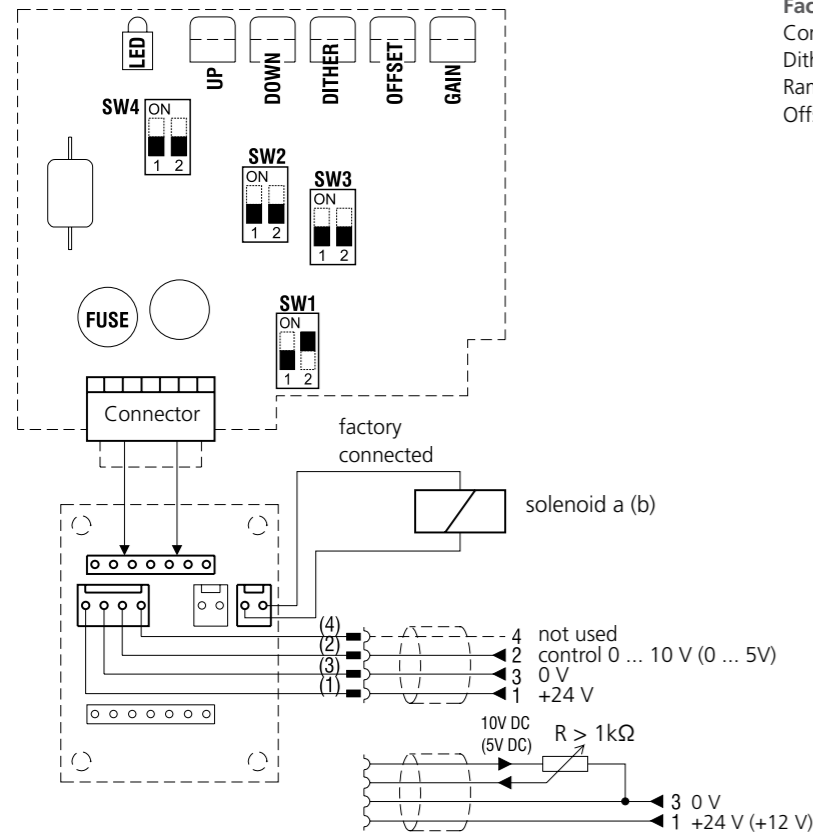


Setting of Control Electronics

Valve PRM2-062*EK (with one solenoid)

Control with external voltage source 0...10 V, 0 ... 5 V (factory setting) or with external potentiometer R>1 kΩ

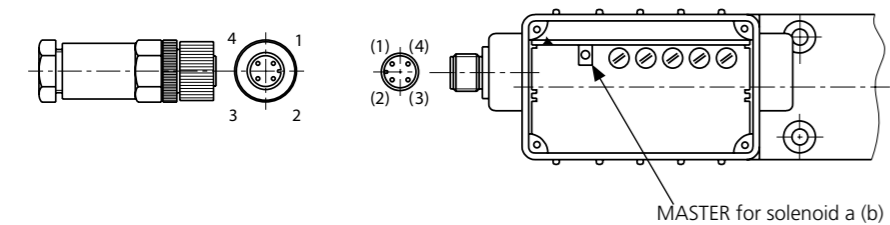
Master card for solenoid a (b)



Factory set values:
Control signal: 0 - 10 V (0 - 5 V)
Dither: frequency 90 Hz amplitude - optimum
Ramps: 0.05 s
Offset, gain: according to the characteristics on page 3



The control signal must have the same ground potential as the supply source.



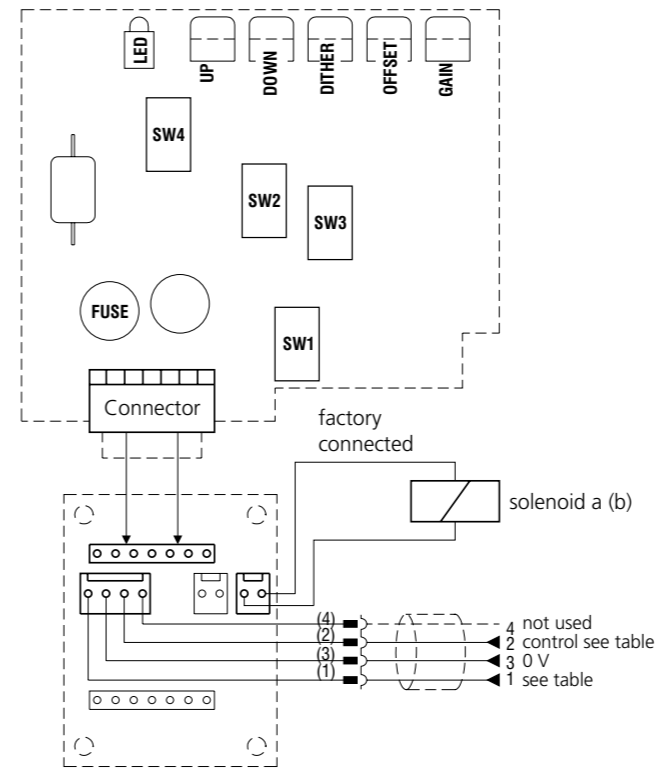
Wire colors (connection connector - electronics)
(1) - brown
(2) - white
(3) - blue
(4) - black

Setting of Control Electronics

Valve PRM2-062*EK (with one solenoid)

Control with external source 0 ... 5 V, 0 ... 20 mA, 4 ... 20 mA

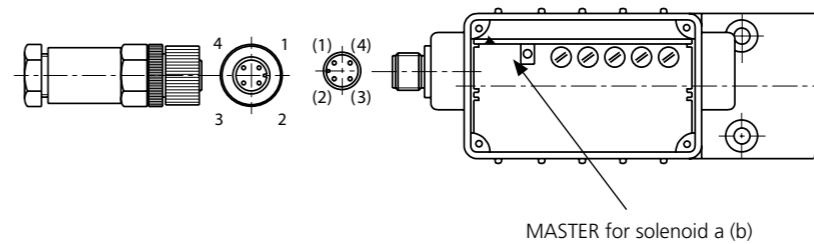
Master card for solenoid a (b)



		Control with external source		
		0 ...5 V	0 ...20 mA	4 ...20 mA
SW1				
SW2				
SW3				
SW4				
PIN 1 (1)		+24 V	+24 V (+12 V)	+24 V (+12 V)
PIN 2 (2)		0 ...5 V	0 ...20 mA	4 ...20 mA

Follow the subsequent steps to modify the factory settings:

1. Unscrew the electronics cover
2. Carefully remove the master card
3. Flip the switch SW1 (2 or 3) in position shown in the table
4. Put in the master card and fix the electronics cover
5. Connect the voltage +24 V (+12 V) from an external supply source to terminals 1 and 3 of the connector
6. Bring the control voltage (current) from an external source to terminals 2 and 3 of the connector



Wire colors (connection connector - electronics)
(1) - brown
(2) - white
(3) - blue
(4) - black



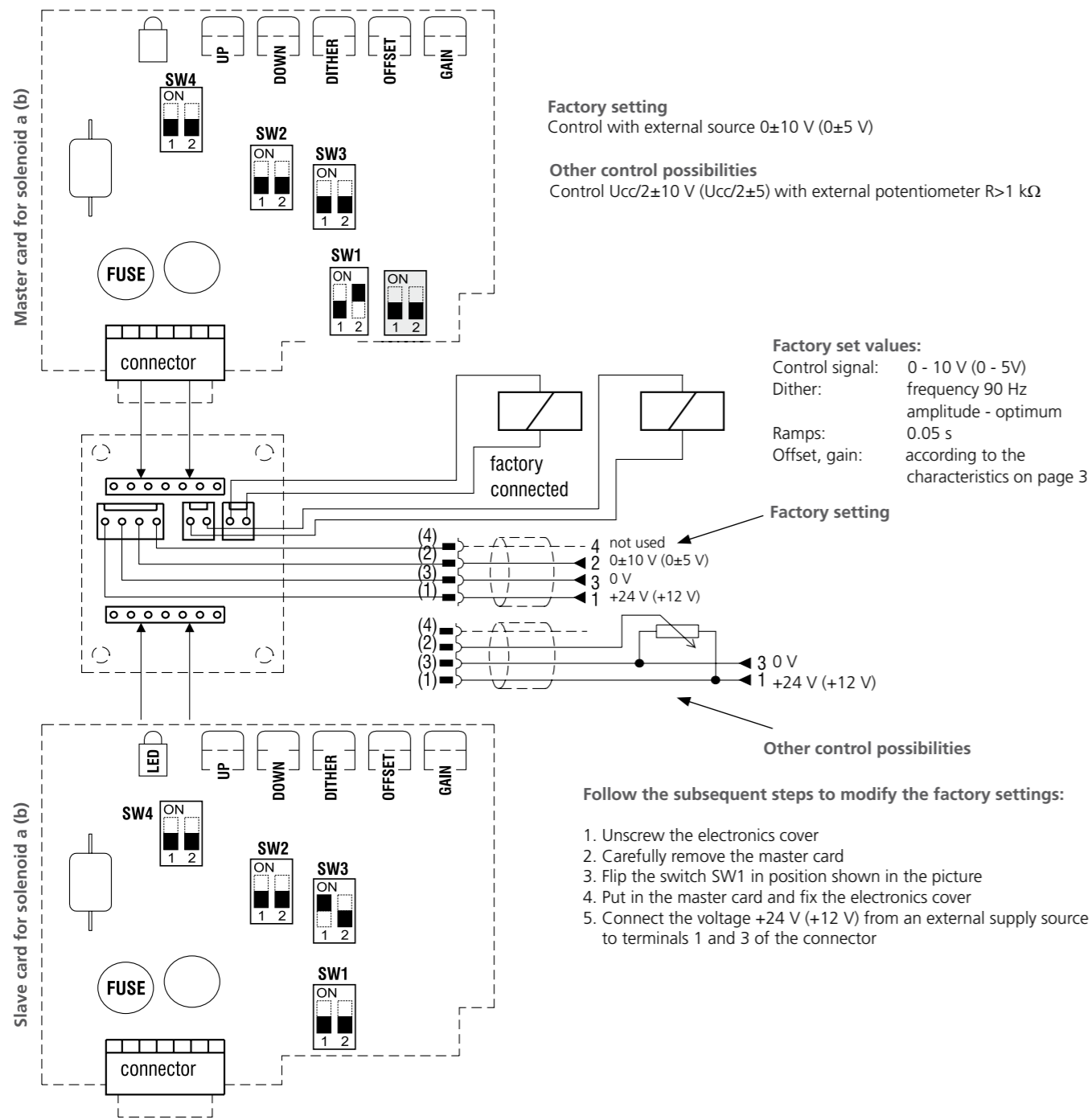
The control signal must have the same ground potential as the supply source.



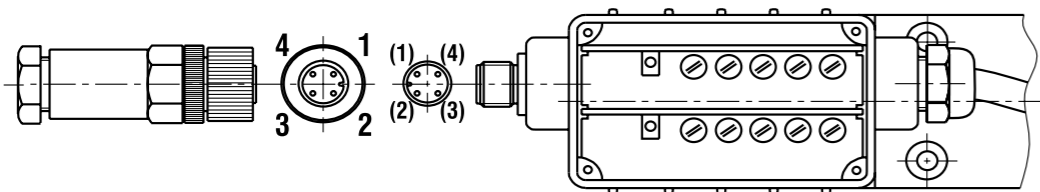
Designation of the basic factory setting.
The ramp functions are adjusted on their minimum values.
The dither is set to the optimal value with respect to hysteresis.
Offset and gain are adjusted according to the characteristic on page 1 and 2.
The manufacturer does not recommend to change these adjusted values.

Setting of control electronics

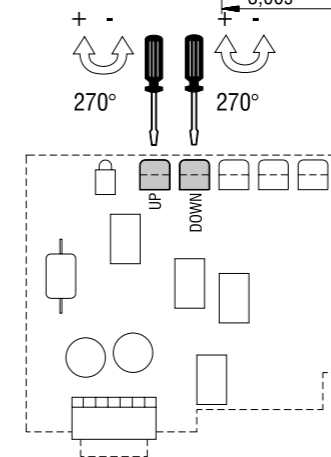
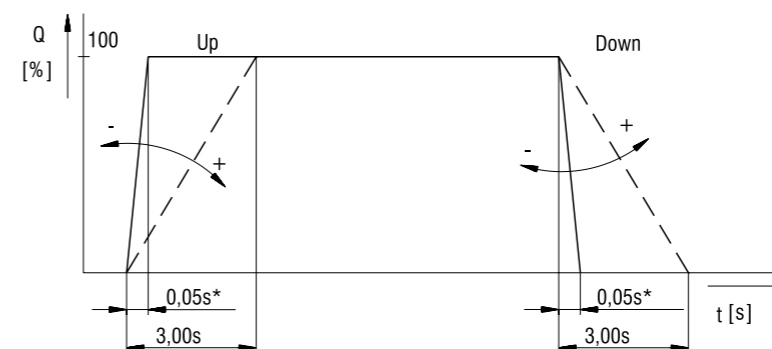
Valve PRM2-063*EK (with two solenoids), factory setting, other control possibilities



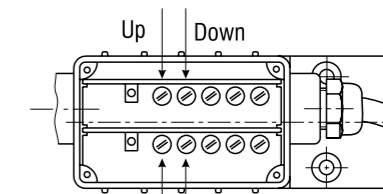
The control signal must have the same ground potential as the supply source.



Ramp Adjustment (Up, Down)



Ramp adjustment for slave solenoid



Ramp adjustment for master solenoid

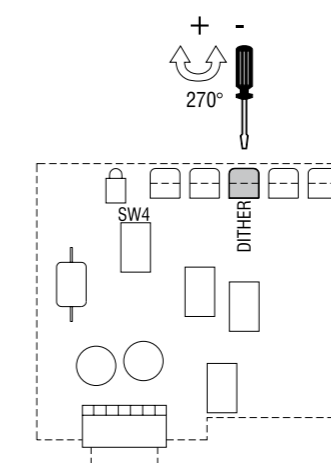
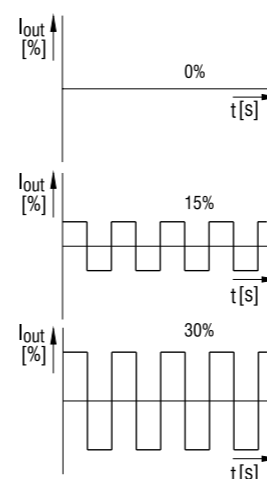
* The value has only an informative character with respect to the particular type of the proportional directional valve (see page 3).



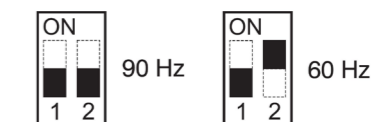
The factory setting of the ramp is at the minimum value.

Dither Adjustment

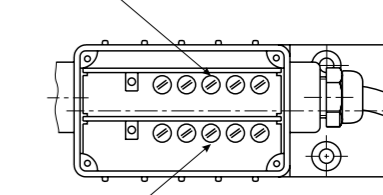
Amplitude - potentiometer (dither) (0 - 30 %)



Frequency - switch SW4



Amplitude adjustment for master solenoid

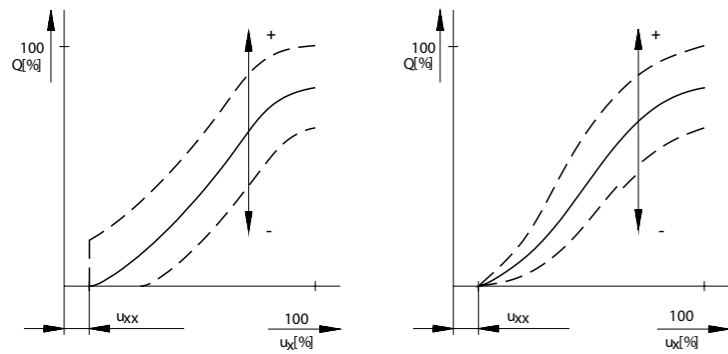


Amplitude adjustment for slave solenoid



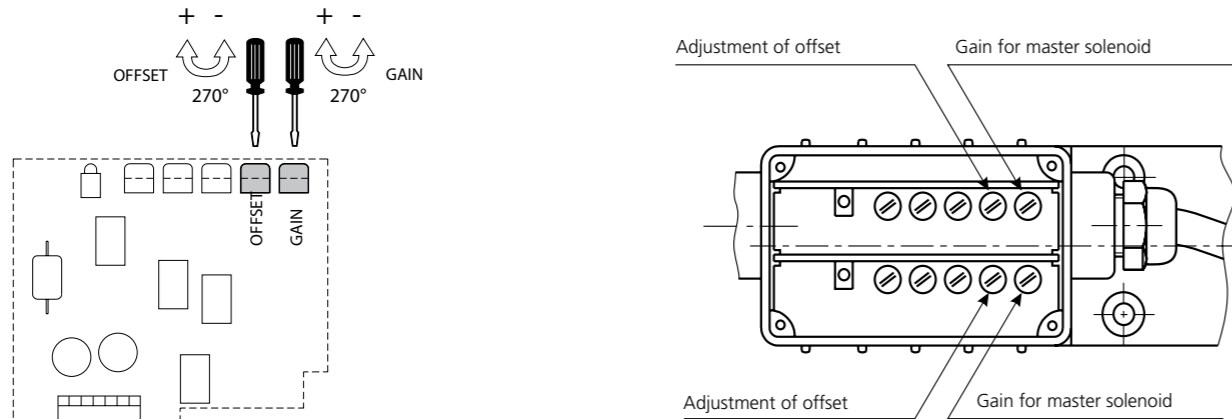
The dither is adjusted to minimize hysteresis.

Offset, Gain Parameters Adjustment



i The factory setting of the offset and gain parameters is specific for the solenoids used. The manufacturer does not recommend to change these settings.

Nominal Electronics Supply Voltage (V)	Area Insensitive to Control Signal uxx (%)
12	1 ... 3
24	0.5 ... 2



Solenoid Coil in millimeters (inches)

E1, E2 Protection Degree IP65	E3A, E4A Protection Degree IP67	E8, E9 Protection Degree IP65	E12A, E13A Protection Degree IP67 / 69K
		 Note: A = Standard 300 mm, (11.8 in) other lengths on demand	

The indicated IP protection level is only achieved if the connector is properly mounted.

Manual Override in millimeters (inches)

No Designation - Standard	Designation N1 - Cap Nut Covered	Designation N2 - Rubber Boot Protected

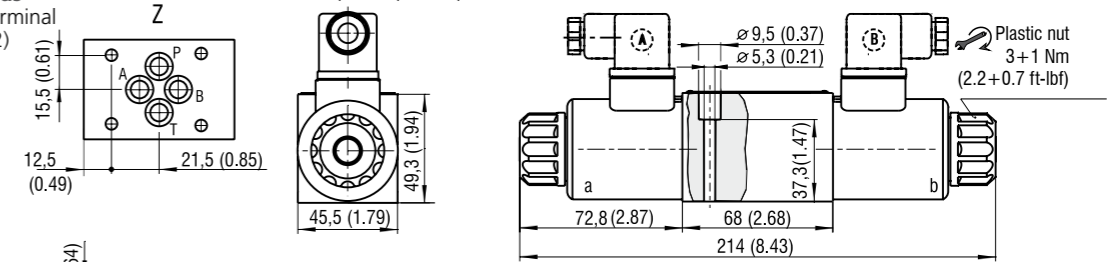
In case of solenoid malfunction or power failure, the spool of the valve can be shifted by manual override as long as the pressure in port T does not exceed 25 bar (363 PSI). For alternative manual overrides contact our technical support.

Dimensions in millimeters (inches)

PRM2-063.../...-E1

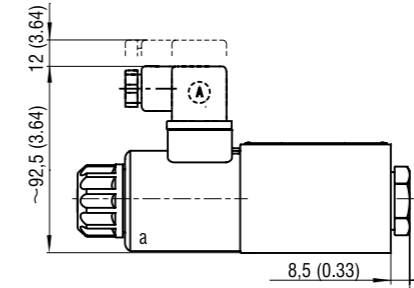
Valve with two solenoids
Example with electrical terminal EN 175301-803-A (E1, E2)

Functional symbols
3Z11, 3Z12, 3Y11, 3Y12

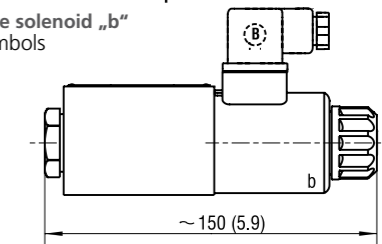


PRM2-062.../...-E1

Valve with one solenoid „a“
Functional symbols
2Z51, 2Y51

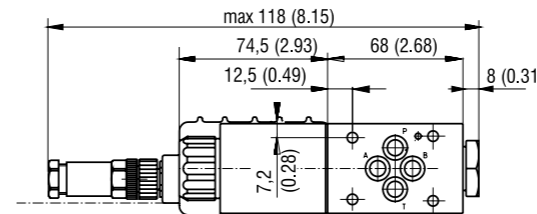


Valve with one solenoid „b“
Functional symbols
2Z11, 2Y11



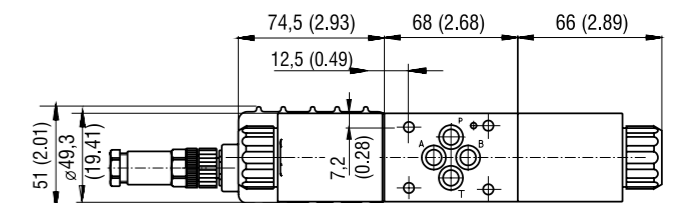
PRM2-063x/xEK*

Valve with one solenoid
OBE on side „a“ version EK



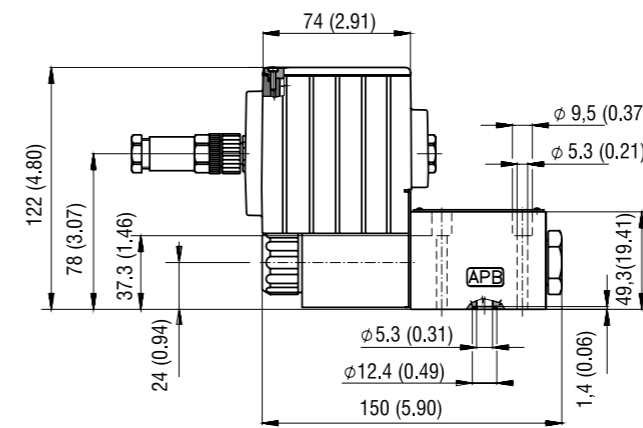
PRM2-063x/xEK*

Valve with two solenoids
OBE on side „a“ version EK



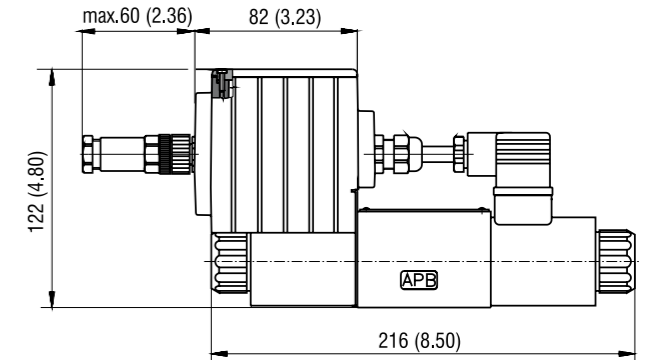
Valve with one solenoid „a“

Spool symbols 2Z51, 2Y51
OBE on side „a“ version EK



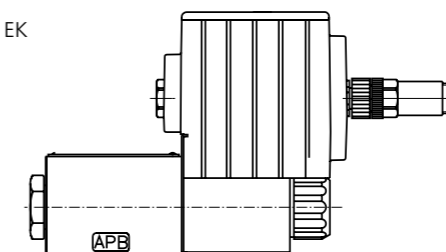
Valve with two solenoids

Spool symbols 3Z11, 3Z12, 3Y11, 3Y12
OBE on side „a“ version EK



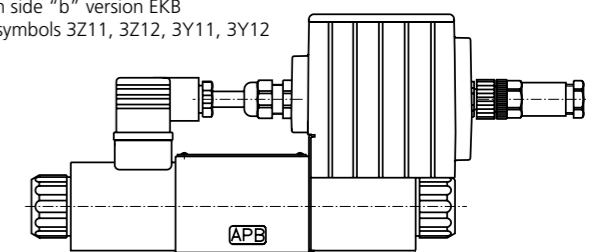
Valve with one solenoid „b“

Spool symbols 2Z11, 2Y11
OBE on side „b“ version EK



Valve with two solenoids

OBE on side „b“ version EKB
Spool symbols 3Z11, 3Z12, 3Y11, 3Y12



Proportional Directional Control Valve, with Digital Control Electronics, Feedback and OBE

PRM7-06

Size 06 (D03) • Q_{max} 40 l/min (11 GPM) • p_{max} 350 bar (5100 PSI)

Technical Features

- ▶ Direct acting, proportional control valve with integrated digital electronic (OBE) proportional control, spool and process feedback
- ▶ Control valve with subplate mounting surface acc. to ISO 4401, DIN 24340 (CETOP 03) standards
- ▶ The valve opening and resulting flow rate can be modulated continuously in proportion to the reference signal
- ▶ Digital converter card allows fine control of the valve spool position, reducing hysteresis and response time and optimizing the performance of the valve
- ▶ Various models with or without onboard digital converter card or position sensor feedback available
- ▶ Used for directional and speed control of hydraulic actuators
- ▶ Wide range of interchangeable spools available
- ▶ For versions without OBE wide range of solenoid electrical terminal versions available
- ▶ The driver directly manages digital settings. It's possible to customize the settings for special applications using the optional kit.
- ▶ In the standard version, the valve housing is phosphated and steel parts zinc-coated for 240 h protection acc. to ISO 9227
- ▶ Enhanced surface protection for mobile sector available (ISO 9227, 520 h salt spray)

Functional Description

The proportional directional valve PRM7 consists of a cast iron housing, a special control spool, two centering springs with supporting washers, one or two proportional solenoids, a position sensor or, if need be, of a control box with digital electronics. The measuring system of the position sensor consists of a differential transformer with core and from the evaluating electronic unit realized in hybrid technique.

Models without integrated electronic unit OBE

The electrical connection of the solenoids is realized by a variety of connectors. The position sensor output is connected by the G4W1F connector plug. Both connectors are supplied.

In this case the proportional valve can be used as follows:

S01, S02 with the internal feedback from the spool position sensor.

Models with the integrated electronic unit OBE

The model comprises an electronic control box that is mounted together with the position sensor on either of the solenoids. The connection of the position sensor to the control box is provided by a cable. For models with two solenoids, the solenoid mounted opposite the control box is connected to the control box by a EN 175301-803 connector.

The connection of the supply voltage, control signal, program input and external output of the position sensor is implemented in a 5-pin connector (ELKA 5012). The connection of the external feedback is provided by a 5-pin connector, which also has three supply voltages +24 V, +10 V and -5 V for an external sensor available.

The solenoid coils, including the control box, can be turned in the range of ± 90°. The digital control unit enables the proportional valve to be controlled on the basis of data required from two feedback circuits. In this case the proportional valve can be used as follows:

- E01** Proportional directional valve
- E02*501** Only with the internal feedback from the spool position sensor.
- E03** Only with the external feedback (pressure sensor, position sensor, etc.).
- E04*501** With internal and external feedback.

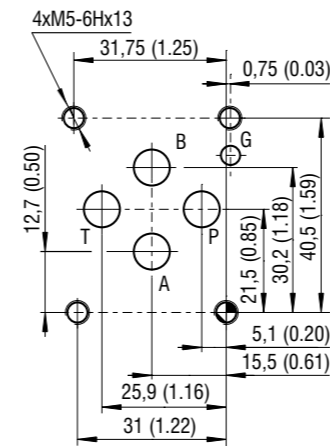
The digital control unit utilizes pulse-width-modulation (PWM) and supplies the solenoids with current proportional to the control signal.

The supply current is additionally modulated with a dither frequency. Individual functional parameters are adjusted through software by a special programmer, or by computer through the RS 232 interface. The cable kit must be ordered separately, as detailed on page 4. The correct function of the digital control unit is signaled by a green LED. The incorrect function (failure) is indicated by a red LED. As a standard, the proportional valve is delivered with factory setting.

For a model including an external feedback contact the manufacturer.

Technical Data

ISO 4401-03-02-0-05



Ports P, A, B, T - max Ø7.5 mm (0.29 in)

Valve Size		06 (D03)
Max. operating pressure at ports P, A, B	bar (PSI)	350 (5100)
Max. operating pressure at port T	bar (PSI)	210 (3050)
Fluid temperature range (NBR)	°C (°F)	-30 ... +80 (-22 ... +176)
Fluid temperature range (FPM)	°C (°F)	-20 ... +80 (-4 ... +176)
Ambient temperature max.	°C (°F)	-30 ... +50 (-22 ... +122)
Nominal flow Q _n at Δp=10 bar (145 PSI)	l/min (GPM)	5 (1.3), 8 (2.1), 15 (4.0), 30 (7.9)
Hysteresis	%	< 6
Hysteresis - closed position loop	%	< 0.5
Protection degree EN 60529		IP65
Mass - valve with 1 solenoid	kg (lbs)	2.3 (5.1)
- valve with 2 solenoids		2.8 (6.2)
	Data Sheet	Type
General information	GI_0060	Products and operating conditions
Coil types / Connectors	C_8007 / K_8008	C22A* / K*
Mounting surface	SMT_0019	Size 06
Spare parts	SP_8010	
Subplates	SP_0002	DP*-06

Ordering Code

PRM7-06 [] / [] - [] [] [] [] - []

Proportional directional control valve, with digital control electronics, feedback and OBE

Valve size

Spool symbols
see the table „Spool symbols“

Nominal flow rate at Δp = 10 bar (145 PSI)

flow 5 l/min (1.3 GPM)	5
flow 8 l/min (2.1 GPM)	8
flow 15 l/min (4.0 GPM)	15
flow 30 l/min (7.9 GPM)	30

Nominal solenoid supply voltage

12V DC	12
24V DC	24

Surface treatment

No designation	Standard
A	240 h salt spray test (ISO 9227)
B	520 h salt spray test (ISO 9227)

Seals

No designation	NBR
V	FPM (Viton)

Installation side of OBE and position transducer

No designation	OBE with spool position transducer at side of port A
----------------	--

Model

S01	position sensor with voltage outlet
S02	position sensor with current outlet
E01	proportional directional valve without feedback
E02S01	proportional directional valve with position feedback
E03	proportional directional valve with external feedback
E04S01	proportional directional valve with position and external feedback

- For proportional valves with two solenoids, one solenoid must be de-energized before the other solenoid can be charged.
- Mounting bolts M5 x 45 DIN 912-10.9 or studs must be ordered separately. Tightening torque is 8.9 Nm (6.56 ft-lbf)
- Besides the shown, commonly used valve versions other special models are available.
- Contact our technical support for their identification, feasibility and operating limits.

Spool Symbols

Type	Symbol	Type	Symbol
2Z51		3Z11	
2Z11		3Z12	
2Y51		3Y11	
2Y11		3Y12	

*Model for cylinders with asymmetric piston area ratio 1:2

Technical Data of Position Sensor - Voltage Outlet

Operating pressure	bar (PSI)	to 350 (5100), static
Electrical connection * only for S01 model		electrical connector G4W1F Hirschmann*
Contact assignment		1 - Power supply 2 - Command signal 3 - GND 4 - not used
Enclosure protection type according to EN 60529		IP65
Measured distance	mm (in)	8 (0.315)
Operating voltage	V	9.6 ... 30 DC
Linearity error	%	< 1
Current consumption at load current of 2 mA	mA	< 15
Output voltage	V	0 ... 5
Output signal range used:		
0 position	V	2.5
1 solenoid - stroke 2.8 mm (0.11 in)		0.75 ... 2.5
2 solenoids - stroke ± 2.8 mm (0.11 in)		0.75 ... 4.025
Max. load current	mA	2
Noise voltage		
- at load current 0	mV _{pp}	< 20
- at load current of 2 mA		< 15
Additional output signal error at:		
- temperature change between 0 ... 80°C (32... 176 °F)		typical 0.2% / 10K
- between 0 ... -25 °C (32 ... -13 °F)		max. 0.5 % / 10K
- Load change from 0 to 2 mA		max. 0.5 % / 10K 0.1 %
Input voltage change		
from 9.6 V to 14.4 V	%	< 0.1
from 14.4 V to 30 V		< 0.25
Long-term drift (30 days)	%	< 0.25
Cut-off frequency	Hz	> 600
3dB fall in amplitude		> 600
Frequency 90°		> 600

Technical Data of Position Sensor - Current Outlet

Linearity	%	< 1
Operating pressure	bar (PSI)	to 350 (5100), static
Electrical connection * only for S01 and S02 model		electrical connector G4W1F Hirschmann*
Contact assignment		1 - Power supply 2 - Command signal 3 - GND 4 - not used
Enclosure protection type according to EN 60529		IP65
Operating voltage	V	20 ... 30 DC
Current	mA	< 35
Output signal range	mA	4 ... 20
Output signal range used:		
0 position	mA	12
1 solenoid - stroke 2.8 mm (0.11 in)		4.4 ... 12
2 solenoids - stroke ± 2.8 mm (0.11 in)		4.4 ... 19.6
Additional output signal error:		
- at temperature change from +10 ... 55°C (50... 131°F)		0.2% / 10K
- at impedance change from 50%		≤ 0.1%
- at input voltage change in the range of operating voltage		≤ 0.05%
Impedance	Ω	≤ 500
Output signal ripple	mA R.M.S.	≤ 0.02
Limit frequency at 3 dB amplitude decrease	Hz	≥ 800

Technical Data of Proportional Solenoid

Type of coil	V	12 DC	24 DC
Limiting current	A	2.4	1.0
Resistance at 20 °C (68 °F)	Ω	2.3	13.4

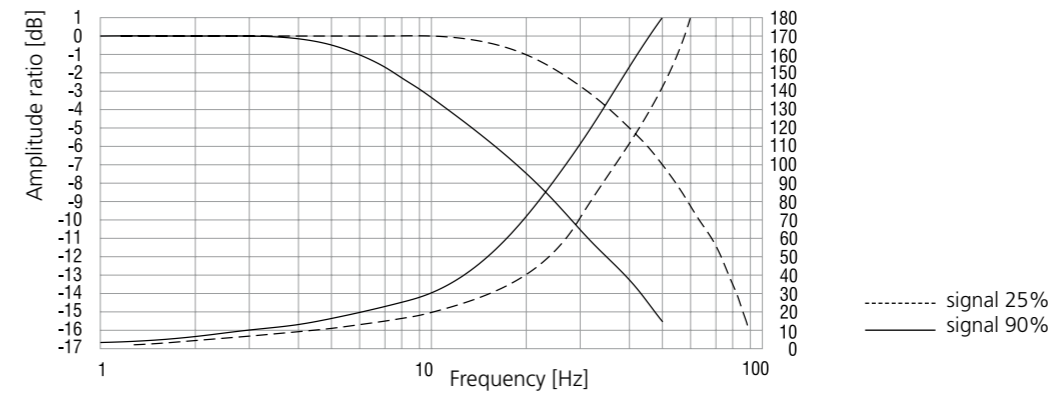
Electronics Data

Supply voltage with polarity inversion protection	V	11.2 ... 28 VDC (residual ripple < 10%)
Input: command signal / according to customer setting		±10 V, 0...10 V, ±10 mA, 4...20 mA, 0...20 mA, 12 mA±8 mA
Input: spool position sensor signal		0...5 V
Input: external feedback signal		0...10V, 4...20 mA, 0...20 mA
Resolution of the A/D converter		12 bit
Output: solenoids		two PWM output stages up to max. 3.5 A
PWM frequency	kHz	18
Adjustment of parameters	μS	170
EMC	Interference resistance	61000 - 6 - 2 : 2005
	Radiation resistance	55011 : 1998 class A
Parameter setting	Serial port RS 232 (zero modem). 19200 bauds, 8 data bits, 1 stop bit, no parity. Special software PRM7 Conf.	

Accessories

Order number	Content
23093400	Connecting cable to PC - length 2 m (6.56 ft), CD-ROM with program PRM7 Conf and user manual
23093500	Connecting cable to PC - length 5 m (16.40 ft), CD-ROM with program PRM7 Conf and user manual
24523400	Connecting cable to PC - length size 2 m (6.56 ft)
24523500	Connecting cable to PC - length size 5 m (6.56 ft)

Frequency Response closed position loop, for E02S01 model

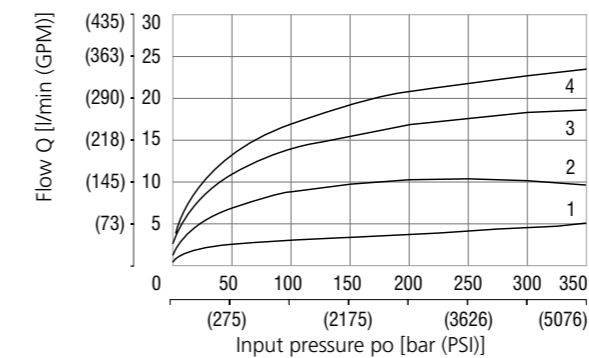


Characteristics measured at v = 32 mm³/s (156 SUS)

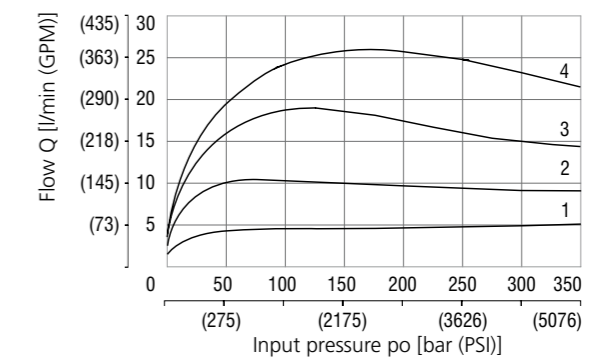
Operating limits: Flow direction P → A / B → T or P → B / A → T

Operating limits (E01 model only)

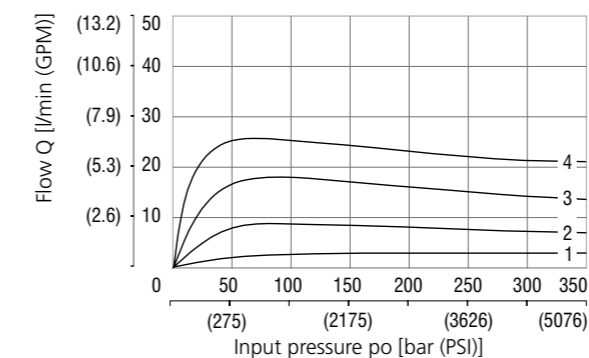
Nominal flow 5 l/min (1.3 GPM)



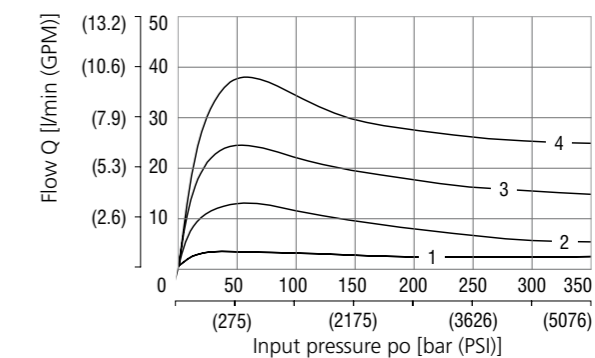
Nominal flow 8 l/min (2.1 GPM)



Nominal flow 15 l/min (4.0 GPM)



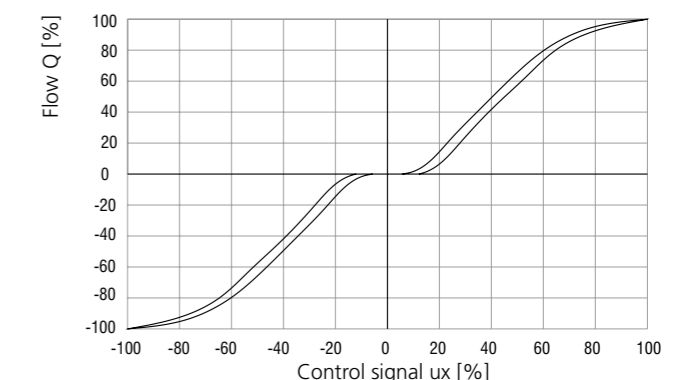
Nominal flow 30 l/min (7.9 GPM)



Solenoid current:
1 = 50 %
2 = 60 %
3 = 70 %
4 = 80 %
5 = 90 %
6 = 100 %

Regulated flow related to control signal

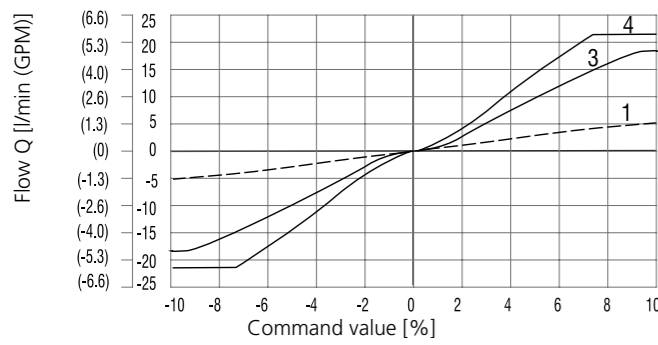
Flow characteristics (E01 model only) Δp=10 bar (145 PSI)



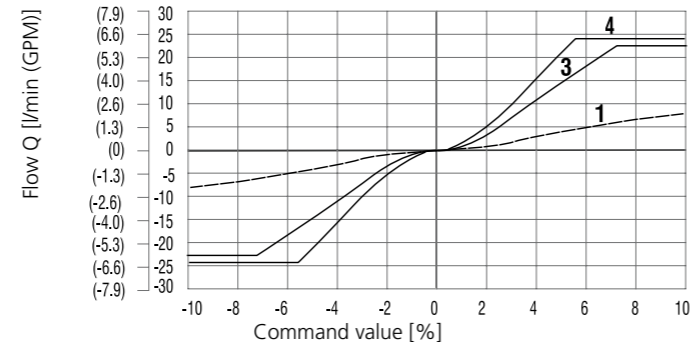
Flow Characteristics measured at $v = 32 \text{ mm}^2/\text{s}$ (156 SUS)

Flow characteristics (E02S01 model only)

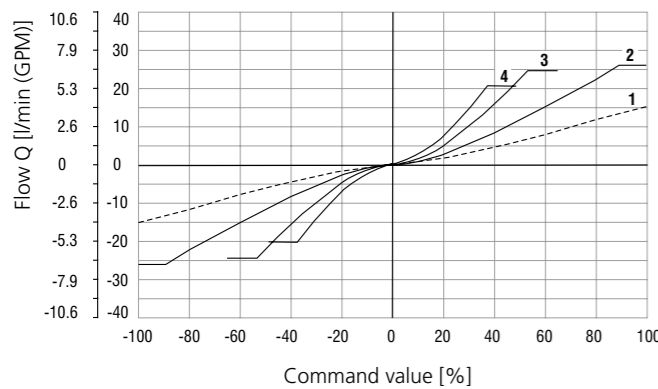
$Q_n = 5 \text{ l/min}$ (1.3 GPM) by $\Delta p = 10 \text{ bar}$ (145 PSI)



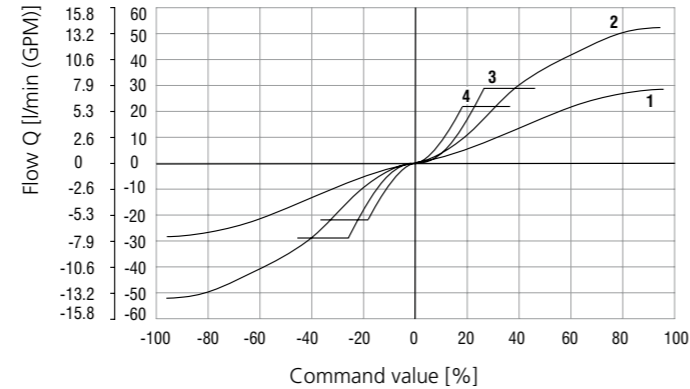
$Q_n = 8 \text{ l/min}$ (2.1 GPM) by $\Delta p = 10 \text{ bar}$ (145 PSI)



$Q_n = 15 \text{ l/min}$ (4.0 GPM) by $\Delta p = 10 \text{ bar}$ (145 PSI)



$Q_n = 30 \text{ l/min}$ (7.9 GPM) by $\Delta p = 10 \text{ bar}$ (145 PSI)



Δp = Valve pressure differential (inlet pressure p_v minus load pressure and return pressure p_r)
 Δp_n = Valve pressure differential for nominal flow Q_n

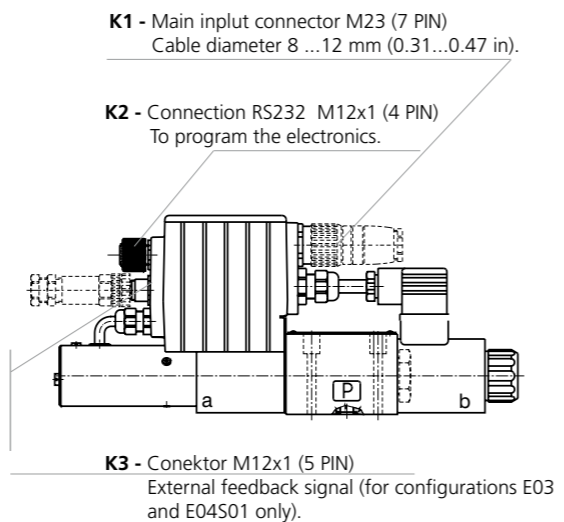
1	$\Delta p_n = 10 \text{ bar}$ (145 PSI)	3	$\Delta p = 160 \text{ bar}$ (2321 PSI)
2	$\Delta p = 50 \text{ bar}$ (725 PSI)	4	$\Delta p = 320 \text{ bar}$ (4641 PSI)

Factory Settings

Item	Model							
	E01		E02S01		E03		E04S01	
	1 Magnet	2 Magnets	1 Magnet	2 Magnets	1 Magnet	2 Magnets	1 Magnet	2 Magnets
Control signal	0 ... 10 V	$\pm 10 \text{ V}$	0 ... 10 V	$\pm 10 \text{ V}$	0 ... 10 V	$\pm 10 \text{ V}$	0 ... 10 V	$\pm 10 \text{ V}$
Signal external feedback	-	-	-	-	0 ... 10 V	-	-	-
Output position sensor spool	-	-	0 ... 5 V	-	-	-	0 ... 5 V	-

Connectors

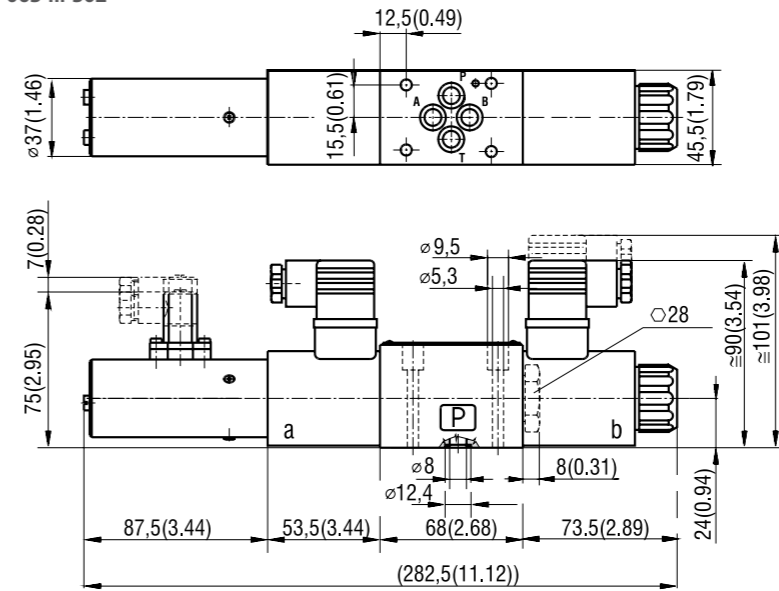
K1	Connector K1 - type M23 (male)	
	PIN	Technical data
	1	* Power supply input
	2	* Ground (power supply)
	3	Control signal
	4	Ground (signal)
	5	Power reference signal
	6	Control signal of position sensor spool
	7	* Protective earth lead (PE)
*Recommended min. lead cross section 0.75 mm ²		
K2	Connector K2 - type M12x1 (male)	
	PIN	Technical data
	1	TxD
	2	RxD
	3	Ground (signal)
	4	Not used
K3	Connector K3 - type M12x1 (female)	
	PIN	Technical data
	1	Power supply output
	2	Signal of external feedback
	3	Ground
	4	Not used
	5	Not used



Dimensions in millimeters (inches)

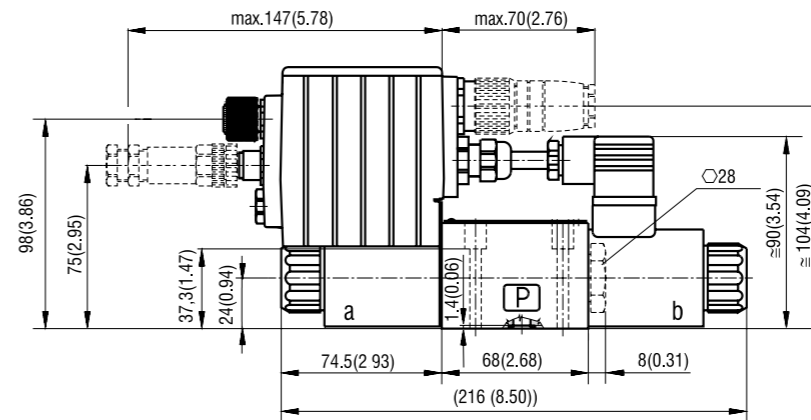
PRM7-063 ... S01

PRM7-063 ... S02



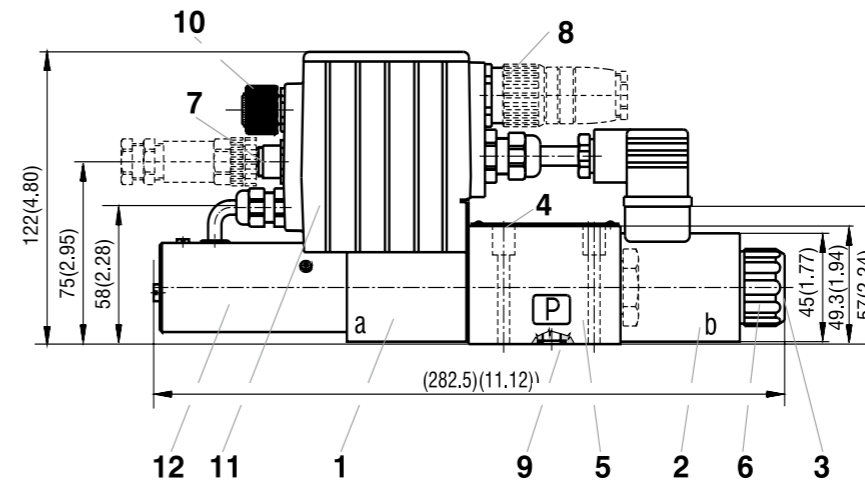
PRM7-063 ... E01 - without connector plug for spool position feedback

PRM7-063 ... E03



PRM7-063 ... E02S01 - without connector plug for spool position feedback

PRM7-063 ... E04S01

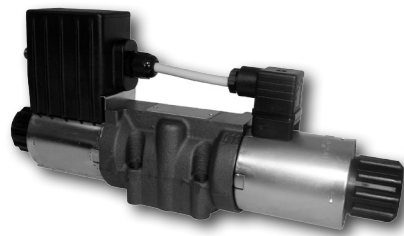


- 1 Solenoid a
- 2 Solenoid b
- 3 Manual override
- 4 Name plate
- 5 4 mounting holes
- 6 Solenoid fixing nut
- 7 Connector M12x1 for connection of external feedback
- 8 Main supply connector M23
- 9 Square ring 7.65 x 1.68 (4 pcs.), supplied in delivery packet
- 10 Cover of connector M12x1 for programming
- 11 Plastic box with integrated electronics
- 12 Position sensor

Proportional Directional Control Valve, with Analog Control Electronics

PRM6-10

Size 10 (D05) • Q_{max} 80 l/min (21 GPM) • p_{max} 350 bar (5100 PSI)



Technical Features

- Direct acting, proportional control valve without or with integrated analog electronic (OBE) with subplate mounting surface acc. to ISO 4401, DIN 24340 (CETOP 05) standards
- Used for directional and speed control of hydraulic actuators
- The valve opening and resulting flow rate can be modulated continuously in proportion to the reference signal
- The valve can be controlled directly by a current control supply unit or by means of the electronic control units to exploit valve performance to the fullest
- Analog converter card allows fine control of the valve spool position, reducing hysteresis and response time and optimizing the valve performance
- Five chambers housing design with reduced hydraulic power dependence on fluid viscosity
- For versions without OBE a wide range of solenoid electrical terminal versions available
- Wide range of interchangeable spools and manual overrides available
- The coil is fastened to the core tube with a retaining nut and can be rotated by 360° to suit the available space
- In the standard version, the valve housing is phosphated and steel parts are zinc-coated for 240 h salt spray protection acc. to ISO 9227
- Enhanced surface protection for mobile sector available (ISO 9227, 520 h salt spray)

Functional Description

PRM6-10* Versions without on board electronics

The valve can be controlled directly by a current control supply unit or by the external electronic card directly mounted to the electrical terminal (see catalog of EL3E card 9145 and EL6 card 9150). This control card, depending on the number of the controlled solenoids, can be mounted onto either solenoid.

PRM6-10*EK Versions with on board electronics

A control box, which comprises one or two electronic control cards, depending on the number of controlled solenoids, can be mounted onto either solenoid. For models with two solenoids, the solenoid mounted opposite the control box is connected to the box by a DIN connector, a two-lead cable and a bushing.

The connection of the control box with the supply source and with the control signal is implemented by a 4-pin connector of type M12x1. The electric control unit supplies the solenoid with current, which varies with the control signal.

The electronic control unit provides the following adjustment possibilities:

Offset, gain, rise and drop-out time of the ramp generator, frequency (2 frequencies) and amplitude of the dither signal generator.

The correct function of the control unit is signaled by LEDs.

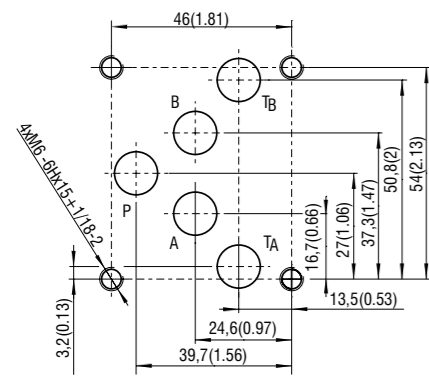
Stabilized voltage +10 V (+5 V for 12 V voltage) is also available to the user.

Using this voltage and a potentiometer $\geq 1k\Omega$ a voltage control signal can be generated.

The electronic control card enables voltage or current control to be used, depending on the position of the switches SW1 to SW3.

Technical Data

ISO 4401-05-04-0-05



Ports P, A, B, T - max. $\varnothing 11.2$ mm (0.44 in)

Valve Size	10 (D05)	
Maximal flow at pressure 320 bar (4640 PSI)	l/min (GPM)	80 (21)
Max. operating pressure at ports P, A, B	bar (PSI)	350 (5080)
Maximum operating pressure at port T	bar (PSI)	210 (3050)
Fluid temperature range (NBR)	°C (°F)	-30 ... +80 (-22 ... +176)
Fluid temperature range (FPM)	°C (°F)	-20 ... +80 (-4 ... +176)
Ambient temperature max.	°C (°F)	-30 ... +50 (-22 ... +122)
Nominal flow rate Q _n at $\Delta p=10$ bar (145 PSI)	l/min (GPM)	30 (7.9) / 60 (15.9) / 80 (21.13)
Hysteresis	%	< 6
Mass - valve with 1 solenoid	kg (lbs)	4.3 (9.48)
- valve with 2 solenoids		5.8 (12.78)
Protection degree (for version PRM*EK)		IP65
Technical Data of the Proportional Solenoid		
Nominal supply voltage	V	12 DC 24 DC
Limit current	A	1.9 1.1
Mean resistance value at 20 °C (68 °F)	Ω	4.7 13.9
Technical Data of the Electronics		
Supply voltage range	V DC	U _{cc} 12V DC U _{cc} 24V DC
Stabilized voltage for control	V DC	5 (R > 1k Ω) 5 (R \geq 1k Ω)
Maximum output current	A	2.4 (R < 4 Ω) 1.5 (R < 10 Ω)
Ramp adjustment range	s	0.05...3
Dither frequency	Hz	90 / 60
Dither amplitude	%	0...30
	Data Sheet	Type
General information	GI_0060	Products and operating conditions
Coil types / Connectors	C_8007 / K_8008	C31* / K*
Mounting interface	SMT_0019	Size 10
Spare parts	SP_8010	
Subplates	SP_0002	DP*-10

Ordering Code

PRM6-10 / - - - - -

Proportional directional control valve

Valve size

Spool symbols
see table „Spool Symbols“

Nominal flow rate at $\Delta p = 10$ bar (145 PSI)

30 l/min (7.9 GPM)	30
60 l/min (15.85 GPM)	60
80 l/min (21 GPM)	80

Rated supply voltage of solenoids (at the coil terminal)

12 V DC	12
24 V DC	24

Electronics on board / Position at solenoid
connection by connector M12 x 1 (4-pin connector, supplied with counterpart)

on board electronics (solenoid „a“)

on board electronics (solenoid „b“)*

Surface treatment

No designation	standard
A	zinc-coated (ZnCr-3), ISO 9227 (240 h)
B	zinc-coated (ZnNi), ISO 9227 (520 h)

Seals

No designation	NBR
V	FPM (Viton)

Manual Override

No designation	standard
N1	protected with retaining nut
N2	protected with rubber boot

Connector
only for version without on board electronic „EK“

E1	EN 175301-803-A
E2	E1 with quenching diode
E3	AMP Junior Timer - radial directions (2 pins; male)
E4	E3 with quenching diode
E8	loose conductors (two insulated wires)
E9	E8 with quenching diode
E12A	deutsch DT04-2P - axial direction
E13A	E12A with quenching diode

*For valve versions with one solenoid the designation „B“ with OBE is not shown.

- Valves without integrated control electronics with E1, E2 coils (with connector according to EN 175301-803, form A) are delivered in the standard version with connector sockets.

- For proportional valves with two solenoids, one solenoid must be de-energized before the other solenoid can be charged.

- Mounting bolts M6 x 40 DIN 912-10.9 or studs must be ordered separately. Tightening torque is 14 Nm (10.3 lbf.ft).

- Besides the shown, commonly used valve versions other special models are available.

- Contact our technical support for their identification, feasibility and operating limits.

Spool Symbols

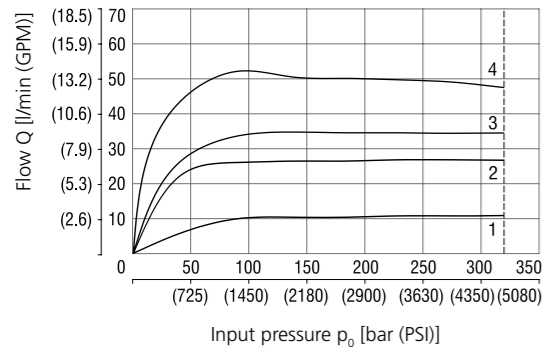
Type	Symbol	Type	Symbol
2Z51		3Z11	
2Z11		3Z12	$\frac{q_A}{q_B} = \frac{1}{2}$
2Y51		3Y11	
2Y11		3Y12	$\frac{q_A}{q_B} = \frac{1}{2}$

*Model for cylinders with asymmetric piston area ratio 1:2

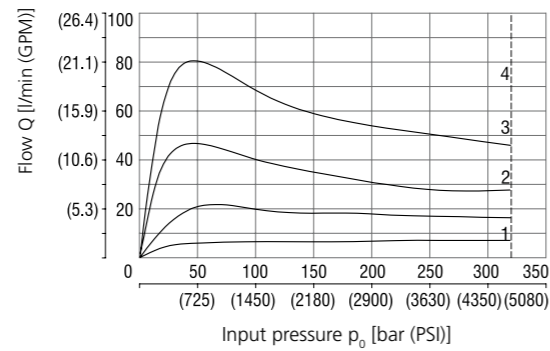
Characteristics measured at $v = 32 \text{ mm}^2/\text{s}$ (156 SUS)

Operating limits: Flow direction P → A / B → T or P → B / A → T

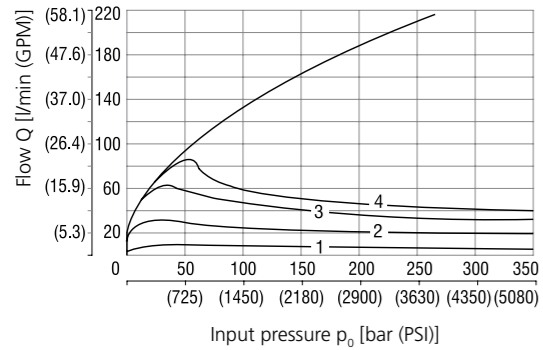
Nominal flow 30 l/min (7.95 GPM)



Nominal flow 60 l/min (15.85 GPM)

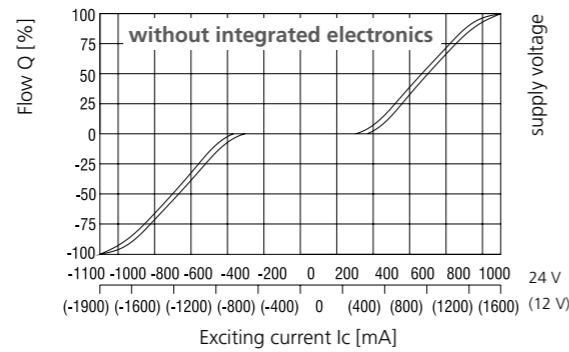
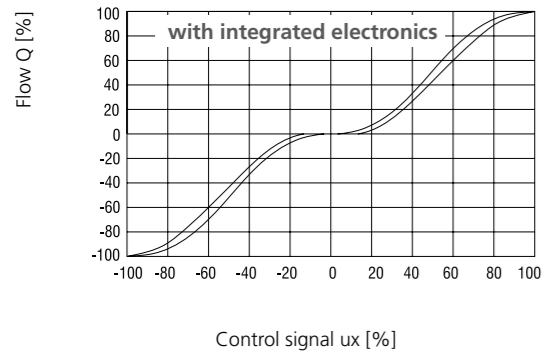


Nominal flow 80 l/min (21.13 GPM)



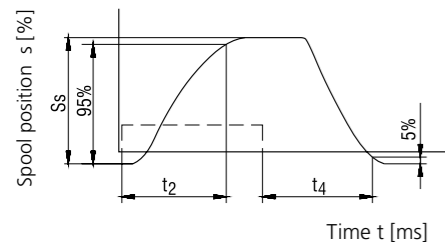
Solenoid current:
1 = 40 %
2 = 60 %
3 = 80 %
4 = 100 %

Regulated flow related to control signal $\Delta p = 10 \text{ bar}$ (145 PSI)



The coil current which initializes the flow through the proportional directional valve can differ due to the production tolerances about in a range of $\pm 6\%$ of the limit current.

Transient Characteristic measured at $v = 32 \text{ mm}^2/\text{s}$ (156 SUS), $\Delta p = 10 \text{ bar}$ (145 PSI)

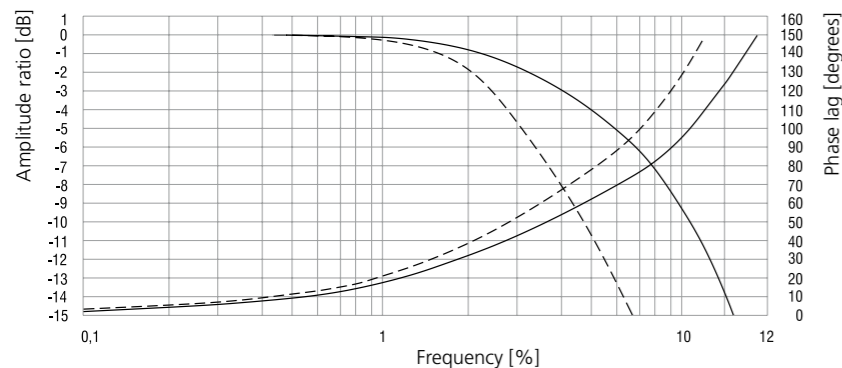


Steady Spool Position S_s [%]	t_2 [ms]	t_4 [ms]
100	85	100
75	70	85
50	55	75
25	45	55

The values in table have only an informative character. The times of the transient characteristics at pressure or flow control will be in a particular hydraulic circuit always longer.

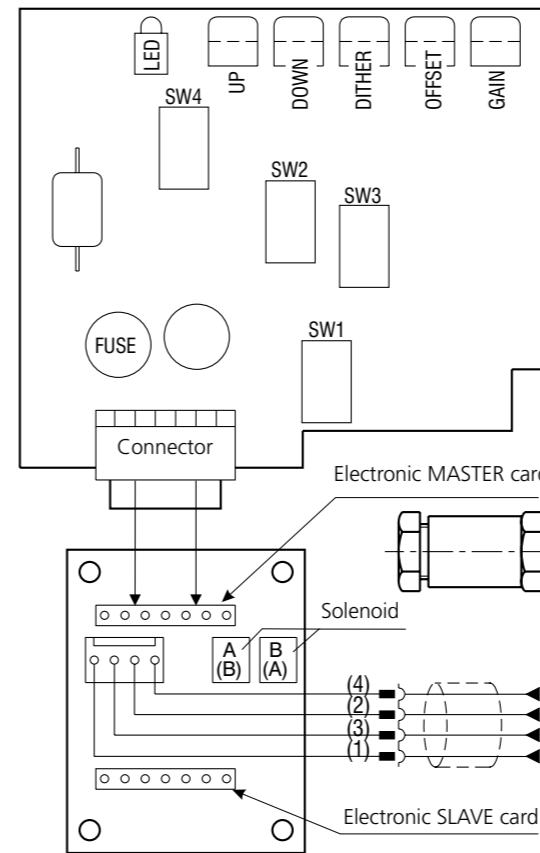
---- the control signal course of the integrated electronics

Frequency Response



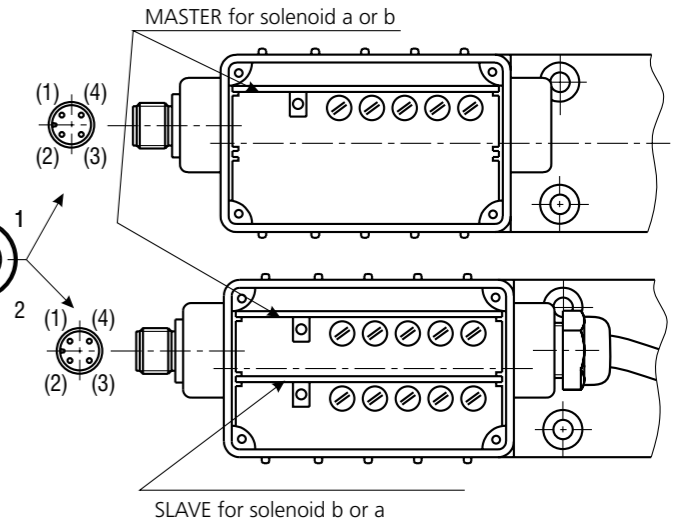
----- signal 90 %
----- signal 25 %

Component Arrangement on the Electronic Card



PIN	Description	Wire Colors	Connection Connector - Electronics
1	+24 V (Ucc) (+12 V)	(1)	brown
2	control	(2)	white
3	0 V	(3)	blue
4	+10 V (+5 V)	(4)	black

SW1 - control signal choice
SW2 - control signal choice
SW3 - control signal choice
SW4 - dither frequency



Attention: The control signal must have the same ground potential as the supply source.

Table of the Switch Configuration for the Control Signal Choices

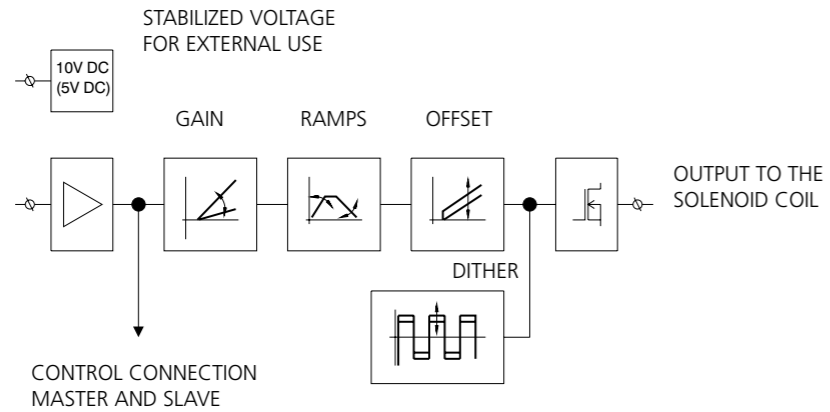
		PRM2-062				PRM2-063	
		0 ... 5 V	0 ... 10 V (0...5 V)*	0 ... 20 mA	4 ... 20 mA	$U_{cc}/2 \pm 10 \text{ V} (\pm 5 \text{ V})^*$	$\pm 10 \text{ V} (\pm 5 \text{ V})^*$
MASTER M	SW1						
	SW2						
	SW3						
	SW4	90 Hz			60 Hz		
SLAVE S	SW1						
	SW2						
	SW3						
	SW4					90 Hz	60 Hz

Designation of the basic manufacture setting.

The ramp functions are adjusted on their minimum values, the dither is set to the optimal value with respect to hysteresis. Offset and gain are adjusted according to the characteristic on page 3 and 4. The manufacturer does not recommend to change these adjusted values.

* Input signal level for the 12 V electronic unit.

Block Diagram

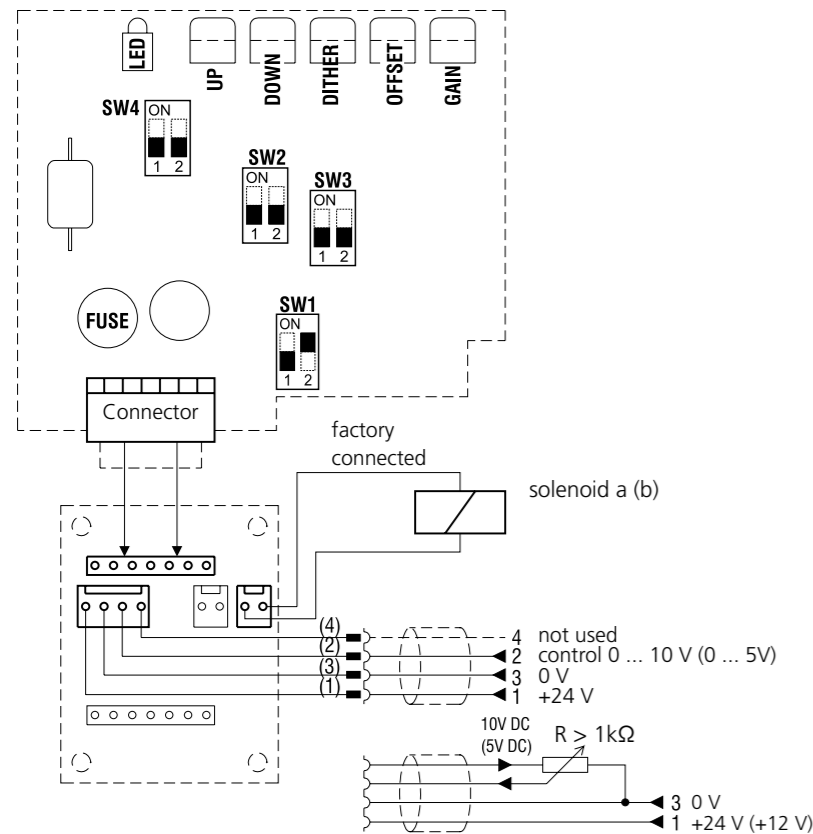


Setting of Control Electronics

Valve PRM2-102*EK (with one solenoid)

Control with external voltage source 0...10 V, 0 ... 5 V (factory setting) or with external potentiometer R>1 kΩ

Master card for solenoid a (b)

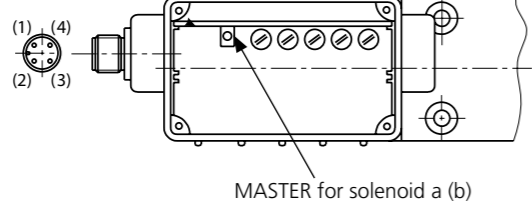
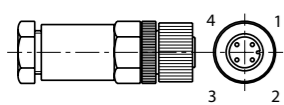


Factory set values:

- Control signal: 0 - 10 V (0 - 5 V)
- Dither: frequency 90 Hz
amplitude - optimum
- Ramps: 0.05 s
- Offset, gain: according to the characteristics on page 3



The control signal must have the same ground potential as the supply source.



Wire colors (connection connector - electronics)

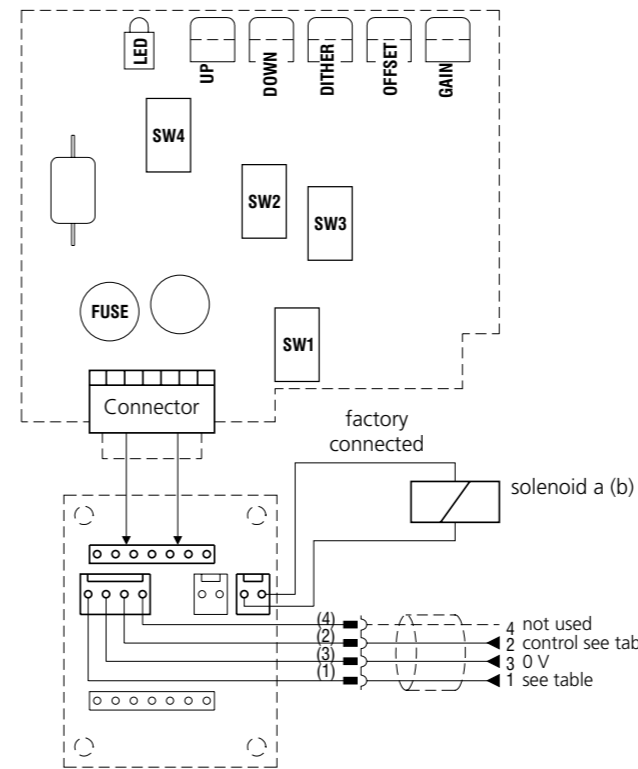
- (1) - brown
- (2) - white
- (3) - blue
- (4) - black

Setting of Control Electronics

Valve PRM2-102*EK (with one solenoid)

Control with external source 0 ... 5 V, 0 ... 20 mA, 4 ... 20 mA

Master card for solenoid a (b)



Control with external source			
	0 ...5 V	0 ...20 mA	4 ...20 mA
SW1			
SW2			
SW3			
SW4			
PIN 1 (1)	+24 V	+24 V (+12 V)	+24 V (+12 V)
PIN 2 (2)	0 ...5 V	0 ...20 mA	4 ...20 mA

Follow the subsequent steps to modify the factory settings:

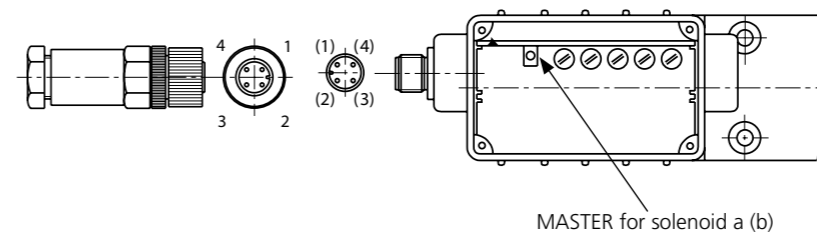
1. Unscrew the electronics cover
2. Carefully remove the master card
3. Flip the switch SW1 (2 or 3) in position shown in the table
4. Put in the master card and fix the electronics cover
5. Connect the voltage +24 V (+12 V) from an external supply source to terminals 1 and 3 of the connector
6. Bring the control voltage (current) from an external source to terminals 2 and 3 of the connector



The control signal must have the same ground potential as the supply source.



Designation of the basic factory setting.
The ramp functions are adjusted on their minimum values.
The dither is set to the optimal value with respect to hysteresis.
Offset and gain are adjusted according to the characteristic on page 3.
The manufacturer does not recommend to change these adjusted values.

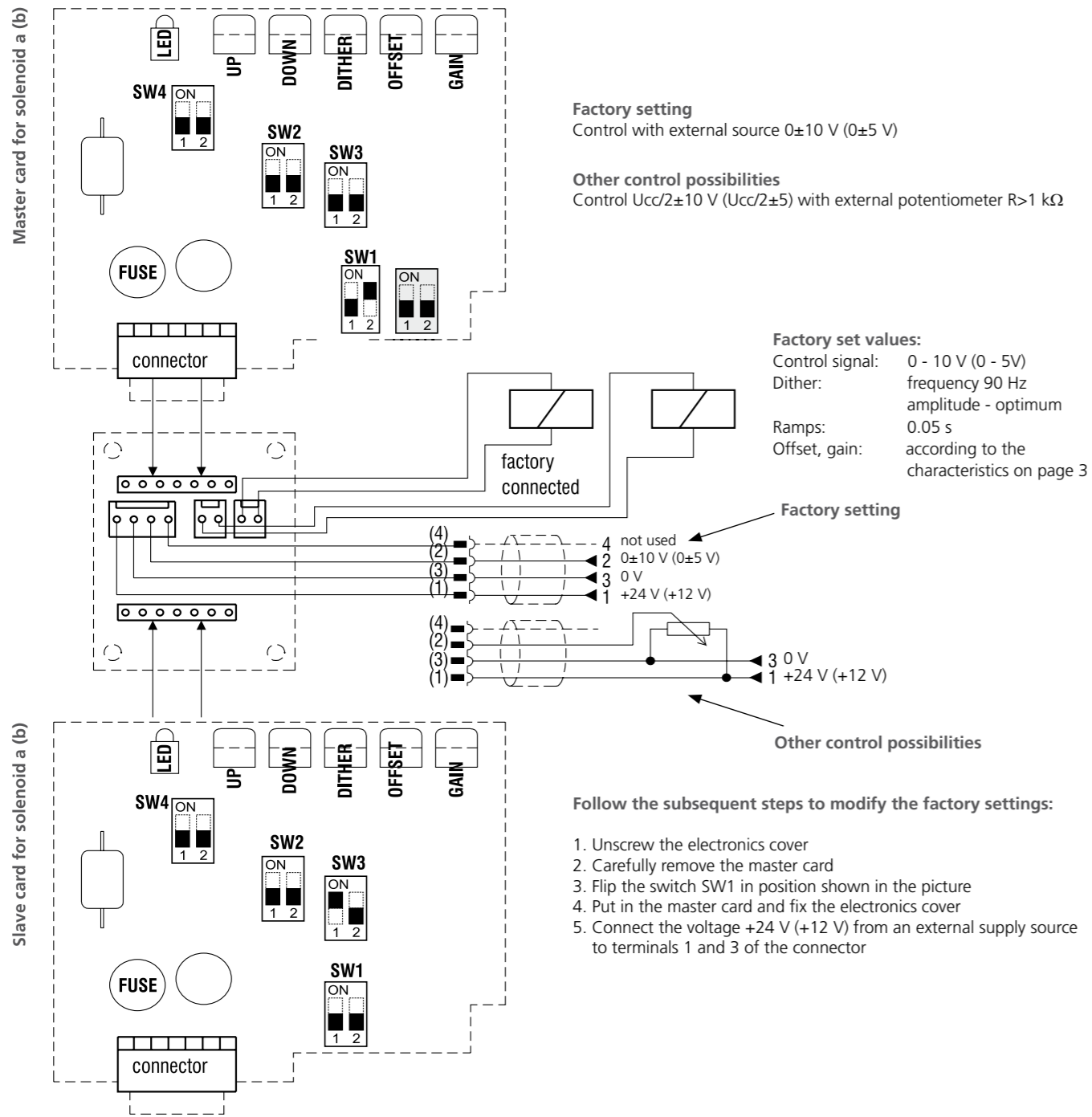


Wire colors (connection connector - electronics)

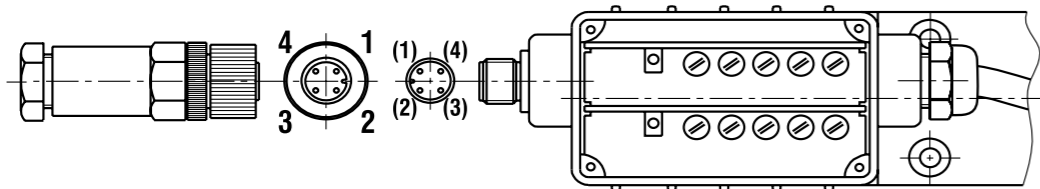
- (1) - brown
- (2) - white
- (3) - blue
- (4) - black

Setting of Control Electronics

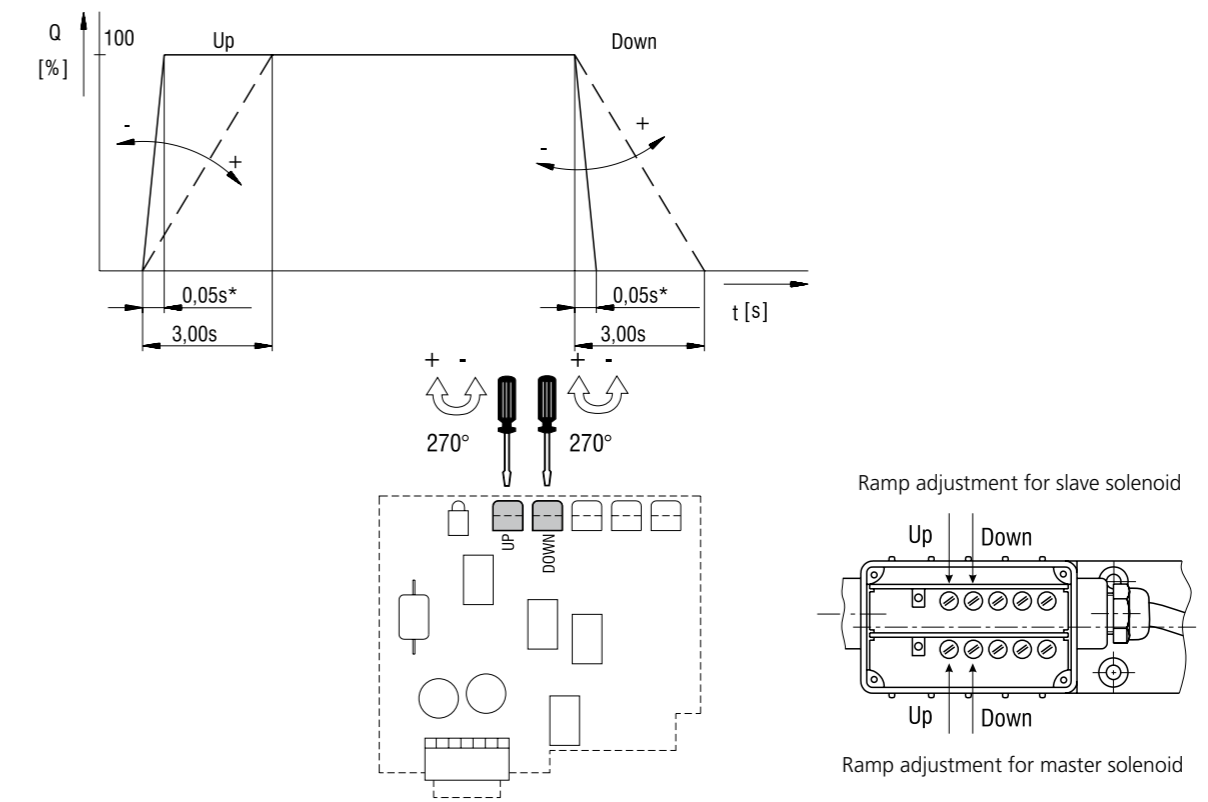
Valve PRM2-103*EK (with two solenoids), factory setting, other control possibilities



The control signal must have the same ground potential as the supply source.



Ramp Adjustment (Up, Down)



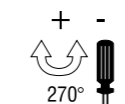
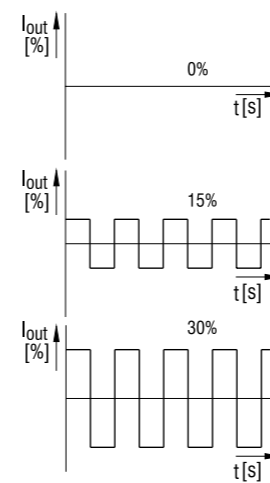
* The value has only an informative character with respect to the particular type of the proportional directional valve (see page 3).



The factory setting of the ramp is at the minimum value.

Dither Adjustment

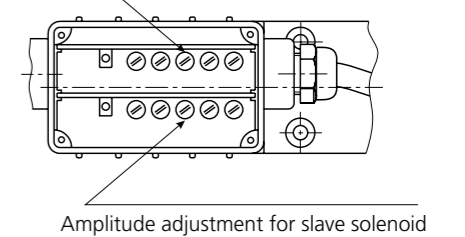
Amplitude - potentiometer (dither) (0 - 30 %)



Frequency - switch SW4

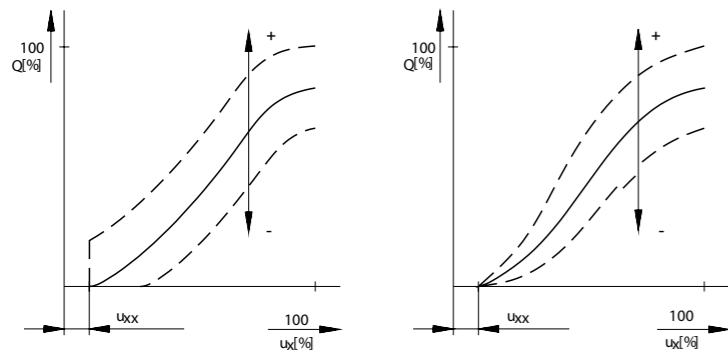


Amplitude adjustment for master solenoid



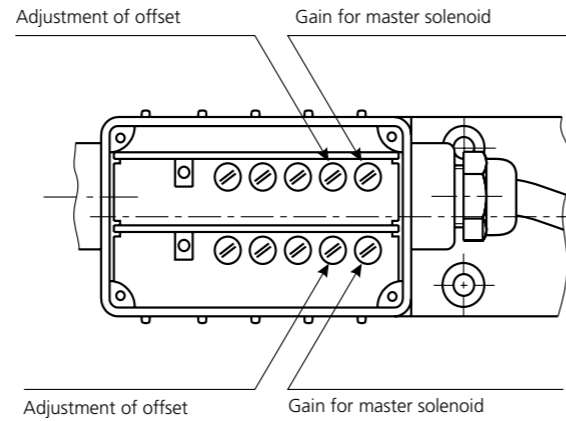
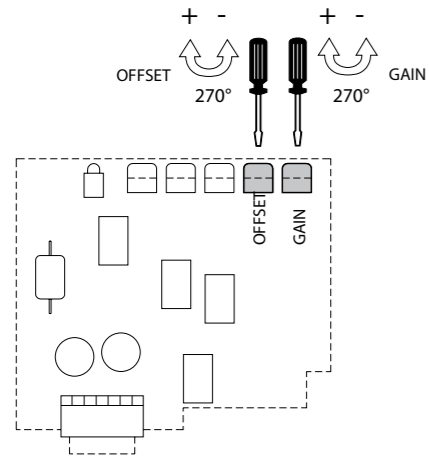
The dither is adjusted to minimize hysteresis.

Offset, Gain Parameters Adjustment



i The factory setting of the offset and gain parameters is specific for the solenoids used. The manufacturer does not recommend to change these settings.

Nominal Electronics Supply Voltage (V)	Area Insensitive to Control Signal u _{xx} (%)
12	1 ... 3
24	0.5 ... 2



Solenoid Coil in millimeters (inches)

E1, E2 Protection Degree IP65	E3A, E4A Protection Degree IP67	E8, E9 Protection Degree IP65	E12A, E13A Protection Degree IP67 / 69K

The indicated IP protection level is only achieved if the connector is properly mounted.

Manual Override in millimeters (inches)

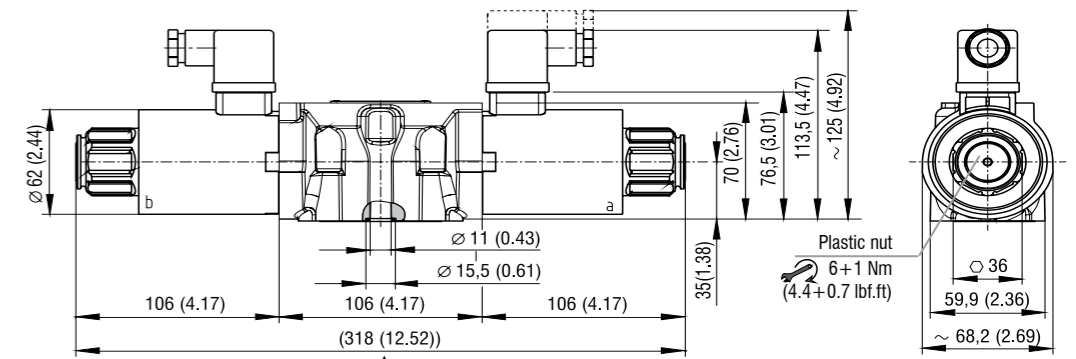
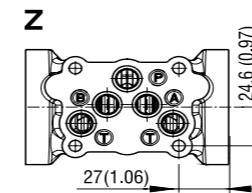
No Designation - Standard	Designation N1 - Cap Nut Covered	Designation N2 - Rubber Boot Protected

In case of solenoid malfunction or power failure, the spool of the valve can be shifted by manual override as long as the pressure in port T does not exceed 25 bar (363 PSI). For alternative manual overrides contact our technical support.

Dimensions in millimeters (inches)

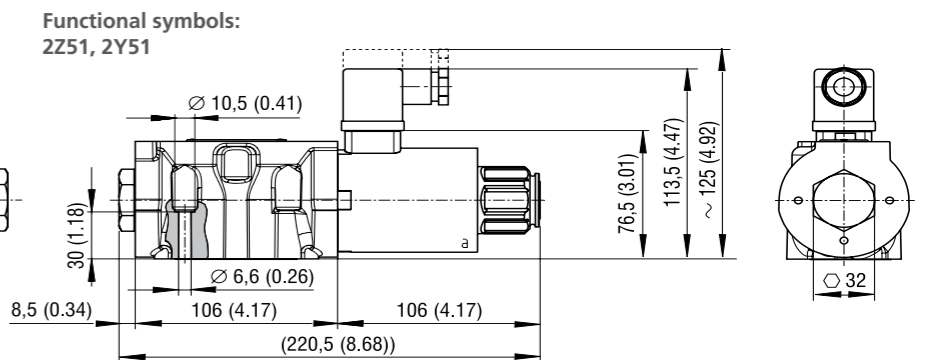
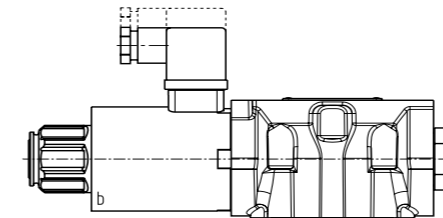
PRM6-103x/x-xxx-x

Functional symbols:
3Z11, 3Z12, 3Y11, 3Y12



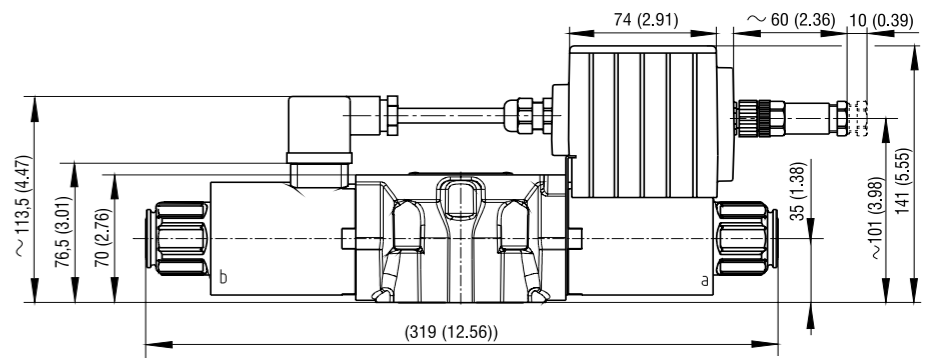
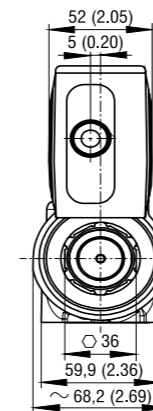
PRM6-102x/x-xxx-x

Functional symbols:
2Z11, 2Y11



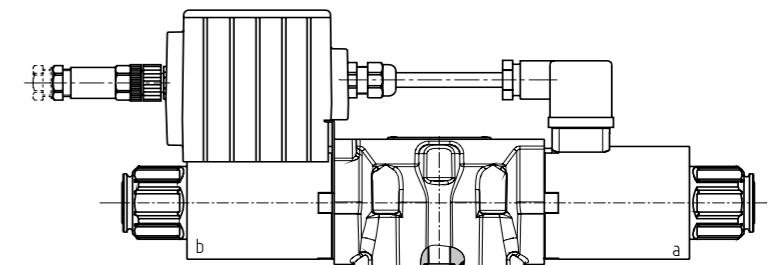
PRM6-103x/x-xxEKx-x

Functional symbols:
3Z11, 3Z12, 3Y11, 3Y12



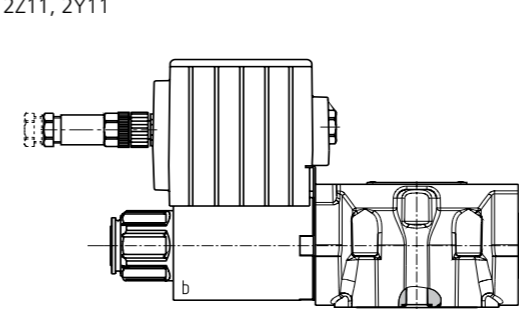
PRM6-103xB/x-xxEKx-x

Functional symbols:
3Z11B, 3Z12B, 3Y11B, 3Y12B

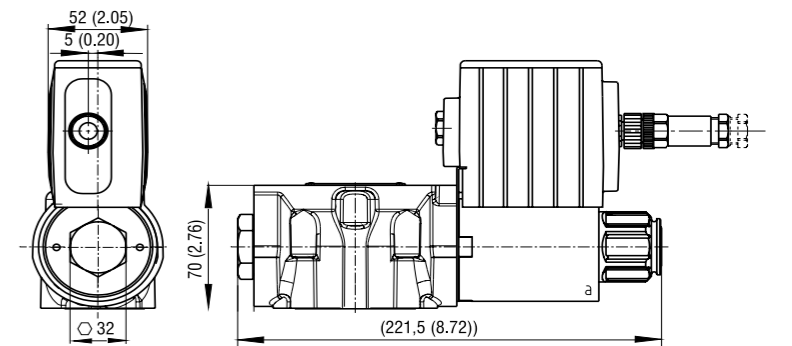


PRM6-102x/x-xxEKx-x

Functional symbols:
2Z11, 2Y11



Functional symbols: 2Z51, 2Y51

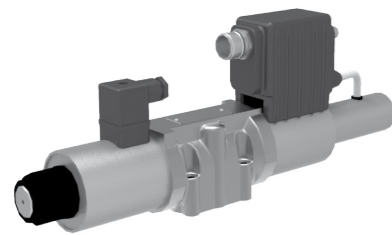


Proportional Directional Control Valve, With Digital Control Electronics, Feedback and OBE

PRM7-10

Size 10 (D05) • Q_{max} 80 l/min (21 GPM) • p_{max} 350 bar (5100 PSI)

Technical Features



- Direct acting proportional control valve with integrated digital electronic (OBE) proportional control, spool and process feedback
- Control valve with subplate mounting surface acc. to ISO 4401, DIN 24340 (CETOP 05) standards
- Valve opening and resulting flow rate can be modulated continuously in proportion to the reference signal
- Digital converter card allows fine control of the valve spool position, reducing hysteresis and response time and optimizing the performance of the valve
- Various models with or without onboard digital converter card or position sensor feedback available
- Used for directional and speed control of hydraulic actuators
- Wide range of interchangeable spools available
- For versions without OBE, a wide range of solenoid electrical terminal versions available
- The driver directly manages the digital settings. It's possible to customize the settings for special applications using an optional kit.
- In the standard version, the valve housing is phosphated and steel parts zinc-coated for 240 h protection acc. to ISO 9227
- Enhanced surface protection for mobile sector available (ISO 9227, 520 h salt spray)

Functional Description

The proportional directional valve PRM7 consists of a cast iron housing, a special control spool, two centering springs with supporting washers, one or two proportional solenoids, a position sensor or, if desired, of a control box with digital electronics. The measurement system of the position sensor consists of a differential transformer with sensor core and its electronic evaluation unit.

Models without integrated electronic unit OBE

The electrical connection of the solenoids is realized by a variety of connectors. The position sensor output is connected by the G4W1F connector plug. Both connectors are supplied.

In this case the proportional valve can be used as follows:

S01, S02 with the internal feedback from the spool position sensor.

Models with integrated electronic unit OBE

The model comprises an electronic control box that is mounted together with the position sensor on either of the solenoids. The connection of the position sensor to the control box is provided by a cable. For models with two solenoids, the solenoid mounted opposite the control box is connected to the control box by a EN 175301-803 connector.

The connection of the supply voltage, control signal, program input and external output of the position sensor is implemented in a 5-pin connector (ELKA 5012). The connection of the external feedback is provided by a 5-pin connector, which also has three supply voltages +24 V, +10 V and -5 V for an external sensor available.

The solenoid coils, including the control box, can be turned in the range of ± 90°. The digital control unit enables the proportional valve to be controlled on the basis of data required from two feedback circuits. In this case the proportional valve can be used as follows:

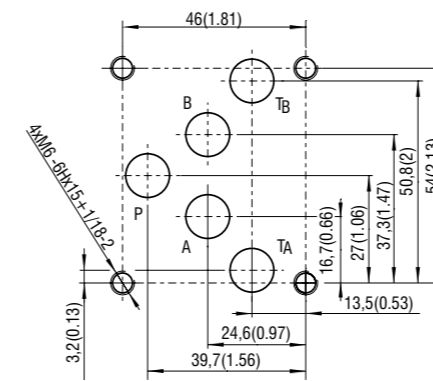
- E01** Proportional directional valve
- E02*S01** Only with the internal feedback from the spool position sensor.
- E03** Only with the external feedback (pressure sensor, position sensor, etc.).
- E04*S01** With internal and external feedback.

The digital control unit utilizes pulse-width-modulation (PWM) and supplies the solenoids with current proportional to the control signal. The supply current is additionally modulated with a dither frequency. Individual functional parameters are adjusted through software by a special programmer, or by computer through the RS 232 interface. The cable kit must be ordered separately, as detailed on page 4. The correct function of the digital control unit is signaled by a green LED. The incorrect function (failure) is indicated by a red LED. As a standard, the proportional valve is delivered with factory setting.

For a model including an external feedback contact the manufacturer.

Technical Data

ISO 4401-05-04-0-05



Ports P, A, B, T - max Ø11.2 mm (0.44 in)

Valve size	10 (D05)	
Max. operating pressure at ports P, A, B	bar (PSI)	350 (5100)
Max. operating pressure at port T	bar (PSI)	210 (3046)
Fluid temperature range (NBR)	°C (°F)	-30 ... +80 (-22 ... +176)
Fluid temperature range (FPM)	°C (°F)	-20 ... +80 (-4 ... +176)
Ambient temperature max.	°C (°F)	-30 ... +50 (-22... +122)
Nominal flow rate Q _n at Δp=10 bar (145 PSI)	l/min (GPM)	30 (7.9) / 60 (15.9) / 80 (21.1)
Hysteresis	%	< 6
Hysteresis - closed position loop	%	< 0.5
Protection degree EN 60529	IP65	
Mass	kg (lbs)	4.4 (9.70) 5.9 (13.01)
	Data Sheet	Type
General information	GI_0060	Products and operating conditions
Coil types / Connectors	C_8007 / K_8008	
Mounting surface	SMT_0019	Size 10
Spare parts	SP_8010	
Subplates	SP_0002	DP*-10

Ordering Code

PRM7-10 / [] - [] [] [] [] - []

Proportional directional control valve, with digital control electronics, feedback and OBE

Valve size

Spool symbols see the table „Spool Symbols“

Nominal flow rate at Δp = 10 bar (145 PSI)

flow 30 l/min (7.9 GPM)	30
flow 60 l/min (15.6 GPM)	60
flow 80 l/min (21.1 GPM)	80

Nominal solenoid supply voltage

12V DC	12
24V DC	24

Surface treatment

No designation	Standard
A	240 h salt spray test (ISO 9227)
B	520 h salt spray test (ISO 9227)

Seals

No designation	NBR
V	FPM (Viton)

Installation side of OBE and position transducer

No designation	OBE with spool position transducer at side of port A
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Model

S01	position sensor with voltage outlet
S02	position sensor with current outlet
E01	proportional directional valve without feedback
E02S01	proportional directional valve with position feedback
E03	proportional directional valve with external feedback
E04S01	proportional directional valve with position and external feedback

- For proportional valves with two solenoids, one solenoid must be de-energized before the other solenoid can be charged.
- Mounting bolts M6 x 40 DIN 912-10.9 or studs must be ordered separately. Tightening torque is 14 Nm (10.3 ft-lbs).
- Besides the shown, commonly used valve versions other special models are available.
- Contact our technical support for their identification, feasibility and operating limits.

Spool Symbols

Type	Symbol	Type	Symbol
2Z51		3Z11	
2Z11		3Z12	
2Y51		3Y11	
2Y11		3Y12	

*Model for cylinders with asymmetric piston area ratio 1:2

Technical Data of Position Sensor - Voltage Outlet

Operating pressure	bar (PSI)	to 350 (5080), static
Electrical connection		electrical connector G4W1F Hirschmann
Contact assignment		1 - Power supply 2 - Command signal 3 - GND 4 - not used
Enclosure protection type according to EN 60529		IP65
Measured distance	mm (in)	8 (0.315)
Operating voltage	V	9.6 ... 30 DC
Linearity error	%	< 1
Current consumption at load current of 2 mA	mA	< 15
Output voltage	V	0 ... 5
Output signal range used:		
0 position	V	2.5
1 solenoid - stroke 1.8 mm (0.07 in)		0.125 ... 2.5
2 solenoids - stroke ±1.8 mm (0.07 in)		0.125 ... 4.875
Max. load current	mA	2
Noise voltage		
- at load current 0	mV _{p-p}	< 20
- at load current of 2 mA		< 15
Additional output signal error at:		
- temperature change between 0 ... 80° C (32... 176 °F)		typical 0.2% / 10K
- between 0... -25 °C (32 ... -13 °F)		max. 0.5 % / 10K
- Load change from 0 to 2 mA		max. 0.5 % / 10K
Input voltage change		
from 9.6 V to 14.4 V	%	< 0.1
from 14.4 V to 30 V		< 0.25
Long-term drift (30 days)	%	< 0.25
Cut-off frequency		
3dB fall in amplitude	Hz	> 600
Frequency 90°		> 600

Technical Data of Position Sensor - Current Outlet

Linearity	%	< 1
Operating pressure	bar (PSI)	to 350 (5076), static
Electrical connection * only for S01 and S02 model.		electrical connector G4W1F Hirschmann*
Contact assignment		1 - Power supply 2 - Command signal 3 - GND 4 - not used
Enclosure protection type according to EN 60529		IP65
Operating voltage	V	20 ... 30 DC
Current	mA	< 35
Output signal range	mA	4 ... 20
Output signal range used:		
0 position	mA	12
1 solenoid - stroke 1.8 mm (0.07 in)		4.4 ... 12
2 solenoids - stroke ±1.8 mm (0.07 in)		4.4 ... 19.6
Additional output signal error:		
- at temperature change from +10... 55° C (50... 131° F)		0.2% / 10K
- at impedance change beyond 50%		≤ 0.1%
- at input voltage change in the range of operating voltage		≤ 0.05%
Impedance	Ω	≤ 500
Output signal ripple	mA R.M.S.	≤ 0.02
Limit frequency at 3 dB amplitude decrease	Hz	≥ 800

Technical Data of Proportional Solenoid

Type of coil	V	12 DC	24 DC
Limiting current	A	1.9	1.1
Resistance at 20° C (68 °F)	Ω	4.7	13.9

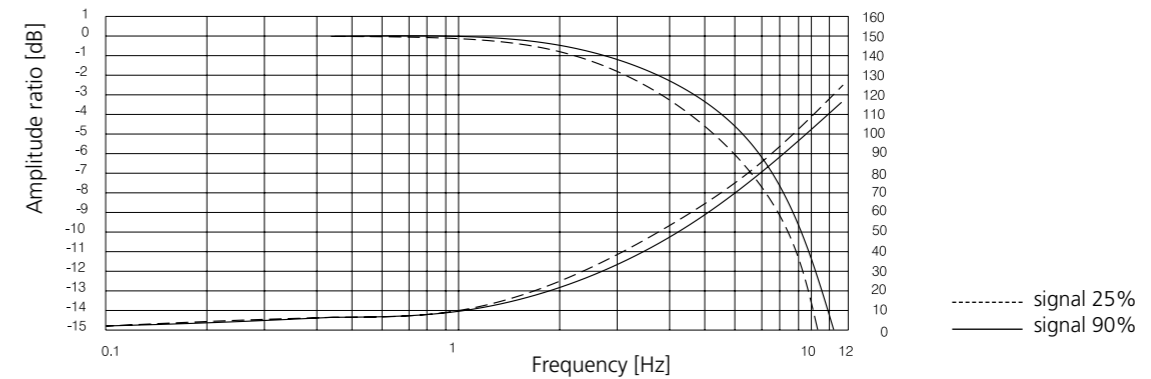
Electronics Data

Supply voltage with polarity inversion protection	V	11.2 ... 28 VDC (residual ripple < 10%)
Input: command signal / according to customer setting		±10 V, 0...10 V, ±10 mA, 4...20 mA, 0...20 mA, 12 mA±8 mA
Input: spool position sensor signal		0...5 V
Input: external feedback signal		0...10 V, 4...20 mA, 0...20 mA
Resolution of the A/D converter		12 bit
Output: solenoids		two PWM output stages up to max. 3.5 A
PWM frequency	kHz	18
Adjustment of parameters	μs	170
EMC		
Interference resistance		61000 - 6 - 2 : 2005
Radiation resistance		55011 : 1998 class A
Parameter setting		Serial port RS 232 (zero modem). 19200 bauds, 8 data bits, 1 stop bit, no parity. Special software PRM7 Conf.

Accessories

Order number	Content
23093400	Connecting cable to PC - length 2 m (6.56 ft), CD-ROM with program PRM7 Conf and user manual
23093500	Connecting cable to PC - length 5 m (16.40 ft), CD-ROM with program PRM7 Conf and user manual
24523400	Connecting cable to PC - length 2 m (6.56 ft)
24523500	Connecting cable to PC - length 5 m (6.56 ft)

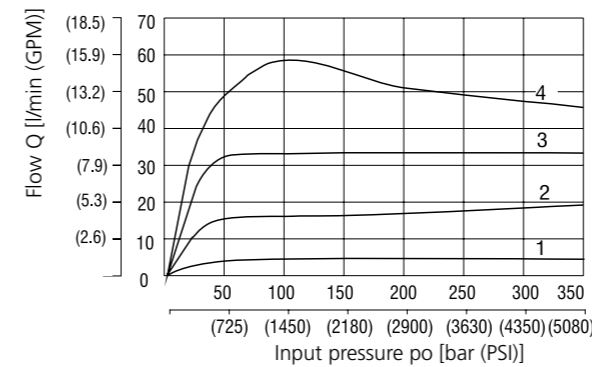
Frequency Response closed position loop, for E02S01 model



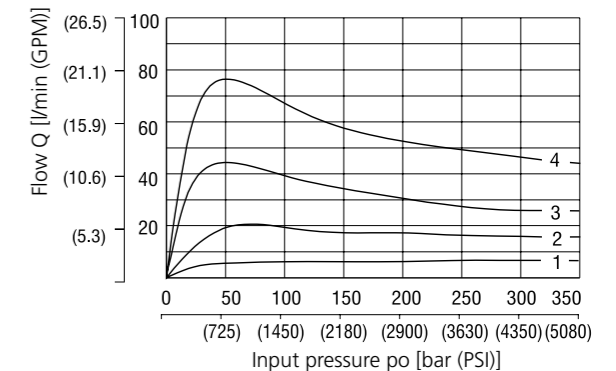
Characteristics measured at v = 32 mm²/s (156 SUS)

Operating limits: Flow direction P → A / B → T or P → B / A → T
Operating limits (E01 model only)

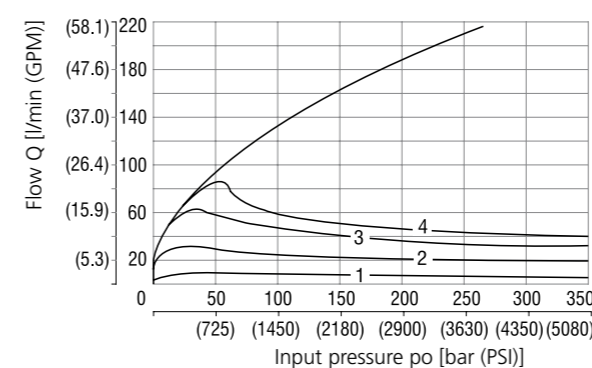
Nominal flow 30 l/min (7.9 GPM)



Nominal flow 60 l/min (15.9 GPM)



Nominal flow 80 l/min (21.1 GPM)

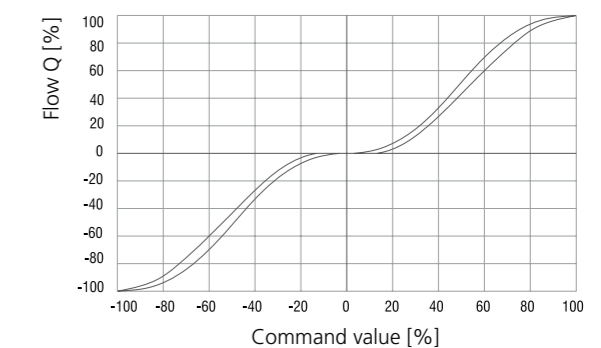


Solenoid current:

- 1 = 50 %
- 2 = 60 %
- 3 = 70 %
- 4 = 80 %
- 5 = 90 %
- 6 = 100 %

Regulated flow related to control signal

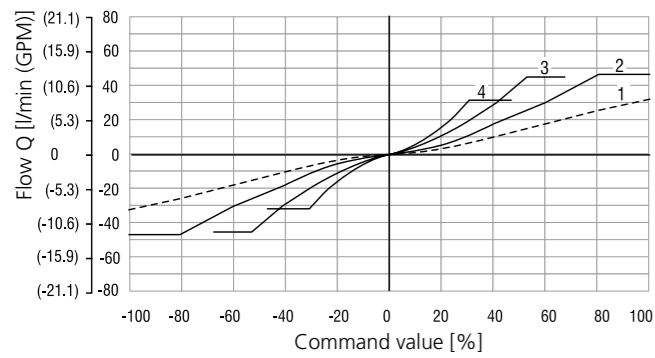
Flow characteristics (E01 model only) Δp=10 bar (145 PSI)



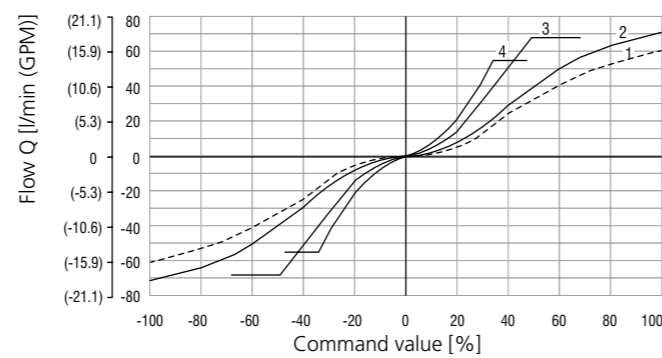
Flow Characteristics measured at $v = 32 \text{ mm}^2/\text{s}$ (156 SUS)

Flow characteristics (E02S01 model only)

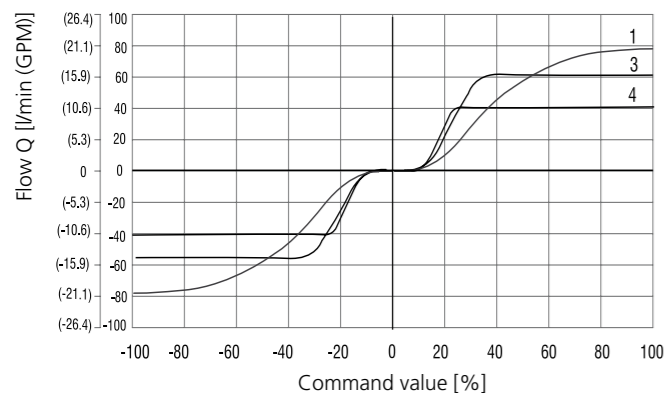
$Q_n = 30 \text{ l/min}$ (7.9 GPM) by $\Delta p = 10 \text{ bar}$ (145 PSI)



$Q_n = 60 \text{ l/min}$ (15.9 GPM) by $\Delta p = 10 \text{ bar}$ (145 PSI)



$Q_n = 80 \text{ l/min}$ (21.1 GPM) by $\Delta p = 10 \text{ bar}$ (145 PSI)



Δp = Valve pressure differential (inlet pressure p_v minus load pressure and return pressure p_r)

Δp_n = Valve pressure differential for nominal flow Q_n

1	$\Delta p_n = 10 \text{ bar}$ (145 PSI)
2	$\Delta p = 50 \text{ bar}$ (725 PSI)
3	$\Delta p = 160 \text{ bar}$ (2321 PSI)
4	$\Delta p = 320 \text{ bar}$ (4641 PSI)

Factory Settings

Item	Model		E02S01	E03	E04S01
	E01				
	1 Magnet	2 Magnets	1 Magnet	2 Magnets	1 Magnet
Control signal	0 ... 10 V	$\pm 10 \text{ V}$	0 ... 10 V	$\pm 10 \text{ V}$	0 ... 10 V
Signal external feedback	-	-	-	0 ... 10 V	-
Output position sensor spool	-	-	0 ... 5 V	-	0 ... 5 V

Connectors

K1

PIN	Technical data
1	* Power supply input
2	* Ground (power supply)
3	Control signal
4	Ground (signal)
5	Power reference signal
6	Control signal of position sensor spool
7	* Protective earth lead (PE)

*Recommended min. lead cross section 0.75 mm^2

K2

PIN	Technical data
1	TxD
2	RxD
3	Ground (signal)
4	Not used

K3

PIN	Technical data
1	Power supply output
2	Signal of external feedback
3	Ground
4	Not used
5	Not used

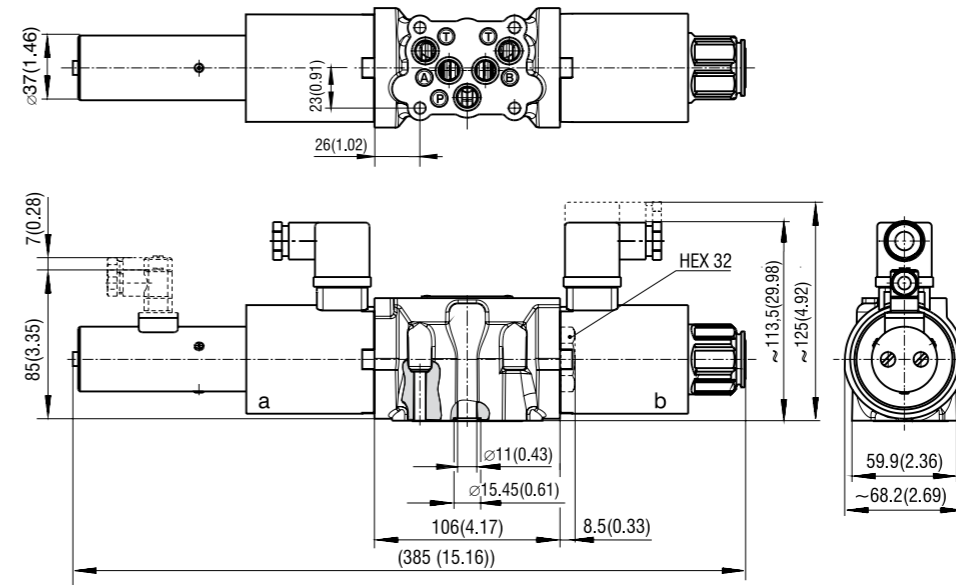
K1 - Main input connector M23 (7 PIN)
Cable diameter 8 ... 12 mm (0.31...0.47 in)

K2 - Connection RS232 M12x1 (4 PIN)
To program the electronics

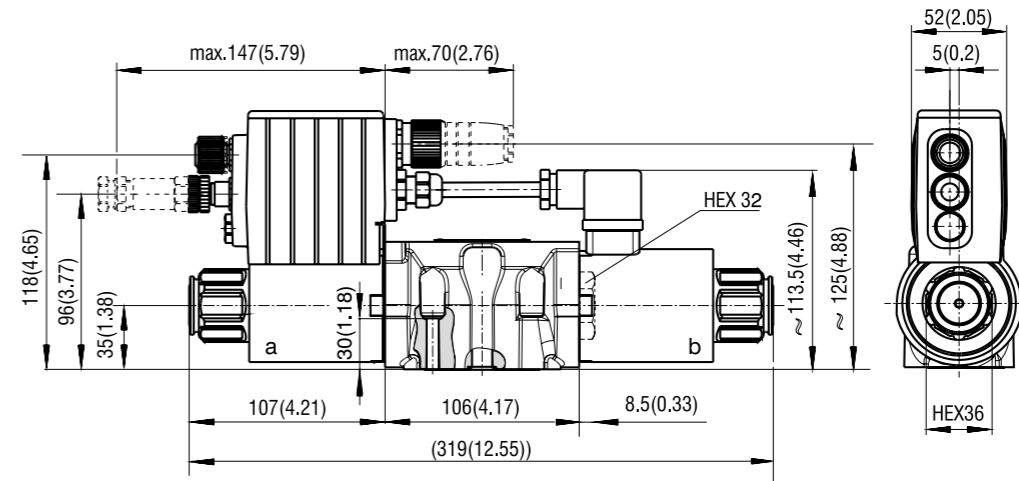
K3 - Connector M12x1 (5 PIN)
External feedback signal (for configurations E03 and E04S01 only)

Dimensions in millimeters (inches)

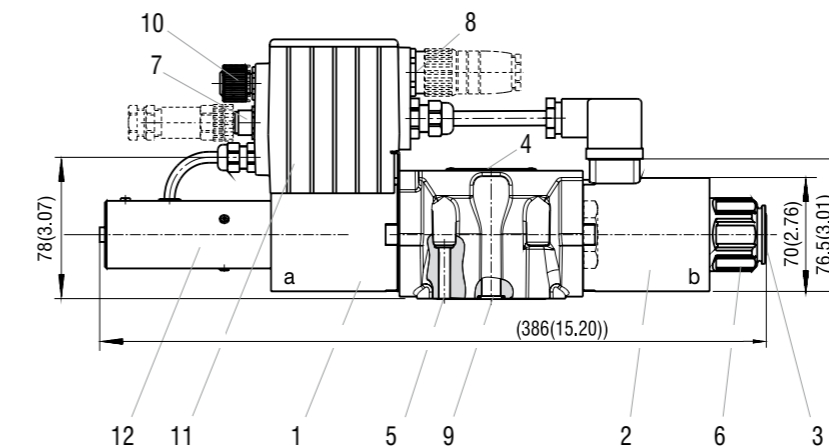
PRM7-102, 103 ... S01
PRM7-102, 103 ... S02



PRM7-102, 103 ... E01 - without connector plug for spool position feedback
PRM7-102, 103 ... E03



PRM7-1023 ... E02S01 - without connector plug for spool position feedback
PRM7-103 ... E04S01



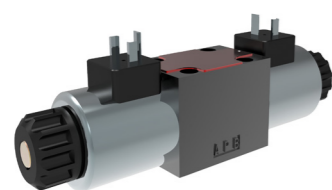
- 1 Solenoid a
- 2 Solenoid b
- 3 Manual override
- 4 Name plate
- 5 4 mounting holes
- 6 Solenoid fixing nut
- 7 Connector M12x1 for connection of external feedback
- 8 Main supply connector M23
- 9 Square ring 7.65 x 1.68 (4 pcs.), supplied in delivery packet
- 10 Cover of connector M12x1 for programming
- 11 Plastic box with integrated electronics
- 12 Position sensor

Proportional Directional Control Valve, Pilot Operated

PRM8-06

Size 06 (D03) • Q_{max} 140 l/min (37 GPM) • p_{max} 350 bar (5100 PSI)

Technical Features



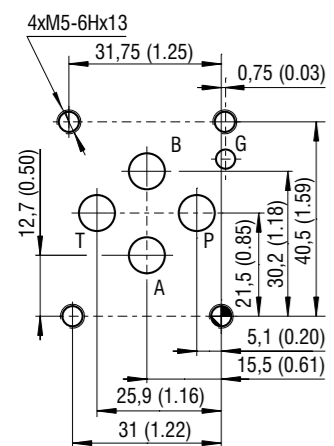
- › Pilot operated proportional control valve with exceptional hydraulic power limits
- › Subplate mounting surface acc. to ISO 4401, DIN 24340 (CETOP 03) standards
- › The valve opening and resulting flow rate can be modulated continuously in proportion to the reference signal
- › The valve can be controlled directly by a current control supply unit or by an electronic control unit to exploit the valve performance to the fullest
- › Analog converter card EL6 allows fine position control of the valve spool, reducing hysteresis and response time and optimizing the performance of the valve
- › Five chamber housing design with reduced hydraulic power dependence on fluid viscosity
- › Wide range of electrical terminal versions for the solenoids available
- › Wide range of interchangeable spools and manual overrides available
- › The coil is fastened to the core tube with a retaining nut and can be rotated by 360° to suit the available space
- › In the standard version, the valve housing is phosphated and steel parts zinc-coated for 240 h salt spray protection acc. to ISO 9227
- › Enhanced surface protection for mobile sector available (ISO 9227, 520 h salt spray)

Functional Description

The pilot operated main spool valve follows the control spool position, which is given by the control current to the solenoid. The solenoids are supplied from an external source, which should be provided with a current feedback. In order to achieve optimum operating parameters the external electronics should be able to generate a dither signal. The proportional valve can be used within the whole range of input pressure where the required continuity of the flow rate characteristics and minimum hysteresis is achieved. The selected concept increases the achieved output parameters of the proportional valve in comparison to direct controlled proportional valve. The valve can be controlled directly by a current control supply unit or by means of the external electronic card directly mounted to the electrical terminal (see Catalogue of EL3E card 9145 and EL6 card 9150). This control card, depending on the number of the controlled solenoids, can be mounted onto either solenoid.

ISO 4401-03-02-0-05

Technical Data

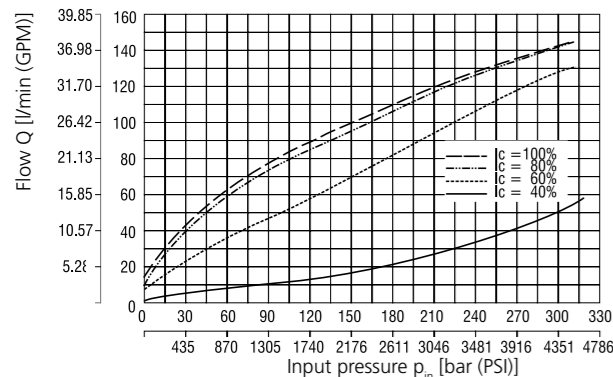


Valve size	06 (D03)	
Max. operating pressure at ports P, A, B	bar (PSI)	350 (5080)
Maximal flow at pressure 320 bar (4640 PSI)	l/min (GPM)	140 (37)
Maximum operating pressure at port T	bar (PSI)	210 (3050)
Fluid temperature range (NBR / FPM)	°C (°F)	-30 .. +80 (-22 ... +176) / -20 .. +80 (-4 .. +176)
Ambient temperature max.	°C (°F)	-30 ... +50 (-22 ... +122)
Nominal flow rate Q _n at Δp=10 bar (145 PSI)	l/min (GPM)	25 (6.6)
Hysteresis	%	< 6
Service life	cycles	10 ⁶
Mass	kg (lbs)	2.4 (5.3)
Technical data of the proportional solenoid		
Nominal supply voltage	V	12 DC 24 DC
Limit current	A	2.5 1.0
Mean resistance value at 20 °C (68 °F)	W	2.3 13.4
General information		
Data Sheet	Type	
GI_0060	Products and operating conditions	
C_8007	C22B* / K*	
Mounting surface	SMT_0019	
Spare parts	SP_8010	

Characteristics measured at v = 32 mm²/s (156 SUS)

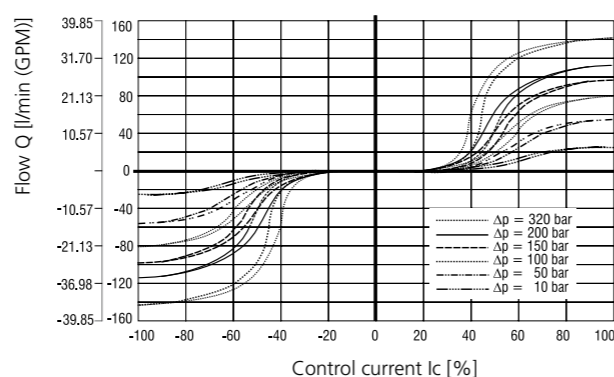
Operating limits:

Flow direction P → A / B → T or P → B / A → T



Regulated flow related to control signal

Δp=10 bar (145 PSI)



The coil current initializing the flow through the proportional directional valve can differ due to the production tolerances in a range of ± 6% of the limit current.

Ordering Code

PRM8-06 / - - - - -		
Proportional directional control valve		Surface treatment No designation standard A zinc-coated (ZnCr-3), ISO 9227 (240 h) B zinc-coated (ZnNi), ISO 9227 (520 h)
Valve size		Seals No designation NBR V FPM (Viton)
Spool symbols	3Z11 3Y11	Manual override No designation standard N1 protected with retaining nut N2 protected with rubber boot
Nominal flow rate at Δp = 10 bar (145 PSI)	25 l/min (6.6 GPM)	Connector E1 with terminal for the connector, EN 175301-803-A E2 E1 with quenching diode E3A with AMP-Junior-Timer-connector - Axial direction E4A E3A with quenching diode E8 loose conductors (two insulated wires) E9 E8 with quenching diode E12A with Deutsch DT04-2P E13A E12A with quenching diode
Rated supply voltage of solenoids (at the coil terminal)	12 V DC 24 V DC	12 24

- For proportional valves with two solenoids, one solenoid must be de-energized before the other solenoid can be charged.
- The solenoid operated valves are delivered without connectors. For available connectors see data sheet K_8008.
- Electronics for controlling proportional valves can be ordered separately, see catalog HA 9150.
- Mounting bolts M5 x 45 DIN 912-10.9 or studs must be ordered separately. Tightening torque is 8.9 Nm (6.56 ft-lbf)
- Besides the shown widely used valve versions other special models are available. Contact our technical support for their identification, feasibility and operating limits.

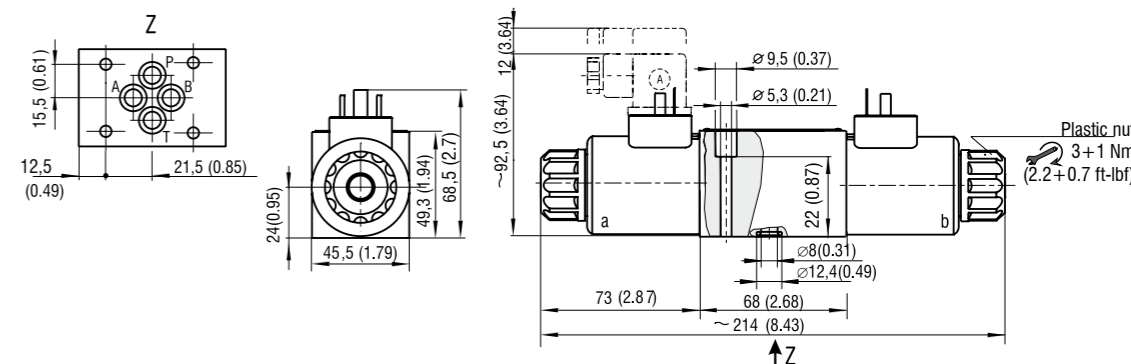
Solenoid Coil in millimeters (inches)

E1, E2 Protection degree IP65	E3A, E4A Protection degree IP67	E8, E9 Protection degree IP65	E12A, E13A Protection degree IP67 / 69K
Note: A = Standard 300 mm, (11.8 in) other lengths on demand			
The indicated IP protection level is only achieved if the connector is properly mounted.			

Manual Override in millimeters (inches)

No Designation - Standard	Designation N1 - Cap Nut Covered	Designation N2 - Rubber Boot Protected
In case of solenoid malfunction or power failure, the spool of the valve can be shifted by manual override as long as the pressure in port T does not exceed 25 bar (363 PSI). For alternative manual overrides contact our technical support.		

Dimensions in millimeters (inches)

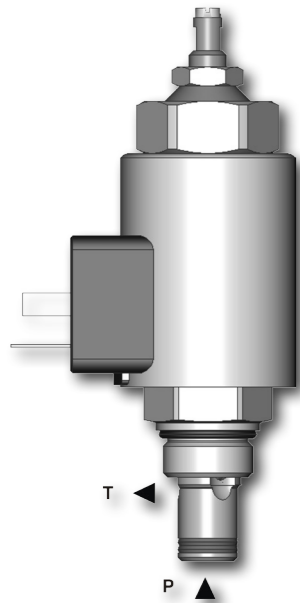


Proper function of the valve is guaranteed only if the supply pressure in the "P" channel is present and exceeds always the pressure in the "T" channel.

Proportional Pressure Control Valve, Relieving, Direct-Acting

SR1P2-A2

3/4-16 UNF • Q_{max} 1.5 l/min (0.40 GPM) • p_{max} 350 bar (5100 PSI)



Technical Features

- › Increasing pressure output proportional with increasing DC current input
- › Low hysteresis, accurate pressure control
- › Wide pressure range up to 350 bar
- › Solenoid electrical terminal option acc. to EN 175301-803-A, AMP Junior Timer, or Deutsch DT04-2P
- › 12 or 24 V DC coils
- › Usable as pilot stage for SR4P2-B2 and SP4P2-B3 proportional valves
- › In the standard version, the valve is zinc-coated for 240 h protection acc. to ISO 9227

Functional Description

A direct operated proportional poppet pressure relief valve in the form of a screw-in cartridge. The valve is designed for continuous regulation of system pressure. It is used mostly as a pilot stage. To set the minimum cracking pressure use the adjusting screw (s=5) which incorporates also the air bleed screw. Back pressure on port T becomes additive to the pressure setting of the valve. Air bleeding is necessary for the correct function of the valve. Installation: When possible, the valve should be mounted below the reservoir oil level. This will keep oil in the actuator at all times, preventing instability caused by air enclosures. If this is not possible, mount the valve for best results vertically downward with proper air bleeding.

Technical Data

Valve size / Cartridge cavity		3/4-16 UNF-2A / A2	
Max. operating pressure (port P)	bar (PSI)	350 (5080)	
Max. operating pressure (port T)	bar (PSI)	100 (1450)	
Max. flow	l/min (GPM)	1.5 (0.40)	
Fluid temperature range (FPM)	°C (°F)	-20 ... +120 (-4 ... 248)	
Ambient temperature range	°C (°F)	-20 ... +80 (-4 ... 176)	
Hysteresis	%	< 5	
Solenoid data			
Supply voltage	V	12 DC	24 DC
Max. current	A	1	0.6
Rated resistance at 20 °C (68 °F)	Ω	6.5 ± 5 %	20.6 ± 5 %
Duty cycle	%	100	
Optimal PWM frequency	Hz	200	
Quenching diode		BZW06-19B	BZW06-33B
Enclosure type acc.to EN 60529**		IP65 / IP67 / IP69K	
Mass with solenoid	kg (lbs)	0.44 (0.97)	
Data Sheet		Type	
General information		GI_0060	
Coil types		C_8007	
Valve bodies	In-line mounted	SB_0018	SB-A2*
	Sandwich mounted	SB-04(06)_0028	SB-*A2*
Cavity details / Form tools		SMT_0019	
Spare Parts		SP_8010	

**The indicated IP protection level is only reached with a properly mounted connector.

Dimensions in millimeters (inches)

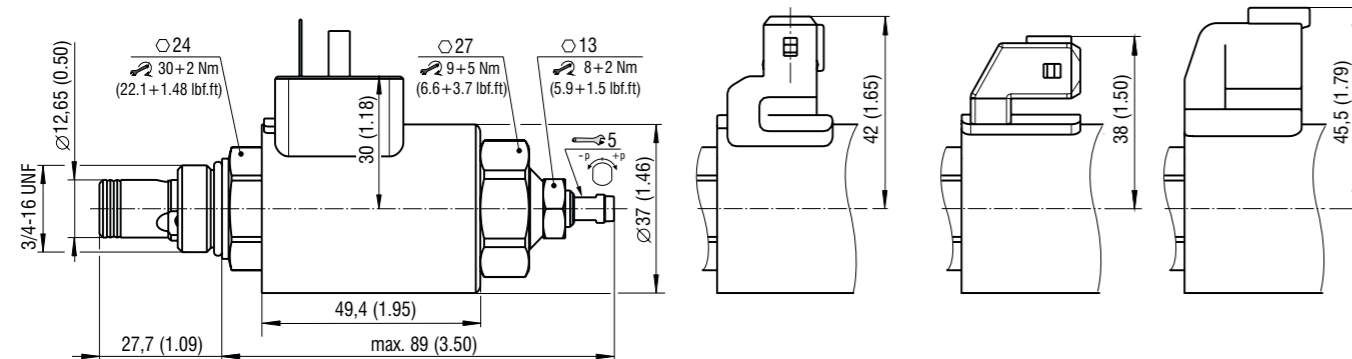
Connector type

E1, E2 - IP65
EN 175301-803-A

E3, E4 - IP67
AMP Junior Timer
- radial

E3A, E4A - IP67
AMP Junior Timer
- axial

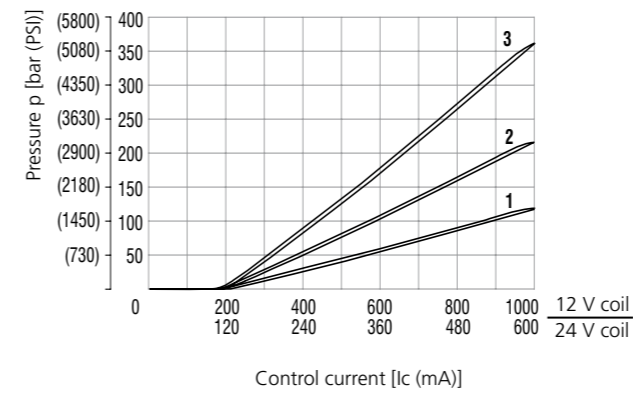
E12A, E13A
- IP67 / IP69K
Deutsch DT04-2P



Characteristics measured at v = 32 mm²/s (156 SUS)

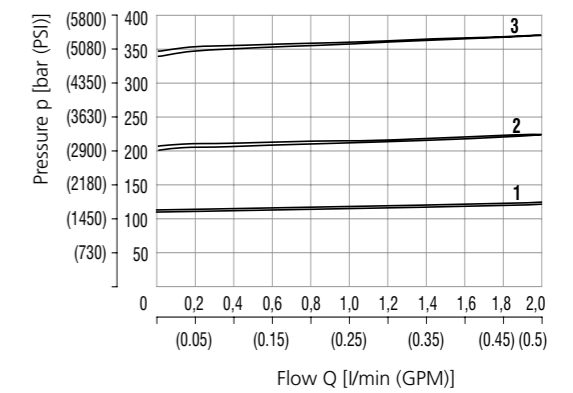
Relief pressure related to control signal

Q=0.2 l/min (0.05 GPM), pressure in port T=0 bar, PWM 160Hz



Pressure range	12	21	35
	1	2	3

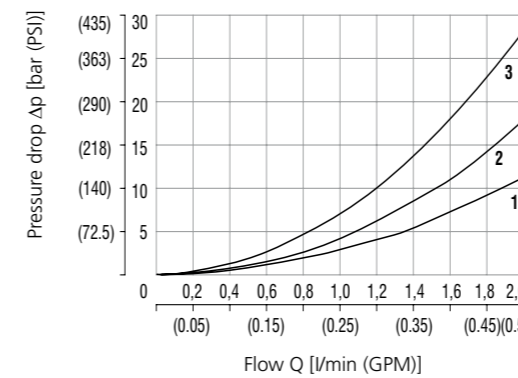
Relief pressure related to flow rate



Pressure range	12	21	35
	1	2	3

Pressure drop related to flow rate

0% of control current, P-T direction



Pressure range	12	21	35
	1	2	3



Attention:
The proportional pressure relief valve is not mechanically protected and it does not perform the relief valve function.

Ordering Code

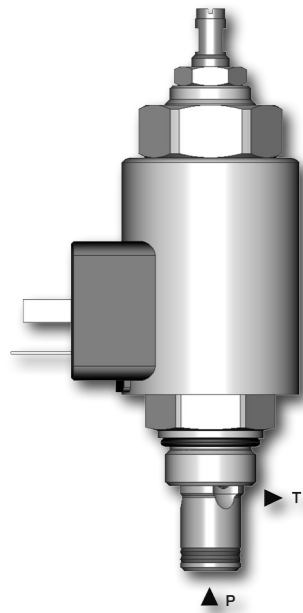
SR1P2 - A2 / H							
Proportional pressure control valve, relieving, direct-acting							
Valve cavity 3/4-16UNF							
Model High performance							
Max. regulated pressure up to 120 bar (1740 PSI) up to 210 bar (3046 PSI) up to 350 bar (5076 PSI)						12 21 35	
Supply voltage / max. current 12 V DC / 1 A 24 V DC / 0.6 A							12 24
							Surface treatment A zinc-coated (ZnCr-3), ISO 9227 (240 h) B zinc-coated (ZnNi), ISO 9227 (520 h)
							Seals NBR V FPM (Viton)
							Connector type E1 EN 175301-803-A E2 E1 with quenching diode E3 AMP Junior Timer - radial direction (2 pins; male) E4 E3 with quenching diode E3A AMP Junior Timer - axial direction (2 pins; male) E4A E3A with quenching diode E12A Deutsch DT04-2P - axial direction E13A E12A with quenching diode

For other solenoid terminals see data sheet No. 8007

Proportional Pressure Control Valve, Relieving, Direct-Acting, Inverted

SRN1P1-A2

3/4-16 UNF • Q_{max} 1.5 l/min (0.40 GPM) • p_{max} 350 bar (5100 PSI)



Technical Features

- › Decreasing pressure output proportional with increasing DC current input
- › Low hysteresis, accurate pressure control
- › Wide pressure range up to 350 bar
- › Mechanical adjustment of minimum cracking pressure
- › Solenoid electrical terminal option acc. to EN 175301-803-A, AMP Junior Timer or Deutsch DT04-2P
- › 12 or 24 V DC coils
- › Usable as pilot stage of SRN4P1-B2 and SPN4P1-B3 proportional valves
- › In the standard version, the valve is zinc-coated for 240 h protection acc. to ISO 9227

Functional Description

A direct operated proportional poppet pressure relief valve in the form of a screw-in cartridge. The valve is designed for continuous regulation of system pressure. It is used mostly as a pilot stage. To set the minimum cracking pressure use the adjusting screw (s=5) which incorporates also the air bleed screw. Back pressure on port T becomes additive to the pressure setting of the valve. Air bleeding is necessary for the correct function of the valve. Installation: When possible, the valve should be mounted below the reservoir oil level. This will keep oil in the actuator at all times, preventing instability caused by air enclosures. If this is not possible, mount the valve for best results vertically downward with proper air bleeding.

Technical Data

Valve size / Cartridge cavity		3/4-16 UNF-2A / A2	
Max. operating pressure (port P)	bar (PSI)	350 (5080)	
Max. operating pressure (port T)	bar (PSI)	100 (1450)	
Max. flow	l/min (GPM)	1.5 (0.40)	
Fluid temperature range (FPM)	°C (°F)	-20 ... +120 (-4 ... 248)	
Ambient temperature range	°C (°F)	-20 ... +80 (-4 ... 176)	
Hysteresis	%	< 5	
Solenoid data			
Supply voltage	V	12 DC	24 DC
Max. current	A	1	0,6
Rated resistance at 20 °C (68 °F)	Ω	6.5 ± 5 %	20.6 ± 5 %
Duty cycle	%	100	
Optimal PWM frequency	Hz	160 - 200	
Quenching diode		BZW06-19B	BZW06-33B
Enclosure type acc.to EN 60529**		IP65 / IP67 / IP69K	
Mass with solenoid	kg (lbs)	0.44 (0.97)	
	Data Sheet	Type	
General information		GI_0060	
Coil types		C_8007	
Valve bodies	In-line mounted	SB_0018	SB-A2*
	Sandwich mounted	SB-04(06)_0028	SB-*A2*
Cavity details / Form tools		SMT_0019	
Spare Parts		SP_8010	

**The indicated IP protection level is reached only with a properly mounted connector.

Dimensions in millimeters (inches)

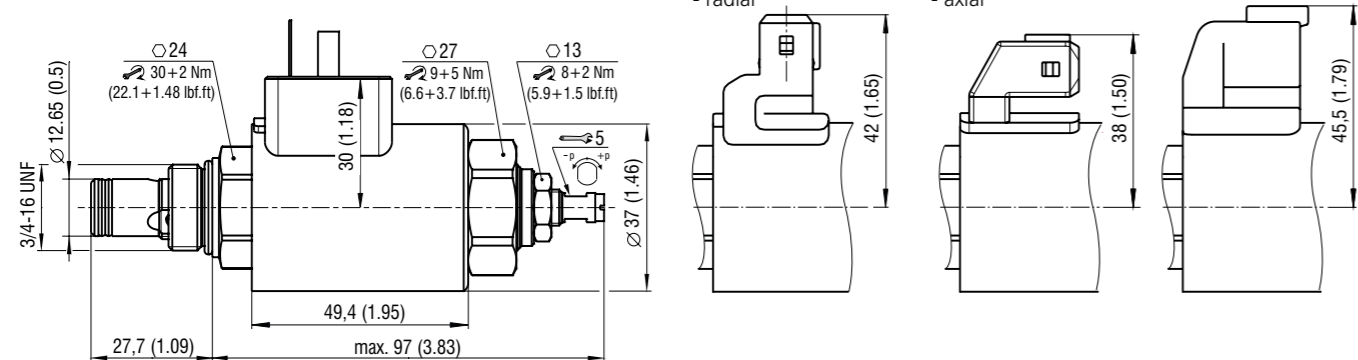
Connector type

E1, E2 - IP65
EN 175301-803-A

E3, E4 - IP67
AMP Junior Timer
- radial

E3A, E4A - IP67
AMP Junior Timer
- axial

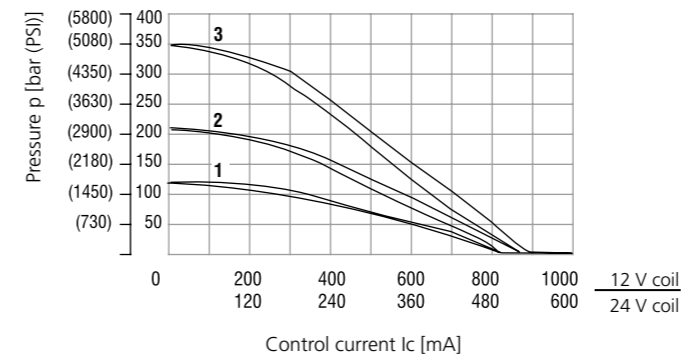
E12A, E13A - IP67 / IP69K
Deutsch DT04-2P



Characteristics measured at v = 32 mm²/s (156 SUS)

Relief pressure related to control signal

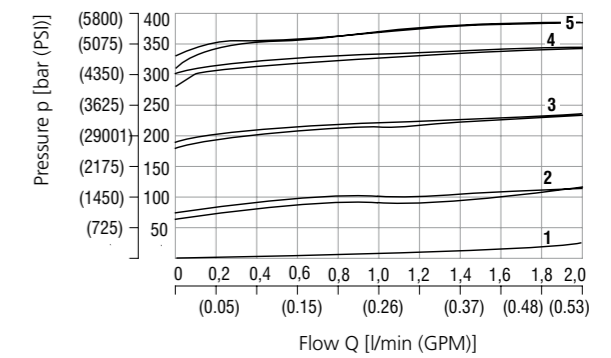
Q=0.2 l/min (0.05 GPM), pressure in port T=0 bar, PWM 160Hz



Pressure range	12	21	35
	1	2	3

Relief pressure related to flow rate

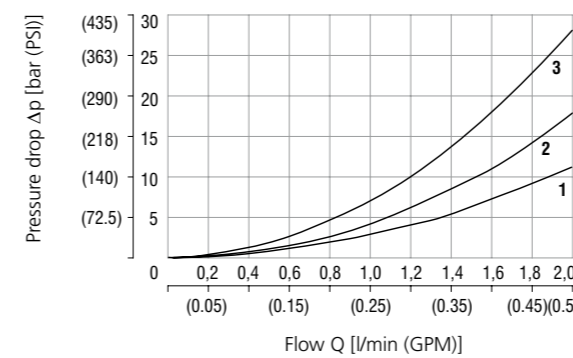
Pressure range 35, various control currents



Control current	1	2	3	4	5
	100 % I _{max}	75 % I _{max}	50 % I _{max}	25 % I _{max}	0 % I _{max}

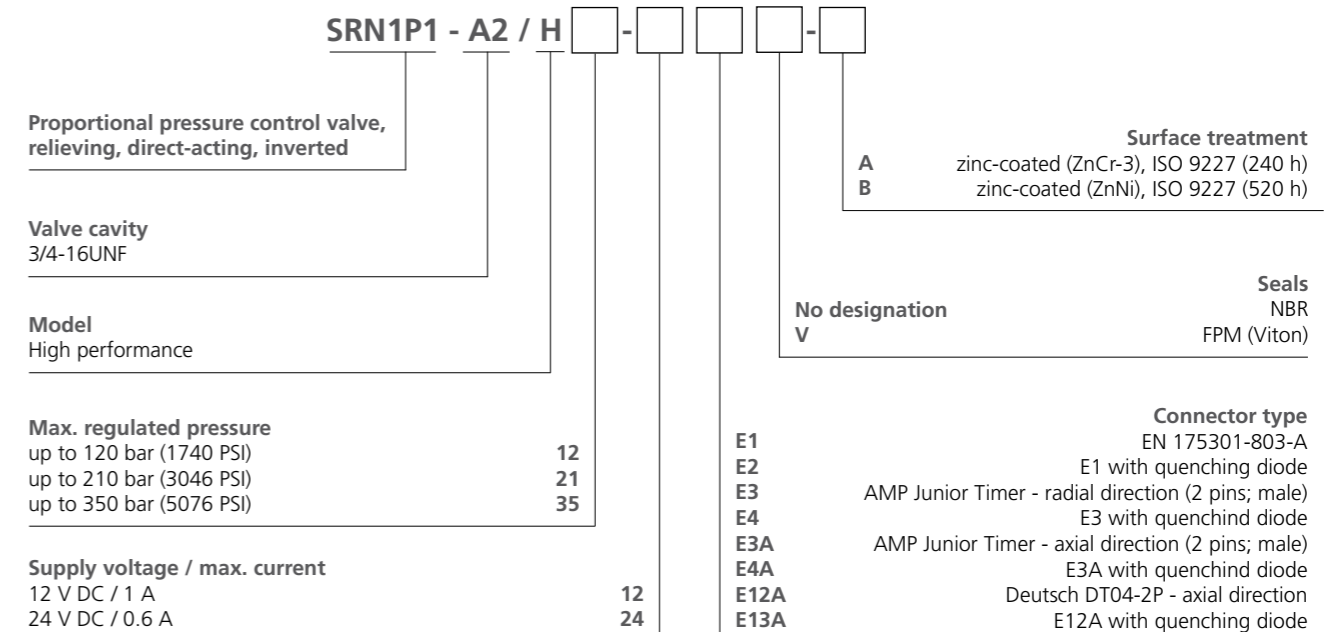
Pressure drop related to flow rate

100% of control current, P-T direction



Pressure range	12	21	35
	1	2	3

Ordering Code

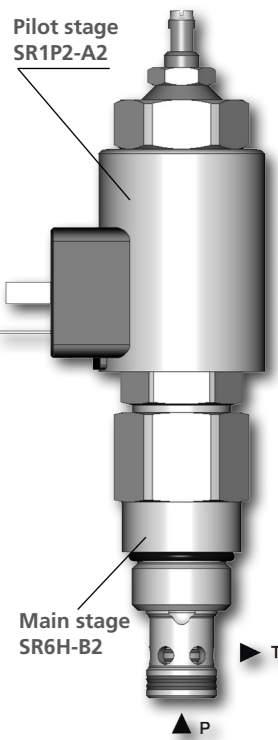


For other solenoid terminals see data sheet No. 8007

Proportional Pressure Control Valve, Relieving, Pilot Operated

SR4P2-B2

7/8-14 UNF • Q_{max} 60 l/min (16 GPM) • p_{max} 350 bar (5100 PSI)



Technical Features

- › Increasing pressure output proportional with increasing DC current input
- › Low hysteresis, accurate pressure control and low pressure drop
- › Wide pressure range up to 350 bar
- › High flow capacity
- › Solenoid electrical terminal option acc. to EN 175301-803-A, AMP Junior Timer, or Deutsch DT04-2P
- › 12 or 24 V DC coils
- › In the standard version, the valve is zinc-coated for 240 h protection acc. to ISO 9227

Functional Description

A pilot operated proportional pressure relief spool valve in the form of a screw-in cartridge. The valve is designed for continuous regulation of system pressure. The complete valve consists of a pilot stage SR1P2-A2 and a main stage with connection 7/8-14 UNF. To set the minimum cracking pressure use the adjusting screw (s=5) which incorporates also the air bleed screw. Back pressure on port T becomes additive to the pressure setting of the valve. Air bleeding is necessary for the correct function of the valve. Installation: When possible, the valve should be mounted below the reservoir oil level. This will keep oil in the actuator at all times, preventing instability caused by air enclosures. If this is not possible, mount the valve for best results vertically downward with proper air bleeding.

Technical Data

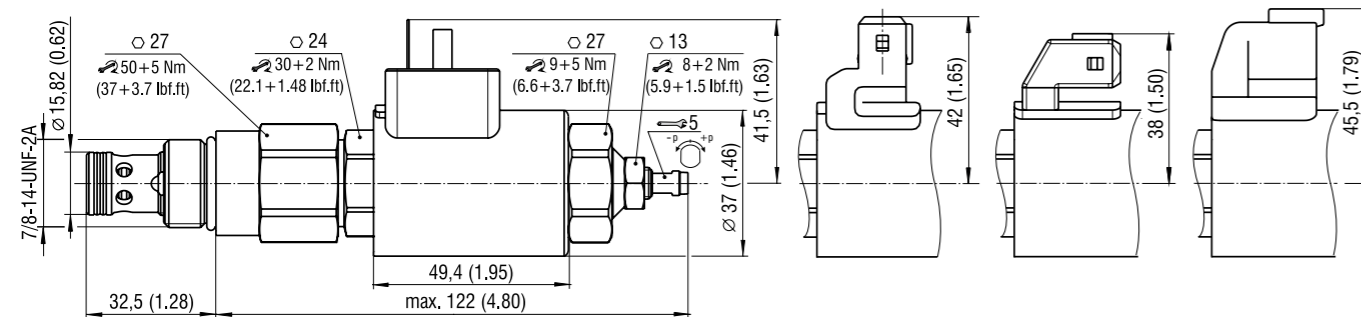
Valve size / Cartridge cavity		7/8-14 UNF-2A / B2	
Max. operating pressure (port P)	bar (PSI)	350 (5080)	
Max. operating pressure (port T)	bar (PSI)	100 (1450)	
Max. flow	l/min (GPM)	60 (15.9)	
Fluid temperature range (FPM)	°C (°F)	-20...+120 (-4...+248)	
Ambient temperature range	°C (°F)	-20...+80 (-4...+176)	
Min. setting pressure	bar (PSI)	7 bar (101.5 PSI) for 5 l/min (1.32 GPM)	
Hysteresis	%	< 5	
Solenoid data			
Supply voltage	V	12 DC	24 DC
Max. current	A	1	0.6
Rated resistance at 20 °C (68 °F)	Ω	6.5±5 %	20.6±5 %
Duty cycle	%	100	
Optimal PWM frequency	Hz	250	
Quenching diode		BZW06-19B	BZW06-33B
Enclosure type acc. to EN 60529**		(acc.to terminal type) IP65 / IP67 / IP69K	
Mass with solenoid	kg (lbs)	0.58 (1.28)	
	Data Sheet	Type	
General information			
Coil types	GI_0060	Products and operating conditions	
Valve bodies	C_8007	C19B*	
Valve bodies	In-line mounted SB_0018	SB-B2*	
Cavity details / Form tools	SMT_0019	SMT-B2*	
Spare parts	SP_8010		

**The indicated IP protection level is only reached with a properly mounted connector.

Dimensions in millimeters (inches)

Connector type

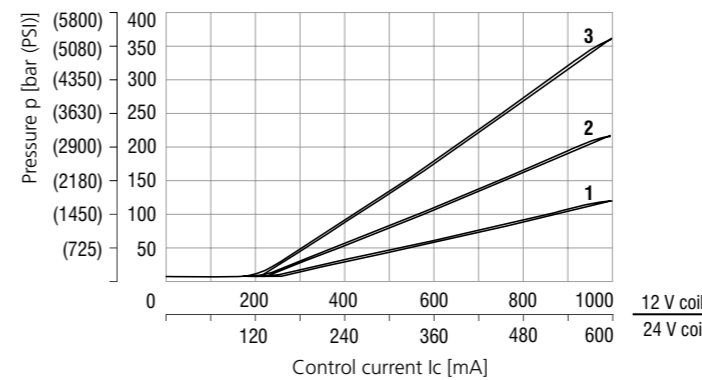
- E1, E2 - IP65
EN 175301-803-A
- E3, E4 - IP67
AMP Junior
Timer - radial
- E3A, E4A - IP67
AMP Junior
Timer - axial
- E12A, E13A - IP67 / IP69K
Deutsch DT04-2P



Characteristics measured at v = 32 mm²/s (156 SUS)

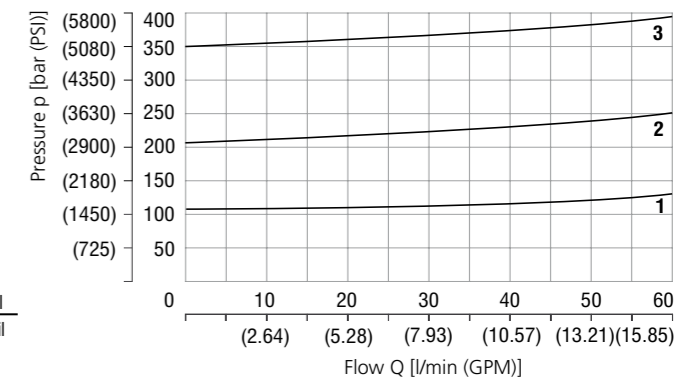
Relief pressure related to control signal

Q=5 l/min (1.32 GPM), pressure in port T=0 bar, PWM 160Hz



Pressure range	12	21	35
	1	2	3

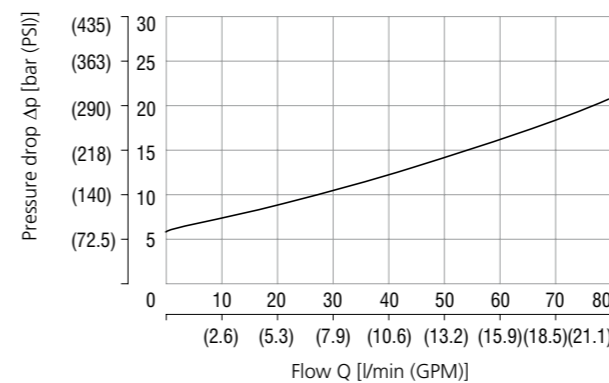
Relief pressure related to flow rate



Pressure range	12	21	35
	1	2	3

Pressure drop related to flow rate

0% of control current, P-T direction



Attention:
The proportional pressure relief valve is not mechanically protected and it does not perform the relief valve function.

Ordering Code

SR4P2 - B2 / H [] - [] - [] - []

- Proportional pressure control valve, relieving, pilot operated**
- Valve cavity**
7/8-14 UNF-2A
- Model**
High performance
- Max. regulated pressure**
up to 120 bar (1740 PSI) 12
up to 210 bar (3046 PSI) 21
up to 350 bar (5076 PSI) 35
- Supply voltage / max. current**
12 V DC / 1.0 A 12
24 V DC / 0.6 A 24
- Surface treatment**
A zinc-coated (ZnCr-3), ISO 9227 (240 h)
B zinc-coated (ZnNi), ISO 9227 (520 h)
- Seals**
No designation NBR
V FPM (Viton)
- Connector type**
EN 175301-803-A
E1 with quenching diode
E3 AMP Junior Timer - radial direction (2 pins; male)
E4 E3 with quenching diode
E3A AMP Junior Timer - axial direction (2 pins; male)
E4A E3A with quenching diode
E12A Deutsch DT04-2P - axial direction
E13A E12A with quenching diode

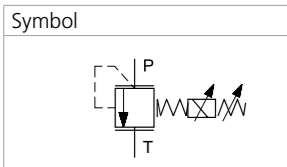
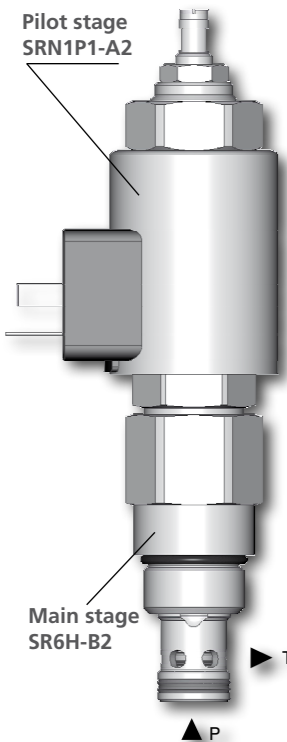
Main stage ordering key: SR6H-B2/HV

For other solenoid terminals see data sheet No. 8007

Proportional Pressure Control Valve, Relieving, Pilot Operated, Inverted

SRN4P1-B2

7/8-14 UNF • Q_{max} 60 l/min (16 GPM) • p_{max} 350 bar (5100 PSI)



Technical Features

- Decreasing pressure output proportional with increasing DC current input
- Low hysteresis, accurate pressure control and low pressure drop
- Wide pressure range up to 350 bar
- Mechanical adjustment of minimum cracking pressure
- High flow capacity
- Solenoid electrical terminal option acc. to EN 175301-803-A, AMP Junior Timer, or Deutsch DT04-2P
- 12 or 24 V DC coils
- In the standard version, the valve is zinc-coated for 240 h protection acc. to ISO 9227

Functional Description

A pilot operated proportional pressure relief spool valve in the form of a screw-in cartridge. The valve is designed for continuous regulation of system pressure. The complete valve consists of pilot stage SRN1P1-A2 and main stage with connection 7/8-14 UNF. To set the minimum cracking pressure use the adjusting screw (s=5) which incorporates also the air bleed screw. Back pressure on port T becomes additive to the pressure setting of the valve. Air bleeding is necessary for the correct function of the valve. Installation: When possible, the valve should be mounted below the reservoir oil level. This will keep oil in the actuator at all times, preventing instability caused by air enclosures. If this is not possible, mount the valve for best results vertically downward with proper air bleeding.

Technical Data

Valve size / Cartridge cavity		7/8-14 UNF-2A / B2	
Max. operating pressure (port P)	bar (PSI)	350 (5080)	
Max. operating pressure (port T)	bar (PSI)	100 (1450)	
Max. flow	l/min (GPM)	60 (15.9)	
Fluid temperature range (FPM)	°C (°F)	-20...+120 (-4...+248)	
Ambient temperature range	°C (°F)	-20...+80 (-4...+176)	
Min. setting pressure	bar (PSI)	7 bar (101.5 PSI) for 5 l/min (1.32 GPM)	
Hysteresis	%	< 5	
Solenoid data			
Supply voltage	V	12 DC	24 DC
Max. current	A	1	0.6
Rated resistance at 20 °C (68 °F)	Ω	6.5±5 %	20.6±5 %
Duty cycle	%	100	
Optimal PWM frequency	Hz	250	
Quenching diode		BZW06-19B	BZW06-33B
Enclosure type acc. to EN 60529**		(acc.to terminal type) IP65 / IP67 / IP69K	
Mass with solenoid	kg (lbs)	0.58 (1.28)	
Data Sheet		Type	
General information	GI_0060	Products and operating conditions	
Coil types	C_8007	C19B*	
Valve bodies	In-line mounted	SB_0018	SB-B2*
Cavity details / Form tools	SMT_0019	SMT-B2*	
Spare parts	SP_8010		

**The indicated IP protection level is only reached with a properly mounted connector.

Dimensions in millimeters (inches)

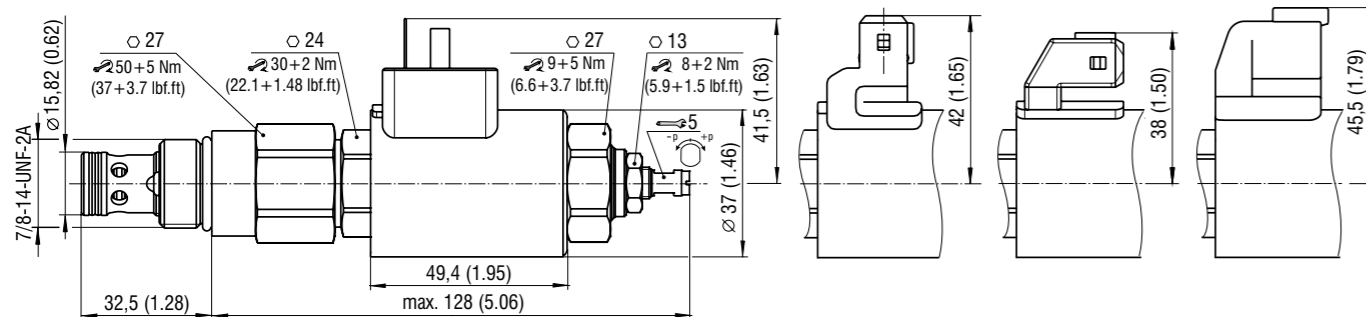
Connector type

E1, E2 - IP65
EN 175301-803-A

E3, E4 - IP67
AMP Junior Timer
- radial

E3A, E4A - IP67
AMP Junior Timer
- axial

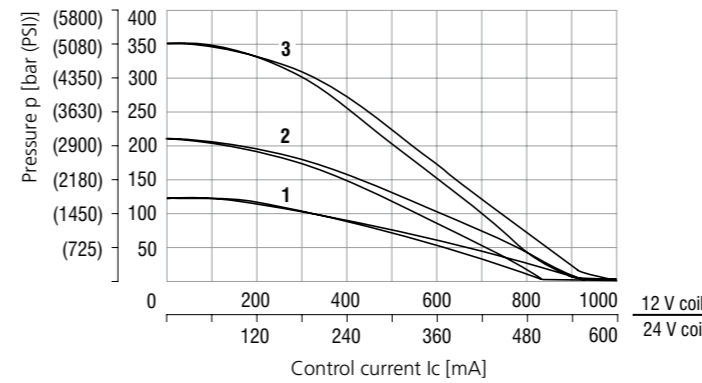
E12A, E13A
- IP67 / IP69K
Deutsch DT04-2P



Characteristics measured at v = 32 mm³/s (156 SUS)

Relief pressure related to control signal

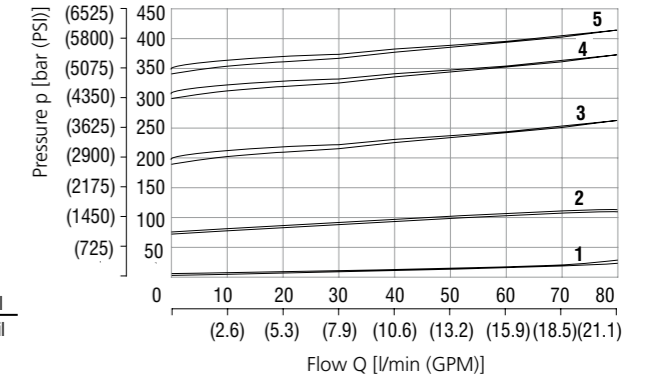
Q=5 l/min (1.32 GPM), pressure in port T=0 bar, PWM 160 Hz



Pressure range	12	21	35
	1	2	3

Relief pressure related to flow rate

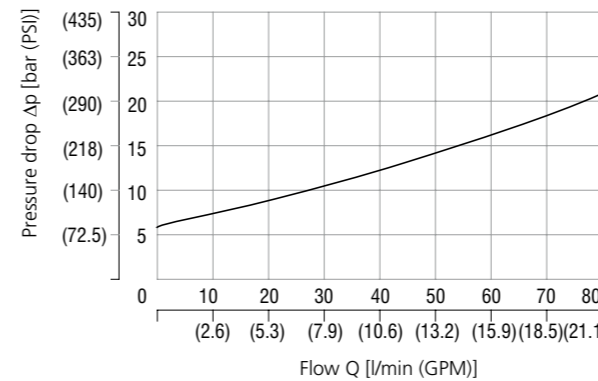
Pressure range 35, various control currents



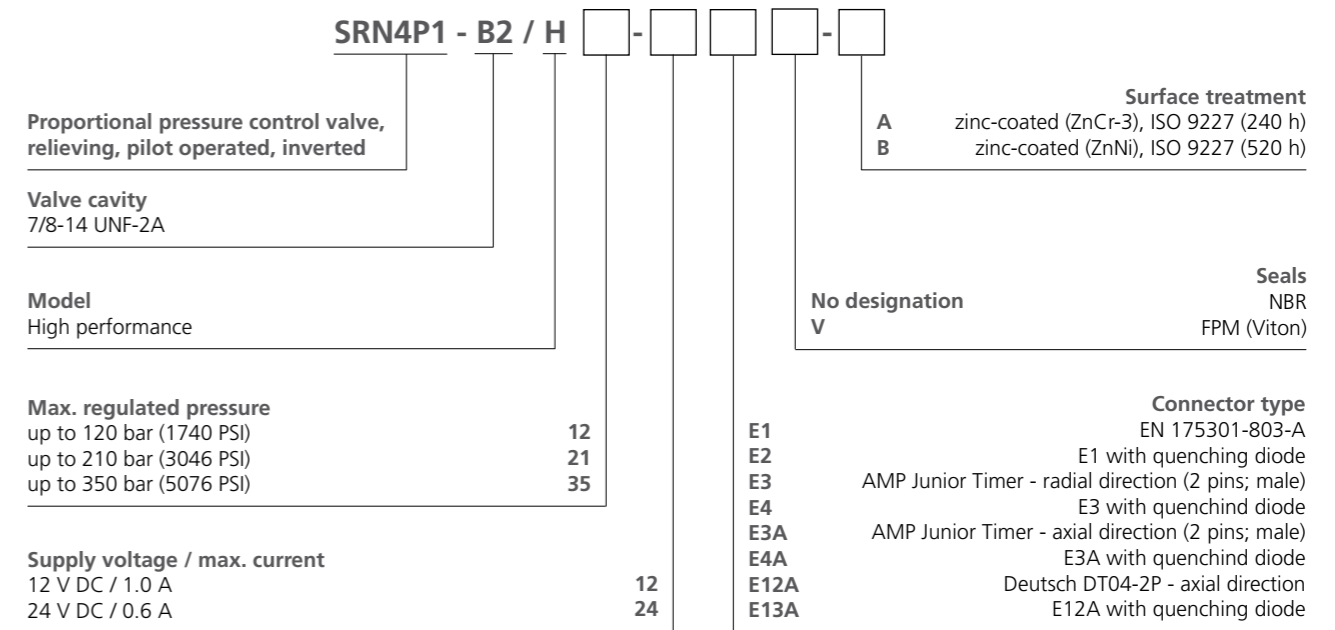
Control current	1	2	3	4	5
	100 % I _{max}	75 % I _{max}	25 % I _{max}	25 % I _{max}	0 % I _{max}

Pressure drop related to flow rate

100 % of control current, P-T direction



Ordering Code



Proportional pressure control valve, relieving, pilot operated, inverted

Valve cavity
7/8-14 UNF-2A

Model
High performance

Max. regulated pressure
up to 120 bar (1740 PSI)
up to 210 bar (3046 PSI)
up to 350 bar (5076 PSI)

Supply voltage / max. current
12 V DC / 1.0 A
24 V DC / 0.6 A

Main stage ordering key: SR6H-B2/HV

Surface treatment
A zinc-coated (ZnCr-3), ISO 9227 (240 h)
B zinc-coated (ZnNi), ISO 9227 (520 h)

Seals
NBR
V FPM (Viton)

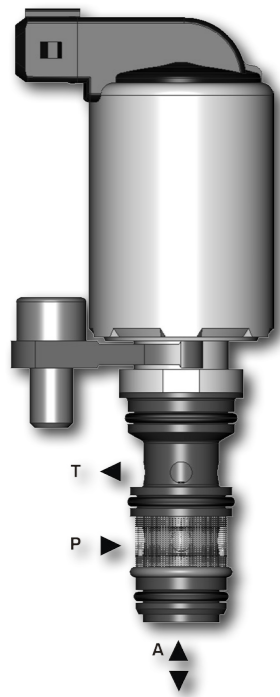
Connector type
E1 EN 175301-803-A
E2 E1 with quenching diode
E3 AMP Junior Timer - radial direction (2 pins; male)
E4 E3 with quenching diode
E3A AMP Junior Timer - axial direction (2 pins; male)
E4A E3A with quenching diode
E12A Deutsch DT04-2P - axial direction
E13A E12A with quenching diode

For other solenoid terminals see data sheet No. 8007

Proportional Pressure Control Valve, Reducing - Relieving, Direct-Acting, Slip-In Style

PP2P1-W3

Size D20 • Q_{max} 20 l/min (5 GPM) • p_{max} 50 bar (700 PSI)



Technical Features

- Excellent stability throughout flow range with rapid response to proportional current input change
- Low hysteresis, accurate pressure control and low pressure drop through CFD optimized flow paths
- Precise pressure control vs current and excellent repeatability
- Integrated relief function for protection against pressure peaks
- Solenoid electrical terminal AMP Junior Timer or Deutsch DT04-2P
- 12 or 24 V DC coils
- Compact design with reduced solenoid dimensions for production cost savings
- High flow capacity and low coil power consumption
- Optional mesh screen
- In the standard version, the valve is zinc-coated for 240 h protection acc. to ISO 9227

Functional Description

A direct-operated, spool-type hydraulic pressure reducing valve in the form of a slip-in cartridge. Reduced pressure output is proportional to DC current input. This valve is intended for use as a pressure limiting device. Note: Consult factory for special OEM versions of this product.

Model Code	no mesh screen	with mesh screen
Symbol		

Technical Data

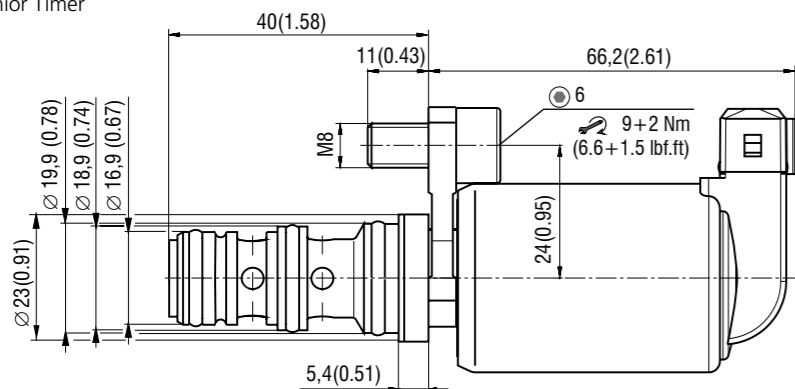
Valve size / Cartridge cavity		D20 / W3		
Max. operating pressure (port P)	bar (PSI)	50 (730)		
Max. regulated pressure (port A)	bar (PSI)	20 (290)	25 (363)	32 (460)
Max. flow rate P-A	l/min (GPM)	20 (5.3)	20 (5.3)	16 (4.2)
Fluid temperature range	°C (°F)	-30 ...90 (-22 ...194), +100 (212) short-time		
Ambient temperature range	°C (°F)	-30 ...90 (-22 ...194), +100 (212) short-time		
Response time at 100% signal	ms	< 50		
Solenoid data				
Supply voltage	V	12 DC		24 DC
Max. current	A	1		1
Rated resistance at 20 °C (68 °F)	Ω	7.2±6.5 %		11.2±6.5 %
Duty cycle	%	100		
Optimal PWM frequency	Hz	signal100		
Quenching diode		BZW06-28B		BZW06-33B
Enclosure type acc. to EN 60529**		(acc.to terminal type) IP 67 / IP 69K		
Mass	kg (lbs)	0.4 (0.88)		
	Data Sheet	Type		
General information				
Valve bodies	In-line mounted	SB_0018		SB-W3-*
Cavity details		SMT_0019		SB-W3-*
Spare parts		SP_8010		

**The indicated IP protection level is only reached with a properly mounted connector.

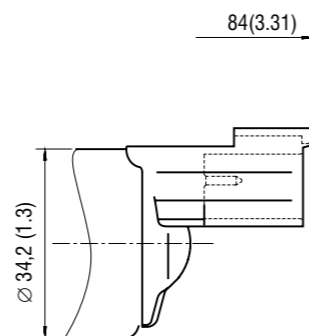
Dimensions in millimeters (inches)

Connector type

E3, E4 - IP67
AMP Junior Timer



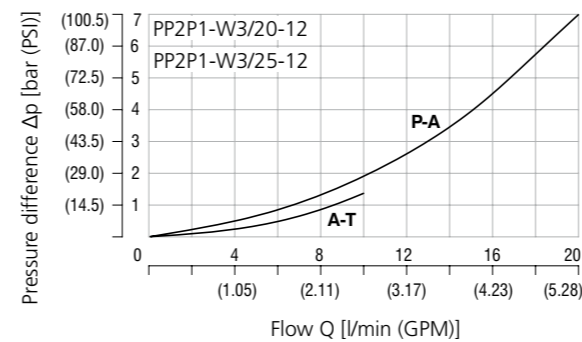
E12A, E13A - IP67 / IP69K
Deutsch DT04-2P



Characteristics measured at v = 32 mm²/s (156 SUS)

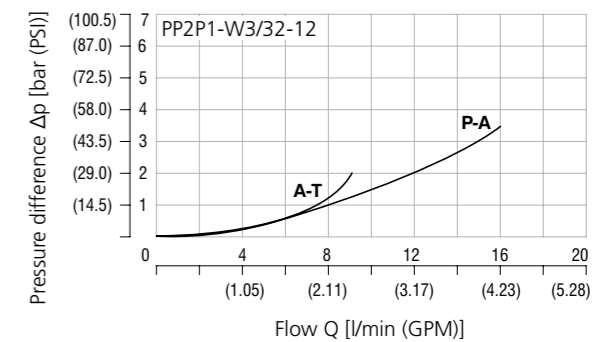
Pressure drop related to flow rate

A-T, Valve coil de-energized (reducing function)
P-A, Valve coil energized (relieving function)



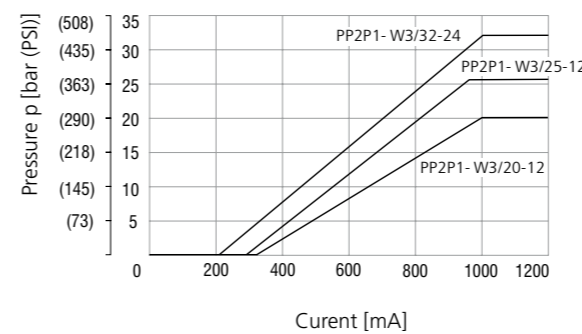
Pressure drop related to flow rate

A-T, Valve coil de-energized (reducing function)
P-A, Valve coil energized (relieving function)



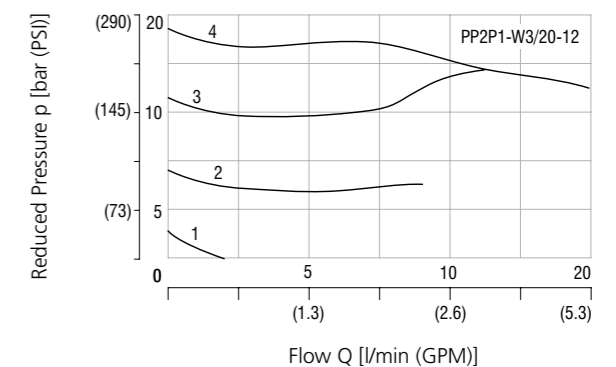
Reduced pressure related to control signal

Port A, range 0 - 20 bar (290 PSI)
Port A, range 0 - 32 bar (464 PSI)
Port P, Inlet pressure 50 bar (730 PSI)
Q = 0 lpm (GPM)



Reducing pressure related to flow rate

Reducing Function P - A



Control signal	
1	40 %
2	60 %
3	80 %
4	100 %

Ordering Code

PP2P1 - W3/ [] - [] [] [] - [] []

Proportional pressure control valve, reducing - relieving, direct-acting, slip-in style

Valve cavity
D20 mm (0.79 in)

Max. regulated pressure
20 bar (290 PSI) **20**
25 bar (363 PSI) **25**
32 bar (464 PSI) **32**

Supply voltage / max. current
12 V DC / 1 A **12**
24 V DC / 1 A **24**

Mesh screen
No designation without mesh screen
SP-125 port P, 125 microns

Surface treatment
A zinc-coated (ZnCr-3), ISO 9227 (240 h)
B zinc-coated (ZnNi), ISO 9227 (520 h)

Seals
No designation NBR
V FPM (Viton)

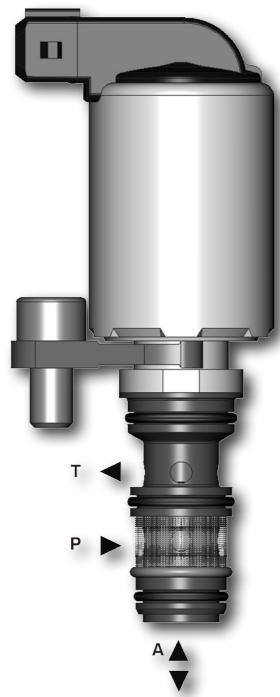
Connector
E3 AMP Junior Timer - radial direction (2 pins; male)
E4 E3 with quenching diode
E12A Deutsch DT04-2P - axial direction
E13A E12A with quenching diode

Besides the shown, commonly used valve versions other special models are available. Contact our technical support for their identification, feasibility and operating limits.

Proportional Pressure Control Valve, Reducing - Relieving, Direct-Acting, Slip-In Style

PP2P3-W3

Size D20 • Q_{max} 30 l/min (8 GPM) • p_{max} 50 bar (700 PSI)



Technical Features

- Valve is primary used in clutch control application typically in mobile transmissions
- Excellent stability throughout flow range with rapid response to proportional current input change
- Low hysteresis, accurate pressure control and low pressure drop through CFD optimized flow paths
- Precise pressure control vs current and excellent repeatability
- Integrated relief function for protection against pressure peaks
- Solenoid electrical terminal AMP Junior Timer or Deutsch DT04-2P
- 12 or 24 V DC coils
- Compact design with reduced solenoid dimensions for production cost savings
- High flow capacity and low coil power consumption
- Optional mesh screen
- In the standard version, the valve is zinc-coated for 240 h protection acc. to ISO 9227

Functional Description

A direct-operated, spool-type hydraulic pressure reducing valve in the form of a slip-in cartridge. Reduced pressure output is proportional to DC current input. This valve is intended for use as a pressure limiting device. Note: Consult factory for special OEM versions of this product.

Model Code	no mesh screen	with mesh screen
Symbol		

Technical Data

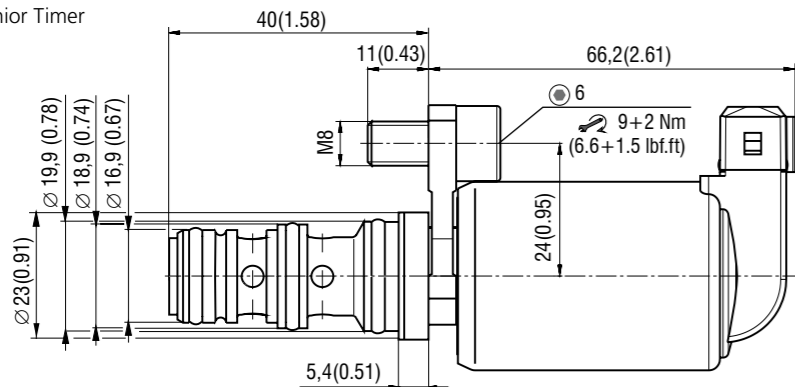
Valve size / Cartridge cavity		D20 / W3	
Max. operating pressure (port P)	bar (PSI)	50 (730)	
Max. reducing pressure (port A)	bar (PSI)	20 (290)	25 (363)
Max. flow rate P-A	l/min (GPM)	30 (7.9)	
Fluid temperature range	°C (°F)	-30 ... 90 (-22 ... 194), +100 (212) short-time	
Ambient temperature range	°C (°F)	-30 ... 90 (-22 ... 194), +100 (212) short-time	
Response time at 100% signal	ms	< 50	
Solenoid data			
Supply voltage	V	12 DC	24 DC
Max. current	A	1	1
Rated resistance at 20 °C (68 °F)	Ω	7.2±6.5%	11.2±6.5%
Duty cycle	%	100	
Optimal PWM frequency	Hz	100	
Quenching diode		BZW06-28B	BZW06-33B
Enclosure type acc. to EN 60529**		(acc.to terminal type) IP 67 / IP 69K	
Mass	kg (lbs)	0.4 (0.88)	
	Data Sheet	Type	
General information			
Valve bodies	In-line mounted	SB_0018	SB-W3-*
Cavity details		SMT_0019	SB-W3-*
Spare parts		SP_8010	

**The indicated IP protection level is only reached with a properly mounted connector.

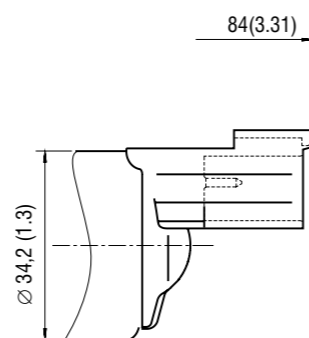
Dimensions in millimeters (inches)

Connector type

E3, E4 - IP67
AMP Junior Timer



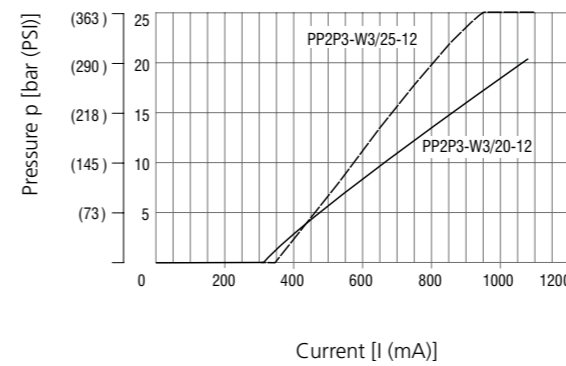
E12A, E13A - IP67 / IP69K
Deutsch DT04-2P



Characteristics measured at v = 32 mm²/s (156 SUS)

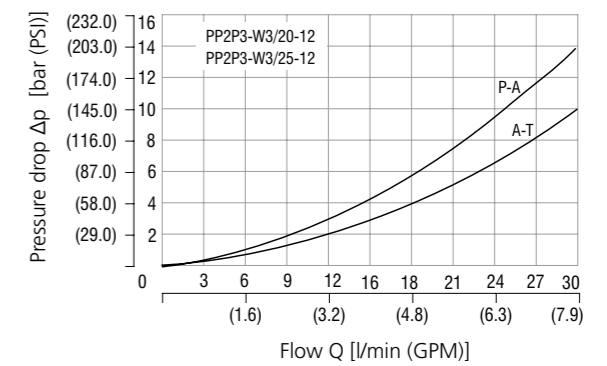
Reduced pressure related to control signal

Port A, range 0 - 20 bar (290 PSI)
Port A, range 0 - 25 bar (363 PSI)
Port P, Inlet pressure 50 bar (730 PSI)
Q = 0 lpm (GPM)

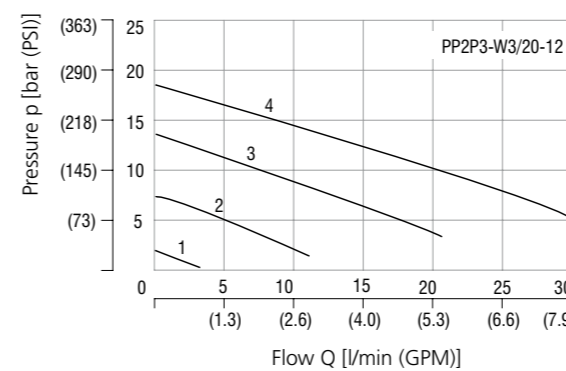


Pressure drop related to flow rate

A-T, Valve coil de-energized (relieving function)
P-A, Valve coil energized (reducing function)

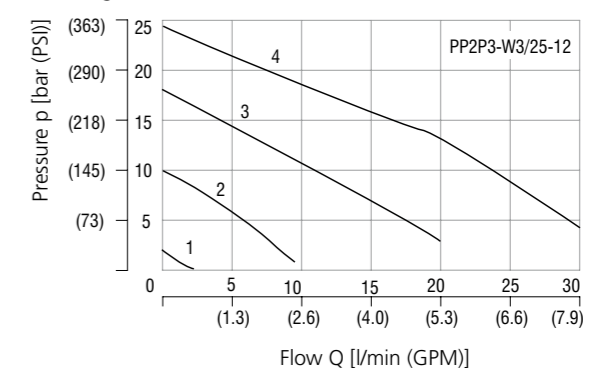


Reducing pressure related to flow rate



Reducing pressure related to flow rate

Reducing Function P - A



Control signal	
1	40 %
2	60 %
3	80 %
4	100 %

Ordering Code

PP2P3 - W3/ - -

Proportional pressure control valve, reducing - relieving, direct-acting, slip-in style

Valve cavity
D20 mm (0.79 in)

Max. reducing pressure
20 bar (290 PSI) 20
25 bar (363 PSI) 25

Supply voltage / max. current
12 V DC / 1 A 12
24 V DC / 1 A 24

Mesh screen
No designation without mesh screen
SP-125 port P, 125 microns

Surface treatment
A zinc-coated (ZnCr-3), ISO 9227 (240 h)
B zinc-coated (ZnNi), ISO 9227 (520 h)

Seals
No designation NBR
V FPM (Viton)

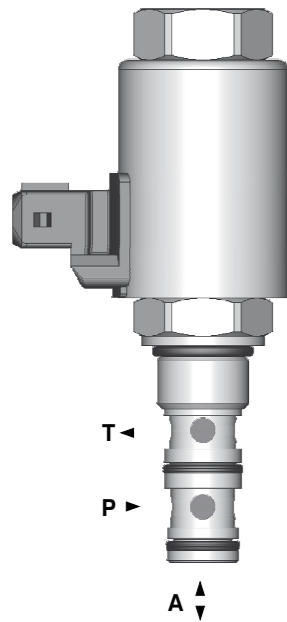
Connector
E3 AMP Junior Timer - radial direction (2 pins; male)
E4 E3 with quenching diode
E12A Deutsch DT04-2P - axial direction
E13A E12A with quenching diode

Besides the shown, commonly used valve versions other special models are available. Contact our technical support for their identification, feasibility and operating limits.

Proportional Pressure Control Valve, Reducing - Relieving, Direct-Acting

PVRM1-063/S

M20x1.5 • Qmax 20 l/min (5 GPM) • pmax 50 bar (700 PSI)



Technical Features

- › Excellent stability throughout flow range with rapid response to proportional current input change
- › Low hysteresis, accurate pressure control and low pressure drop
- › Precise pressure control vs current and excellent repeatability
- › Integrated relief function for protection against pressure peaks
- › Solenoid electrical terminal acc. to EN 175301-803-A, AMP Junior Timer, or Deutsch DT04-2P
- › 12 or 24 V DC coils
- › Optional mesh screen
- › In the standard version, the valve is zinc-coated for 240 h protection acc. to ISO 9227

Functional Description

A direct-operated, spool-type hydraulic pressure reducing-relieving valve in the form of a screw-in cartridge. Reduced pressure output is proportional to DC current input. This valve is intended for use as a pressure limiting device. Note: Consult factory for special OEM versions of this product.

Model Code	no mesh screen	with mesh screen
Symbol		

Technical Data

Valve size / Cartridge cavity		M20x1.5 / QE3	
Max. operating pressure (port P)	bar (PSI)	50 (730)	
Max. reduced pressure (port A)	bar (PSI)	20 (290)	32 (464)
Max. flow rate P-A	l/min (GPM)	20 (5.3)	
Fluid temperature range	°C (°F)	-30 ...90 (-22 ...194), +100 (212) short-time	
Ambient temperature range	°C (°F)	-30 ...90 (-22 ...194), +100 (212) short-time	
Response time at 100% signal	ms	< 50	
Solenoid data			
Supply voltage	V	12 DC	24 DC
Max. current	A	1	0,75
Rated resistance at 20 °C (68 °F)	Ω	7.1 ± 6.5%	20.6 ± 6.5%
Duty cycle	%	100	
Optimal PWM frequency	Hz	100	
Quenching diode		BZW06-28B	BZW06-33B
Enclosure type acc. to EN 60529**	DIN / AMP / Deutsch DT04-2P	IP65 / IP67 / IP69K	
Mass with solenoid	kg (lbs)	0.4 (0.88)	

	Data sheet	Type
General information	GI_0060	Products and operating conditions
Cavity details	SMT_0019	SMT-QE3*
Spare parts	SP_8010	

**The indicated IP protection level is only reached with a properly mounted connector.

Dimensions in millimeters (inches)

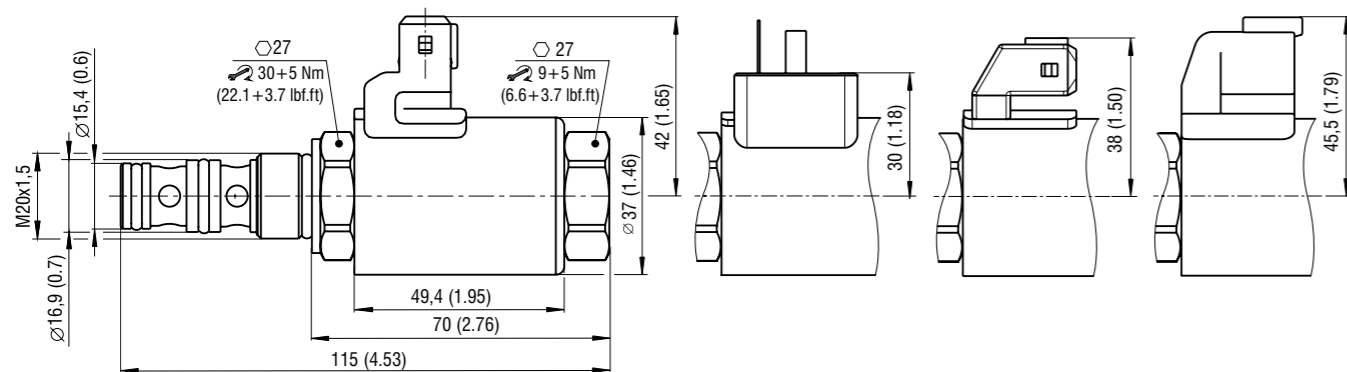
Connector type

E3, E4 - IP67
AMP Junior Timer - radial

E1, E2 - IP65
EN 175301-803-A

E3A, E4A - IP67
AMP Junior
Timer - axial

E12A, E13A - IP67/ IP69K
Deutsch DT04-2P

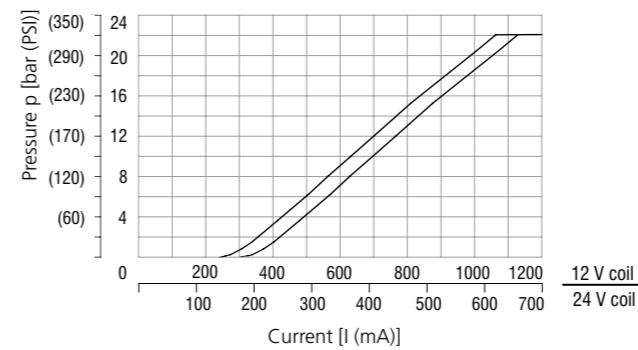


Characteristics measured at v = 32 mm³/s (156 SUS)

Reduced pressure related to control signal

Port A, range 0 - 20 bar (290 PSI), Q = 0 lpm (GPM)
Port P, inlet pressure 50 bar (730 PSI)

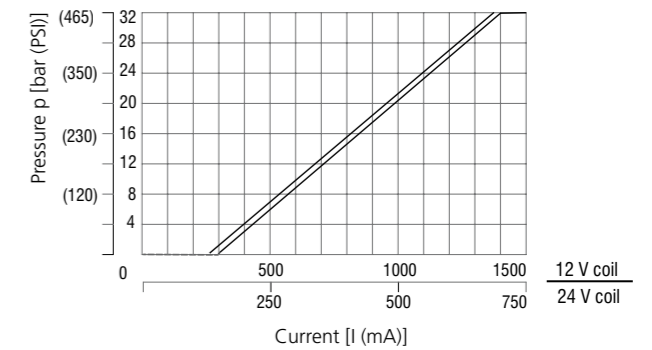
PVRM1-063/S*20



Reduced pressure related to control signal

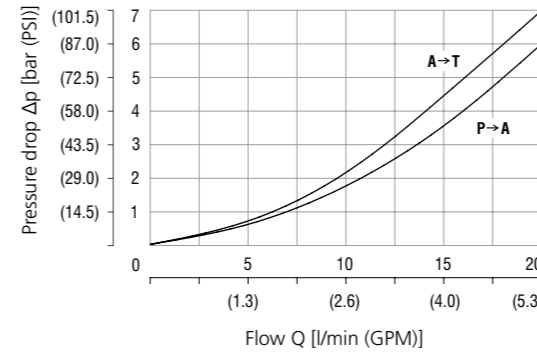
Port A, range 0 - 32 bar (464 PSI), Q = 0 lpm (GPM)
Port P, inlet pressure 50 bar (730 PSI)

PVRM1-063/S*32



Pressure drop related to flow rate

A-T, Valve coil de-energized (relieving function)
P-A, Valve coil energized (reducing function)



Ordering Code

PVRM1 - 063 / S - [] - [] - [] - [] - []	
Proportional pressure control valve, reducing - relieving, direct-acting	No designation
Valve cavity M20x1.5 / QE3	Mesh screen without mesh screen SP-125
Model screw-in cartridge	Surface treatment A zinc-coated (ZnCr-3), ISO 9227 (240 h) B zinc-coated (ZnNi), ISO 9227 (520 h)
Max. reduced pressure 20 bar (290 PSI) 32 bar (464 PSI)	Seals No designation V NBR FPM (Viton)
Supply voltage / max. current 12 V DC / max. 1 A 24 V DC / max. 0.75 A	Connector E1 EN 175301-803-A E2 E1 with quenching diode E3 AMP Junior Timer - radial direction (2 pins; male) E4 E3 with quenching diode E3A AMP Junior Timer - axial direction (2 pins; male) E4A E3A with quenching diode E12A Deutsch DT04-2P - axial direction E13A E12A with quenching diode

Proportional Pressure Control Valve, Reducing - Relieving, Direct-Acting

PVRM3-10

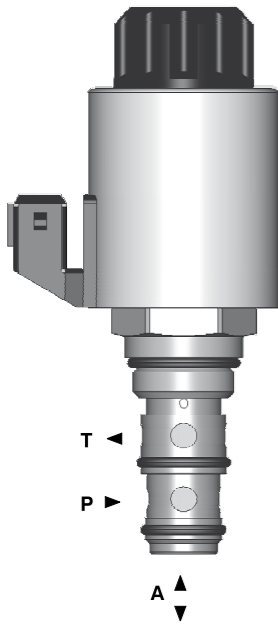
M24x1.5 • Q_{max} 40 l/min (11 GPM) • p_{max} 90 bar (1300 PSI)

Technical Features

- Excellent stability throughout flow range with rapid response to proportional current input change
- Low hysteresis, accurate pressure control and low pressure drop through CFD optimized flow paths
- Precise pressure control vs current and excellent repeatability
- Integrated relief function for protection against pressure peaks
- Solenoid electrical terminal AMP Junior Timer, or Deutsch D04-2P
- 12 or 24 V DC coils
- In the standard version, the valve is zinc-coated for 240 h protection acc. to ISO 9227

Functional Description

A direct-operated, spool-type hydraulic pressure reducing-relieving valve in the form of a screw-in cartridge. Reduced pressure output is proportional to DC current input. This valve is intended for use as a pressure limiting device. Note: Consult factory for special OEM versions of this product.



Model Code	no mesh screen
Symbol	

Technical Data

Valve size / Cartridge cavity	M24x1.5 / QJ3		
	Max. operating pressure (port P)	bar (PSI)	50 (730)
Max. reduced pressure (port A)	bar (PSI)	18 (260)	20 (290) 30 (435) 80 (1160)
Max. flow rate P-A	l/min (GPM)	40 (11)	
Fluid temperature range	°C (°F)	-30 ... +90 (-22 ... +194), +100 (212) short-time	
Ambient temperature range	°C (°F)	-30 ... +90 (-22 ... +194), +100 (212) short-time	
Response time at 100% signal	ms	< 50	
Solenoid data			
Supply voltage	V	12 DC	24 DC
Max. current	A	1.5	1
Rated resistance at 20 °C (68 °F)	Ω	5 ± 6.5%	13.4 ± 6.5%
Duty cycle	%	100	
Optimal PWM frequency	Hz	150	
Quenching diode		BZW06-28B	BZW06-33B
Enclosure type acc. to EN 60529**	AMP / Deutsch DT04-2P	(acc.to terminal type) IP67 / IP69K	
Mass with solenoid	kg (lbs)	0.4 (0.88)	

	Data Sheet	Type
General information	GI_0060	Products and operating conditions
Cavity details	SMT_0019	SMT-QJ3*
Spare parts	SP_8010	

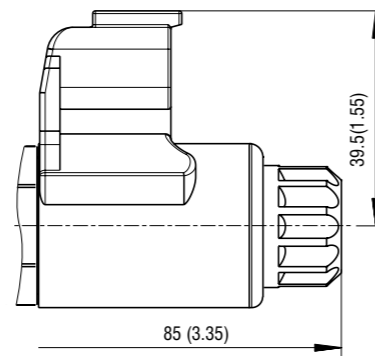
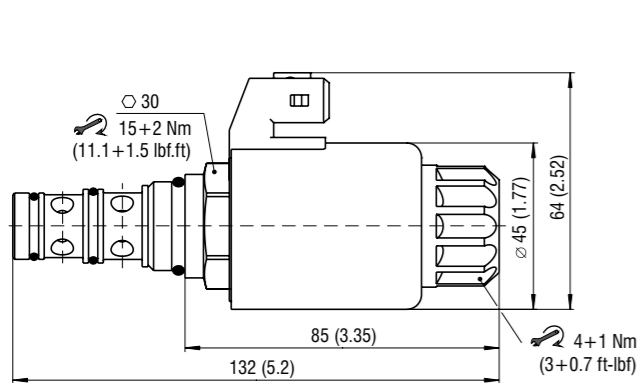
**The indicated IP protection level is only reached with a properly mounted connector.

Dimensions in millimeters (inches)

Connector type

AMP Junior Timer E3A, E4A - IP67

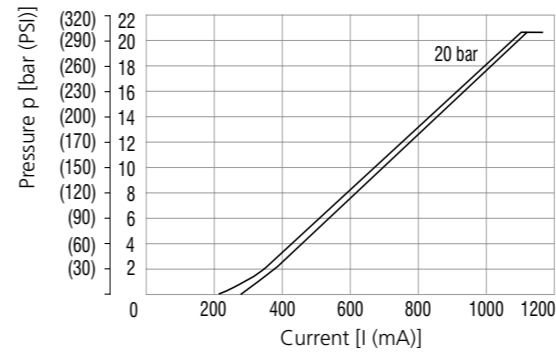
Deutsch DT04-2P - E12A, E13A - IP69K



Characteristics measured at v = 32 mm²/s (156 SUS)

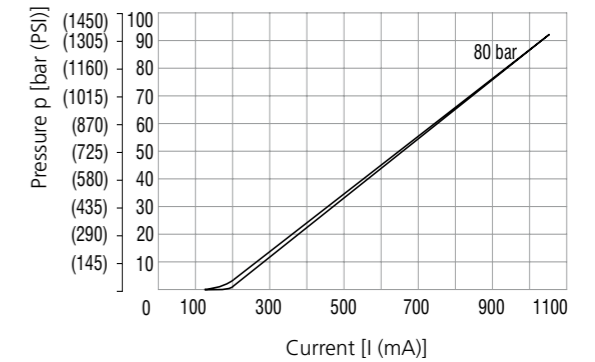
Reduced pressure related to control signal

Port A, range 0 - 20 bar (290 PSI), Q = 0 lpm (GPM)
Port P, inlet pressure 50 bar (730 PSI)



Reduced pressure related to control signal

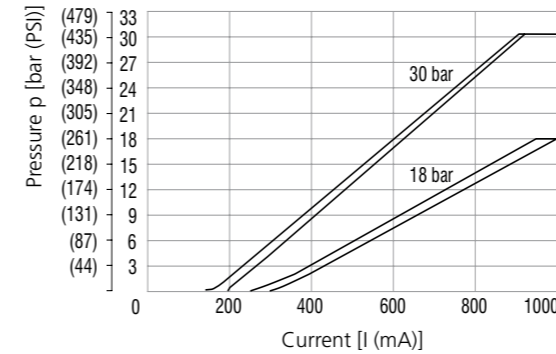
Port A, range 0 - 80 bar (1160 PSI), Q = 0 lpm (GPM)
Port P, inlet pressure 90 bar (1305 PSI)



Reduced pressure related to control signal

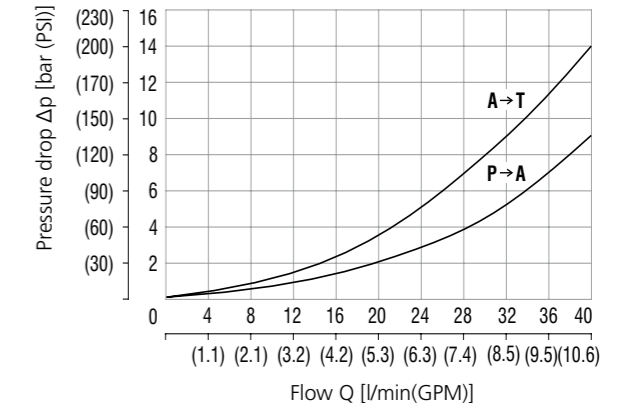
Port A, range 0 - 18 bar (260 PSI), Q = 0 lpm (GPM)
Port P, inlet pressure 50 bar (730 PSI)

Port A, range 0 - 30 bar (435 PSI), Q = 0 lpm (GPM)
Port P, inlet pressure 50 bar (730 PSI)



Pressure drop related to flow rate

A-T, Valve coil de-energized (relieving function)
P-A, Valve coil energized (reducing function)



Ordering Code

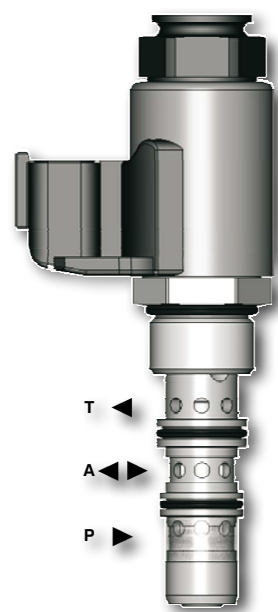
PVRM3 - 10 / S - [] - [] - [] - []

- Proportional pressure control valve, reducing - relieving, direct-acting**
- Valve cavity**
M24x1.5 / QJ3
- Model**
screw-in cartridge
- Max. reduced pressure**
18 bar (260 PSI) 18
20 bar (290 PSI) 20
30 bar (435 PSI) 30
80 bar (1160 PSI) 80
- Supply voltage / max. current**
12 V DC / 1.5 A 12
24 V DC / 1 A 24
- Surface treatment**
A zinc-coated (ZnCr-3), ISO 9227 (240 h)
B zinc-coated (ZnNi), ISO 9227 (520 h)
- Seals**
NBR
V FPM (Viton)
- Connector type**
E3A AMP Junior Timer - axial direction (2 pins; male)
E4A E3A with quenching diode
E12A Deutsch DT04-2P - axial direction
E13A E12A with quenching diode
- No designation**
V

Proportional Pressure Control Valve, Reducing - Relieving, Pilot Operated, Screw-In Style

SP4P1-B4

7/8-14 UNF • Q_{max} 40 l/min (11 GPM) • p_{max} 30 bar (435 PSI)



Technical Features

- › Excellent stability throughout flow range with rapid response to proportional current input change
- › Low hysteresis, accurate pressure control and low pressure drop through CFD optimized flow paths
- › Precise pressure control vs current and excellent repeatability
- › Integrated relief function for protection against pressure peaks
- › Solenoid electrical terminal: AMP Junior Timer or Deutsch DT04-2P
- › 12 or 24 V DC coils
- › Compact design with reduced solenoid dimensions for production cost saving
- › High flow capacity and low coil power consumption
- › Optional mesh screen
- › In the standard version, the valve is zinc-coated for 240 h protection acc. to ISO 9227

Functional Description

A pilot-operated, spool-type hydraulic pressure reducing valve in the form of a screw-in cartridge. Reduced pressure output is proportional to DC current input. This valve is intended for use as a pressure limiting device. Note: Consult factory for special OEM versions of this product.

Model Code	no mesh screen	with mesh screen
Symbol		

Technical Data

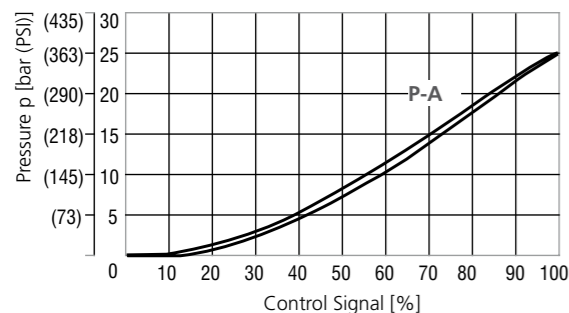
Valve size / Cartridge cavity		7/8-14 UNF-2A / B4	
Max. operating pressure (port P)	bar (PSI)	30 (435)	
Max. reducing pressure (port A)	bar (PSI)	25 (363)	
Max. flow rate P-A	l/min (GPM)	40 (11)	
Fluid temperature range	°C (°F)	-30 ...90 (-22 ...194), +100 (212) short time	
Ambient temperature range	°C (°F)	-30 ...90 (-22 ...194), +100 (212) short time	
Response time at 100 % signal	ms	< 50	
Solenoid data			
Supply voltage	V	12 DC	24 DC
Max. current	A	0.7	0.35
Rated resistance at 20 °C (68 °F)	Ω	7.82±5 %	29.5±4.5 %
Duty cycle	%	100	
Optimal PWM frequency	Hz	200	
Quenching diode		BZW06-28B	BZW06-33B
Enclosure type acc.to EN 60529**		(acc.to terminal type) IP67 / IP69K	
Mass with solenoid	kg (lbs)	0.3 (0.66)	
Data Sheet		Type	
General information		GI_0060	
Coil types		C_8007	
Valve bodies	In-line mounted	SB_0018	
	Sandwich mounted	SB-04(06)_0028	
Cavity details / Form tools		SMT_0019	
Spare parts		SP_8010	

**The indicated IP protection level is only reached with a properly mounted connector.

Characteristics measured at $v = 32 \text{ mm}^2/\text{s}$ (156 SUS)

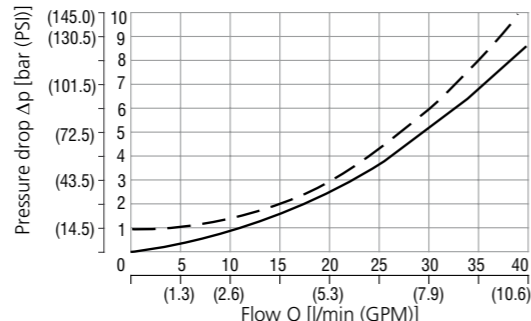
Reduced pressure related to control signal

Port A of range 0 - 25 bar (363 PSI), $Q = 0 \text{ lpm}$ (GPM)
Port P inlet pressure 30 bar (435 PSI)
measured without mesh screen



Pressure drop related to flow rate

— A-T Valve coil de-energized (relieving function)
— P-A Valve coil energized (reducing function)
measured without mesh screen

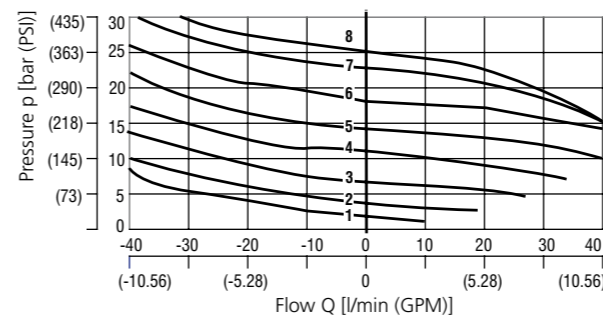


Characteristics measured at $v = 32 \text{ mm}^2/\text{s}$ (156 SUS)

Reducing - relieving pressure related to flow rate

Reducing pressure range 0 - 25 bar (0 - 363 PSI), input 30 bar (435 PSI)
various control currents
measured without mesh screen

relieving function A-T / reducing function P-A

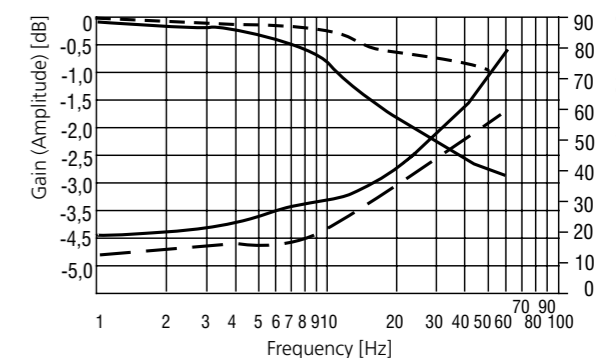


1	2	3	4	5	6	7	8
24%	35%	47%	59%	70%	82%	94%	100%

Frequency response characteristics

Inlet pressure at port P - 30 bar (435 PSI), flow = 0 lpm (GPM)

----- signal 70 ± 25%
— signal 55 ± 40%

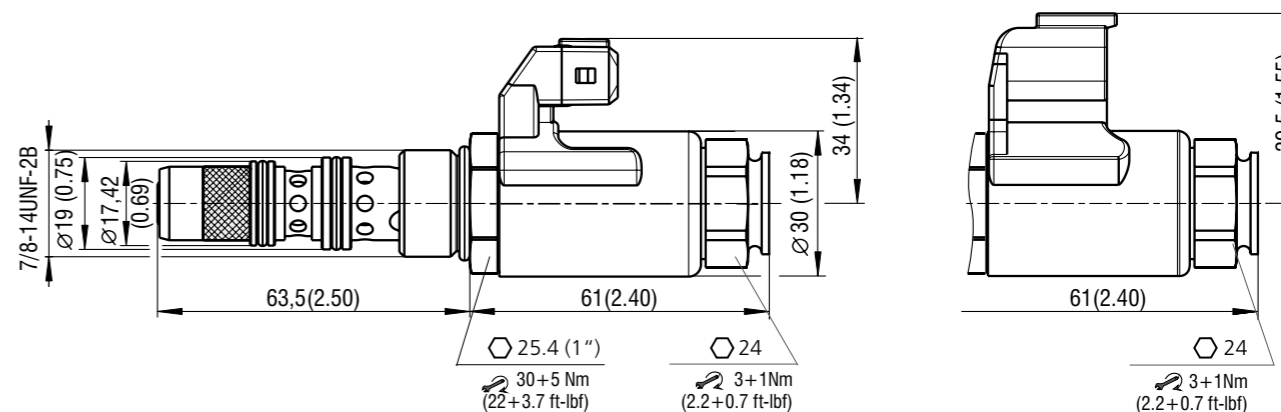


Dimensions in millimeters (inches)

Connector type

E3A, E4A - IP67
AMP Junior Timer

E12A, E13A - IP67 / IP69K
Deutsch DT04-2P



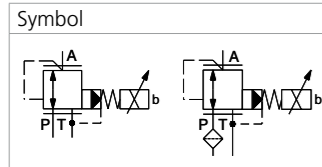
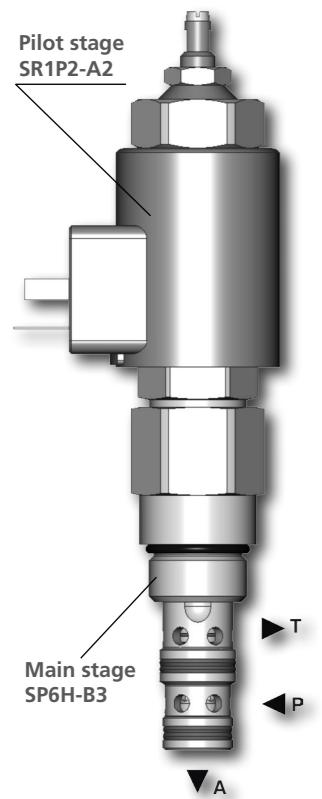
Ordering Code

SP4P1-B4 / [] - [] - [] - [] - []	
Proportional pressure control valve, reducing - relieving, pilot operated, screw-in style	
Valve cavity 7/8-14 UNF	
Max. reducing pressure 20 bar (290 PSI) 25 bar (363 PSI)	20 25
Supply voltage / max. current 12 V DC / 0.7 A 24 V DC / 0.35 A	12 24
Mesh screen No designation SP-300	Mesh screen without mesh screen port P, 300 microns
Surface treatment A B	zinc-coated (ZnCr-3), ISO 9227 (240 h) zinc-coated (ZnNi), ISO 9227 (520 h)
Seals No designation V	NBR FPM (Viton)
Connector type E3A E4A E12A E13A	AMP Junior Timer - axial direction (2 pins; male) E3A with quenching diode Deutsch DT04-2P - axial direction E12A with quenching diode

Proportional Pressure Control Valve, Reducing - Relieving, Pilot Operated

SP4P2-B3

7/8-14 UNF • Q_{max} 60 l/min (16 GPM) • p_{max} 350 bar (5100 PSI)



Technical Features

- Increasing pressure output proportional with increasing DC current input
- Low hysteresis, accurate pressure control and low pressure drop
- Wide pressure range up to 350 bar
- The valve manual override allows the setting of a relief pressure when power supply is lost
- High flow capacity
- Solenoid electrical terminal acc. to EN 175301-803-A, AMP Junior Timer, or Deutsch DT04-2P
- 12 or 24 V DC coils
- In the standard version, the valve is zinc-coated for 240 h protection acc. to ISO 9227

Functional Description

A pilot-operated proportional pressure reducing valve in the form of a screw-in cartridge. The valve is designed for continuous regulation of pressure in the consumer port. The complete valve consists of a pilot stage valve SR1P2-A2 and a main stage with connection 7/8-14 UNF. Due to its 3-way design the valve is capable to relief the secondary pressure to the tank port. To set the minimum cranking pressure use the adjusting screw (s=5) which incorporates also an air bleed screw. Back pressure on port T becomes additive to the pressure setting of the valve. Air bleeding is necessary for the correct function of the valve. Installation: When possible, the valve should be mounted below the reservoir oil level. This will maintain oil in the actuator, preventing instability caused by air in the system. If this is not possible, mount the valve for best results vertically downward coil and ensure proper air bleeding.

Technical Data

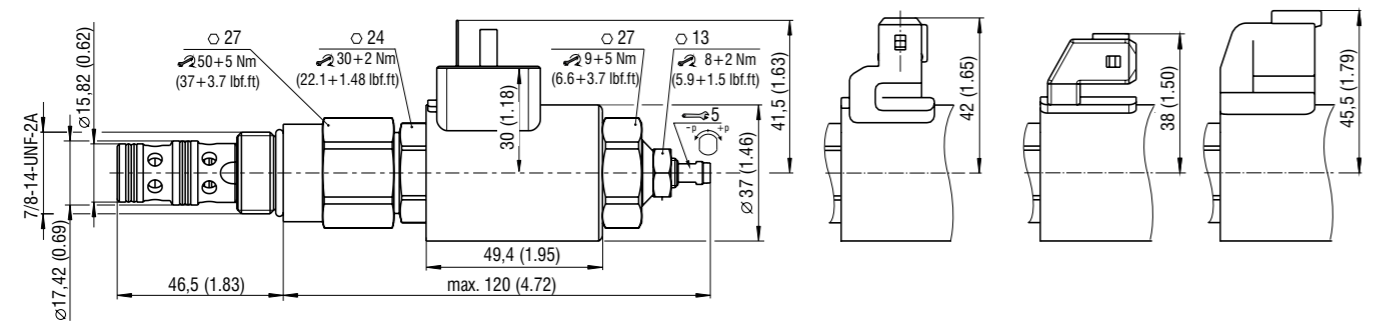
Valve size / Cartridge cavity		7/8-14 UNF-2A / B3	
Max. operating pressure (port P)	bar (PSI)	350 (5080)	
Max. reduced pressure (port A)	bar (PSI)	100 (1450)	
Max. flow rate P-A	l/min (GPM)	60 (15.9)	
Fluid temperature range (FPM)	°C (°F)	-20 ... 120 (-4 ... 248)	
Ambient temperature range	°C (°F)	-20 ... 80 (-4 ... 176)	
Min. setting pressure	bar (PSI)	6 (87) for 0 l/min (0 GPM)	
Hysteresis	%	< 5	
Solenoid data			
Supply voltage	V	12 DC	24 DC
Max. current	A	1	0.6
Rated resistance at 20 °C (68 °F)	Ω	6.5±5 %	20.6±5 %
Duty cycle	%	100	
Optimal PWM frequency	Hz	250	
Quenching diode		BZW06-19B	BZW06-33B
Enclosure type acc.to EN 60529**		(acc.to terminal type) IP65 / IP67 / IP69K	
Mass with solenoid	kg (lbs)	0.6 (1.32)	
Data Sheet	Type		
General information			
GI_0060	Products and operating conditions		
Coil types	C_8007	C19B*	
Valve bodies	In-line mounted SB_0018	SB-B3*	
Cavity details / Form tools	SMT_0019	SMT-B3*	
Spare parts	SP_8010		

**The indicated IP protection level is only reached with a properly mounted connector.

Dimensions in millimeters (inches)

Connector type

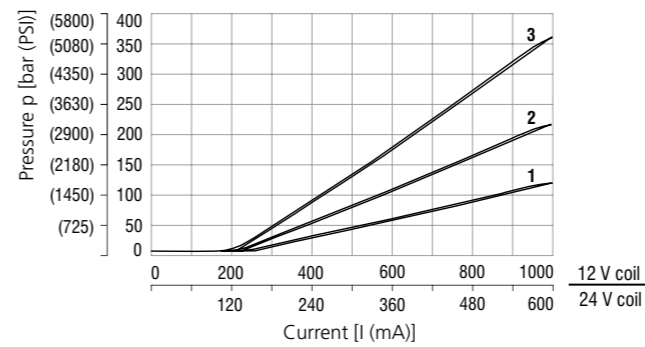
- | | | | |
|-----------------|------------------------------|-----------------------------|---------------------------|
| E1, E2 - IP65 | E3, E4 - IP67 | E3A, E4A - IP67 | E12A, E13A - IP67 / IP69K |
| EN 175301-803-A | AMP Junior
Timer - radial | AMP Junior
Timer - axial | Deutsch DT04-2P |



Characteristics measured at v = 32 mm²/s (156 SUS)

Reduced pressure related to control signal

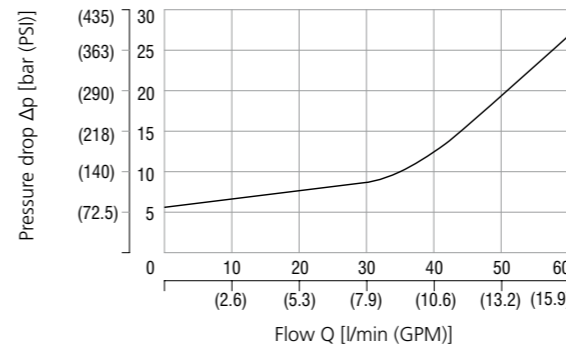
Q = 0 l/min (0 GPM), pressure in port T = 0 bar, PWM 160 Hz



Pressure range	12	21	35
	1	2	3

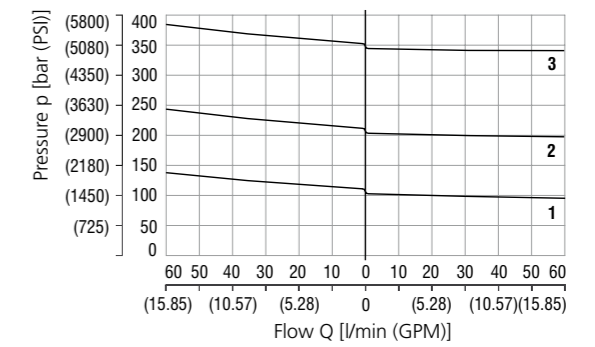
Pressure drop related to flow rate

0% of control current, A-T direction



Reducing - relieving pressure related to flow rate

relieving function A-T / reducing function P-A



Pressure range	12	21	35
	1	2	3

Ordering Code

SP4P2 - B3 / H [] - [] - [] - []

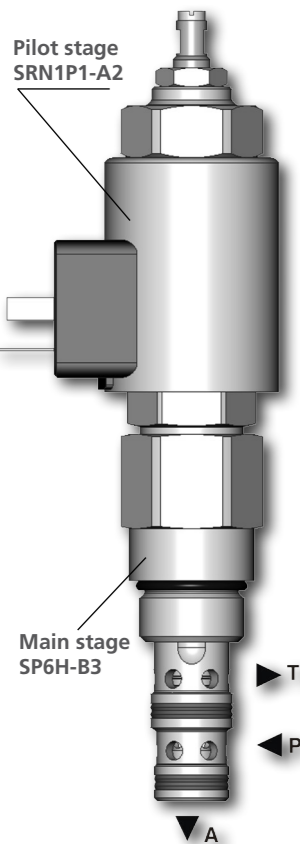
- Proportional pressure control valve, reducing - relieving, pilot operated**
- Valve cavity**
7/8-14 UNF
- Model**
High performance
- Max. reduced pressure**
up to 120 bar (1740 PSI) **12**
up to 210 bar (3046 PSI) **21**
up to 350 bar (5076 PSI) **35**
- Supply voltage / max. current**
12 V DC / 1.0 A **12**
24 V DC / 0.6 A **24**
- Main stage ordering key:** SP6H-B3/HV
- Surface treatment**
A zinc-coated (ZnCr-3), ISO 9227 (240 h)
B zinc-coated (ZnNi), ISO 9227 (520 h)
- Seals**
V NBR
FPM (Viton)
- Connector**
EN 175301-803-A
E1 with quenching diode
E2 AMP Junior Timer - radial direction (2 pins; male)
E3 with quenching diode
E3A AMP Junior Timer - axial direction (2 pins; male)
E4 with quenching diode
E4A E3A with quenching diode
E12A Deutsch DT04-2P - axial direction
E13A E12A with quenching diode
- No designation**

For other solenoid terminals see data sheet No. 8007

Proportional Pressure Control Valve, Reducing - Relieving, Pilot Operated, Inverted

SPN4P1-B3

7/8-14 UNF • Q_{max} 60 l/min (16 GPM) • p_{max} 350 bar (5100 PSI)



Technical Features

- Decreasing pressure output proportional with increasing DC current input
- Low hysteresis, accurate pressure control and low pressure drop
- Wide pressure range up to 350 bar
- Mechanical adjustment of minimum cracking pressure
- High flow capacity
- Solenoid electrical terminal acc. to EN 175301-803-A, AMP Junior Timer, Deutsch DT04-2P
- 12 or 24 V DC coils
- In the standard version, the valve is zinc-coated for 240 h protection acc. to ISO 9227

Functional Description

A pilot-operated proportional pressure reducing valve in the form of a screw-in cartridge. The valve is designed for continuous regulation of pressure in the consumer port. The complete valve consists of a pilot stage valve SRN1P1-A2 and a main stage with connection 7/8-14 UNF. Due to its 3-way design the valve is capable to relief the secondary pressure to the tank port. To set the minimum cracking pressure use the adjusting screw (s=5) which incorporates also an air bleed screw. Back pressure on port T becomes additive to the pressure setting of the valve. Air bleeding is necessary for the correct function of the valve.

Installation: When possible, the valve should be mounted below the reservoir oil level. This will maintain oil in the actuator, preventing instability caused by air in the system. If this is not possible, mount the valve for best results vertically downward coil and ensure proper air bleeding.

Technical Data

Valve size / Cartridge cavity	7/8-14 UNF-2A / B3	
Max. operating pressure (port P)	bar (PSI)	350 (5080)
Max. operating pressure (port T)	bar (PSI)	100 (1450)
Max. flow	l/min (GPM)	60 (15.9)
Fluid temperature range (FPM)	°C (°F)	-20 ... +120 (-4 ... 248)
Ambient temperature range	°C (°F)	-20 ... +80 (-4 ... 176)
Min. setting pressure	bar (PSI)	6 (87) for 0 l/min (0 GPM)
Hysteresis	%	< 5
Solenoid data		
Supply voltage	V	12 DC 24 DC
Max. current	A	1 0.6
Rated resistance at 20 °C (68 °F)	Ω	6.5±5 % 20.6±5 %
Duty cycle	%	100
Optimal PWM frequency	Hz	250
Quenching diode		BZW06-19B BZW06-33B
Enclosure type acc. to EN 60529**		(acc. to terminal type) IP65 / IP67 / IP69K
Mass with solenoid	kg (lbs)	0.6 (1.32)
Data Sheet		
General information	GI_0060	Type
Coil types	C_8007	C19B*
Valve bodies	In-line mounted	SB_0018 SB-B3*
Cavity details / Form tools	SMT_0019	SMT-B3*
Spare Parts	SP_8010	

**The indicated IP protection level is only reached with a properly mounted connector.

Dimensions in millimeters (inches)

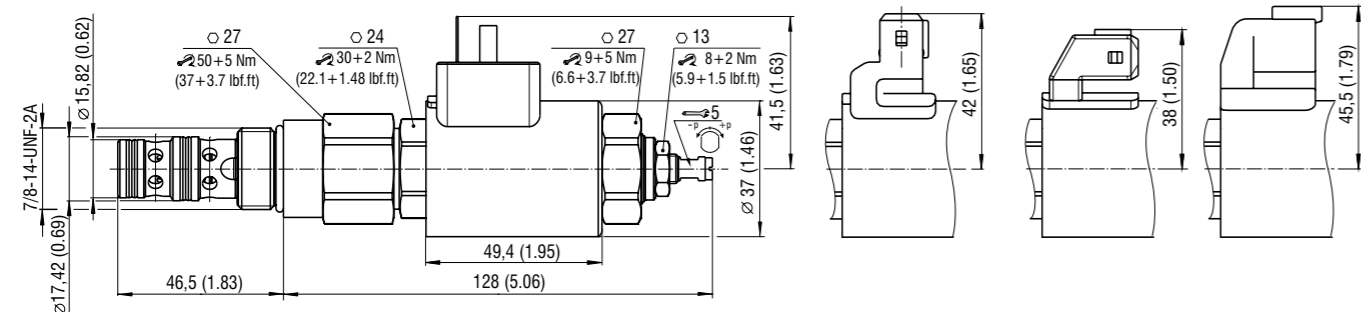
Connector type

E1, E2 - IP65
EN 175301-803-A

E3, E4 - IP67
AMP Junior Timer
- radial

E3A, E4A - IP67
AMP Junior Timer
- axial

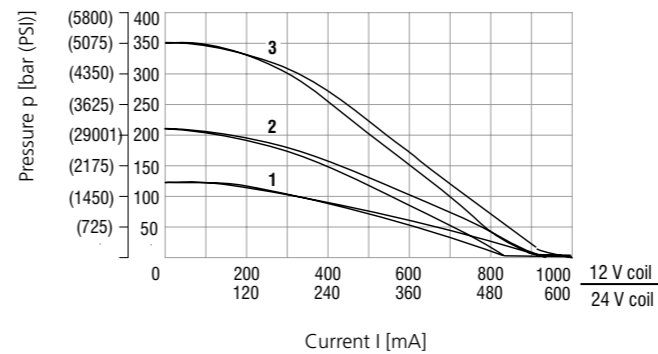
E12A, E13A
- IP67 / IP69K
Deutsch DT04-2P



Characteristics measured at v = 32 mm³/s (156 SUS)

Reduced pressure related to control signal

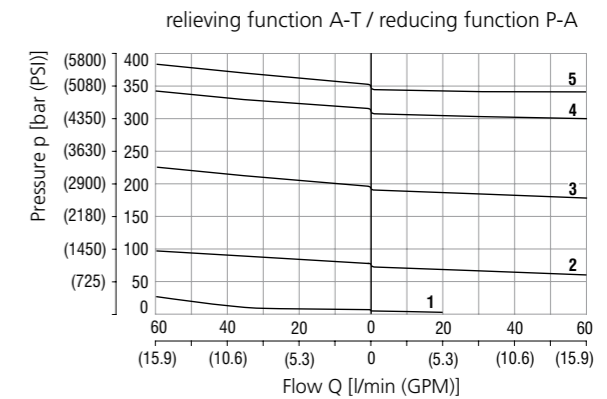
Q = 0 l/min (0 GPM), pressure in port T = 0 bar, PWM 160 Hz



Pressure range	12	21	35
	1	2	3

Reducing - relieving pressure related to flow rate

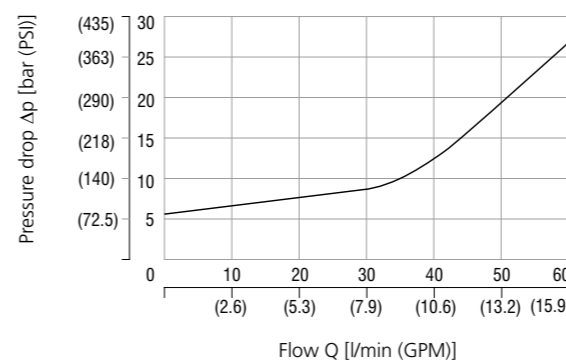
Pressure range 35, Input 400 bar, various control currents



Control current	1	2	3	4	5
	100%Imax	75%Imax	50%Imax	25%Imax	0%Imax

Pressure drop related to flow rate

100% of control current, A-T direction



Ordering Code

SPN4P1 - B3 / H [] - [] - [] - []

Proportional pressure control valve,
reducing - relieving, pilot operated,
inverted

Valve cavity
7/8-14 UNF

Model
High performance

Max. reduced pressure
up to 120 bar (1740 PSI)
up to 210 bar (3046 PSI)
up to 350 bar (5076 PSI)

Supply voltage / max. current
12 V DC / 1.0 A
24 V DC / 0.6 A

Main stage ordering key: SP6H-B3/HV

Surface treatment
A zinc-coated (ZnCr-3), ISO 9227 (240 h)
B zinc-coated (ZnNi), ISO 9227 (520 h)

Seals
No designation
V NBR
FPM (Viton)

Connector
E1 EN 175301-803-A
E2 E1 with quenching diode
E3 AMP Junior Timer - radial direction (2 pins; male)
E4 E3 with quenching diode
E3A AMP Junior Timer - axial direction (2 pins; male)
E4A E3A with quenching diode
E12A Deutsch DT04-2P - axial direction
E13A E12A with quenching diode

For other solenoid terminals see data sheet No. 8007

2-Way Pressure Compensator, Spool-Type, Direct-Acting, Modular

TV2-042/M

Size 04 (D02) • Q_{max} 16 l/min (4 GPM) • p_{max} 320 bar (4600 PSI)



Technical Features

- 2-Way pressure compensator, spool-type, direct-acting with subplate interface acc. to ISO 4401, DIN 24340 (CETOP 02)
- Modular design for vertical stacking assemblies with built-in load sensing shuttle valve
- Meter-in and meter-out flow control models with integrated by-pass check valves
- The valve keeps the pressure drop between the inlet and the pilot connection at a constant level
- Used as a load sensing valve with proportional directional and flow valves to control the flow rate independently of pressure variations
- Excellent stability throughout the flow range, rapid response to dynamic pressure changes
- Quiet and modulate response to load changes
- Hardened precision parts
- High flow capacity
- In the standard version, the valve housing is phosphated and steel parts are zinc-coated

Functional Description

A normally open, direct-acting, spring loaded 2-way pressure compensator in the form of a sandwich plate.

2-Way compensators for meter-in applications (models A,B,C)
The 2-way meter-in pressure compensators will maintain a constant pressure difference across the metering edge of the proportional directional valve. In this case, the pressure variations due to load changes as well as pump pressure changes are compensated. Any increase in pump pressure does not affect the flow. The meter-in compensators may only be used with positive load direction. They are designated for load compensation in inlet port P.

2-Way compensators for meter-out applications (models D,E,F)
In systems with changing load directions or negative load, the use of meter-out pressure compensators is required. With respect to the application, a valve with a pressure compensator installed in one or in both actuator ports are available. The pressure compensator is always mounted between the actuator and the proportional directional valve.

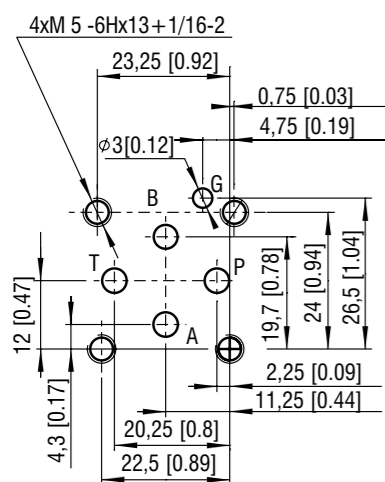
The valve will maintain the pressure difference between A and T or B and T constant. The flow rate and the flow direction are adjusted by the proportional directional valve. To enable free reverse flow, two by-pass check valves are incorporated into the valve body.

Technical Data

Valve size		04 (D02)
Max. operating pressure	bar (PSI)	320 (4640)
Max. flow	l/min (GPM)	16 (4.2)
Control pressure differential	bar (PSI)	10 (145)
Fluid temperature range (NBR)	°C (°F)	-30 +100 (-22 ... +212)
Fluid temperature range (FPM)	°C (°F)	-20 +120 (-4 ... +248)
Mass (all models)	kg (lbs)	0.6 (1.32)

	Data Sheet	Type
General information	GI_0060	Products and operating conditions
Mounting interface	SMT_0019	Size 04
Spare parts	SP_8010	

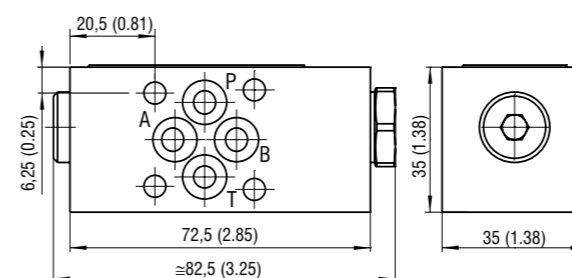
ISO 4401-02-01-0-05



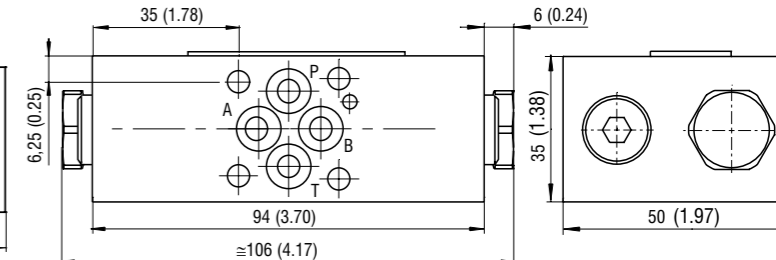
Ports P, A, B, T - max. Ø4.5 mm (0.18 in)

Dimensions in millimeters (inches)

TV2-042/MA (B, C) Meter-in compensator

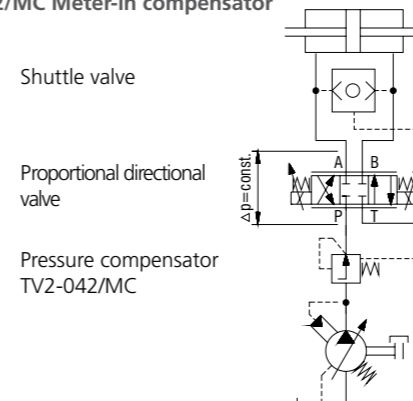


TV2-042/MD (E, F) Meter-out compensator

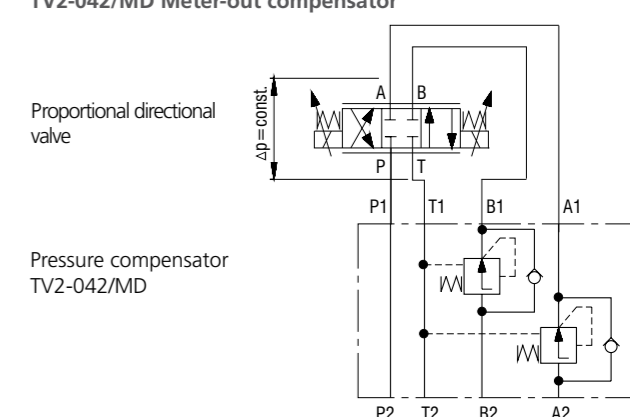


Application Example

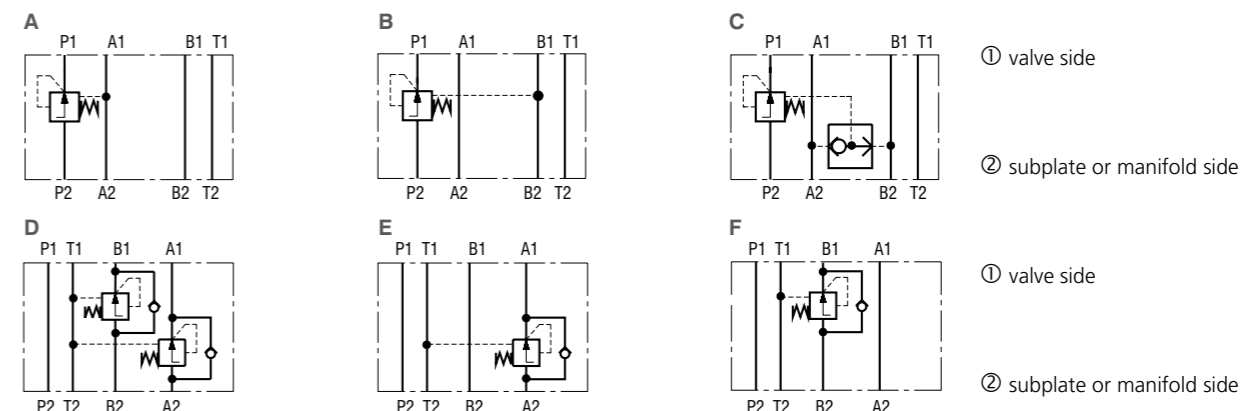
TV2-042/MC Meter-in compensator



TV2-042/MD Meter-out compensator



Functional Symbols



Notice: The orientation of the symbol on the name plate corresponds with the valve function.

Ordering Code

TV2-042/M 1 **C** -

2-Way pressure compensator, spool-type, direct-acting, modular

Nominal size
ISO 4401-02-01-0-05,
DIN 24340 (CETOP 02), NG04

2-way pressure compensator

Sandwich plate

Model
Meter-in compensator in port A
Meter-in compensator in port B
Meter-in compensator in port A and B
Meter-out compensator in port A and B
Meter-out compensator in port A
Meter-out compensator in port B

Surface treatment
No designation housing phosphated, steel parts
zinc-coated (ZnCr-3), ISO 9227 (240 h)
A zinc-coated (ZnCr-3), ISO 9227 (240 h)
B zinc-coated (ZnNi), ISO 9227 (520 h)

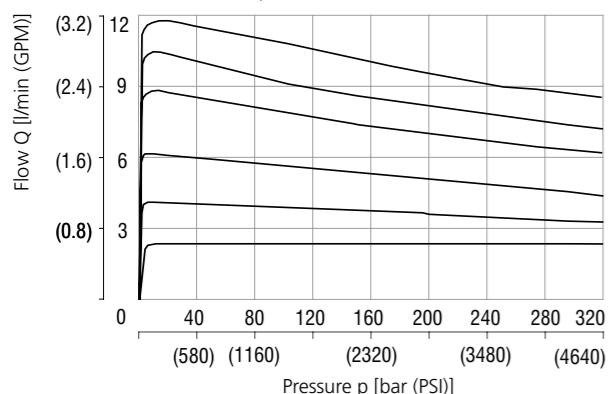
Seals
No designation
V NBR
FPM (Viton)

Adjustment option
fixed setting, not adjustable

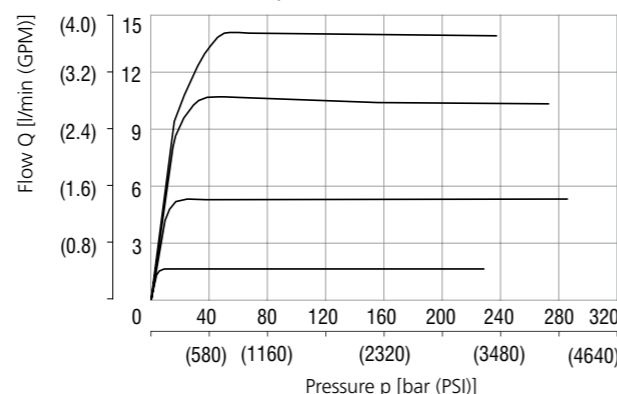
Control pressure differential
10 bar (145 PSI)

Regulated flow related to input pressure

TV2-042/MC Meter-in compensator



TV2-042/MD Meter-out compensator

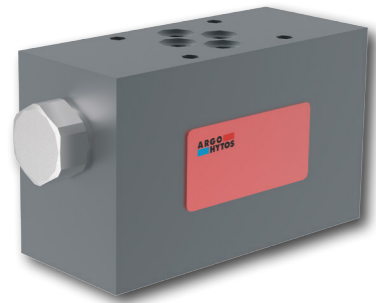


The characteristic of the pressure compensator corresponds to the flow rate of a PRM2-043Z11/12 proportional directional valve. If the pressure resistance increases due to a flow rate increase, the pressure differential also has to increase in order to ensure correct regulation.

2-Way Pressure Compensator, Spool-Type, Direct-Acting, Modular

TV2-062/M

Size 06 (D03) • Q_{max} 35 l/min (9 GPM) • p_{max} 350 bar (5100 PSI)



Technical Features

- 2-Way pressure compensator, spool-type, direct-acting with subplate interface acc. to ISO 4401, DIN 24340 (CETOP 03)
- Modular design for vertical stacking assemblies with built-in load sensing shuttle valve
- Meter-in and meter-out flow control models with integrated by-pass check valves
- The valve keeps the pressure drop between the inlet and the pilot connection at a constant level
- Used as a load sensing valve with proportional directional and flow valves to control the flow rate independently of the pressure variations
- Excellent stability throughout the flow range, rapid response to dynamic pressure changes
- Quiet and modulate response to load changes
- Hardened precision parts
- Load sensing port from mounting pattern side option
- High flow capacity
- In the standard version, the valve housing is phosphated and steel parts zinc-coated for 240 h protection acc. to ISO 9227

Functional Description

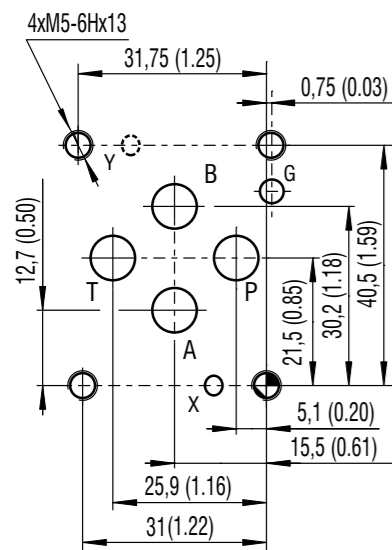
A normally open, direct-acting, spring loaded 2-way pressure compensator in the form of a sandwich plate. **2-Way compensators for meter-in applications (models A,B,C, CX)**
The 2-way meter-in pressure compensators will maintain a constant pressure difference across the metering edge of the proportional directional valve. In this case, the pressure variations due to load changes, as well as pump pressure changes are compensated. Any increase in pump pressure does not affect the flow. The meter-in compensators may only be used with positive load direction. They are designated for load compensation in inlet port P.
2-Way compensators for meter-out applications (models D,E,F)
In systems with changing load directions or negative load, the use of meter-out pressure compensators is required. With respect to the application, a valve with a pressure compensator installed in one or in both actuator ports are available. The pressure compensator is always mounted between the actuator and the proportional directional valve. The valve will maintain the pressure difference between A and T or B and T constant. The flow rate and the flow direction are adjusted by the proportional directional valve. To enable free reverse flow, two by-pass check valves are incorporated into the valve body.

Technical Data

Valve size		06 (D03)
Max. operating pressure	bar (PSI)	350 (5080)
Max. flow	l/min (GPM)	35 (9.2)
Control pressure differential	bar (PSI)	10 (145)
Fluid temperature range (NBR)	°C (°F)	-30 ... +100 (-22 ... +212)
Fluid temperature range (FPM)	°C (°F)	-20 ... +120 (-4 ... +248)
Mass (all models)	kg (lbs)	1.0 (2.20)

	Data Sheet	Type
General information	GI_0060	Products and operating conditions
Mounting interface	SMT_0019	Size 06
Spare parts	SP_8010	

ISO 4401-03-02-0-05

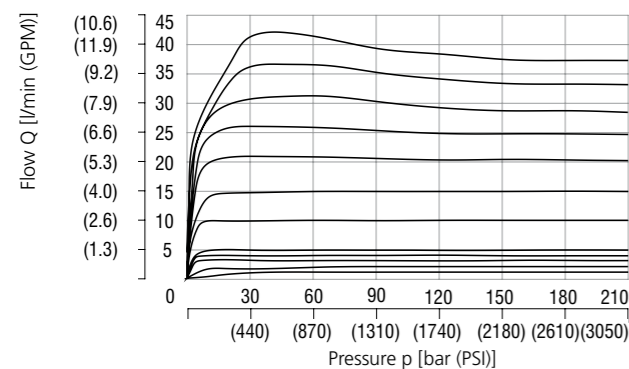


Ports P, A, B, T max. \varnothing 7.5 mm (0.29)

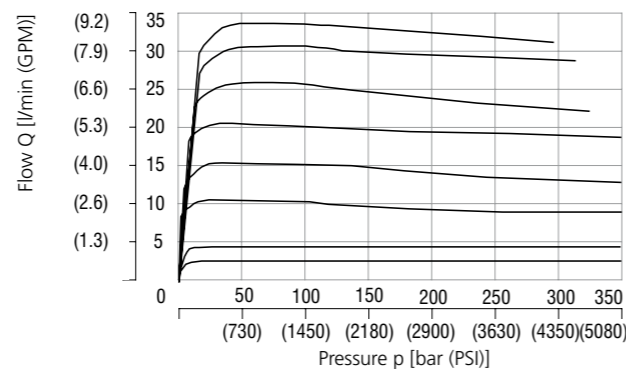
Characteristics measured at $v = 32 \text{ mm}^2/\text{s}$ (156 SUS)

Regulated flow related to input pressure

TV2-062/MC Meter-in compensator



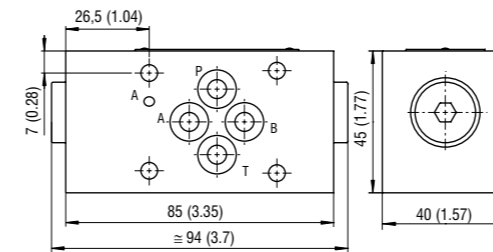
TV2-062/MD Meter-out compensator



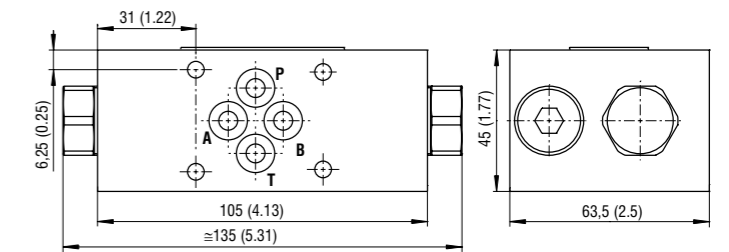
The characteristic of the pressure compensator corresponds to the flow rate of a PRM2-063Z11/30 proportional directional valve. If the pressure resistance increases due to a flow rate increase, the pressure differential also has to increase in order to ensure correct regulation.

Dimensions in millimeters (inches)

TV2-062/MA (B, C, CX) Meter-in compensator

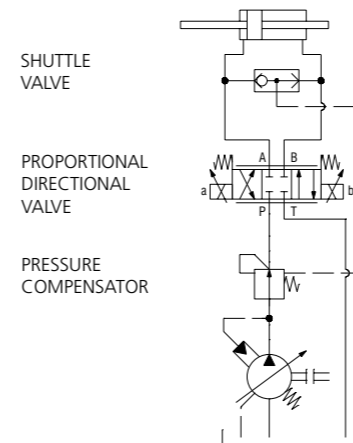


TV2-062/MD (E, F) Meter-out compensator

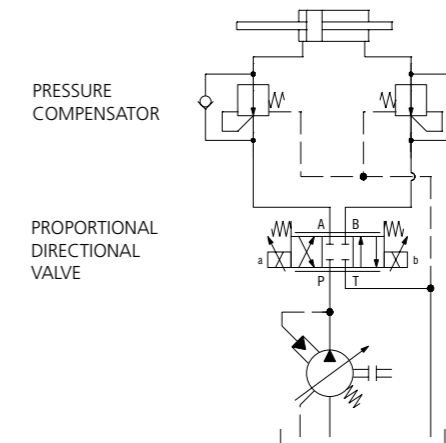


Application Example

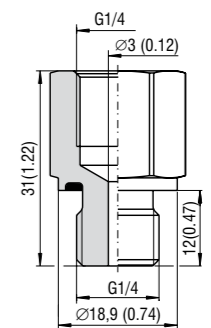
Meter-in compensator



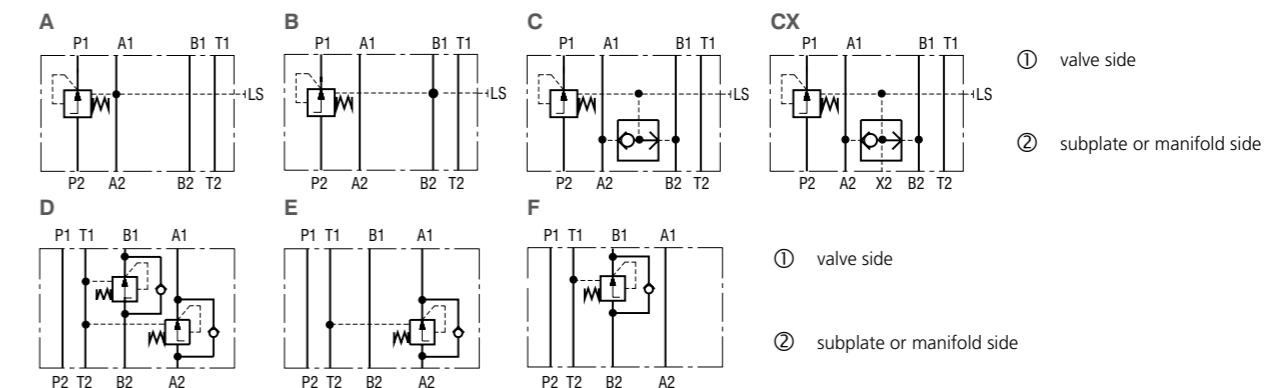
Meter-out compensator



Adapter G1/4/G1/4-ED
addition of equipment for external LS connection
Ordering number: 28004900



Functional Symbols



Notice: The orientation of the symbol on the name plate corresponds with the valve function.

Ordering Code

TV2-062/M 1 C -

2-Way pressure compensator, spool-type, direct-acting, modular

Nominal size
ISO 4401-03-02-0-05, DIN 24340 (CETOP 03), NG 06

2-Way pressure compensator

Sandwich plate

Model
Meter-in compensator in port A: **A**
Meter-in compensator in port B: **B**
Meter-in compensator in port A and B: **C**
Meter-in compensator in port A and B with LS pattern port: **CX**
Meter-out compensator in port A and B: **D**
Meter-out compensator in port A: **E**
Meter-out compensator in port B: **F**

Surface treatment
No designation: housing phosphated, steel parts zinc-coated (ZnCr-3), ISO 9227 (240 h)
A: zinc-coated (ZnCr-3), ISO 9227 (240 h)
B: zinc-coated (ZnNi), ISO 9227 (520 h)

Seals
No designation: NBR
V: FPM (Viton)

Adjustment option
fixed setting, not adjustable

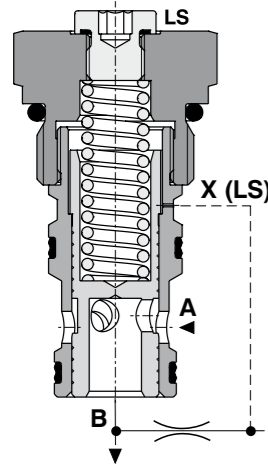
Control pressure differential
10 bar (145 PSI)

2-Way Pressure Compensator, Spool-Type, Direct-Acting

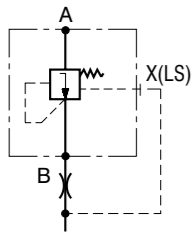
TV2-102/S

M27x2 • Q_{max} 80 l/min (21 GPM) • p_{max} 350 bar (5100 PSI)

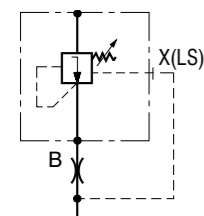
TV2-102/S*C



TV2-102/S*C



TV2-102/S*S(RP)



Technical Features

- › The valve keeps the pressure drop between the inlet and the pilot connection at a constant level
- › Used as a load sensing valve with proportional directional and flow valves to control the flow rate independently of the pressure variations
- › Excellent stability throughout the flow range, rapid response to dynamic pressure changes
- › Spring setting of the variable adjustment compensator can be varied from 4 to 14 bar (58 to 203 PSI)
- › Quiet and modulate response to load changes
- › Integrated stroke limiter for reliable operation
- › Adjustable by allen key or hand knob, or delivered with fix setting
- › Hardened precision parts
- › High flow capacity
- › In the standard version, the valve is zinc-coated for 240 h protection acc. to ISO 9227

Functional Description

A normally open, direct-acting, spring loaded pressure compensator in the form of a screw-in cartridge. The outlet of the controlled directional or proportional flow valve can be connected back to the pressure compensator port X as a load sensing signal. Typically, 2-way pressure compensators are used in serial connection with a flow restrictor valve to control raising or lowering a variable load at the same velocity. The pressure compensator valve then keeps a nearly constant pressure difference between its pressure inlet and the pressure at the output port of the regulated flow valve. When the pressure differential exceeds the pre-set value, the pressure compensator closes and restricts the flow to the flow valve. If there is no flow demand from the consumer, the compensator remains open.

Technical Data

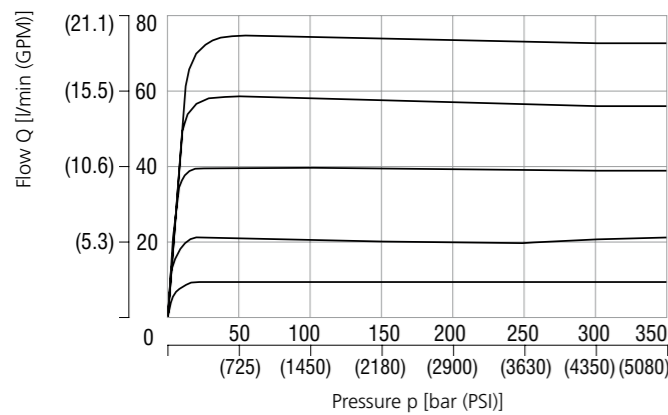
Valve size / Cartridge cavity	M27x2 / QM3	
Max. operating pressure	bar (PSI)	350 (5080)
Max. flow	l/min (GPM)	80 (21.1)
Control pressure differential	bar (PSI)	4... 14 (58...203)
Fluid temperature range (NBR)	°C (°F)	-30... +100 (-22... +212)
Fluid temperature range (FPM)	°C (°F)	-20... +120 (-4... +248)
Mass	kg (lbs)	0.15 (0.3)

		Data Sheet	Type
General information		GI_0060	Products and operating conditions
Valve bodies	Sandwich mounted	SB-04(06)_0028	SB-*QM3*
Cavity details		SMT_0019	SMT-QM3*
Spare parts		SP_8010	

Characteristics measured at v = 32 mm²/s (156 SUS)

Regulated flow related to input pressure

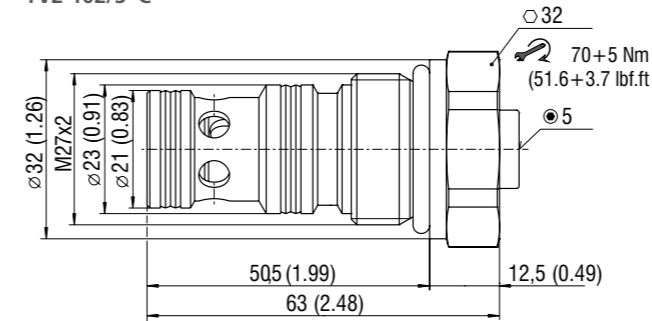
The characteristic of the pressure compensator corresponds to the flow rate of a PRM2-103Z11/60 proportional directional valve.



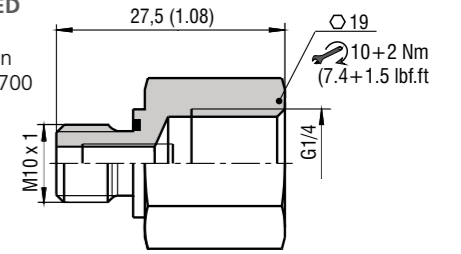
If the pressure resistance increases due to a flow rate increase, the pressure differential also has to increase in order to ensure correct regulation.

Dimensions in millimeters (inches)

TV2-102/S*C

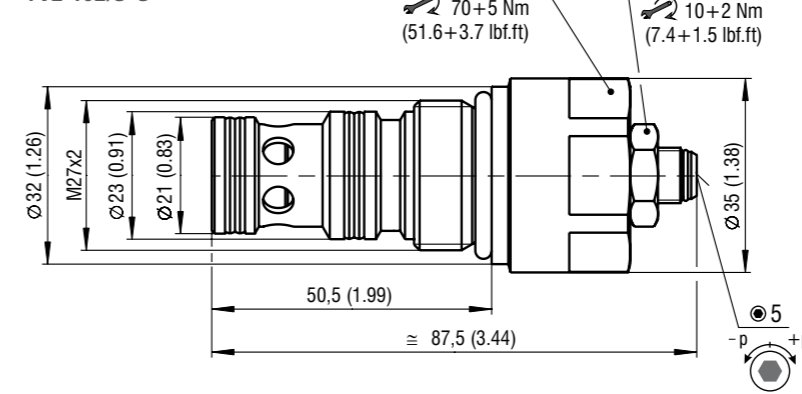


Adapter M10x1/G1/4-ED
addition of equipment
for external LS connection
Ordering number: 19860700

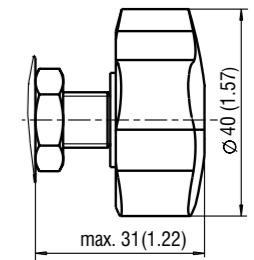


Applicable only for „TV*C“ versions. (Fixed setting, not adjustable)

TV2-102/S*S

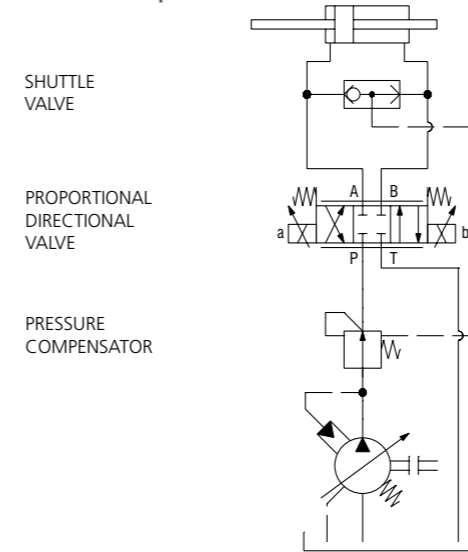


TV2-102/S*RP

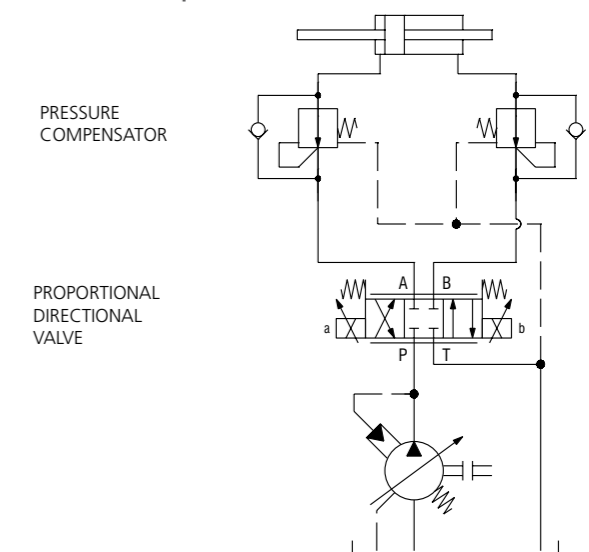


Application Example

Meter-in compensator



Meter-out compensator



Ordering Code

TV2-102/S		Surface treatment	
2-Way pressure compensator, spool-type, direct-acting		A	zinc-coated (ZnCr-3), ISO 9227 (240 h)
Nominal size M27x2 / QM3		B	zinc-coated (ZnNi), ISO 9227 (520 h)
2-way pressure compensator		Seals	
Cartridge design		No designation	NBR
Control pressure differential		V	FPM (Viton)
4 - 12 bar (58 - 174 PSI), 10 bar (145 PSI) "C" Model	1	Adjustment option	
10 - 14 bar (145 - 203 PSI), 14 bar (203 PSI) "C" Model	2	C	fixed setting, not adjustable
		S	allen key (hex. 5), without protective cap
		RP	hand knob, plastic

2-Way Pressure Compensator, Spool-Type, Direct-Acting, Modular

TV2-102/M

Size 10 (D05) • Q_{max} 80 l/min (21 GPM) • p_{max} 350 bar (5100 PSI)



Technical Features

- > 2-Way pressure compensator, spool-type, direct-acting with subplate interface acc. to ISO 4401, DIN 24340 (CETOP 05)
- > Modular design for vertical stacking assemblies with built-in load sensing shuttle valve
- > Meter-in flow control models with load sensing from optional consumer ports
- > The valve keeps the pressure drop between the inlet and the pilot connection at a constant level
- > Used as a load sensing valve with proportional directional and flow valves to control the flow rate independently of the pressure variations
- > Excellent stability throughout the flow range, rapid response to dynamic pressure changes
- > Adjustable by allen key or hand knob, or delivered with fix setting
- > Quiet and modulate response to load changes
- > Hardened precision parts
- > High flow capacity
- > In the standard version, the valve housing is phosphated and steel parts zinc-coated for 240 h protection acc. to ISO 9227

Functional Description

A normally open, direct-acting, spring loaded 2-way pressure compensator in the form of a sandwich plate. They consist of a body, a 2-way screw-in cartridge compensator TV2-102/S and a load shuttle valve.

2-Way compensators for meter-in applications (models A,B,C)
The 2-way meter-in pressure compensators will maintain a constant pressure difference across the metering edge of the proportional directional valve. In this case, the pressure variations due to load changes, as well as pump pressure changes are compensated. Any increase in pump pressure does not affect the flow. The meter-in compensators may only be used with positive load direction. They are designated for load compensation in inlet port P.

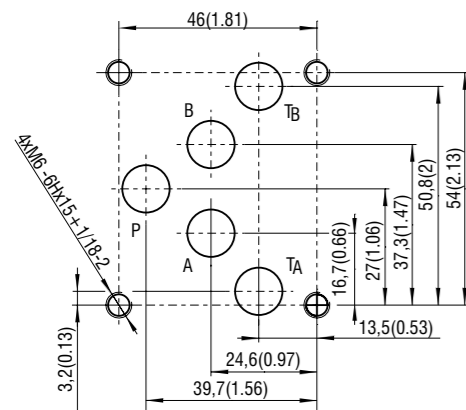
2-Way compensators for meter-out applications (models D,E,F)
In systems with changing load directions or negative load, the use of meter-out pressure compensators is required. With respect to the application, a valve with pressure compensator installed in one or in both actuator ports are available. The pressure compensator is always mounted between the actuator and the proportional directional valve. The valve will maintain the pressure difference between A and T or B and T constant. The flow rate and the flow direction are adjusted by the proportional directional valve. To enable free reverse flow, two by-pass check valves are incorporated into the valve body.

Technical Data

Valve size		10 (D05)
Max. operating pressure	bar (PSI)	350 (5100)
Max. flow	l/min (GPM)	80 (21.1)
Control pressure differential	bar (PSI)	4... 14 (58...203)
Fluid temperature range (NBR)	°C (°F)	-30... +100 (-22... +212)
Fluid temperature range (FPM)	°C (°F)	-20... +120 (-4... +248)
Mass (Models A, B, C / D, E, F)	kg (lbs)	3.7 (8.2) / 6.65 (14.7)

	Data Sheet	Type
General information	GI_0060	Products and operating conditions
Mounting interface	SMT_0019	Size 10
Spare parts	SP_8010	

ISO 4401-05-04-0-05

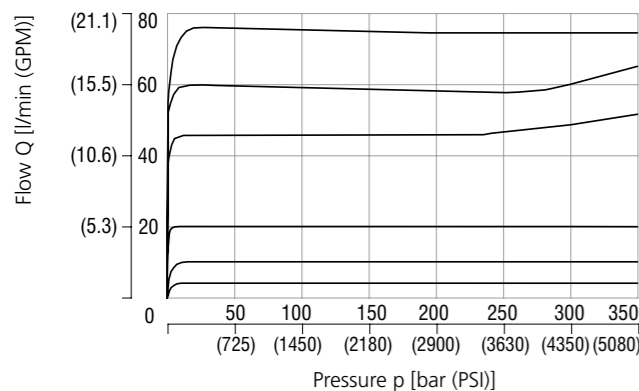


Ports P, A, B, T - max. Ø11.2 mm (0.44 in)

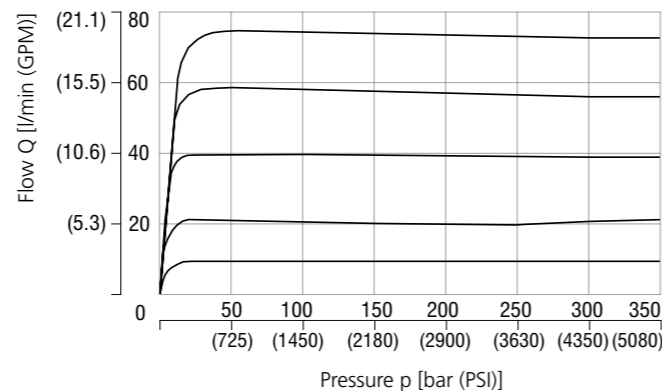
Characteristics measured at v = 32 mm²/s (156 SUS)

Regulated flow related to input pressure

TV2-102/MC Meter-in compensator



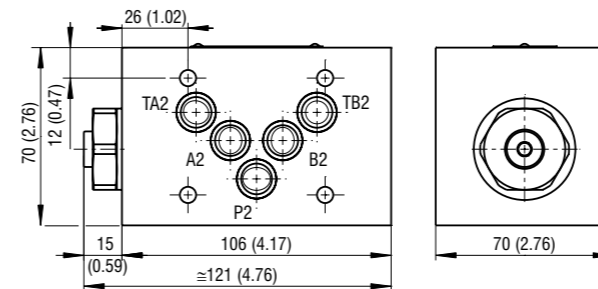
TV2-102/MD Meter-out compensator



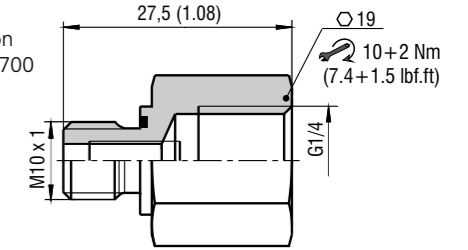
The characteristic of the pressure compensator corresponds to the flow rate of a PRM2-103Z11/60 proportional directional valve. If the pressure resistance increases due to a flow rate increase, the pressure differential also has to increase in order to ensure correct regulation.

Dimensions in millimeters (inches)

TV2-102/MC**C* Meter-in compensator

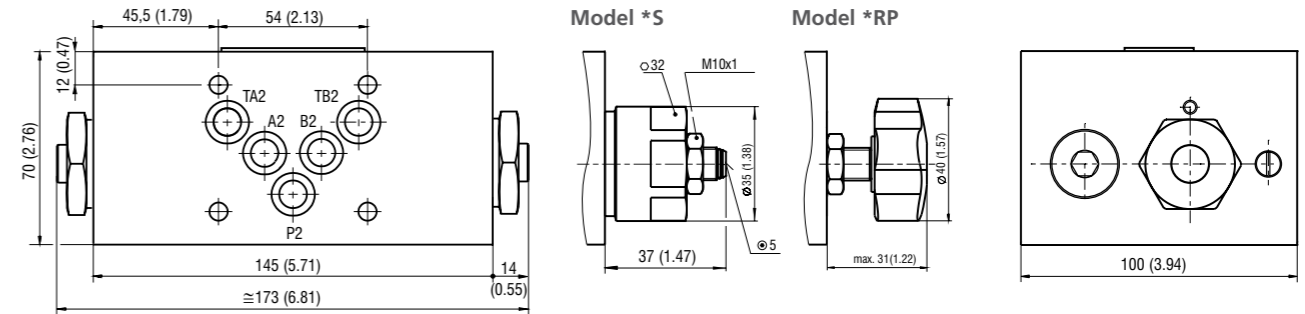


Adapter M10x1/G1/4-ED
addition of equipment
for external LS connection
Ordering number: 19860700



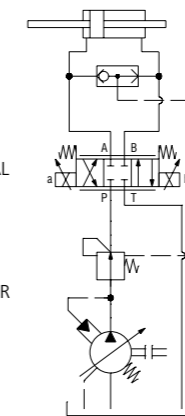
Applicable only for „TV**C*“ versions. (Fixed setting, not adjustable)

TV2-102/MD**C* Meter-out compensator

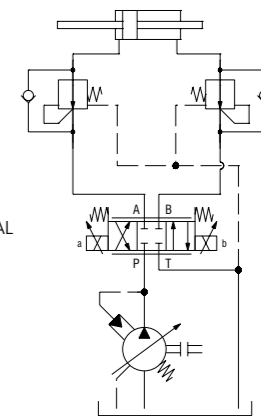


Application Example

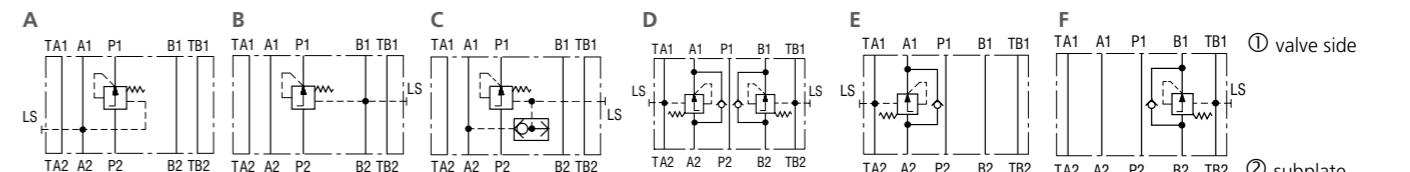
Meter-in compensator



Meter-out compensator



Functional Symbols



Notice: The orientation of the symbol on the name plate corresponds with the valve function.

Ordering Code

2-Way pressure compensator, spool-type, direct-acting, modular	TV2-102/M								
Sandwich plate									
Model									
Meter-in compensator in channel A									A
Meter-in compensator in channel B									B
Meter-in compensator in channel A and B									C
Meter-out compensator in channel A and B									D
Meter-out compensator in channel A									E
Meter-out compensator in channel B									F
Control pressure differential									
4 - 12 bar (58 - 174 PSI), 10 bar (145 PSI) "C" Model									1
10 - 14 bar (145 - 203 PSI), 14 bar (203 PSI) "C" Model									2
Surface treatment									
No designation									housing phosphated, steel parts zinc-coated (ZnCr-3), ISO 9227 (240 h)
A									zinc-coated (ZnCr-3), ISO 9227 (240 h)
B									zinc-coated (ZnNi), ISO 9227 (520 h)
Seals									
No designation									NBR
V									FPM (Viton)
Adjustment option									
No designation									fixed setting, non adjustable
S									allen key (hex. 5), without protective cap
RP									hand knob, plastic

3-Way Pressure Compensator, Spool-Type, Direct-Acting

TV2-063/S

M20x1.5 • Q_{max} 40 l/min (11 GPM) • p_{max} 350 bar (5100 PSI)

Technical Features

- › The valve keeps the pressure drop between the inlet and the pilot connection at a constant level
- › Used as a load sensing valve with proportional directional and flow valves to control the flow rate independently of pressure variations
- › Excellent stability throughout flow range with rapid response to dynamic pressure changes
- › Spring setting of the variable adjustment compensator can be varied from 5 to 40 bar (72.5 to 580 PSI)
- › Quiet and modulate response to load changes
- › Hardened precision parts
- › High flow capacity
- › In the standard version, the valve is zinc-coated for 240 h protection acc. to ISO 9227

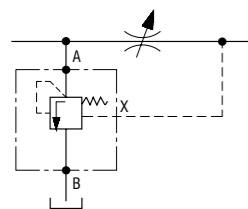
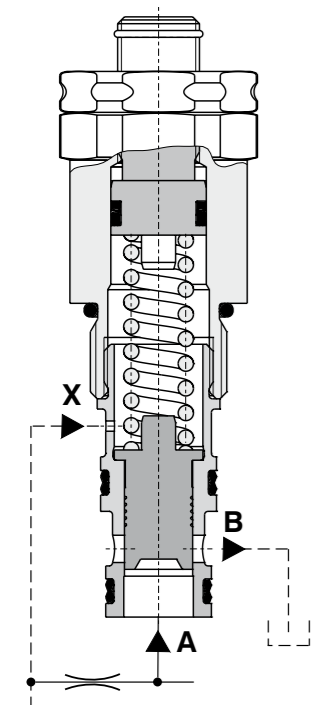
Functional Description

A normally closed, direct-acting, spring loaded pressure compensator valve in the form of a screw-in cartridge. From the outlet of the controlled directional or proportional flow valve a load sensing signal is taken to the spring chamber of the pressure compensator port X. Typically, 3-way pressure compensators are used as meter-in regulators in parallel with flow restrictor valves when raising or lowering variable loads at the same velocity is required. The pressure compensator valve then keeps the pressure difference between its pressure inlet and the pressure at the output port of the regulated flow valve nearly constant. When the pressure differential exceeds the pre-set value, the pressure compensator opens and releases excessive flow from the main circuit to port B. If there is no flow demand from the consumer, the compensator allows the oil to flow back to tank and therefore vents the whole system. This prevents the hydraulic system from overheating especially in load sensing circuits with a fixed displacement pump.

Technical Data

Valve size / Cartridge cavity		M20x1.5 / QE3
Max. operating pressure	bar (PSI)	350 (5080)
Max. flow	l/min (GPM)	40 (10.6)
Control pressure differential	bar (PSI)	5 ... 40 (72.5 ... 580)
Fluid temperature range (NBR)	°C (°F)	-30 ... +100 (-22 ... +212)
Fluid temperature range (FPM)	°C (°F)	-20 ... +120 (-4 ... +248)
Mass	kg (lbs)	0.15 (0.3)

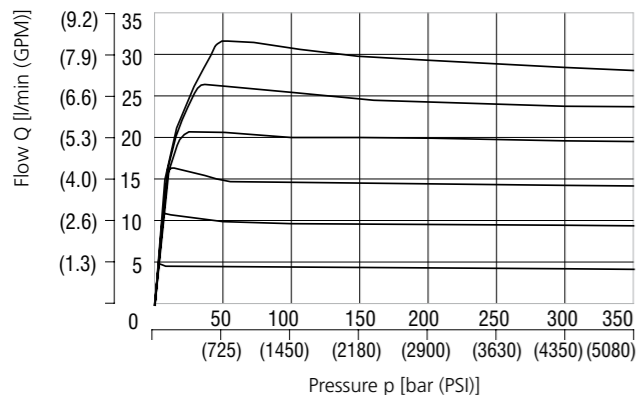
	Data Sheet	Type
General information	GI_0060	Products and operating conditions
Valve bodies	Sandwich mounted SB-04(06)_0028	SB-*QE3*
Cavity details	SMT_0019	SMT-QE3*
Spare parts	SP_8010	



Characteristics measured at v = 32 mm²/s (156 SUS)

Regulated flow related to input pressure

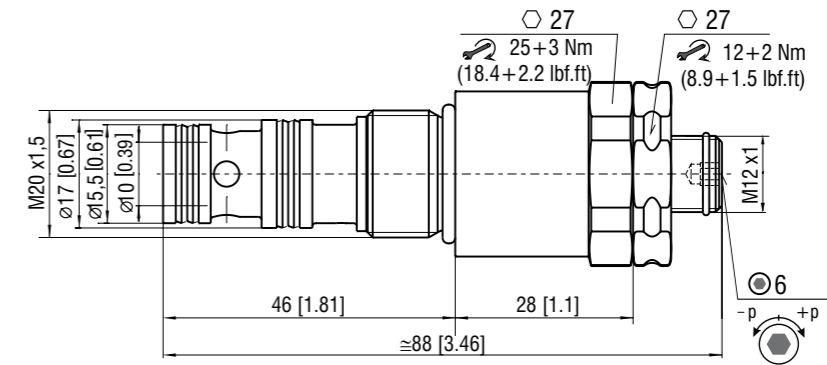
The characteristic of the pressure compensator corresponds with the flow rate of a PRM2-043Z11/12 and PRM2-063Z11/30 proportional directional valve.



If the pressure resistance increases due to a flow rate increase, the pressure differential also has to increase in order to ensure correct regulation.

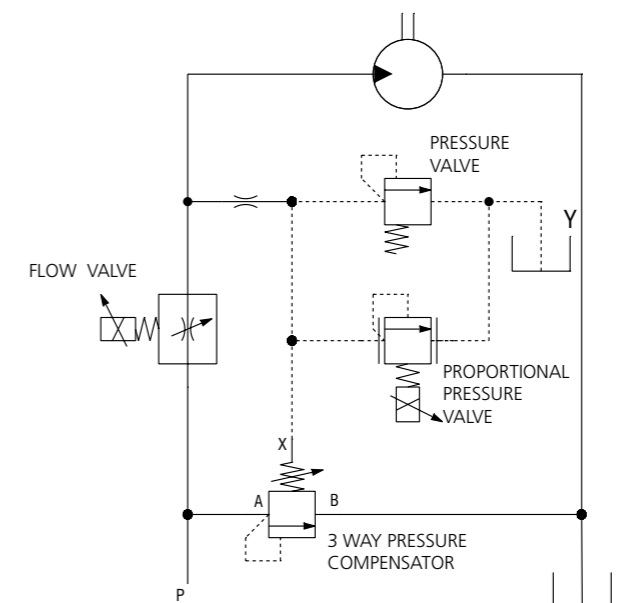
Dimensions in millimeters (inches)

TV2-063/S



Application Example

Meter-in compensator



Ordering Code

TV2-063/S

- 3-Way pressure compensator, spool-type, direct-acting
- Nominal size M20x1.5 / QE3
- 3-Way pressure compensator
- Cartridge design
- Pressure range 5 - 40 bar (72.5 - 580 PSI)
- Surface treatment: A zinc-coated (ZnCr-3), ISO 9227 (240 h); B zinc-coated (ZnNi), ISO 9227 (520 h)
- Seals: NBR; FPM (Viton)
- Adjustment option: S allen key (hex. 6), without protective cap
- No designation: V

3-Way Pressure Compensator, Spool-Type, Direct-Acting, Modular

TV2-043/M

Size 04 (D02) • Q_{max} 20 l/min (4 GPM) • p_{max} 320 bar (4600 PSI)



Technical Features

- › 3-Way pressure compensator, spool-type, direct-acting with subplate interface acc. to ISO 4401, DIN 24340 (CETOP 02)
- › Modular design for vertical stacking assemblies with built-in load sensing shuttle valve
- › Meter-in flow control models with load sensing from optional consumer ports
- › The valve keeps the pressure drop between the inlet and the pilot connection at a constant level
- › Used as a load sensing valve with proportional directional and flow valves to control the flow rate independently of pressure variations
- › Excellent stability throughout flow range with rapid response to dynamic pressure changes
- › Spring setting of the variable adjustment compensator can be varied from 5 to 40 bar (72.5 to 580 PSI)
- › Quiet and modulate response to load changes
- › Hardened precision parts
- › High flow capacity
- › Adjustable by allen key
- › In the standard version, the valve housing is phosphated and steel parts are zinc-coated for 240 h protection acc. to ISO 9227

Functional Description

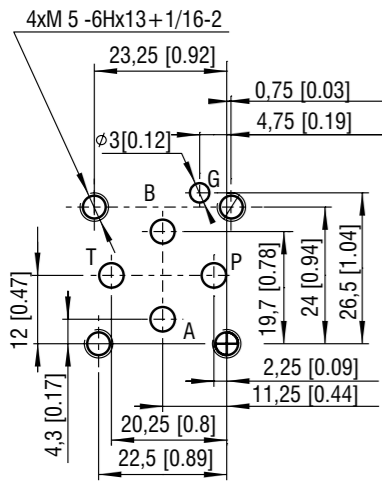
A normally closed, direct-acting, spring loaded 3-way pressure compensator valve in the form of sandwich plate. It consists of a body, a 3-way screw-in cartridge compensator TV2-043/S and a load shuttle valve. Ports A and B are always connected through the load shuttle valve with the spring chamber of the pressure compensator cartridge valve. Typically, 3-way pressure compensators are used as meter-in regulators in parallel with flow restrictor valves when raising or lowering variable loads at the same velocity is required. The pressure compensator valve then keeps the pressure difference between its pressure inlet and the pressure at the output port of the regulated flow valve nearly constant. When the pressure differential exceeds the pre-set value, the pressure compensator opens and releases excessive flow from the main circuit to port B. If there is no flow demand from the consumer, the compensator allows the oil to flow back to tank and therefore vents the whole system. This prevents the hydraulic system from overheating especially in load sensing circuits with a fixed displacement pump.

Technical Data

Valve size		04 (D02)
Max. operating pressure	bar (PSI)	320 (4640)
Max. flow	l/min (GPM)	20 (4.2)
Control pressure differential	bar (PSI)	5... 40 (72.5... 580)
Fluid temperature range (NBR)	°C (°F)	-30... +100 (-22... +212)
Fluid temperature range (FPM)	°C (°F)	-20... +120 (-4... +248)
Mass (All models)	kg (lbs)	0.6 (1.32)

	Data Sheet	Type
General information	GI_0060	Products and operating conditions
Mounting interface	SMT_0019	Size 04
Spare parts	SP_8010	

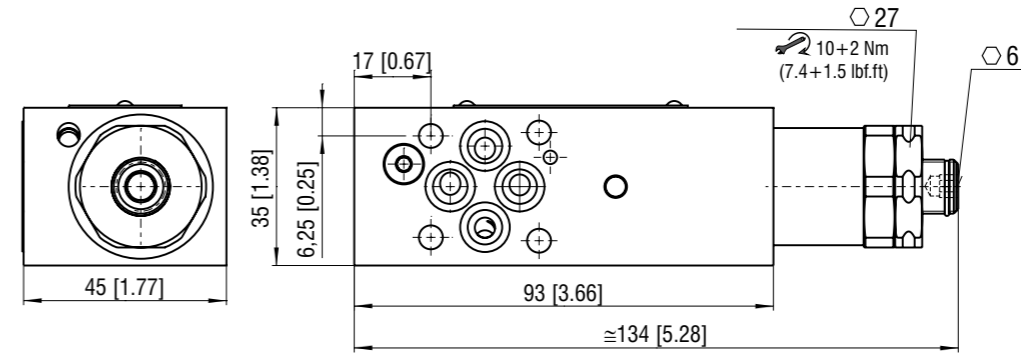
ISO 4401-02-01-0-05



Ports P, A, B, T - max. Ø4.5 mm (0.18 in)

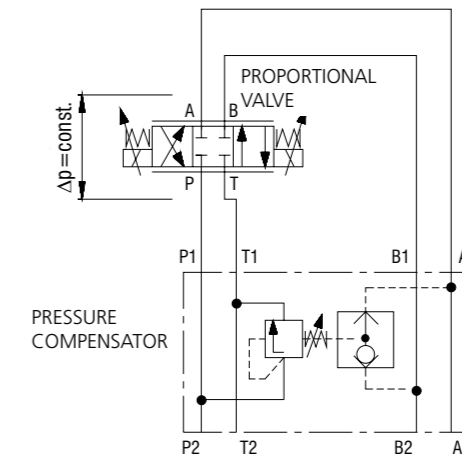
Dimensions in millimeters (inches)

TV2-043/MA (B, C) - Meter-in compensator

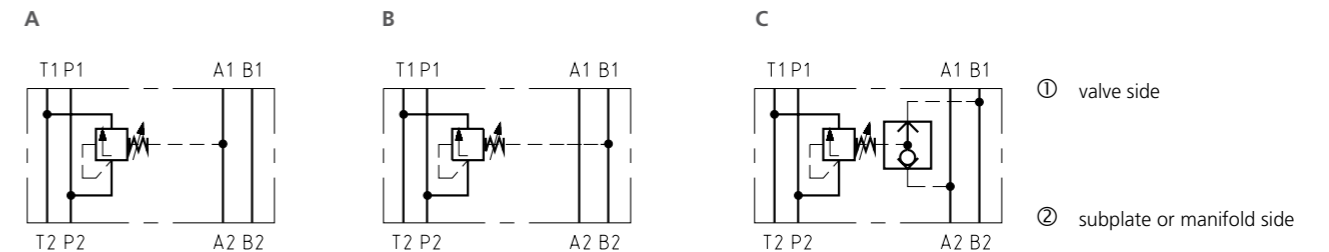


Application Example

Meter-in compensator



Functional Symbols



Notice: The orientation of the symbol on the name plate corresponds with the valve function.

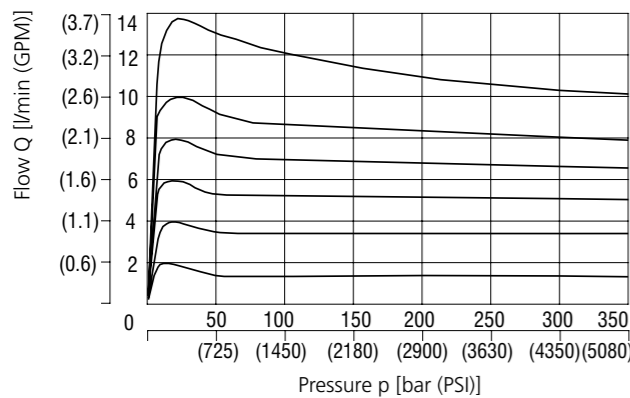
Ordering Code

TV2-043/M [] [] [] [] - []

- 3-Way pressure compensator, spool-type, direct-acting, modular**
- Nominal size**
ISO 4401-02-01-0-05,
DIN 24340 (CETOP 02), NG 04
- 3-Way pressure compensator**
- Sandwich plate**
- Model**
Meter-in compensator in port A: A
Meter-in compensator in port B: B
Meter-in compensator in port A and B: C
- Control pressure differential**
5 - 40 bar (72.5 - 580 PSI): 4
- Surface treatment**
No designation: housing phosphated, steel parts zinc-coated (ZnCr-3), ISO 9227 (240 h)
A: zinc-coated (ZnCr-3), ISO 9227 (240 h)
B: zinc-coated (ZnNi), ISO 9227 (520 h)
- Seals**
No designation: NBR
V: FPM (Viton)
- Adjustment option**
allen head (hex.6), without protective cap: S

Regulated flow related to input pressure

TV2-043/MC Meter-in compensator



The characteristic of the pressure compensator corresponds to the flow rate of a PRM2-043Z11/12 proportional directional valve.

If the pressure resistance increases due to a flow rate increase, the pressure differential also has to increase in order to ensure correct regulation.

Analog Control Electronics, External

EL3E

Rail mounting acc. to DIN 50022

EL3E-24A



EL3E-24AB

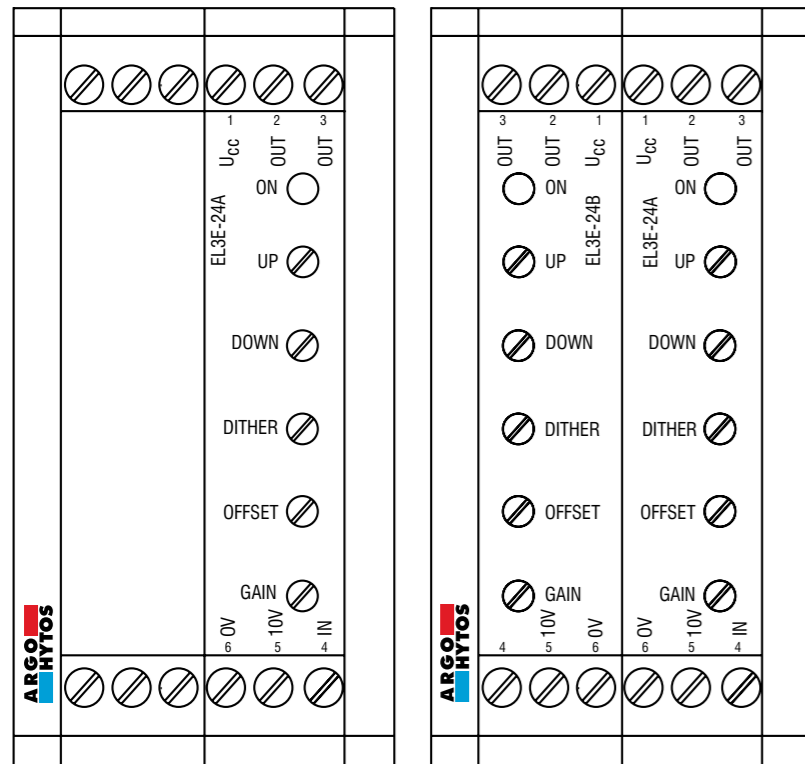
Technical Features

- › Analog electronic control unit for open-loop solenoid PRM2-04(06) and PRM6-10 proportional valves, modular
- › Easy access of the electronics setting elements (trims) enables adjustment of the parameters during operation
- › The electric design of the external electronics is identical with the design of the integrated electronics situated directly on the valve solenoid coil
- › Smaller power input than the digital counterpart
- › Rail mounting 35/7.5 acc to DIN 50022

Functional Description

The external models of the analog electronics EL3E-12 and EL3E-24 have been developed to control the proportional directional valves of the series PRM2 with one solenoid (EL3E-xxA) or two solenoids (EL3E-xxAB). The electronics performs the function of an amplifier and shaper of the input control signals with the defined transfer characteristic. The main advantages of the external electronics model are the possibility to mount it together with the other electronic components on a DIN 50 022 35x7.5mm strip. Hence, space requirement is deterministic which enhances planing and reduces mounting space. No separate box is required further improving protection against undesired vibrations.

Front panel of the one-solenoid version Front panel of the two-solenoid version

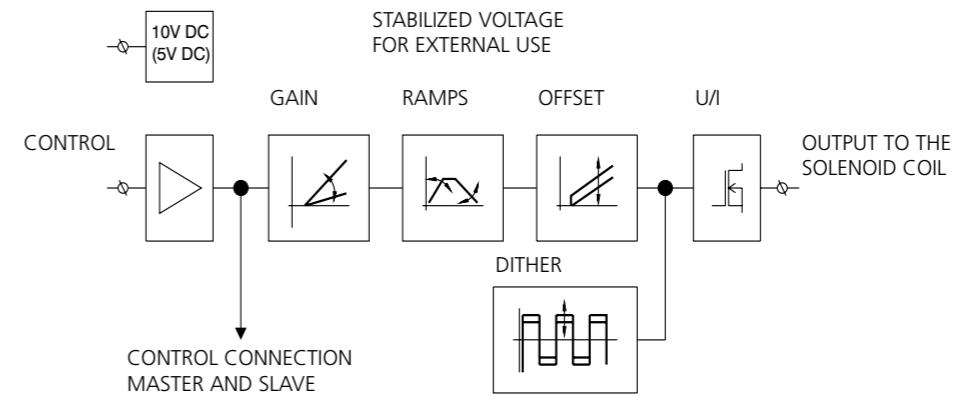


The external electronics EL3E is built into a standard plastic box of dimensions 85.5x79x40mm supporting the grouping on a 35x7.5 mm strip. Situated on the front panel are the trims for setting the individual parameters of the electronics and a control LED signaling the presence of the power supply as well as the connection of the electronics output to the solenoid coil of the directional valve controlled. Two models of the electronics with one or two solenoids are available. The models differ in the inner electric circuitry and in arrangement of the setting elements situated on the front panel as well as the in wiring of the terminal strips.

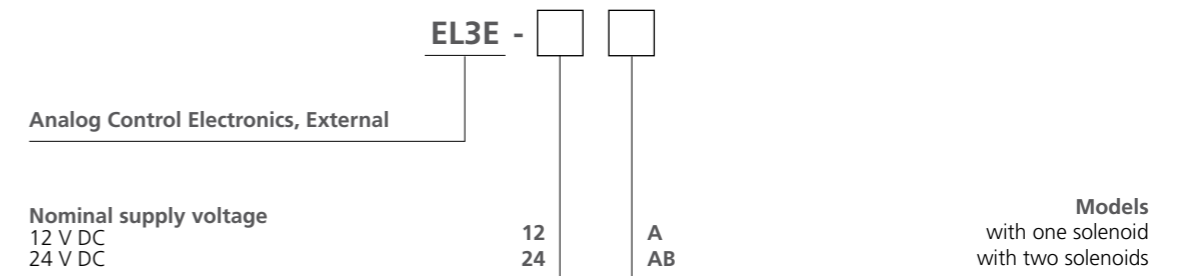
Technical Data

Solenoid data		12	24
Nominal supply voltage	V DC	12	24
Operating voltage	V DC	11.2 ... 14.7	20 ... 30
Max. output current	A	2.4 (for R < 4 Ω)	1.5 (for R < 10 Ω)
Max. input power	W	25	
Stabilized voltage for potentiometer control		5 VDC / 100mA	10 VDC / 100mA
Control signal type		0... 20 mA, 4... 20 mA, ±5 V, 0... +5 V, U _{CC} /2 ± 5 V	0... 20 mA, 4... 20 mA, ±10 V, 0... +10 V, 0... +5 V, U _{CC} /2 ± 10 V
Setting range of ramp functions	s	0.05 ... 3	
PWM / Dither frequency	Hz	60 / 90	
Dither amplitude	%	0 ... 30	
Linearity	%	3	
Operating ambient temperature	°C (°F)	-20... +50 (-4... +122)	
Enclosure type of the solenoid to EN 60529		IP20	
Mass	kg (lbs)	0.25 (0.55)	
Max. coil excitation current of proportional directional valves	PRM2-04 PRM2-06 PRM6-10	A	(Coil 16186100) ... 1.7 (Coil 16187500) ... 1.6 (Coil 16195800) ... 1.9
			(Coil 16186200) ... 0.8 (Coil 16186800) ... 1.0 (Coil 16196200) ... 1.1

Block Diagram

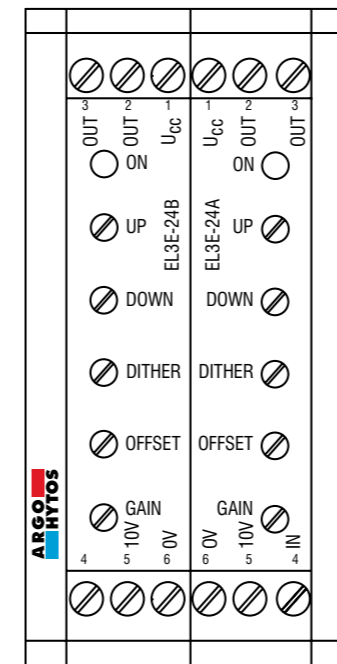


Ordering Code



Settings and Range

Two-solenoid version



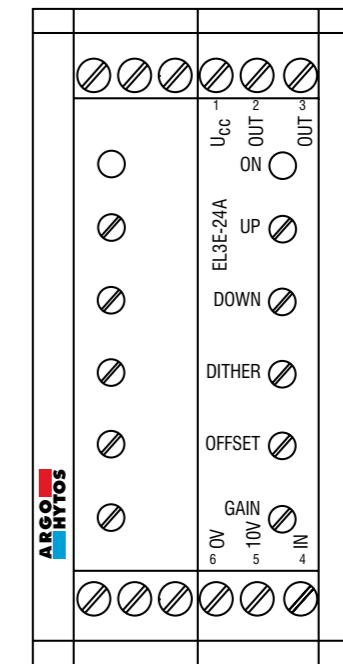
Wiring of connection clamps

Clamp	Description
1	+U _{CC} 24 V (12 V)*
2	Output to the solenoid coil
3	Control signal input
4	Output of the stabilized voltage +10 V/100 mA (+5V/100 mA)*
5	0 V
Clamp	Card SLAVE EL3E-XXB
1	+U _{CC} 24 V (12 V)*
2	Output to the solenoid coil
3	-
4	Output of the stabilized voltage +10 V/100 mA (+5 V/100 mA)*
5	0 V
6	0 V

*Values in parenthesis are valid for the supply voltage 12 V

The electronics for directional valves with two solenoids consists of two identical electronic cards mutually interconnected. The card designated at its specification end with character A (EL3E-xxA) works as the so-called MASTER; the other card designated with character B (EL3E-xxB) works as the so-called SLAVE. The distinction of the cards is necessary because of the different setting of the changeover switches on both cards serving the configuration of the selected operational parameters, such as the type of the control signal and the dither frequency.

One-solenoid version



Wiring of connection clamps

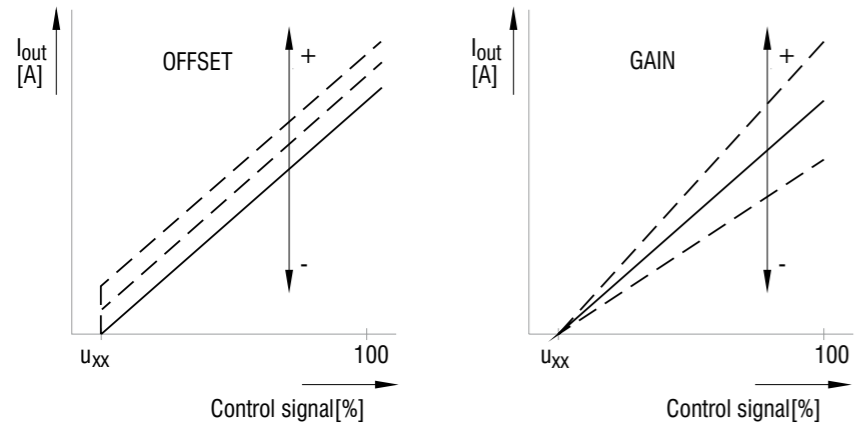
Clamp	Description
1	+U _{CC} 24 V (12 V)*
2	Output to the solenoid coil
3	Control signal input
4	Output of the stabilized voltage +10 V/100 mA (+5 V/100 mA)*
5	0 V
6	0 V

*Values in parenthesis are valid for the supply voltage 12 V

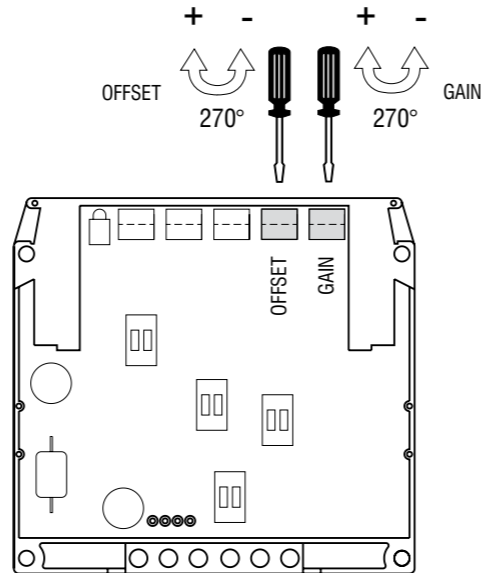
The electronics for controlling the proportional directional valves with one solenoid is built into a box with dimensions corresponding to the previous configuration, but only a part of the electronic is fitted with components. The electric wiring of the clamps is identical with the arrangement of the MASTER card in the previous two-magnet configuration.

Set up Procedure

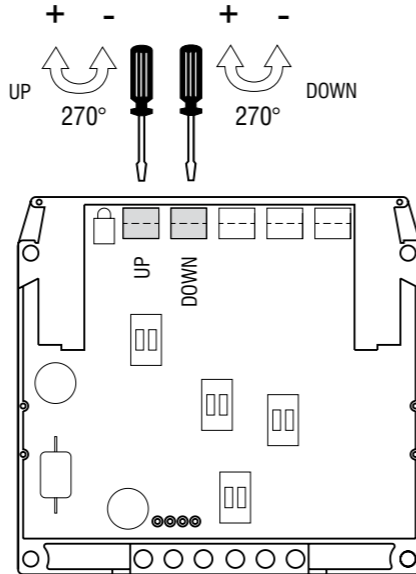
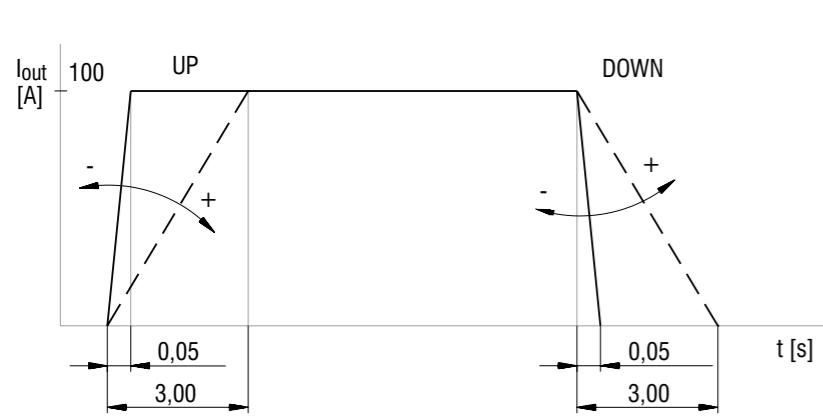
Offset, gain - parameters adjustment



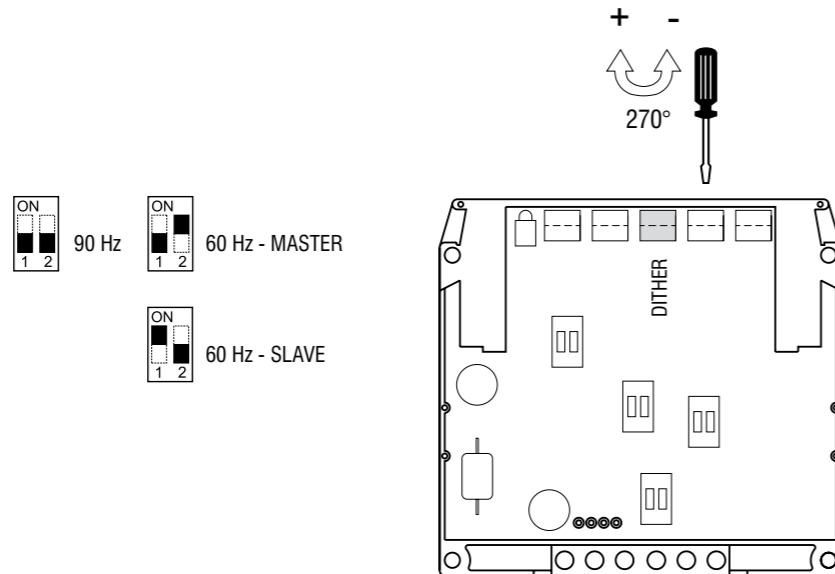
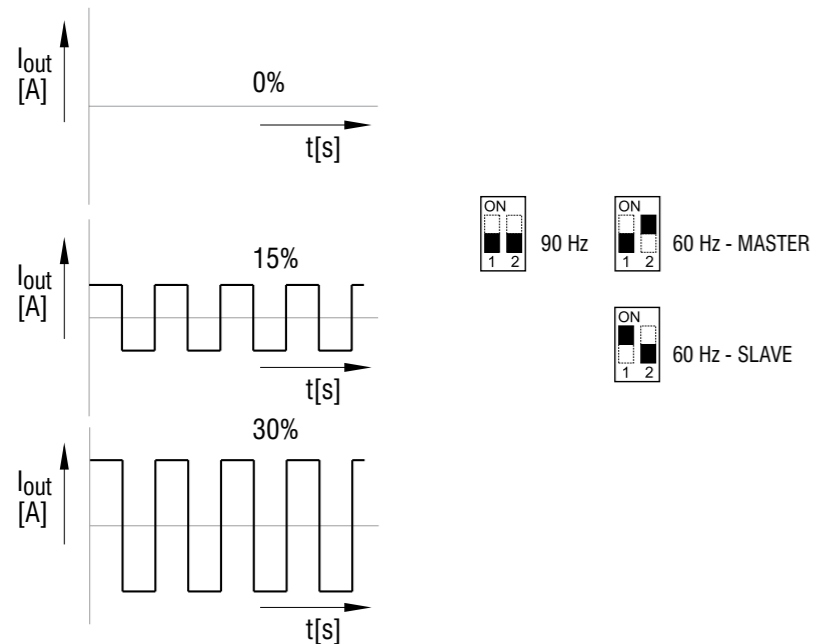
Nominal supply voltage of electronics [V]	Dead band u_{xx} [%]
12	1... 3
24	0.5... 2



Ramp Adjustment (up, down)



Ramp Adjustment (up, down)



Configuration of Changeover Switches on the Electronics Card

Table of the switch configuration for the control signal choices

		PRM2-062				PRM2-063	
		0... 5 V	0... 10 V (0...5 V)*	0... 20 mA	4... 20 mA	$U_{cc}/2 \pm 10 V (\pm 5 V)^*$	$\pm 10 V (\pm 5 V)^*$
MASTER M	SW1						
	SW2						
	SW3						
	SW4	90 Hz			60 Hz		
SLAVE S	SW1						
	SW2						
	SW3						
	SW4	90 Hz			60 Hz		

Designation of the basic manufacture setting

*Values in parenthesis are valid for the supply voltage 12 V

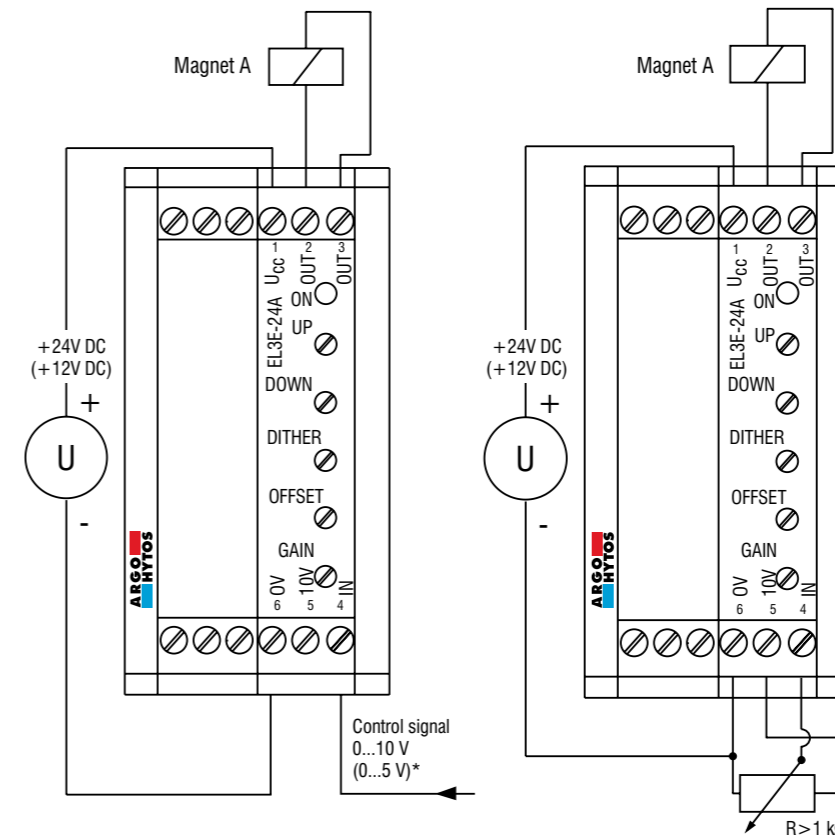


Installation note:

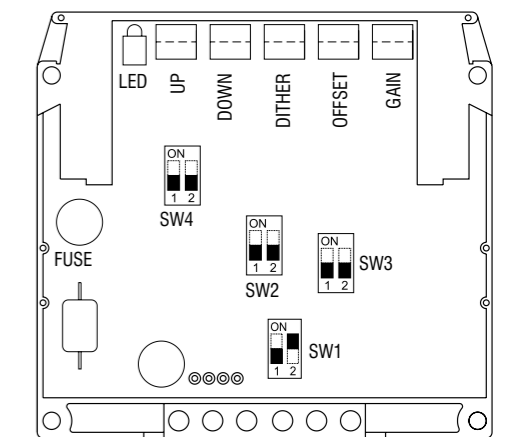
The null potential of the control signal must be the same as the null potential of the supply voltage.

Proportional directional valve with one solenoid

control signal 0... 10 V (0... 5 V)* or controlling by an external potentiometer $R > 1k\Omega$



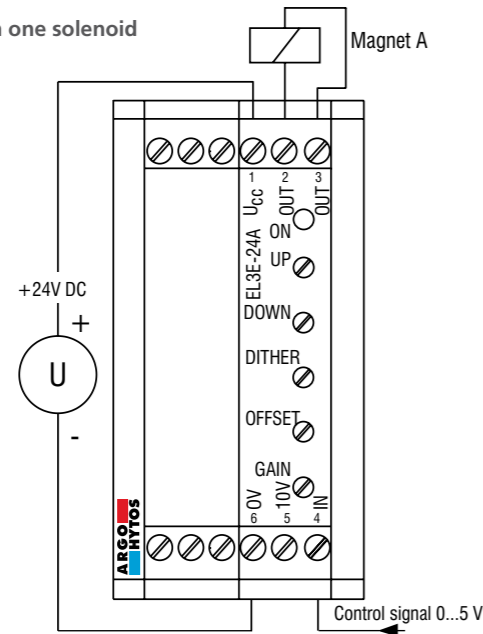
MASTER card for solenoid A



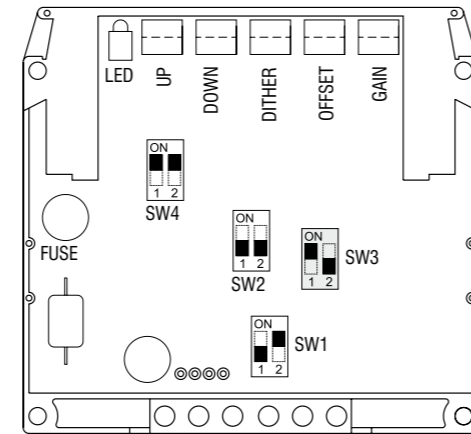
SW1 - control signal choice
SW2 - control signal choice
SW3 - control signal choice
SW4 - dither frequency

Configuration of Changeover Switches on the Electronics Card

Proportional directional valve with one solenoid
control signal 0... 5 V (external)

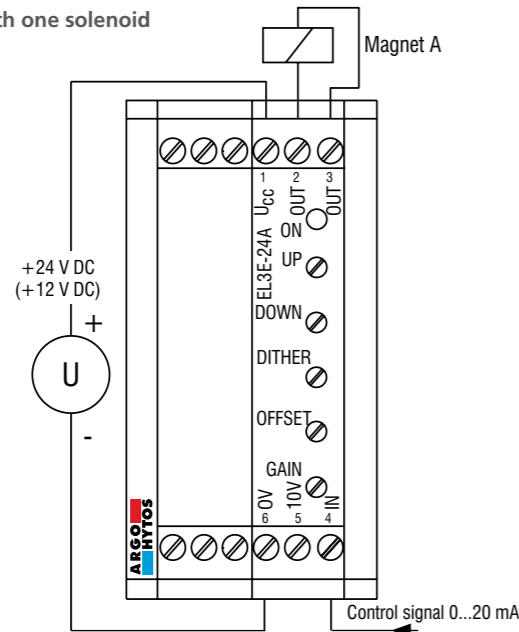


MASTER card for solenoid A

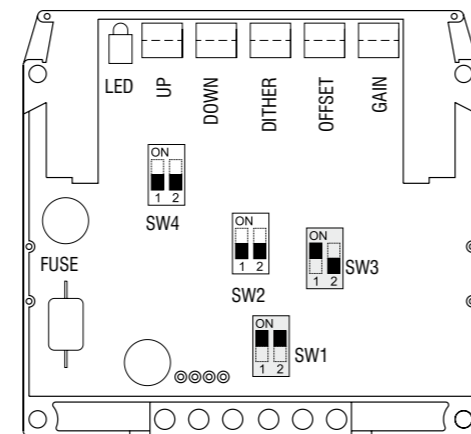


SW1 - control signal choice
SW2 - control signal choice
SW3 - control signal choice
SW4 - dither frequency

Proportional directional valve with one solenoid
control signal 0... 20 mA

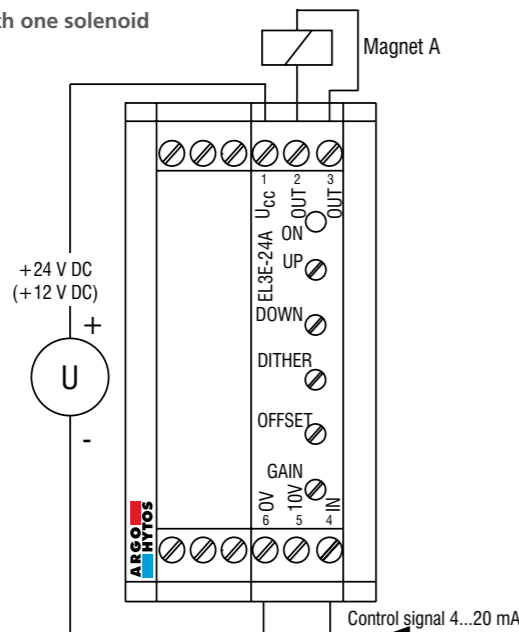


MASTER card for solenoid A

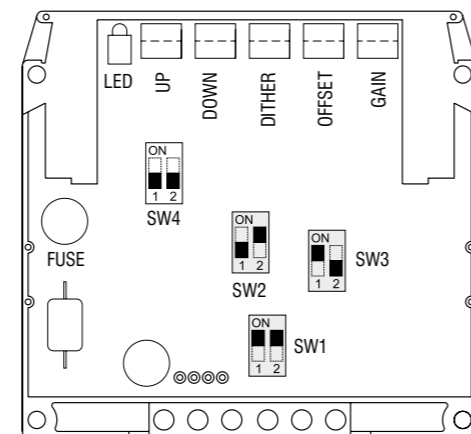


SW1 - control signal choice
SW2 - control signal choice
SW3 - control signal choice
SW4 - dither frequency

Proportional directional valve with one solenoid
control signal 4... 20 mA



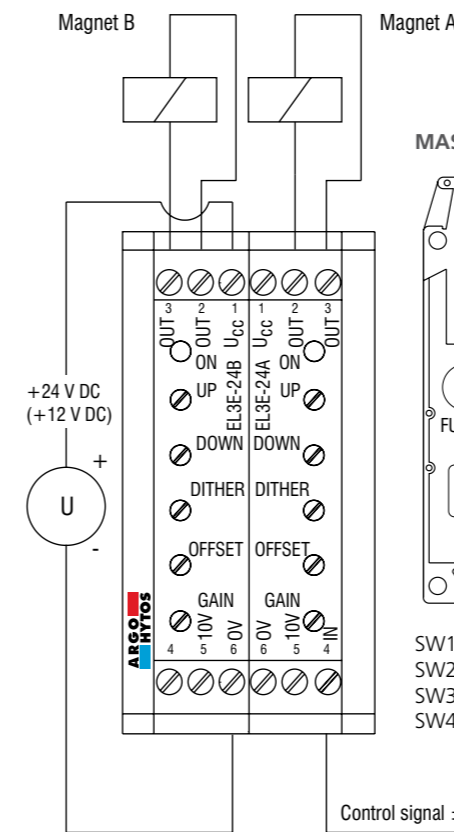
MASTER card for solenoid A



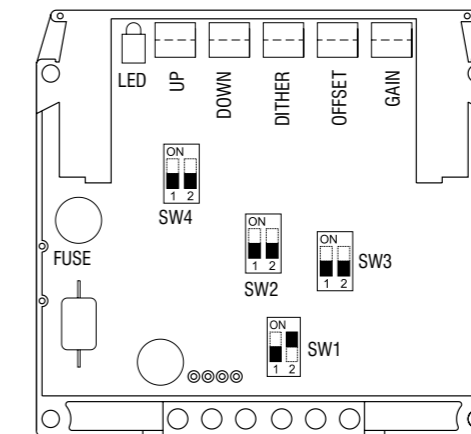
SW1 - control signal choice
SW2 - control signal choice
SW3 - control signal choice
SW4 - dither frequency

Configuration of Changeover Switches on the Electronics Card

Proportional directional valve with two solenoids
control signal ± 10 V (± 5 V)*

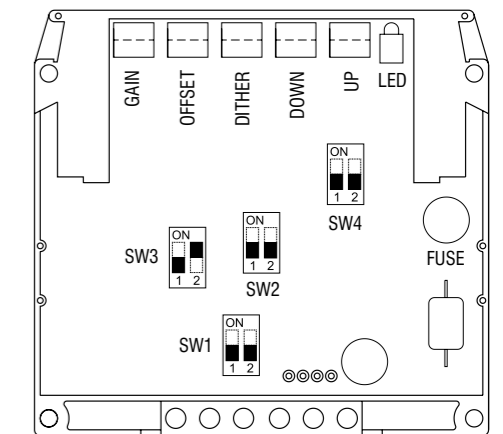


MASTER card for solenoid A



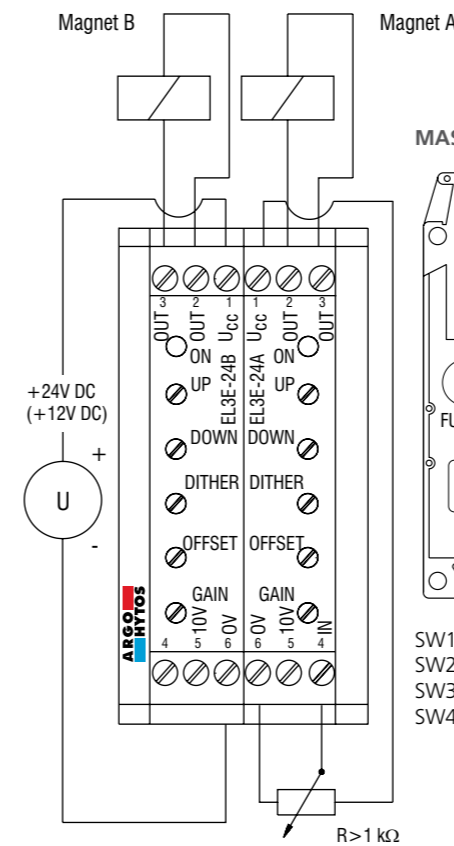
SW1 - control signal choice
SW2 - control signal choice
SW3 - control signal choice
SW4 - dither frequency

SLAVE card for solenoid B

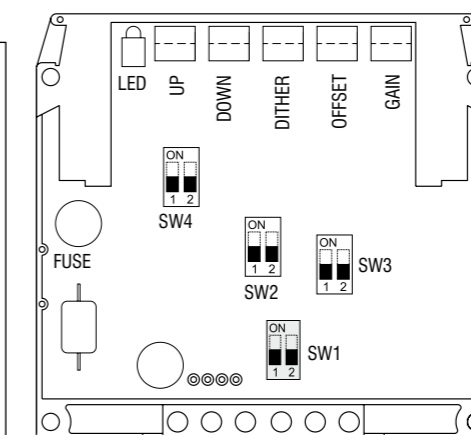


SW1 - control signal choice
SW2 - control signal choice
SW3 - control signal choice
SW4 - dither frequency

Proportional directional valve with two solenoids, control signal $U_{cc}/2 \pm 10$ V ($U_{cc}/2 \pm 5$ V)*
with an external potentiometer $R > 1$ k Ω

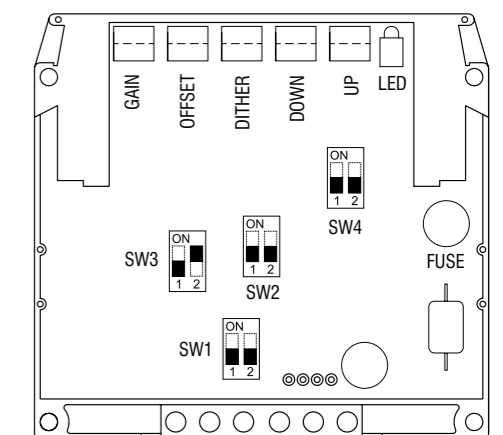


MASTER card for solenoid A



SW1 - control signal choice
SW2 - control signal choice
SW3 - control signal choice
SW4 - dither frequency

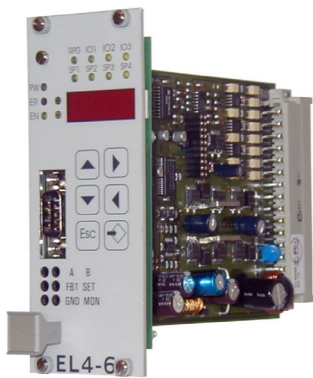
SLAVE card for solenoid B



SW1 - control signal choice
SW2 - control signal choice
SW3 - control signal choice
SW4 - dither frequency

*Values in parenthesis are valid for the supply voltage 12 V.

EL4

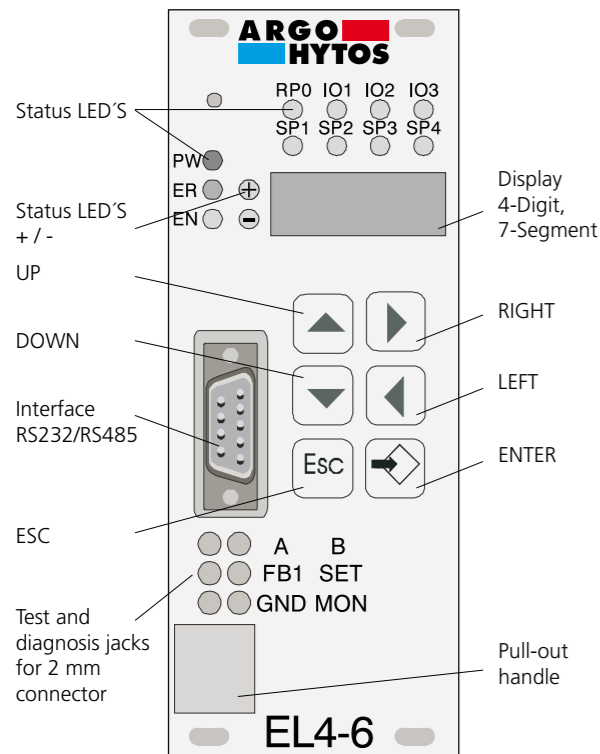


Technical Features

- › Digital electronic control unit for closed- and open-loop control of single or double solenoid proportional valves with positional feedback control - Eurocard type
- › The unit is suitable for control of various proportional valves as directional, flow, pressure and servo valves and regulates feedback from various process values
- › The unit controls the position of the valve spool according to the reference input signal ensuring linear regulation with minimum hysteresis
- › The unit supplies a variable current proportional to the input reference signal and independently of temperature variations or load impedance
- › The PWM stage on the solenoid power supply reduces valve hysteresis thus optimising control precision
- › Large, easy-to-use adjustments and readout 4-digit 7-segment LED display to indicate card functions and potentiometers to optimize control
- › The unit is suitable for management of various process values as "fast-slow" work cycles, P/Q, pressure cascade controls
- › Flexible and reliable system using a 16 Bit microcontroller with high power reserve
- › Highly flexible settings with the help of the intergrated software. Assured safety through the use of a hardware watch-dog and reset module
- › Error resistant unit - signals do not degrade because they are transmitted or stored with integrated error-correcting algorithms if corruption does occur
- › Variable settings for various solenoid systems and sensor signals providing a high degree of flexibility
- › Easy software update by use of a Flash-EPROM. Adaptations and extensions can be made without change to EPROM (download from PC via RS232)

Functional Description

Display and Keypad



The EL4 card is multifunctional electronic control unit in Eurocard format for open and closed loop control of single or double solenoid proportional valves typically with positional feedback control. The unit controls the position of the valve spool according to the reference input signal ensuring linear regulation with minimum hysteresis. The front panel is fitted with LEDs to indicate the card functions and selectros for parametrization together with 2 mm jacks for test and diagnostics. The EL4 card option is designed to accommodate up to 2 process signals.

Functional use of the interface allows to change parameters "on-the-fly" without interference or interrupting the controller. The unit provides means for system performance analysis through display parameters selection with the PC or the monitoring program. Direct access to the amplifier with the use of external system controllers (e.g. programmable logic controllers /PLC) is possible. The EL4 card enables access to different amplifiers from a PC or a controller by addressing them (using option RS485) and sending data from amplifier to amplifier (copy parameter settings)

Element	Function
Status LED's	display of status and signals at the digital inputs and outputs
Status LED's +/-	display of set point direction through polarity signs for parameters and measured values
Display	4-digit display of parameters and measured values
Buttons UP, DOWN, LEFT, RIGHT, ESC and ENTER	all operating, programming and saving may be performed with the buttons UP, DOWN, LEFT, RIGHT, ESC and ENTER
Serial interface	RS232/RS485 (optional), trough which programming and accessing parameters via PC or communications to machine, or from amplifier to amplifier
Measuring and test jacks	direct measurement of set point, actual value, solenoid currents and internal values via the monitor output. Use 2 mm sockets (S1.06, FB1, A, B, d1.01 ... d2.13)

Technical Data

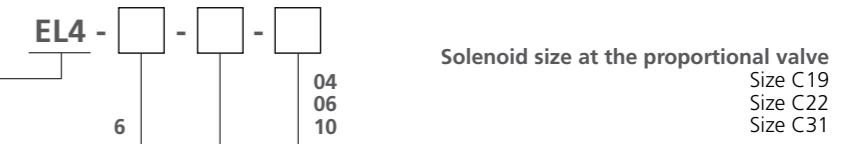


Main parameters	
Operating voltage	UB = 24 V DC (12 V DC on request)
Upper limit value	UB(t) max. = 30 V
Lower limit value	UB(t) min. = 18 V
Residual ripple	< 10%
Current consumption I (A)	I max. = 3.15 A 0.8 / 1.1 / 1.3 / 1.6 / 2.4 / 2.7 / 3.5 (other versions on request)
Solenoid systems selection	
Input power	50 W
Maximum output current (fast fuse)	3.15 A
Reference signal	±10 V, max. load 10 mA
Control voltage for external recallable set point	24 V ±10 %
Residual ripple	≤10 % current input ≤20 mA each
Ambient temperature	0... 50 °C (32... 122 °F)
Storage temperature	-20... 60 °C (-4... 140 °F)
Plug connection	DIN 41 612, 48 pol. form F gold plated
EMC	
Protection	Burst on wires as per EN 61000-4-4 HF-Field as per EN 61000-4-3 ESD as per EN 61000-4-2
Emissions	
Emissions depending on power as per EN 50011 Radiated emissions as per EN 55011	
Dimensions	
Front panel	50.5x128.4 mm (1.99x5.06 in)
PCB	10 TE / 3 HE 100x160 mm (3.94x6.30 in)
Input signals	
Analog set values	1 input, differential 14 Bit resolution, 0... ±10 V 1 input, single ended 14 Bit resolution, 0... ±10 V 1 input, single ended 14 Bit resolution, 0 or 4... 20 mA (R = 250 Ω)
Analog feedback (sensor input)	1 input, 14 Bit resolution, 0... ±12 V, 0... 20 mA / 4... 20 mA Offset: 3 ... 10 V, Gain: ca. 0...14 (R = 100 Ω) 1 input, 14 Bit resolution, 0... ±10 V
Digital inputs	8 inputs, voltage level 0 V/24 V, 10 mA (Set point 1 ... 4, ENABLE, RAMP, SIGN +, SIGN -)
Output signals	
Solenoid current (with over-energization and quick de-energization)	2 output stages for up to 3.5 A
Analog output (for controlling of subsequent electronic)	1 output, 12 Bit resolution, 0... ±10 V
Monitor output (for monitoring of internal values)	1 output, 12 Bit resolution, 0... ±10 V
Digital outputs (Error, Comparator)	2 outputs, voltage level 0 V/24 V, 10 mA
Test jacks	Solenoid current, sensor 1, set value, Monitor and GND
Auxiliary voltage	±10 V, max. load 10 mA
Optional I/O signals	3 in or outputs, output level 24 V, input level 5 V or 24 V (5 V level for incremental sensors on request)
Interface	
RS232 or RS485 with 9-pol Sub-D connector at front panel; RS485 also at back connector available (RS485 functions in preparation)	
Display and operation	
EL4-6 versions	4 digit display, 6 buttons (up, down, left, right, enter and Esc) Status-LED's: PW (Power), ER (Error), EN (Enable), SP1... SP4 (S1.01... S1.04), RP0 (Ramp = 0), IO1... IO3"
Frequencies and cycle times	
PWM Frequency	18 kHz
Cycle times	Current controller ca. 0.22 ms, inner closed loop controller ca. 0.22 ms (for valve feedback), external closed loop controller ca. 0.44 ms (twice inner loop)
Accessories	
Ordering Number	
Connecting cable to PC and EL4 - 5 m (196.9 in)	23144800
CD - ROM with software and manual (English, German version), connecting cable 5 m (196.9 in)	23144600

Ordering Code

Digital control electronics, external, eurocard format

Model
With display



Operation mode

- Control: 1 valve with 2 solenoids, open loop, without feedback **01**
- Control: 2 valves with 1 solenoid each, open loop, without feedback **02**
- Regulation (valve): 1 valve with 2 solenoids, closed loop, with valve spool position feedback **03**
- Regulation (process): 1 valve with 2 solenoids, closed loop with 1 process value feedback **04**
- Dual regulation: 1 valve with 2 solenoids, closed loop with valve spool position feedback and 1 process value feedback **06**
- Dual regulation: 2 independent valves with 1 solenoid each, closed loop with valve spool position feedback at one valve **07**
- Dual regulation: 2 independent valves with 1 solenoid each, closed loop with valve spool position feedback at each valve **08**
- Regulation (process only, without valve): control of other electronic unit (e.g. amplifier) and regulation of 1 process value **10**
- Regulation (process only, without valve): control of other electronic unit (e.g. amplifier) and regulation of 2 process values **11**

Hardware - Block Diagram

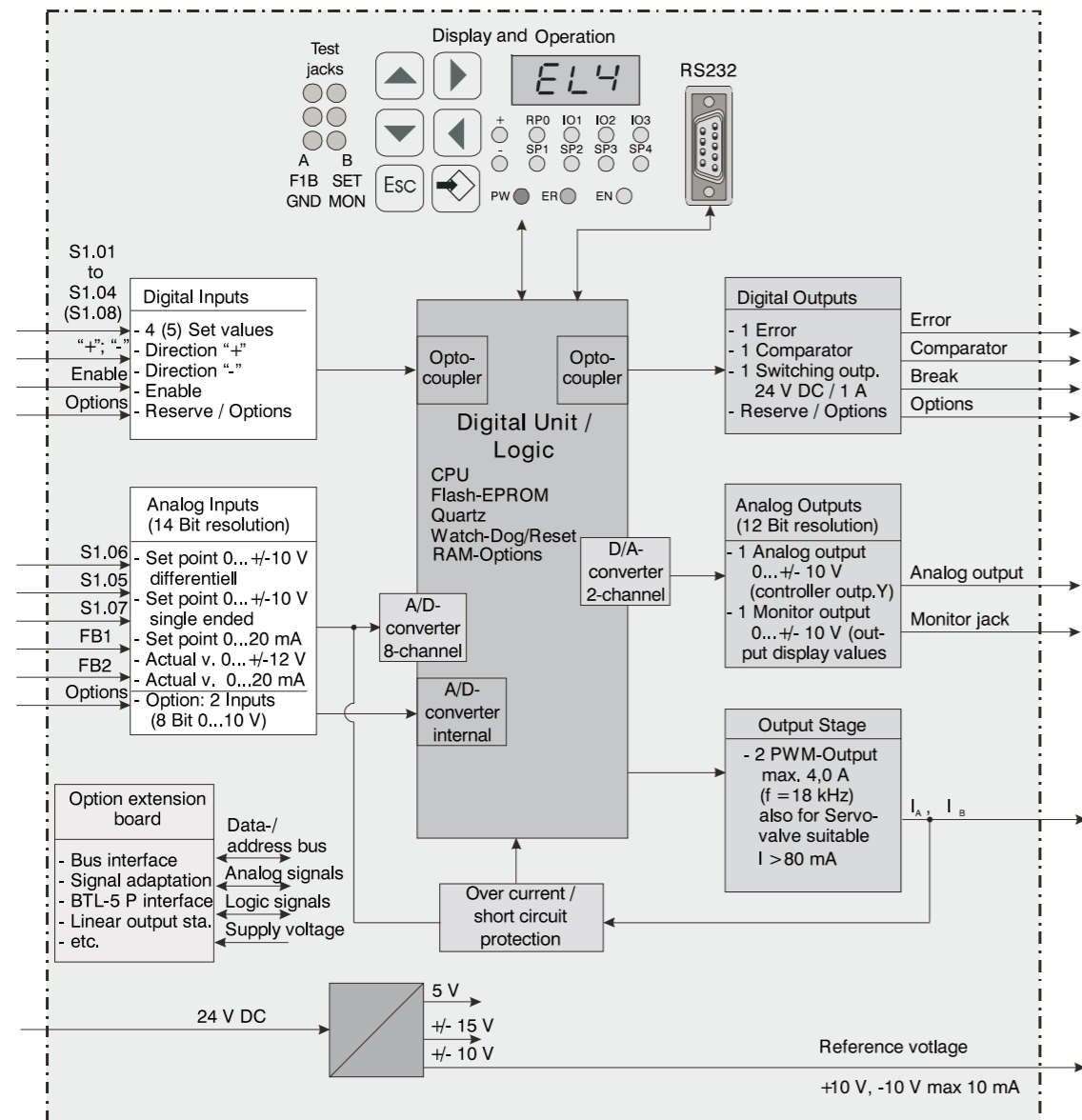
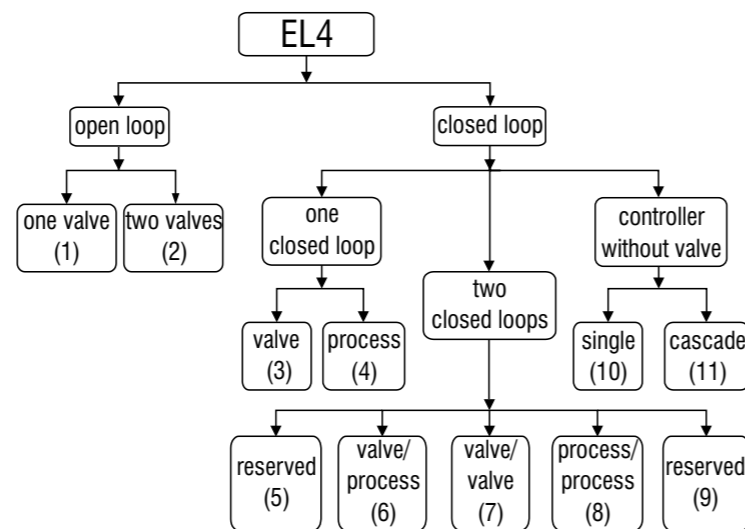


Diagram of Operation Modes

Operation modes

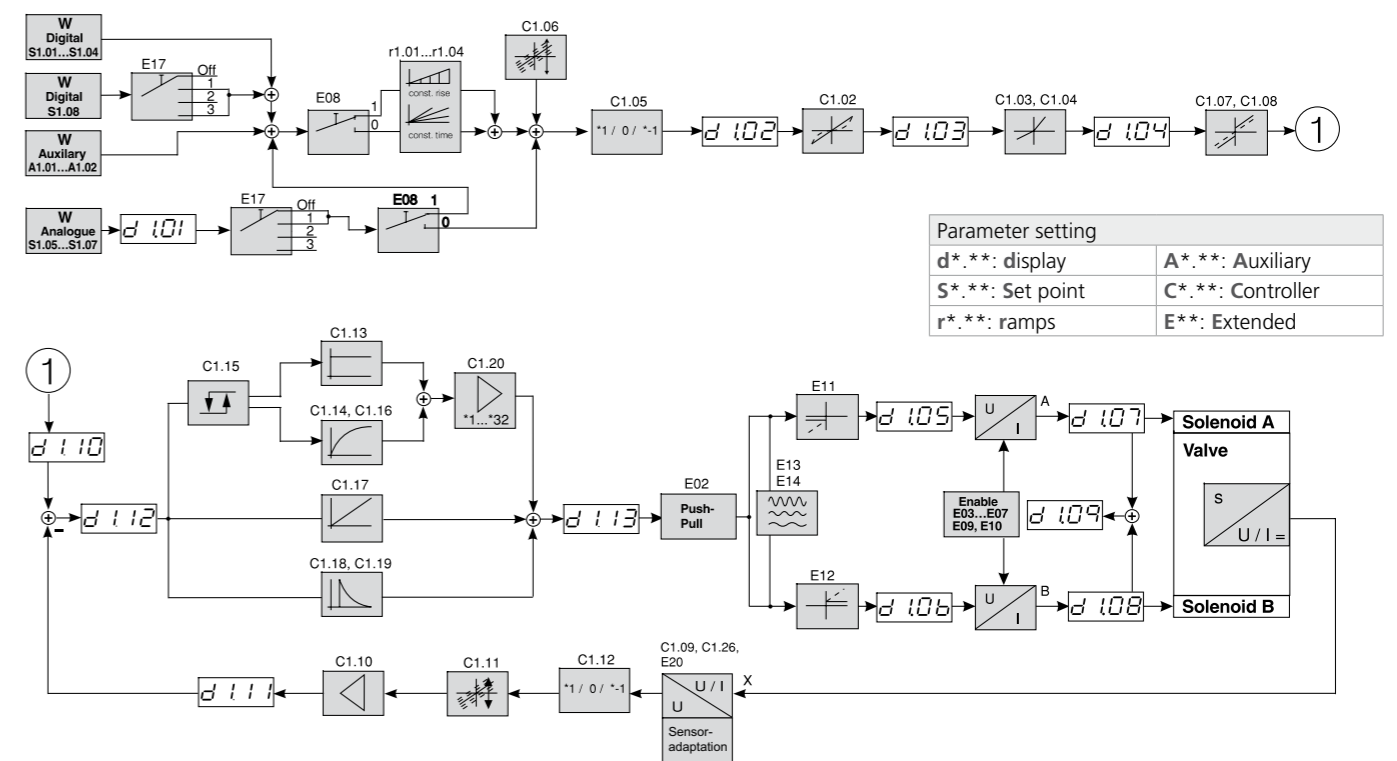
- 01 Control: 1 valve with 2 solenoids, open loop, without feedback
- 02 Control: 2 valves with 1 solenoid each, open loop, without feedback
- 03 Regulation (valve): 1 valve with 2 solenoids, closed loop, with valve spool position feedback
- 04 Regulation (process): 1 valve with 2 solenoids, closed loop with 1 process value feedback
- 05 Reserve mode (not used)
- 06 Dual regulation: 1 valve with 2 solenoids, closed loop with valve spool position feedback and 1 process value feedback
- 07 Dual regulation: 2 independent valves with 1 solenoid each, closed loop with valve spool position feedback at one valve
- 08 Dual regulation: 2 independent valves with 1 solenoid each, closed loop with valve spool position feedback at each valve
- 09 Reserve mode (not used)
- 10 Regulation (process only, without valve): control of other electronic unit (e.g. amplifier) and regulation of 1 process value
- 11 Regulation (process only, without valve): control of other electronic unit (e.g. amplifier) and regulation of 2 process values



Software Structure Diagrams

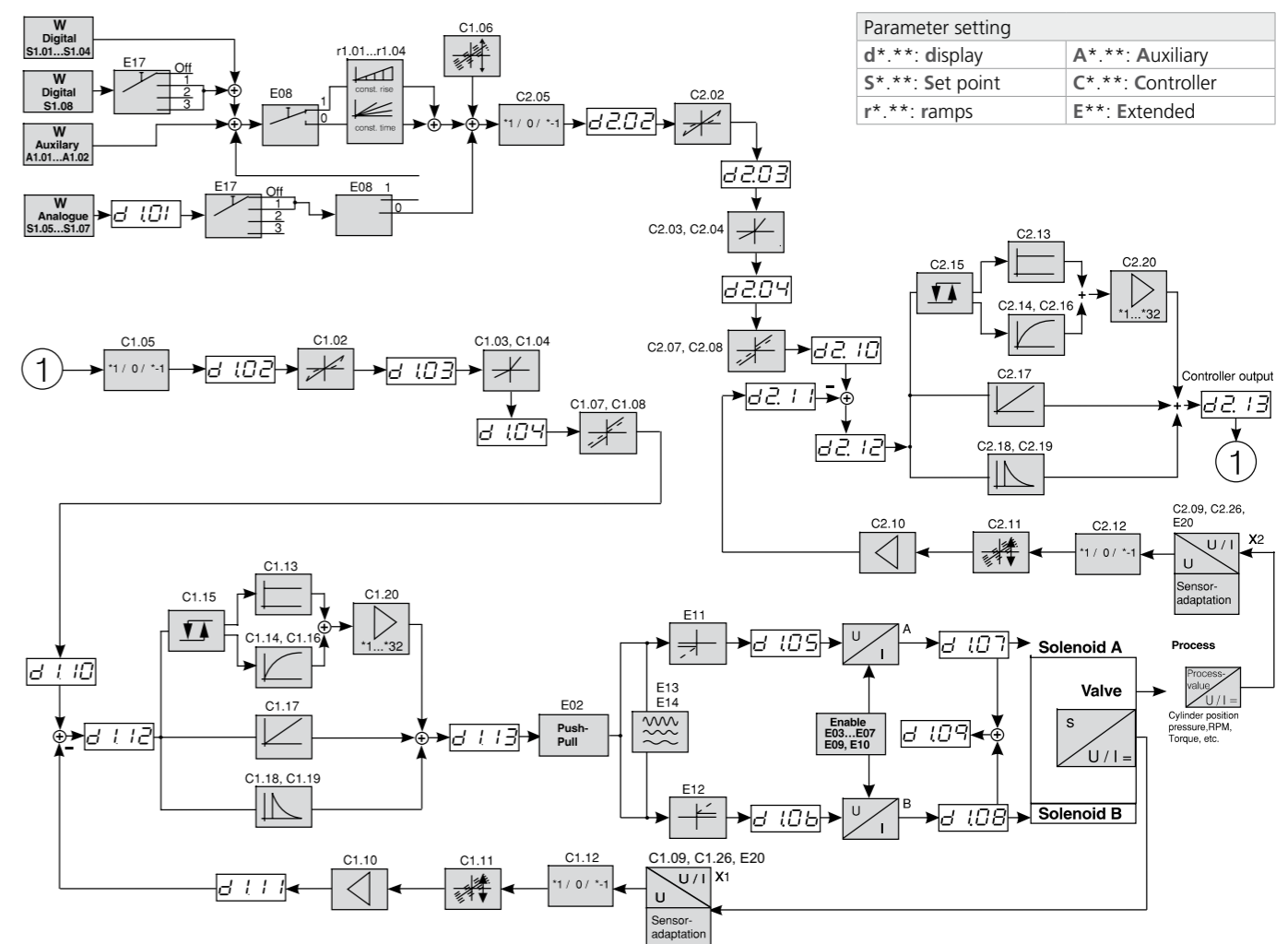
Mode 03 Regulation (valve):

1 valve with 2 solenoids, closed loop, with valve spool position feedback



Mode 06 Dual Regulation:

1 valve with 2 solenoids, closed loop, with valve spool position feedback and 1 process value feedback



Digital Control Electronics Unit - Plug-in Version

EL6



Technical Features

- › Digital electronics for open-loop control of a single proportional valve solenoid - plug-in version
- › Independent adjustments (including ramp up and ramp down)
- › Large, easy-to-use adjustments, readout on a 3-digit, 7-segment LED display
- › Display of actual values direct adjustment (current & voltage)
- › User selectable input type through menu setup (ex: 0 to 5V, 0 to 10 V, 4 to 20 mA)
- › Wide range of supply voltage and ramp time (0 to 99.5 sec)
- › Simple control with analog input, locally supplied reference voltage
- › Energy efficient PWM circuit, no heat sink required
- › Electronic limiting circuit/ short-circuit proof
- › Reverse polarity, command input protection
- › Load can be connected and disconnected live
- › Mounting: DIN 43650-A/ISO 4400 solenoid terminal

Functional Description

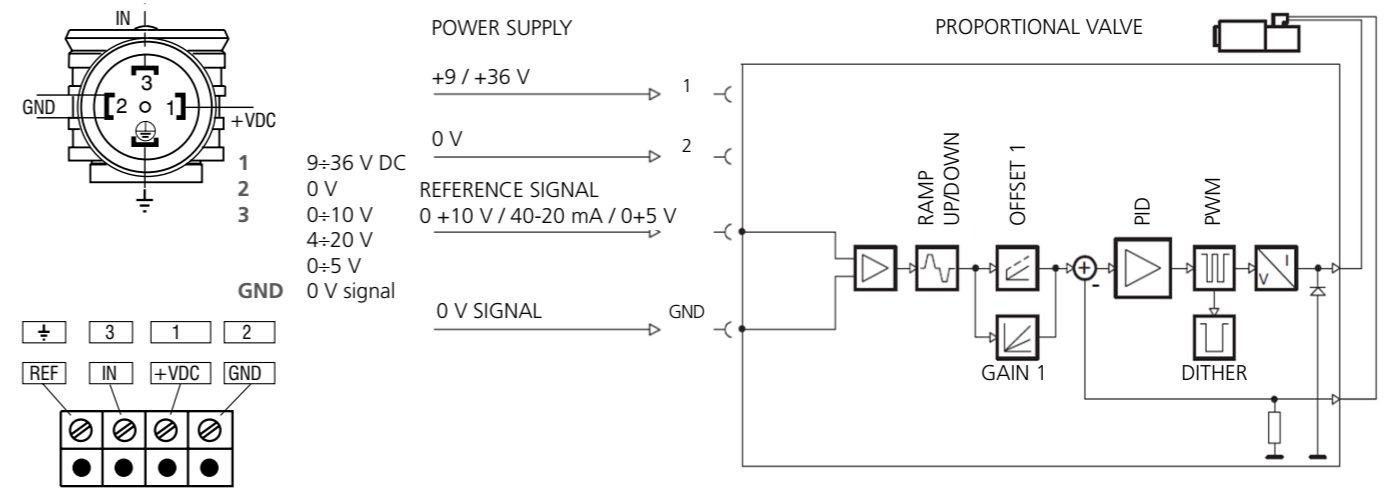
The control electronics is intended for the open-loop control of proportional valves with one solenoid. Its great advantage is its miniature design in form of a socket for a standardized DIN connector base. The unit supplies a variable current proportional to the reference signal, independently of temperature or load impedance variations. To optimize valve control and minimize valve hysteresis the unit contains a PWM stage to supply the solenoid. The card's top surface contains two revolving selectors, a terminal block to connect supply and control wires, and a three-digit LED display. The selector marked as "SELECT" is used to select the parameter to be adjusted. The second selector, marked as "ADJUST", is used to set the desired value. In basic operational mode, the display shows an input/output parameter value; in adjustment mode, the selected parameter abbreviation and the value being set up are indicated. The correct input signal type must be selected before operation.

Technical Data

Solenoid data			
Operating voltage	V DC	9... 36	
Max. output current	A	3	
Control signal type		0 - 5 [V], 0 - 10 [V], 4 - 20 [mA]	
Adjustable range of ramp functions	s	0.05... 99.5	
PWM / Dither frequency	Hz	40 - 450	
Linearity	%	1	
Operating ambient temperature	°C (°F)	-40... +75 (-40... +167)	
Recommended cross-section of lead-in wires	mm ²	0.5... +0.75	
Enclosure type of the solenoid to EN 60529		IP65	
Mass	kg (lbs)	0.13 (0.29)	
	V	13	24
Max. coil excitation current of proportional directional valves	PRM2-04	(Coil 16186100) ... 1.7	(Coil 16186200)... 0.8
	PRM2-06	(Coil 16187500) ... 1.6	(Coil 16186800)... 1.0
	PRM6-10	(Coil 16195800) ... 1.9	(Coil 16196200)... 1.1

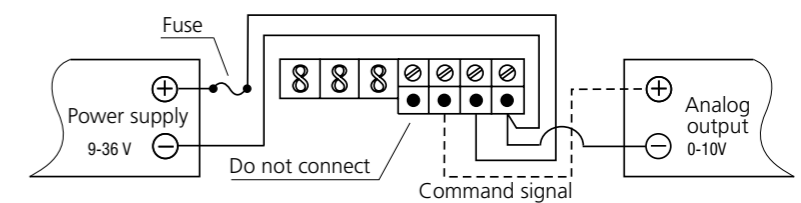
Attention: A cable with a circular cross-section and outside diameter of 4 to 6 mm should be used for the electronics supply, only this way the declared degree of IP protection can be secured.

Block Diagram

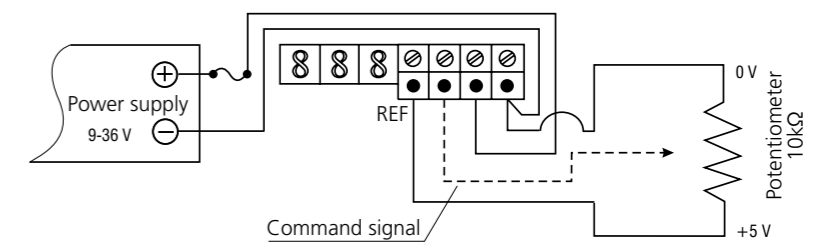


Wiring Diagram

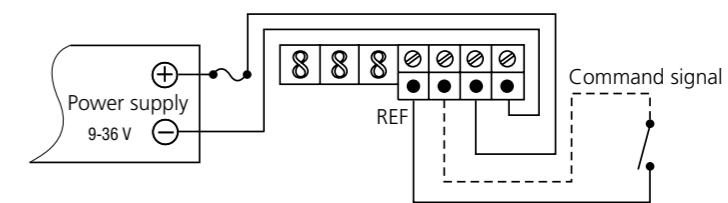
1) EXTERNAL INPUT SIGNAL CONNECTION
("in" set to "10")



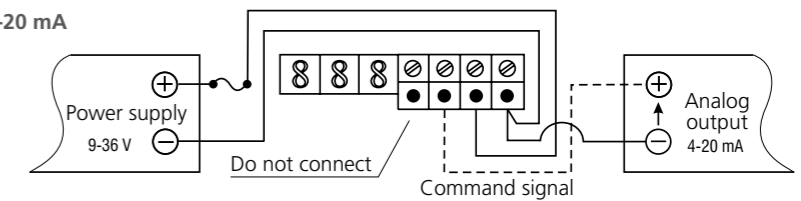
2) POTENTIOMETER CONNECTION
("in" set to "5")



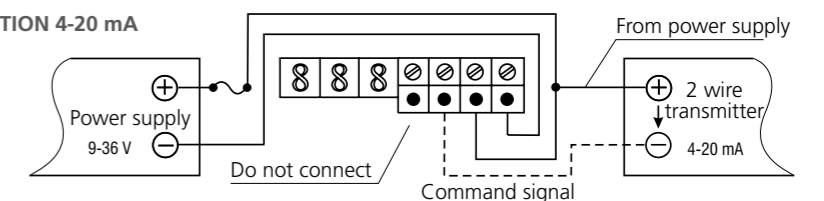
3) RAMP UP & DOWN ONLY OPERATION
("in" set to "5")



4) EXTERNAL INPUT SIGNAL CONNECTION 4-20 mA
("in" set to "420")



5) TWO WIRE TRANSMITTER INPUT CONNECTION 4-20 mA
("in" set to "420")



Installation note:

1. The power supply voltage on the connector must be higher than the rated working voltage of the solenoid to be controlled.
2. The IP rating depends on proper installation by the user. A round cable of 4 - 6 mm (0.15 - 0.25 in) diameter must be used.
3. For „0 to 5 V DC“ and for „0 to 10 V DC“ command input drivers, it is recommended to use independent negative conductors for power supply and analog output channel (PLC/PC) to maintain command signal accuracy due to voltage drop on long cables.

Set up Procedure

Attention:

- Prior to setting up parameters, you must select the proper input signal type for your system. The standard is preset to an input signal from 0 to 10 V.
- Applying an improper input signal type may damage the driver unit and may cause the system to fault to the „Error“ status mode.

1. At power up, the display will show either the output current signal or the input signal (default display setting shows the output signal). The decimal point will be flashing.
2. Rotate „SELECT“ to enter the set-up mode. Parameter abbreviation is indicated on the display.
3. When you reach the setting you want to modify, rotate „ADJUST“ up or down to the desired value.
4. To modify another setting, rotate „SELECT“ again and repeat.
5. The driver is fully functional during the set-up procedure with any adjustments taking effect immediately.
6. In order to write the new settings in the memory and return to normal mode of operation, rotate „SELECT“ until the display shows „SR“ and then rotate „ADJUST“ from 0 to 1 or wait for 100 seconds.
7. If you do not want to save the new settings you have just modified, you must disconnect the Driver from the power supply before the end of the 100 seconds to restore previous settings.
8. After saving the parameters to memory, the decimal point will be flashing and the driver display will be back showing either the output current signal or input signal depending on your „di“ selection.
9. To start over completely, you can restore the factory settings by rotating „SELECT“ to „rFP“ and then rotate „ADJUST“ up from 0 to 10 for the display to reset.
(NOTE for Step 9: You may have to adjust your input signal type again if you reset to factory settings).

Settings and Range

Parameter Abbreviation	Parameter	Adjustable Range
Hi	HIGH, maximum current output	0.20 - 3 A
Lo	LOW, minimum current output	0 - 2.99 A
rUP	RAMP UP, time for output to increase from min. to max.	0 - 99.5 s
rdn	RAMP DOWN, time for output to decrease from max. to min.	0 - 99.5 s
Cdb	dead band – output current to the coil is zero, until the control signal exceeds a threshold of insensitivity (the threshold is expressed in % of the control signal maximum value)	0 - 5 %
dFr	DITHER FREQUENCY, 40 (40Hz) to 450 (450Hz)	40 - 450 Hz
in 5 10 420	Input control signal type selection - Voltage signal - Voltage signal - Current signal	0 - 5 V 0 - 10 V 4 - 20 mA
di 0 1	Signal value indication for checking or problem solving purposes - Command signal [V] or [mA] - Output signal [A] Flashing decimal point is an indicator for present display mode: - Fast flashing decimal point, several flashes per second indicates – command signal (di = 0) - Slow flashing decimal point, 1 per second indicates) – output signal (di = 1) - No flashing decimal point or no decimal point indicates display in SETTING/ADJUST	
SR	SAVE SETTINGS	
rFP	RESET FACTORY PARAMETERS	
Err 0 1 2	ERROR DETECTION STATE, short circuit, reverse polarity protection and detection - Error 0 - no errors - Error 1 - overcurrent in driver likely due to short circuit in solenoid - Error 2 - current exceeding 20 mA in „4 to 20 mA“ input mode	
CLr	CLEAR ERROR, clears driver of error state	

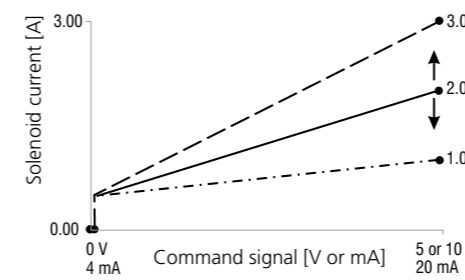
Note: When adjusting the Hi and Lo parameters, the Hi parameter value cannot be adjusted below the Lo parameter value as well the Lo parameter value cannot exceed the Hi parameter value.

Optional features

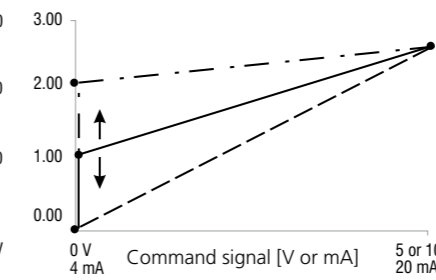
- Pcd:** PASSWORD, adjust code for password protection settings for lock or unlock
- Loc:** LOCK, locks driver to LOCKED state with password set in Pcd
- Unl:** UNLOCK, unlocks driver with correct password set in Pcd. **Only available in LOCKED mode!**

Range Characteristics

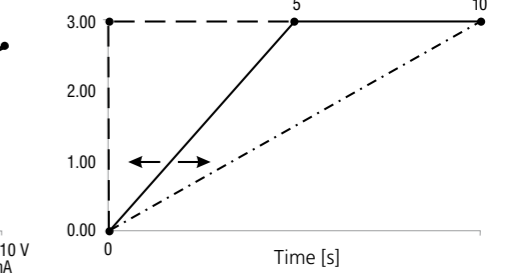
Adjustment of maximum:
(High) / parameter „Hi“
maximum current output, 0.20 to 3.00 A



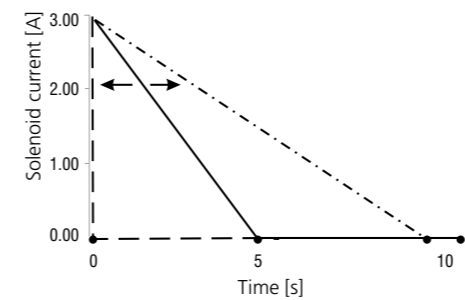
Adjustment of minimum:
(Low) / parameter „Lo“
maximum current output, 0.00 to 2.99 A



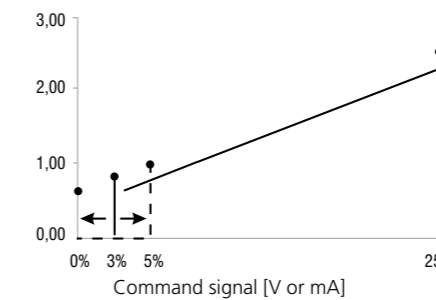
Adjustment of ramp up:
(Ramp up) / parameter „rUP“ (from min. to max.)
time for output to increase, 0 to 99.5 s



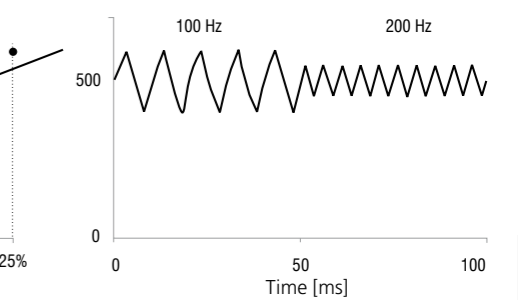
Adjustment of ramp down:
(Ramp down) / parameter „rdn“ (from max. to min.)
time for Output to Decrease 0 to 99.5 s



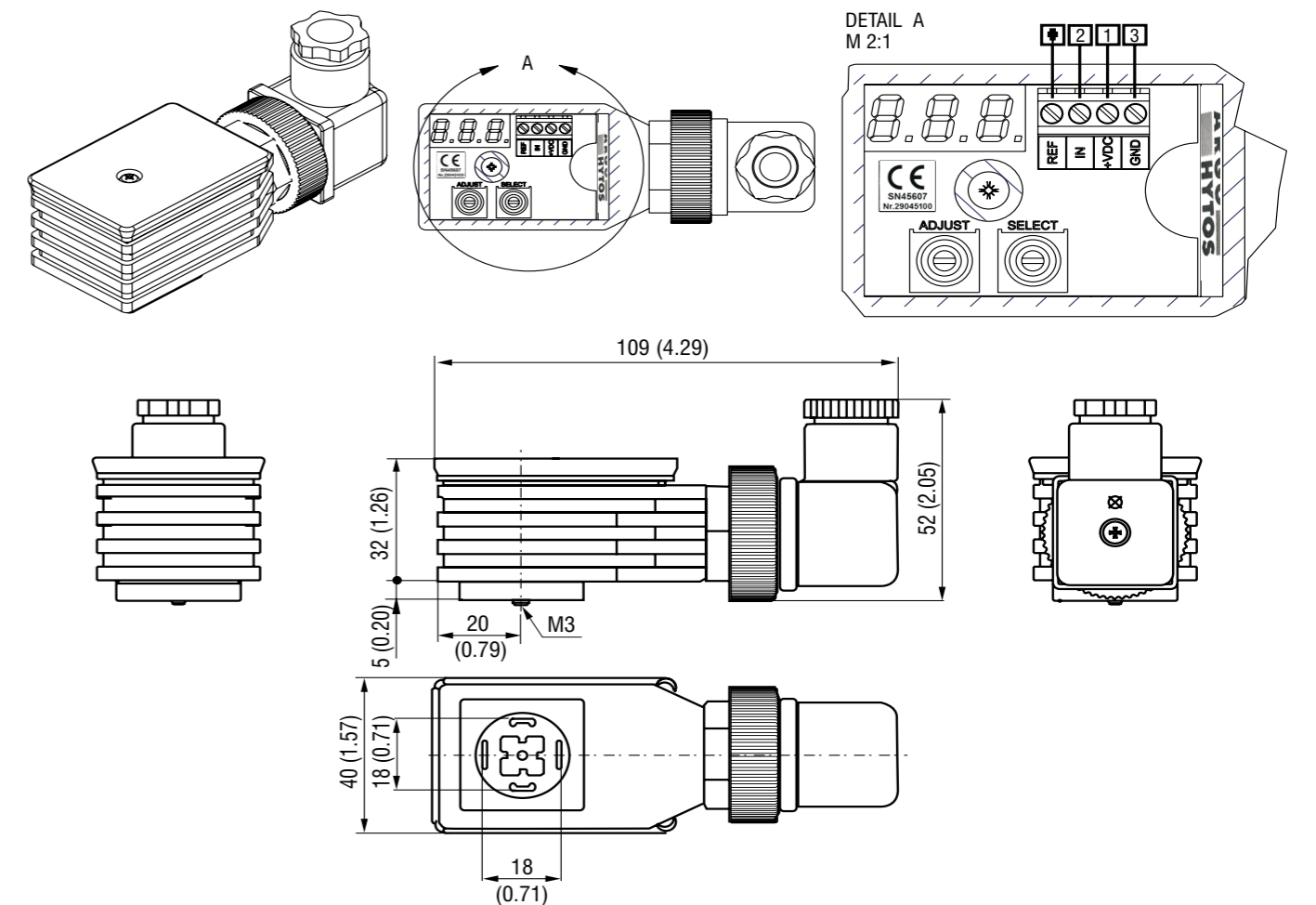
Adjustment deadband:
(Command deadband) / parameter „Cdb“
output disabled if command signal less than deadband
0 to 5 % of the maximum command signal



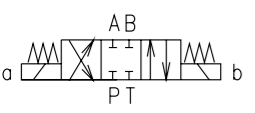
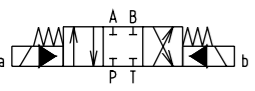
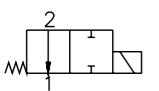
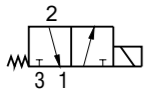
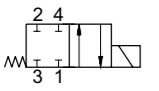
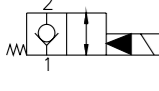
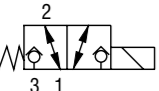
Dither Frequency
(Dither frequency) / parameter „dFr“
Frequency selectable in a range from 40 to 450 Hz



Dimensions in millimeters (inches)



Content

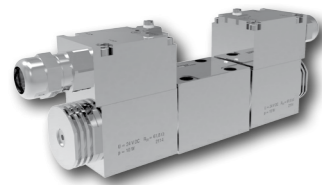
Symbol Example	Flow l/min (GPM)	Pressure bar (PSI)	Type Code	Cartridge				Page	Data Sheet
				Size 06; D03	Size 10; D05	Size 16; D07	Size 25; D08		
Operating Instructions for Explosion Proof Valves									
4/2 and 4/3 Directional Control Valves, Solenoid Operated									
	60 (16)	350 (5100)	RPEX3-06	X				442	HA 4054
4/2 and 4/3 Directional Control Valves, Internally and Externally Pilot Operated									
	150 (40)	320 (4600)	RNEXH1-10		X			446	HA 4077
	300 (79)	350 (5100)	RNEXH5-16			X		450	HA 4058
	600 (159)	320 (4600)	RNEXH4-25				X	454	HA 4059
2/2 Directional Valves, Solenoid Operated, Spool Type, Direct Acting									
	45 (12)	350 (5100)	SD2EX-B2	X	(X)			458	HA 4064
3/2 Directional Valves, Solenoid Operated, Spool Type, Direct Acting									
	60 (16)	350 (5100)	SD2EX-B3	X	(X)			462	HA 4065
4/2 Directional Valves, Solenoid Operated, Spool Type, Direct Acting									
	50 (13)	350 (5100)	SD2EX-B4	X	(X)			466	HA 4066
2/2 Directional Valves, Solenoid Operated, Poppet Type, Pilot Operated									
	75 (20)	420 (6100)	SD3EX-B2	X	(X)			470	HA 4067
3/2 Directional Valves, Solenoid Operated, Poppet Type, Direct Acting									
	40 (11)	350 (5100)	SD1EX-A3	X	(X)			474	HA 4068

Notes

Operating Instructions for Explosion-proof Valves

RPEX3-06, SD2EX-B2, SD2EX-B3, SD2EX-B4, SD3EX-B2, SD1EX-A3

RPEX3-06



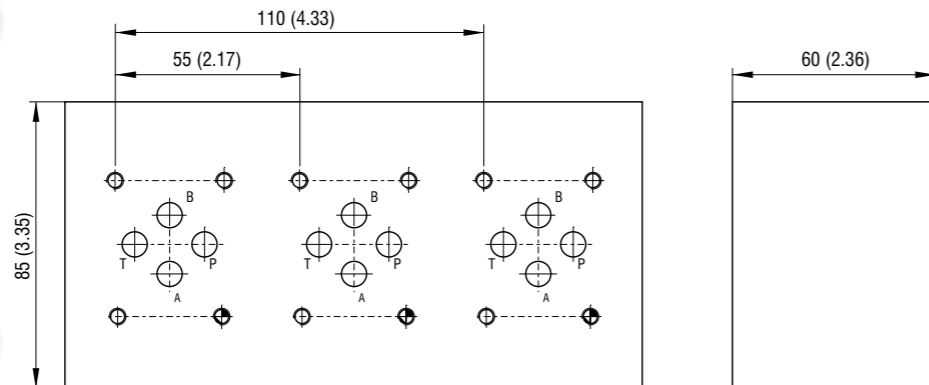
Content:
Valve installation
Mechanical part
Electrical part - solenoid

Valve Installation - Dimensions in millimeters (inches)

The minimum dimensions of the manifold must not be below the defined volume.
Heat conductivity of the subplate ≥ 38 W/mK (EN-GJS-500-7)

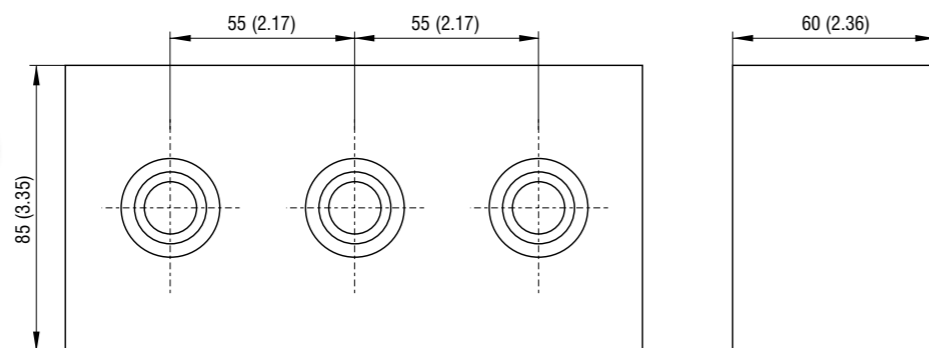
RPEX3-06 Single valve - min. subplate volume 116 cm³
min. subplate dimensions: 80x58x25 (3.15x2.28x0.98)

RPEX3-06 Parallel assembly



SD*EX- Single valve - min. housing volume 144 cm³**
min. housing dimensions: 60x60x40 (2.36x2.36x1.57)

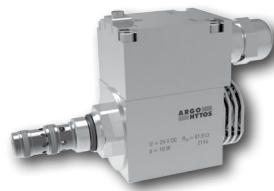
SD*EX- Screw-in cartridges - parallel assembly**



SD3EX-B2



SD1EX-A3



SD2EX-B2



SD2EX-B3



SD2EX-B4



Protection against mechanical damage
The valve must be protected against damage by falling objects with a suitable cover or a suitable location on the machine or device.

Mechanical Part of the Valve

Marking II 2GD c T4
I M2 c

ATEX/IECEx Classification

The valves equipped with a explosion-proof single stroke solenoid are available with the following certifications and protection modes:

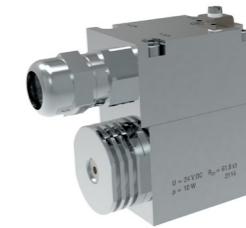
	Certificate No.: EPS14ATEX1744 X	Certificate No.: IECEx EPS14.0064 X
AC	I M2 Ex mb I Mb	Ex mb I Mb
	II 2G Ex mb IIB T4, T5, T6 Gb	Ex mb IIB T4, T5, T6 Gb
	II 2D Ex mb IIIC T135°C, T100°C, T85°C Db	Ex mb IIIC T135°C, T100°C, T85°C Db
DC	I M2 Ex e mb I Mb	Ex e mb I Mb
	II 2G Ex e mb IIB T4, T5, T6 Gb	Ex e mb IIB T4, T5, T6 Gb
	II 2D Ex tb IIIC T135°C, T100°C, T85°C Db	Ex tb IIIC T135°C, T100°C, T85°C Db

Electrical Part of the Valve

Registry-No. of above authority: 0408
Declaration of conformity: K 19 / 2014



Document: B 32 / 2014
Data as of: 03.06.2014



1. Introduction

The solenoid was designed, manufactured, and tested in compliance with the standards and regulations generally applicable within the European Union. On leaving the factory, the solenoid's safety-related conditions were tested and proven to be faultless. The operator must read and observe the notes and warnings provided with these operating instructions to maintain this status and to ensure safe operation. The solenoid must only be installed and wired by a qualified technician, who is familiar with and works according to the generally accepted engineering standards and the latest legal regulations and standards of explosion protection.

2. Usage

This solenoid is assigned to Group II, Category 2 of the ATEX directive and to Group I, Category M2 for mining applications. This device can be used in areas where explosion hazard occurs through:
- gas/air mixtures, vapours or mists of flammable materials according to classes IIA and IIB acc. ATEX and IECEx.
- flammable dust/air mixtures according to classes IIIA, IIIB and IIIC.

This device may be used in the following explosion hazard areas outside mining:
Zone 1, Zone 2, Zone 21 and Zone 22.

The maximum ambient temperatures are as follows:

Temperature class T6 or rather T 80 °C (176 °F): Tamb= -40 °C (104 °F) up to +45 °C (113 °F) and coil power P_n=10 W
T5 or rather T 95 °C (203 °F): Tamb= -40 °C (104 °F) up to +55 °C (131 °F) and coil power P_n=10 W
T4 or rather T1 30 °C (266 °F): Tamb= -40 °C (104 °F) up to +70 °C (158 °F) and coil power P_n=10 W
T4 or rather T1 30 °C (266 °F): Tamb= -40 °C (104 °F) up to +60 °C (140 °F) and coil power P_n=18 W

3. Solenoid Ordering Code

EX22 46			Cable length	
Explosion-proof solenoid, inner diameter 22 mm			No designation	no cable (only for DC) cable 3 m cable 8 m
Housing size				
DC voltage	12 V DC	01200	T4 T6	Temperature class for 10 W, 18 W for 10 W only
connection box	24 V DC	02400		
+ Cable gland	48 V DC	04800		
	110 V DC	11000		
AC voltage 50/60 Hz	110 V AC	11050	A B	Solenoid nominal power 10 W 18 W
fix installed cable	230 V AC	23050		

Solenoid Codes	Ordering No.	Solenoid Codes	Ordering No.	Solenoid Codes	Ordering No.
EX224601200AT4	32754300	EX224601200BT4	32755000	EX224623050AT43M	32756000
EX224601200AT6	32754400	EX224602400BT4	32755300	EX224623050AT48M	32756100
EX224602400AT4	32041400	EX224604800BT4	32755400	EX224623050AT63M	32756200
EX224602400AT6	32754500	EX224611000BT4	32755500	EX224623050AT68M	32756300
EX224604800AT4	32754600	EX224611050AT43M	32755600	EX224611050BT43M	32756400
EX224604800AT6	32754700	EX224611050AT48M	32755700	EX224611050BT48M	32756500
EX224611000AT4	32754800	EX224611050AT63M	32755800	EX224623050BT43M	32756600
EX224611000AT6	32754900	EX224611050AT68M	32755900	EX224623050BT48M	32756700

4. Electrical Data - Version A and B

- › Rated voltage: U_n [V DC] ± 10 % max.
- › Supply voltage: U_n [V DC or V AC] for electronics
- › Ripple voltage: ± 15 %
- › Resistance: R_{20} [Ω] ± 5 % at 20 °C
- › Working duty: S1 (100 % ED) in mounted state with valve

Table 2: Voltage versions A and B

Type	Voltage	Resistance	Nominal current	Limiting current	Protection concept	Power
	U_n	R_{20}	I_n	I_G		P_n
	[V DC]	[Ω]	[A]	[A]		[W]
xx EX18 046A A012	12	16.1	0.75	0.65	Diode (36V)	8.9
xx EX18 046A A024	24	61.8	0.39	0.34	Diode (36V)	9.3
xx EX18 046A A048	48	252.4	0.19	0.16	Diode (75V)	9.1
xx EX18 046A A110	110	1171.5	0.094	0.08	Diode (180V)	10.3
xx EX18 046B A012	12	7.7	1.56	1.37	Diode (36V)	18.8
xx EX18 046B A024	24	32.3	0.74	0.65	Diode (36V)	17.8
xx EX18 046B A048	48	125.7	0.38	0.33	Diode (75V)	18.3
xx EX18 046B A110	110	655.6	0.17	0.15	Diode (180V)	18.5
	[V AC] 50/60 Hz					
xx EX18 046A B110	110	894.1	0.112	0.095	Bridge rectifier	11.2
xx EX18 046A B230	230	3987	0.052	0.044	Bridge rectifier	10.7
xx EX18 046B B110	110	524.4	0.19	0.167	Bridge rectifier	19.1
xx EX18 046B B230	230	2251.4	0.092	0.08	Bridge rectifier	19

*Limiting current (I_G) - current at the highest temperature.

5. Initial Installation

- › The ambient temperature range shall not exceed the temperatures given in chapter 2. The maximum temperature of the medium (generally hydraulic fluid) shall not exceed 70 °C (158 °F).
- › It is the user's duty to ensure free and unhindered heat emission during operation. This means that the solenoid shall neither be covered nor stored immediately adjacent to heat sources (e.g. fan heaters) during operation.
- › The solenoid shall not be subjected to direct sunlight during operation.

6. Installation - Installation, Mounting, Demounting

- › Using the V DC type for temperature class T4 requires a cable with an operating temperature limit of at least +105 °C (221 °F), e.g. LAPP FD Robust. T5 and T6 require a cable with an operating temperature limit of at least +90 °C (194 °F). The fastening torque on the cable gland depends of the used cable and is to be determined by the installing user.
- › When installing the V DC solenoid, the fastening torque of the screws shall be [4 Nm (2.95 lbf.ft)] and for the BARTEC connection box [0.4 Nm (0.30 lbf.ft)].
- › When installing the V DC solenoid, an appropriate cable shoe of size M3 with a crosssectional area of 0.75 mm² with an operating temperature limit of at least +105 °C (221 °F) is to be used.
- › The user has to safeguard each solenoid with a fuse: $I_n \leq 3xI_G$, with trigger characteristic "slow blow". (I_G values see Operating Instructions - Table 2). The breaking capacity of the fuse link has to be stronger than the maximum short circuit current at the user's operating area.
- › EX-secured components must be used during mounting in case the fuse and/or the interface are within the EX-range.
- › The solenoid may be connected to ground via the purpose-built ground clamp on the connector casing.
- › The EX-solenoid shall only be operated with a valve body according to the instructions in chapter 12.
- › The coil must not be activated alone – a connection to the valve body is required!
- › The single parts needed for assembly are listed in chapter 13.

7. Specification

- › Coils and plug cavity with watertight encapsulation. Insulation class "F" [155 C° (311 °F)]
- › Protection type IAW DIN VDE 0470, EN 60529 and/or IEC 529, device: IP65
- › Surface protection (casing) acc. DIN 50979 Fe/Zn8-12//Cn//T0
- › Max. temperature of the operating medium (generally hydraulic fluid): 70 °C (158 °F)
- › Max. ambient temperature: see chapter 2!

8. Suppressor - Connection Diagrams

Figure 1 - Bidirectional voltage limiter – diodes:
 $U_Z = 36$ V, bipolar for $U_n = 12$ und 24 V DC
 $U_Z = 75$ V, bipolar for $U_n = 48$ V DC
 $U_Z = 180$ V, bipolar for $U_n = 110$ V DC

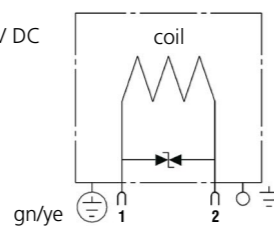
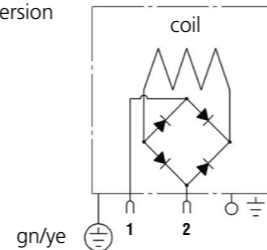


Figure 2 - Bridge rectifier for AC version



9. Maintenance, Service, Troubleshooting

- › The solenoid generally requires almost no maintenance. All electrical connections shall be checked regularly for possible damages (visual check).
- › The surface of the device shall be checked regularly for dust deposits, which should be cleaned off.
- › Do not try to open or to repair the device. If any trouble occurs, please contact the manufacturer.

10. Standards and Regulations

- › Directive 94/9/EG of the European Parliament and the European Council (ATEX 95)
- › DIN VDE 0580
- › EN 60529
- › EN 60079-0:2012, EN 60079-7:2007, EN 60079-18:2009, EN 60079-31:2009
- › IEC 60079-0:2011, IEC 60079-7:2006, IEC 60079-18:2009, IEC 60079-31:2008

11. Safety Notice - Please Read Carefully!

- › In case the solenoid shows any signs of a defect, malfunctioning or external damage. (including corrosion), the device must immediately be taken out of operation.
- › Any deposits on the surface of the device shall not obstruct heat emission.
- › To maintain legibility of the data plate, the solenoid must not be coated.

Caution:

- › Always disconnect the solenoid from the power supply before any maintenance or other work on it.
- › Always exchange the complete solenoid. Do not try to repair the solenoid.
- › Under no circumstances shall any changes be made to the solenoid or the connecting cable.
- › Never operate the solenoid when disconnected from the valve body.
- › Demount the solenoid only in secure areas (not in EX-areas). If this is not possible, the solenoid must cool off for at least 10 minutes.



Any warranty claims are denied in case the regulations in this operating manual are not observed!

12. Grouping of Single Solenoids and Valves

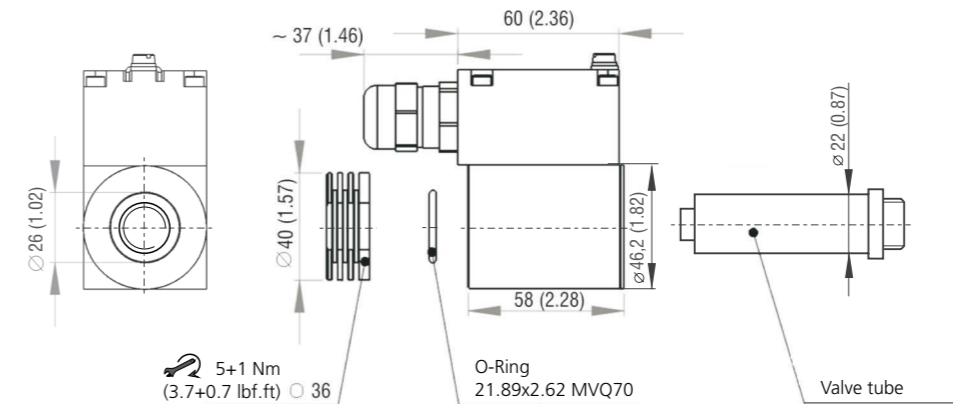
General

- › A single solenoid must only be operated with a valve body within at least a **minimum volume described in "Valve Installation"**.

Instructions – Please Read Carefully !

- › If two solenoids per valve body are installed (RPEX3-06), they have to be mounted on opposite sides.
- › The user has to ensure only one solenoid per valve body is actuated at a time. Simultaneous activation of solenoids at one and the same valve body is forbidden. The user has to fulfil this requirement by proper electrical connections.

13. Dimensions in millimeters (inches)



14. Transport and Storage / Service and Maintenance

- › The valves are wrapped in polyethylene bags (vacuum packed) and fitted with paper labels bearing the product number, name and manufacturing order.
- › The valves should be stored in boxes and protected against weather influences that may cause corrosion.
- › Except for the replacement of the external gasket, any other repairs of the valve are prohibited. They may be carried out at the manufacturer's only.

PRODUCER:
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 543 15 Vrchlaby, Czech Republic

Telefon: + 420 499 403 111
 Internet: www.argo-hytos.com
 E-mail: info.cz@argo-hytos.com

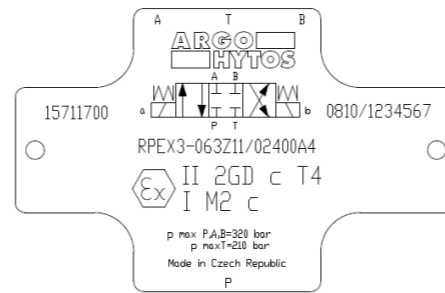
Samples of Marking

Marking of Solenoid

74 EX18 046A A024
UN=24VDC Ig=0,34A R20=61,8Ω
IP65 CE 0408
EPS14ATEX1744 X
I M2 Ex e mb I Mb
II 2G Ex e mb IIB T4 Gb
II 2D Ex tb IIIC T135°C Db
IECEX EPS14.0064 X
Ex e mb I Mb
Ex e mb IIB T4 Gb
Ex tb IIIC T135°C Db
1234/01
02/14
-40 °C ≤ Tamb ≤ +70 °C

74 EX18 046A A024
UN=24VDC Ig=0,34A R20=61,8Ω
IP65 CE 0408
EPS14ATEX1744 X
I M2 Ex e mb I Mb
II 2G Ex e mb IIB T6 Gb
II 2D Ex tb IIIC T85°C Db
IECEX EPS14.0064 X
Ex e mb I Mb
Ex e mb IIB T6 Gb
Ex tb IIIC T85°C Db
1234/01
02/14
-40 °C ≤ Tamb ≤ +45 °C

Marking of Body



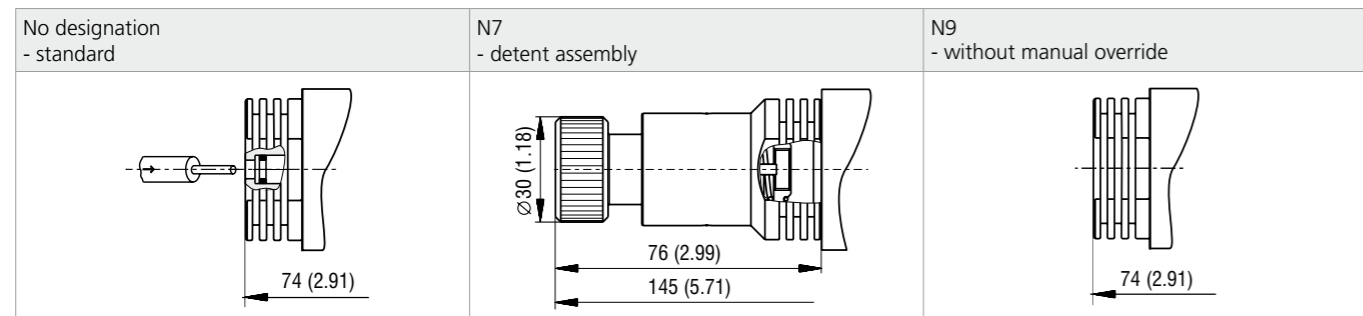
Group I (mining)

- Ex ATEX mark of conformity to the 94/9CE directive and to the technical norms.
- I Group I for mines
- M2 High protection - equipment category
- Ex e mb Type of protection: e - increased safety, mb - encapsulated
- I Gas group (Methane)
- Mb Equipment protection level - High level protection for explosive atmosphere

Group II

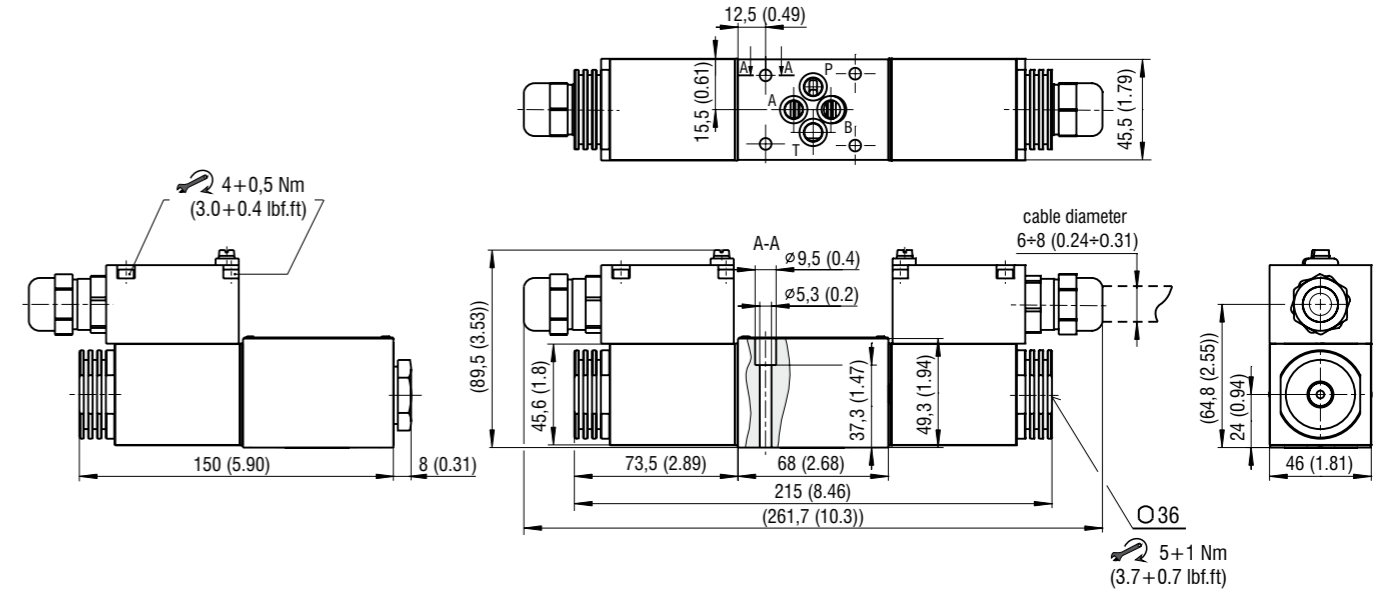
- Ex ATEX mark of conformity to the 94/9CE directive and to the technical norms.
- II 2G Solenoid for surface plants with Gas and Vapors environment for zones 1 and 2.
- II 2D Solenoid for surface plants with Dust environment for zones 21 and 22.
- Ex e mb Type of protection: e - increased safety, mb - encapsulated
- Ex tb Type of protection: tb - protection by enclosure
- IIB Equipment suitable for substances (gas) of group IIB
- IIIC Equipment suitable for conductive dust (Specific resistance $\rho \leq 10^3 \Omega m$)
- T6/T4 Temperature class (maximum solenoid surface temperature)
- T85/T135 Maximum solenoid surface temperature
- Gb Equipment protection level - High level protection for explosive Gas atmosphere
- Db Equipment protection level - High level protection for explosive Dust atmosphere

Manual Override in millimeters (inches)



In the case of solenoid malfunction or power failure, the spool of the valve can be shifted by manual override. For other manual overrides consult our technical department.

Dimensions in millimeters (inches)



Information for Customers

Initial installation

- The ambient temperature range shall not overstep the temperatures given in the chapter Technical Data - Explosion proof solenoid (page 1). The maximum temperature of the medium (generally hydraulic fluid) shall not exceed 70 °C (158 °F).
- It is the users duty to ensure free and unhindered heat emission during operation. This means that the solenoid shall neither be covered nor stored immediately adjacent to heat sources (e.g. fan heaters) during operation.
- Care is to be given that the solenoid is not subjected to direct sunlight during operation.

Installation notice - installation, mounting, demounting

- Installing the type V DC for temperature class T4 a cable with an ambient operating temperature of at least +105 °C (+221°F) is to be used. For T5 and T6 a cable with an ambient operating temperature of at least +90 °C (+194°F) is sufficient. The fastening torque on the cable gland depends of the used cable and is to be determined by installing user.
- When installing the V DC solenoid type, please note the fastening torque of the screws (4 Nm or 2.95 Lbf.ft) and of the Connection box (0,4 Nm or 0.30 Lbf.ft).
- When installing the V DC solenoid type, an appropriate cable shoe M3 - 0,75 mm² (with an ambient operating temperature of at least +105 °C or +221°F) is to be used.
- The user has to safeguard each solenoid with a fuse: $I_n \leq 3I_{Gr}$ with tigger characteristic "slow blow". (I_G values see Operating Instructions HA 4090 - Table 2). The breaking capacity of the fuse link has to be stronger than the max short circuit current at the users operating area.
- EX-secured components must be used during mounting in case the fuse and/or the interface are within the EX-range.
- In addition, the solenoid may be connected to ground via the purpose-built ground clamp an the connector casing.

Safety notice - please read carefully

- In case the solenoid shows any signs of a defect, malfunctioning or external damage (including corrosion), the device must immediately be taken out of operation.
- Any deposits on the surface of the device shall not obstruct heat emission.
- To maintain legibility of the date plate, the solenoid must not be coated.

Caution

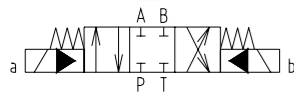
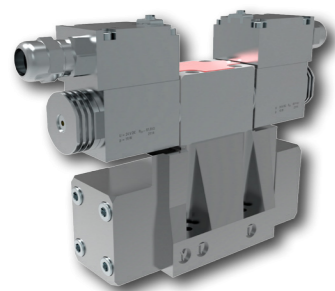
- Always disconnect the solenoid from the power supply before any maintenance or other work on it.
- Always exchange the complete solenoid. Do not try to repair the solenoid.
- In no case shall any changes be made to the solenoid or the connecting cable.
- Demount the solenoid only in secure areas (not in EX-areas). If this is not possible, the solenoid must cool for 10 minutes minimum.



Explosion Proof, 4/2 and 4/3 Directional Control Valve, Pilot Operated

RNEXH1-10

Size 10 (D05) • Q_{max} 150 l/min (40 GPM) • p_{max} 320 bar (4600 PSI) / 420 bar (6100 PSI)



Technical Features

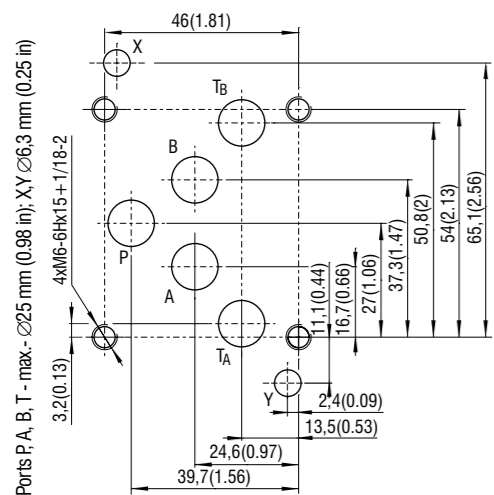
- Directional control valve internally or externally pilot operated with standard mounting interface CETOP 4.2-4 P05-320, optional interface acc. to ISO 4401-05-05-05
- Driven by an ISO 4401-03 (CETOP 03) solenoid operated directional valve
- High pressure version of main stage 420 bar (6090 PSI) available
- High transmitted hydraulic power, optimized design to minimize the pressure drop
- Flexibly changed from internal pilot or drain to external by inserting or removing threaded plugs in the main control valve body
- Wide range of interchangeable spools and valve controls available
- Soft-shift, spool speed, main stroke limiter control options
- In the standard version, the valve housing is zinc-coated for 520 h protection acc. to ISO 9227

ATEX/IECEX Classification

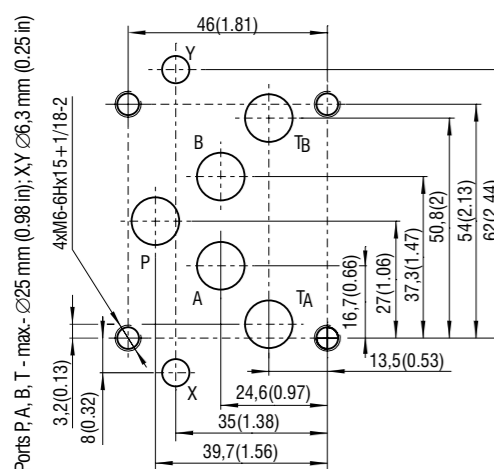
The valves equipped with explosion proof solenoids are available with following certifications and protection modes:

	EPS14ATEX1744 X	IECEX EPS14.0064 X
AC	Ex I M2 Ex mb I Mb	Ex mb I Mb
	Ex II 2G Ex mb IIB T4, T5, T6 Gb	Ex mb IIB T4, T5, T6 Gb
	Ex II 2D Ex mb IIIC T135°C, T100°C, T85°C Db	Ex mb IIIC T135°C, T100°C, T85°C Db
DC	Ex I M2 Ex e mb I Mb	Ex e mb I Mb
	Ex II 2G Ex e mb IIB T4, T5, T6 Gb	Ex e mb IIB T4, T5, T6 Gb
	Ex II 2D Ex tb IIIC T135°C, T100°C, T85°C Db	Ex tb IIIC T135°C, T100°C, T85°C Db

CETOP 4.2-4 P05-320 STANDARD PATTERN



ISO 4401-05-05-005 CETOP 4.2-4 R05-320



Technical Data

Valve type		RNEX*1-10	RNEX*1H-10
Valve size		10 (D05)	
Max. flow	l/min (GPM)	150 (37)	
Max. operating pressure at port P, A, B	bar (PSI)	320 (4640)	420 (6090)
	- at port T (external drain)	210 (3050)	350 (5080)
- at port T (internal drain)		210 (3050)	
Minimum pilot pressure	bar (PSI)	12 (174)	
Maximum pilot pressure	bar (PSI)	210 (3050)*	350 (5080)*
Fluid temperature range (NBR)	°C (°F)	-30 ... +80 (-22 ... +176)	
Fluid temperature range (FPM)	°C (°F)	-20 ... +80 (-4 ... +176)	
Ambient temperature range	°C (°F)	-30 ... +50 (-22 ... +122)	
Supply voltage tolerance	%	AC: ±10	DC: ±10
Max. switching frequency	1/h	10 000	
Enclosure type acc. to EN 60529		IP 65	
Switching time at v=32 mm ² /s (156 SUS)	ON	AC: 45 ... 60**	DC: 55 ... 75**
	OFF	AC: 60 ... 90**	DC: 60 ... 90**
Weight	RNEXH1-102	7.3 (16.1)	
	RNEXH1-103	8.8 (19.4)	
	Data Sheet	Type	
General information	GI_0060	Products and operating conditions	
Mounting interface	SMT_0019	Size 10	
Spare parts	SP_8010		

*For higher system pressure use option „Z“
**The values indicated refer to a solenoid valve working with a pilot pressure of 100 bar (mineral oil, temperature = 50 °C, viscosity = 36 mm²/s, P - A and B - T connected).

Ordering Code

RNEXH [] - [] [] [] / [] [] [] / [] [] [] [] - []

Explosion proof 4/2 and 4/3 directional control valve, internally and externally pilot operated

Design series
standard 320 bar: 1
high pressure 420 bar (not available for C11 spools): 1H

Valve size
standard pattern: 10
ISO 4401-05-05-0-05: 10R

Number of valve positions
two positions: 2
three positions: 3

Spool symbols
see the table „Spool Symbols“

Control options
without additional features: No designation
main spool stroke limiter: C
main spool shifting speed control: D
shifting speed control, with orifice (0.8 mm) in port P of solenoid pilot valve: PF

Piloting
internal: No designation
internal with installed pressure reducing valve, fixed 30 bar setting: Z
external: E

Surface treatment
B: zinc-coated (ZnNi), ISO 9227 (520 h)

Seals
No designation: NBR

Manual override on pilot valve
No designation: standard
N7: detent assembly
N9: without manual override

Cable length
No designation (only for DC): without cable
3 (AC and DC version): 3000 mm
8 (AC and DC version for request): 8000 mm

Temperature class - solenoid nominal power
A4: class T4 - 10 W
A6: class T6 (T5) - 10 W

DC voltage connection box + cable gland
01200: 12 V DC / 0.75 A
02400: 24 V DC / 0.39 A
04800: 48 V DC / 0.19 A
11000: 110 V DC / 0.094 A

AC voltage 50/60 Hz fix installed cable
11050: 110 V AC / 0.112 A
23050: 230 V AC / 0.052 A

Drain
No designation: I
external
internal

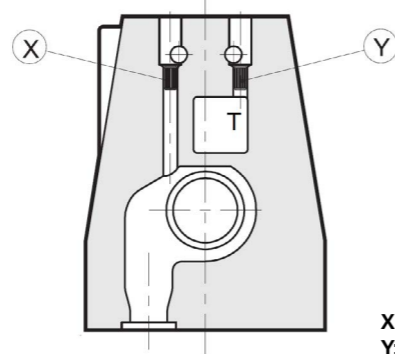
Installation Note:
-It is necessary to ensure minimum pilot pressure, therefore external piloting must be used for spools which have connection between P and T ports (H11, C11, R52, X52, J27).
- Attention: spools J17, J27 may assume an undefined position without energy supply.
- Other special versions are available. Consult our technical department.

Spool Symbols

Three positions with centering spring		Two positions with return spring	
Z11		R51	
H11		R52	
Y11		X51	
C11		X52	
P11		Two positions with mechanical detent on pilot valve	
		J17	
		J27	

Pilot and Drain

The RNEXH valves are available with pilot and drain, both internal and external.



X: plug M5x6 for external pilot
Y: plug M5x6 for external drain

Type of valve		Plug assembly	
		X	Y
RNEXH1-10**/*	internal pilot and external drain	NO	YES
RNEXH1-10**/*1	internal pilot and internal drain	NO	NO
RNEXH1-10**/*E	external pilot and external drain	YES	YES
RNEXH1-10**/*EI	external pilot and internal drain	YES	NO

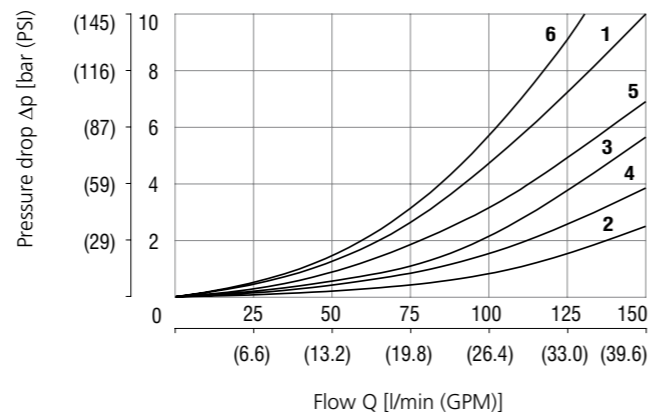
Characteristics measured at $v = 32 \text{ mm}^2/\text{s}$ (156 SUS)

Operating limits

Operating limits for maximum hydraulic power at rated temperature and supplied with voltage equal to 90 % of the nominal value

Maximum flow rates in l/min (GPM)	at pressure	
	210 bar (3050 PSI)	320 bar (4640 PSI)
Spool type C11	500 (133)	450 (119)
All other spools	600 (159)	500 (133)

Pressure drop related to flow rate



	Spool position	P-A	P-B	A-T	B-T	P-T		Spool position	P-A	P-B	A-T	B-T	P-T
Z11	Energized	1	1	2	3		J17, J27	Energized	1	1	4	3	
H11	De-energized					6*	R51, R52, X51, X52	De-energized	1			3	
	Energized	5	5	2	4			Energized		1	4		
Y11	De-energized			1**	1***		P11	De-energized					6***
	Energized	1	1	2	4			Energized	6	6	3	5	
C11	De-energized					6							
	Energized	6	6	3	5								

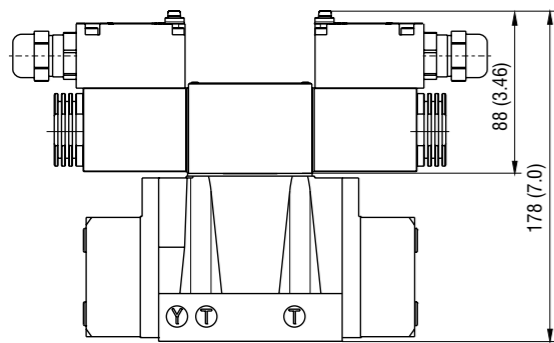
*A-B blocked **B blocked ***A blocked

For detail information on the pilot valve RPEX3-06 refer to data sheet No. 4054.

Actuation in millimeters (inches)

Solenoid control: RNEXH

The valve is supplied with an RPEX3-06 pilot solenoid valve.



The minimum piloting pressure can be as low as 5 bar at low flow rates, but with higher flow rates a pressure of 12 bar is needed.

If the valve operates with higher pressures it is necessary to use the version with external pilot and reduced pressure. Otherwise, the valve with internal pilot and a pressure reducing valve with a 30 bar fixed setting can be ordered.

Control Options - Special Features

Control of the main spool shifting speed: D

By placing a flow control valve between the pilot solenoid valve and the hydropiloted valve, the pilot flow rate can be controlled and therefore the shifting speed adjusted. Add the letter D to the identification code to request this device.

Pilot pressure reducing valve - 30 bar fixed setting: Z

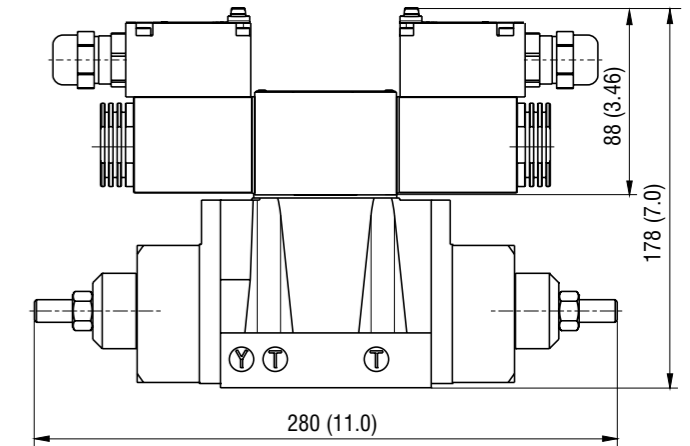
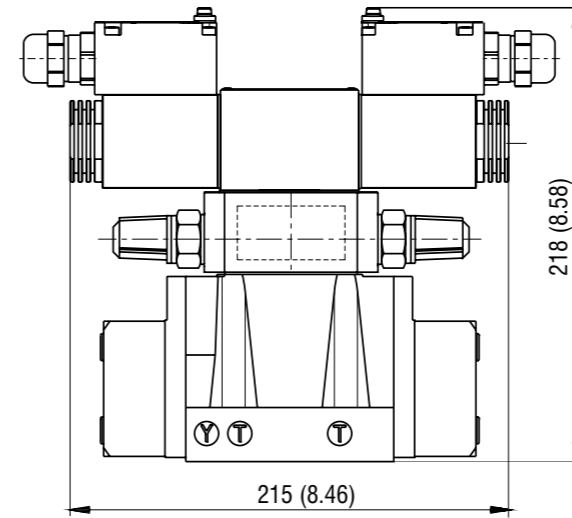
Internal piloting with mounted pressure reducing valve with 30 bar fixed setting. The option Z may be used together with option D.

Control of the main spool stroke: C

Using special side plugs, it is possible to introduce stroke control the piloted valve so as to vary the maximum spool opening clearance. This solution allows the control of the flow rate from the pump to the actuator and from the actuator to the outlet, resulting in double adjustable control of the actuator. Add the letter C to the identification code to request this device.

Shifting speed control: PF

with an orifice (0.8 mm) in port P of the solenoid pilot valve. Add PF to the identification code to request this device.

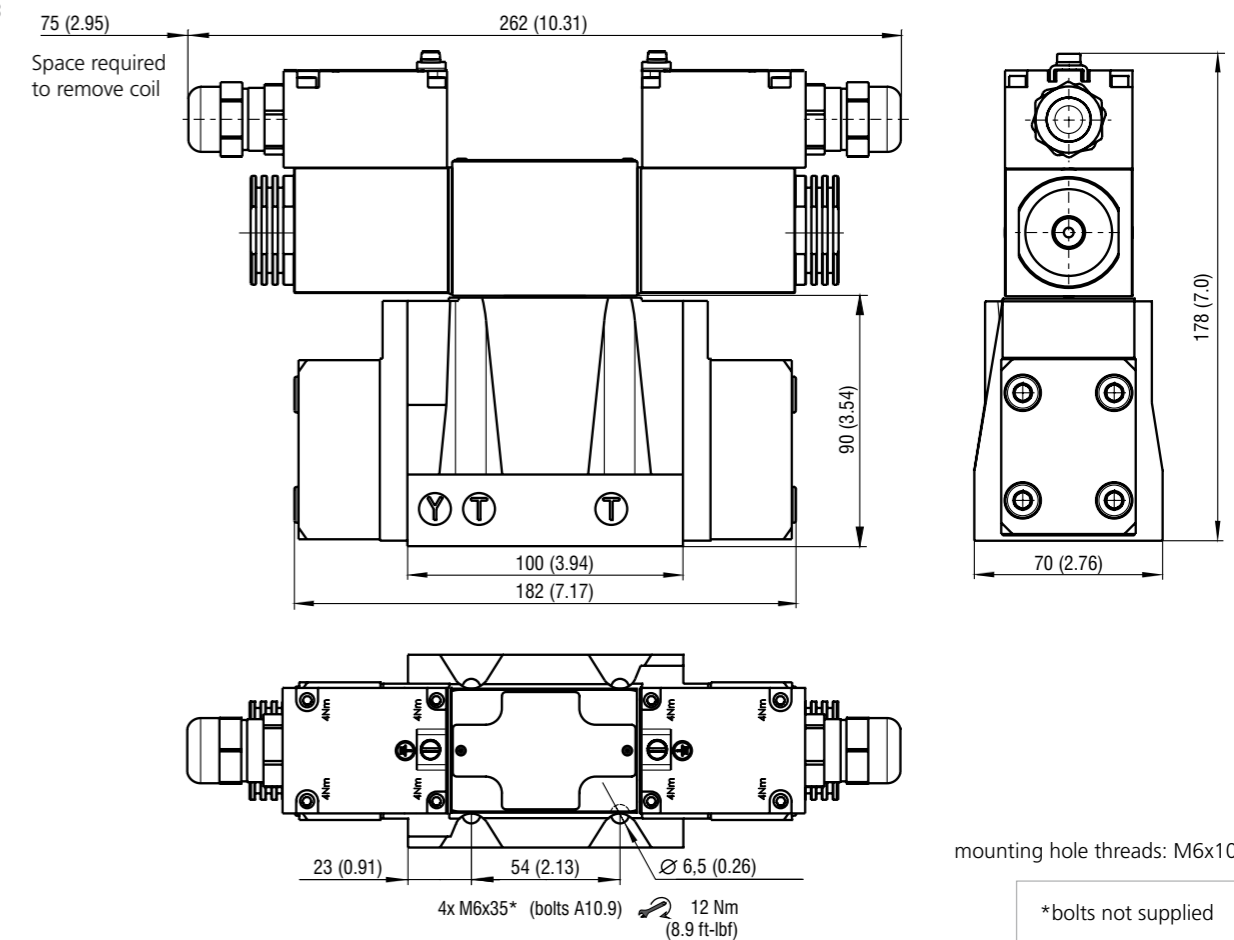


Solenoid operated distributor with pilot valve in the configuration 3H11

It is possible to deliver the solenoid operated distributor with the pilot valve in configuration 3H11 (all the ports at the outlet). This configuration is used with external piloting in order to allow the unloading of the piloting line when the solenoid operated valve is in the rest position. With this option, the piloting is necessarily external.

Dimensions in millimeters (inches)

RNEXH1-103



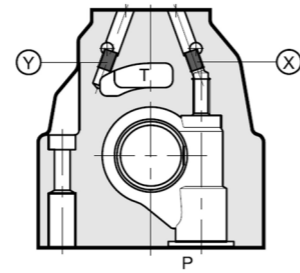
mounting hole threads: M6x10

*bolts not supplied

Pilot and Drain

The RNEXH valves are available with pilot and drain, both internal and external.

Type of valve		Plug assembly	
		X	Y
RNEXH5-16**/*	internal pilot and external drain	NO	YES
RNEXH5-16**/*I	internal pilot and internal drain	NO	NO
RNEXH5-16**/*E	external pilot and external drain	YES	YES
RNEXH5-16**/*EI	external pilot and internal drain	YES	NO

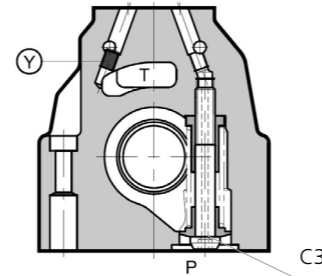
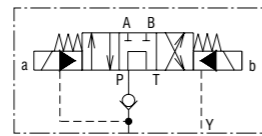


plug M6x8
X: for external pilot, Y: for external drain

Check Valve Incorporated in Line P

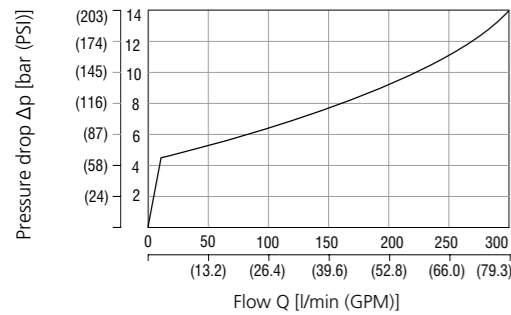
Check valve incorporated in line P: C3

Valves RNEXH are available with a back pressure valve incorporated on line P (Type „C3“). This is necessary to obtain the piloting pressure when the valve (in the rest position) has the line P connected to the port T (spools H11, C11, X21, R21, J19). The cracking pressure is 5 bar with a minimum flow rate of 15 l/min.



pilot always internal
Y: plug M6x8 for external drain

Back pressure valve incorporated on line P (type C3)



The curve refers to the pressure drop (body part only) with back pressure valve energized to which the pressure drop of the reference spool must be added.



In the C3 version the piloting is always internal. The back pressure valve can't be used as a check valve because it doesn't guarantee sealing.

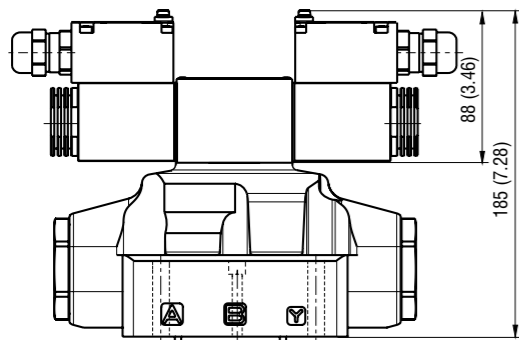
The back pressure valve can be also delivered separately and it can be easily mounted on line P of the main control valve. Specify the code to order the back pressure valve separately from the spare part data sheet No. 8010.

For detail information on the pilot valve RPEX3-06 refer to data sheet No. 4054.

Actuation in millimeters (inches)

Solenoid control: RNEXH

The valve is supplied with an RPEX3-06 pilot solenoid valve.



The minimum piloting pressure can be as low as 5 bar at low flow rates, but with higher flow rates a pressure of 12 bar is needed.

If the valve operates with higher pressures it is necessary to use the version with external pilot and reduced pressure. Otherwise, the valve with internal pilot and a pressure reducing valve with a 30 bar fixed setting can be ordered.

Control Options - Special Features

Control of the main spool shifting speed: D

By placing a flow control valve between the pilot solenoid valve and the hydropiloted valve, the pilot flow rate can be controlled and therefore the shifting speed adjusted. Add the letter D to the identification code to request this device.

Pilot pressure reducing valve - 30 bar fixed setting: Z

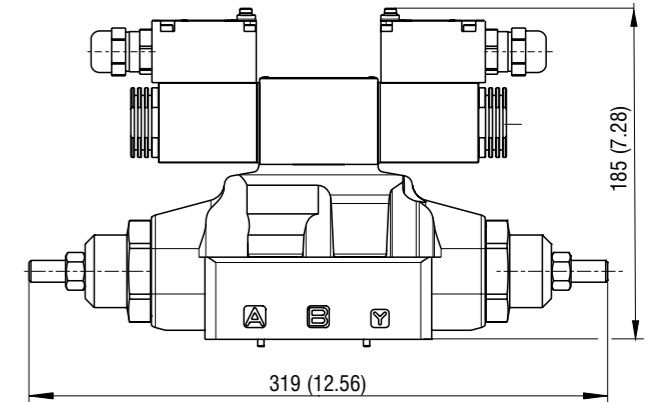
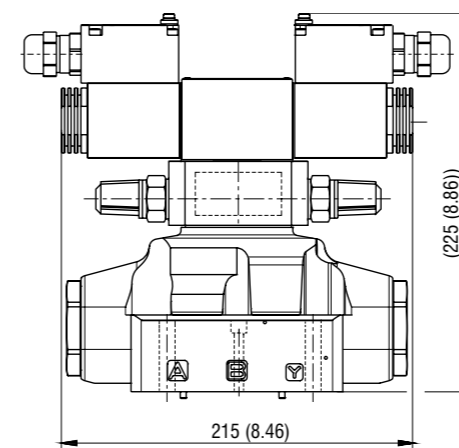
Internal piloting with mounted pressure reducing valve with 30 bar fixed setting. The option Z may be used together with option D.

Control of the main spool stroke: C

Using special side plugs, it is possible to introduce stroke control the piloted valve so as to vary the maximum spool opening clearance. This solution allows the control of the flow rate from the pump to the actuator and from the actuator to the outlet, resulting in double adjustable control of the actuator. Add the letter C to the identification code to request this device.

Shifting speed control: PF

with an orifice (0.8 mm) in port P of the solenoid pilot valve. Add PF to the identification code to request this device

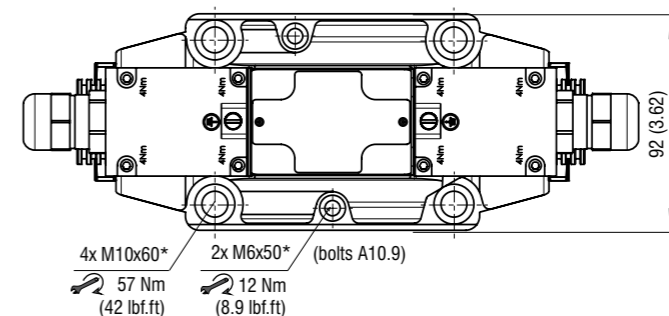
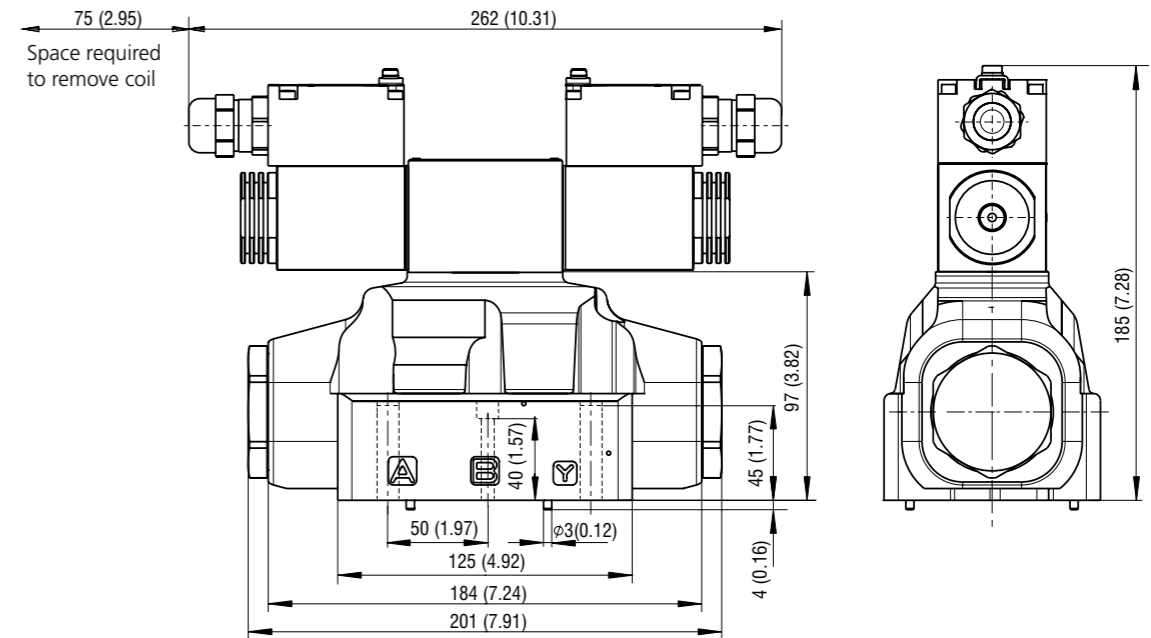


Solenoid operated distributor with pilot valve in the configuration 3H11

It is possible to deliver the solenoid operated distributor with the pilot valve in configuration 3H11 (all the ports at the outlet). This configuration is used with external piloting in order to allow the unloading of the piloting line when the solenoid operated valve is in the rest position. With this option, the piloting is necessarily external.

Dimensions in millimeters (inches)

RNEXH5-163



mounting hole threads: M6x12 (1/2-13 UNC)
M10x20 (1/2-13 UNC)

*bolts not supplied

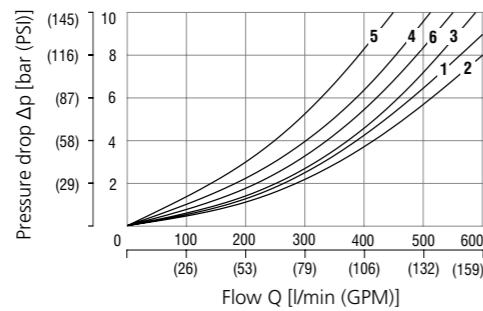
Characteristics measured at $v = 32 \text{ mm}^2/\text{s}$ (156 SUS)

Operating limits

Operating limits for maximum hydraulic power at rated temperature and supplied with voltage equal to 90 % of the nominal value

Maximum flow rates in l/min (GPM)	at pressure	
	210 bar (3050 PSI)	320 bar (4640 PSI)
Spool type C11	500 (133)	450 (119)
All other spools	600 (159)	500 (133)

Pressure drop related to flow rate



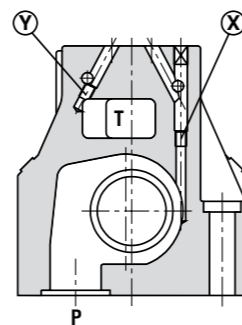
	Spool position	P-A	P-B	A-T	B-T	P-T
Z11, J17, J27	Energized	1	1	2	3	
H11	De-energized					6*
	Energized	5	5	1	2	
Y11	De-energized			4**	4***	
	Energized	1	1	1	2	
C11	De-energized					6
	Energized	6	6	3	4	
R51, R52, X51, X52	De-energized		1	2		
	Energized	1	1	2	3	
P11	De-energized	4**	4***			
	Energized	2	2	2	3	

* A-B blocked ** B blocked *** A blocked

Pilot and Drain

The RNEXH valves are available with pilot and drain, both internal and external.

X: plug M6x8 for external pilot
Y: plug M6x8 for external drain



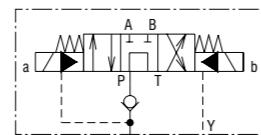
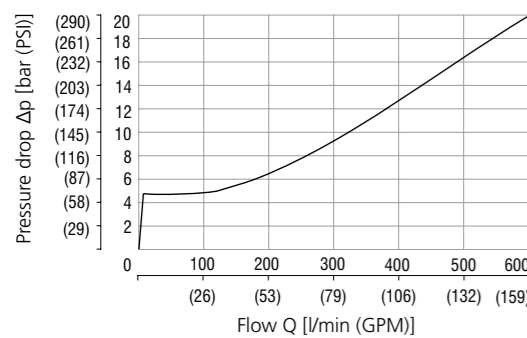
Type of valve	Plug assembly		
		X	Y
RNEXH4-25**/*	internal pilot and external drain	NO	YES
RNEXH4-25**/*I	internal pilot and internal drain	NO	NO
RNEXH4-25**/*E	external pilot and external drain	YES	YES
RNEXH4-25**/*EI	external pilot and internal drain	YES	NO

Check Valve Incorporated in Line P

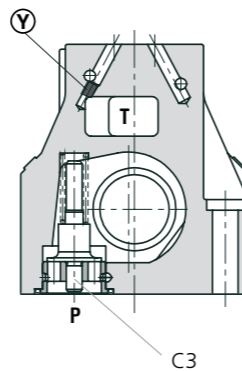
Check valve incorporated in line P: C3

Valves RNEXH are available with a back pressure valve incorporated in line P (Type „C3“). This is necessary to obtain the piloting pressure when the control valve (in the rest position) has the line P connected to the port T (spools H11, C11, R52, X52, J27). The cracking pressure is 5 bar with a minimum flow rate of 15 l/min.

Back pressure valve incorporated on line P (type C3)



pilot always internal
Y: plug M6x8 for external drain



The curve refers to the pressure drop (body part only) with back pressure valve energized to which the pressure drop of the reference spool must be added.

Warning: In the C3 version the piloting is always internal. The back pressure valve can't be used as a check valve because it doesn't guarantee sealing.

The back pressure valve can be also delivered separately and it can be easily mounted in line P of the main control valve. Specify the code to order the back pressure valve separately from the spare part data sheet No. 8010.

For detail information on the pilot valve RPEX3-06 refer to data sheet No. 4054.

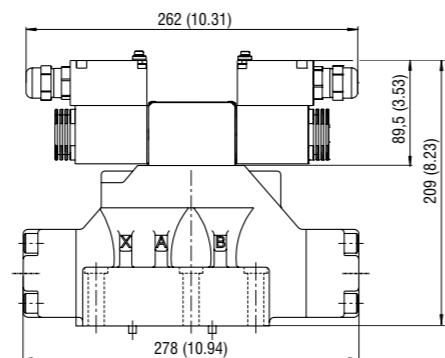
Actuation in millimeters (inches)

Solenoid control: RNEXH

The valve is supplied with an RPEX3-06 pilot solenoid valve.

The minimum piloting pressure can be as low as 5 bar at low flow rates, but with higher flow rates a pressure of 12 bar is needed.

If the valve operates with higher pressures it is necessary to use the version with external pilot and reduced pressure. Otherwise, the valve with internal pilot and a pressure reducing valve with a 30 bar fixed setting can be ordered.



Control Options - Special Features

Control of the main spool shifting speed: D

By placing a flow control valve between the pilot solenoid valve and the hydro-piloted valve, the pilot flow rate can be controlled and therefore the shifting speed adjusted. Add the letter D to the identification code to request this device.

Pilot pressure reducing valve - 30 bar fixed setting: Z

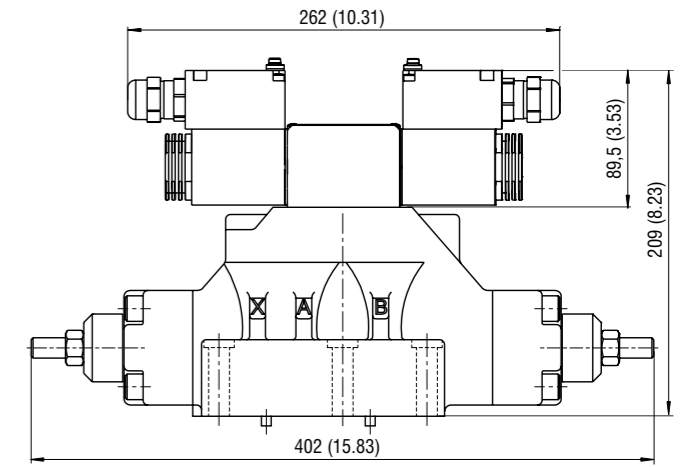
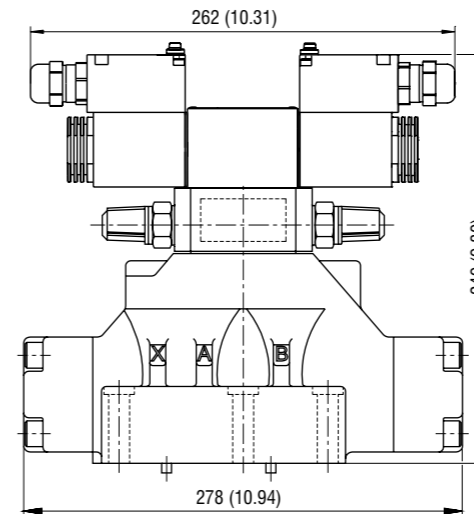
Internal piloting with mounted pressure reducing valve with 30 bar fixed setting. The option Z may be used together with option D.

Control of the main spool stroke: C

Using special side plugs, it is possible to introduce stroke control the piloted valve so as to vary the maximum spool opening clearance. This solution allows the control of the flow rate from the pump to the actuator and from the actuator to the outlet, resulting in double adjustable control of the actuator. Add the letter C to the identification code to request this device.

Shifting speed control: PF

with an orifice (0.8 mm) in port P of the solenoid pilot valve. Add PF to the identification code to request this device.

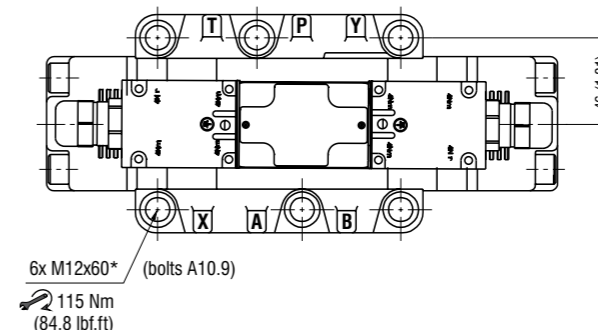
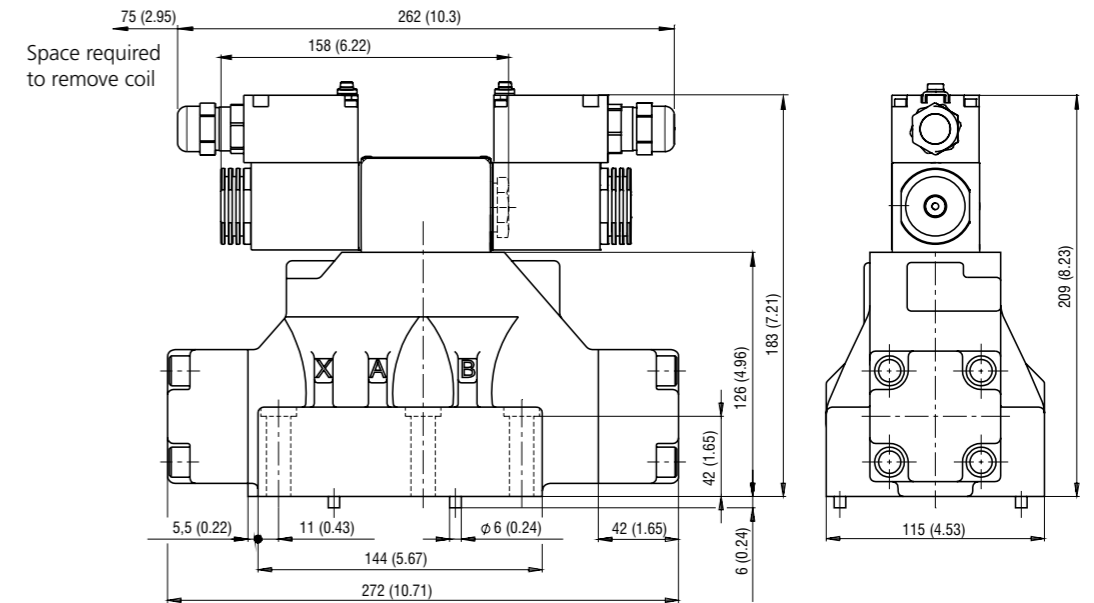


Solenoid operated distributor with pilot valve in the configuration 3H11

It is possible to deliver the solenoid operated distributor with the pilot valve in configuration 3H11 (all the ports at the outlet). This configuration is used with external piloting in order to allow the unloading of the piloting line when the solenoid operated valve is in the rest position. With this option, the piloting is necessarily external.

Dimensions in millimeters (inches)

RNEXH4-253



mounting hole threads: M12x20 (1/2-13 UNC)

*bolts not supplied

Explosion Proof 2/2 Directional Valve, Solenoid Operated, Spool Type, Direct Acting

SD2EX-B2

7/8-14 UNF • Q_{max} 45 l/min (12 GPM) • p_{max} 350 bar (5100 PSI)



Technical Features

- Valve and solenoid design prevents a surface temperature capable of igniting
- Solenoid coil in acc. with directive 94/9/EC (ATEX) for explosion-hazard zones
- Explosion protection for gas, dust, and mining; solutions for all zones
- Solenoid with encapsulated enclosure
- Hardened precision parts
- High flow capacity and high transmitted hydraulic power
- All ports may be fully pressurised
- Wide range of manual overrides available
- Coils interchangeable within Argo-Hytos ATEX/IECEx product line
- In the standard version, the valve is zinc-coated for 520 h protection acc. to ISO 9227

Technical Data

Valve size / Cartridge cavity		7/8-14 UNF-2A / B2	
Max. flow	l/min (GPM)	45 (11.9)	
Max. operating pressure	bar (PSI)	350 (5080)	
Fluid temperature range	°C (°F)	-30 ... +70 (-22 ... +158)	
Max. switching frequency	1/h	15 000	
Mass with coil	kg (lbs)	1.59 (3.51)	
Technica Data - Explosion-proof Solenoid			
Voltage type		AC 50 / 60 HZ	DC
Available voltages		V 110, 230	12, 24, 48, 110
Available nominal power		W 10	
Supply voltage tolerance		% AC, DC ± 10	
Duty cycle		S1 (100 % ED)	
Enclosure type acc. to EN 60529		IP 65	
Mass (solenoid only)		kg (lbs) 1.3 (2.87)	
Ambient temperature range			
Temperature class / Nominal power		T4 / 10 W	-30 ... +70 (-22 ... +158)
		T5 / 10 W	-30 ... +55 (-22 ... +131)
		T6 / 10 W	-30 ... +45 (-22 ... +113)

ATEX/IECEx Classification

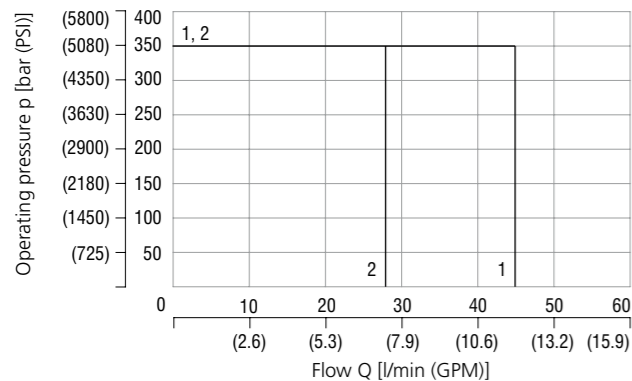
EPS14ATEX1744 X	
AC	Ex I M2 Ex mb I Mb
	Ex II 2G Ex mb IIB T4, T5, T6 Gb
	Ex II 2D Ex mb IIIC T135°C, T100°C, T85°C Db
DC	Ex I M2 Ex e mb I Mb
	Ex II 2G Ex e mb IIB T4, T5, T6 Gb
	Ex II 2D Ex tb IIIC T135°C, T100°C, T85°C Db
IECEx EPS14.0064 X	
AC	Ex mb I Mb
	Ex mb IIB T4, T5, T6 Gb
	Ex mb IIIC T135°C, T100°C, T85°C Db
DC	Ex e mb I Mb
	Ex e mb IIB T4, T5, T6 Gb
	Ex tb IIIC T135°C, T100°C, T85°C Db

	Datasheet	Type
General information	GI_0060	Products and operating conditions
Coil types	C_8007	74 EX 18
Valve bodies	In-line mounted	SB_0018 SB-B2*
	Sandwich mounted	SB-04(06)_0028 SB-*B2*
Cavity details / Form tools	SMT_0019	SMT-B2*
Spare parts	SP_8010	

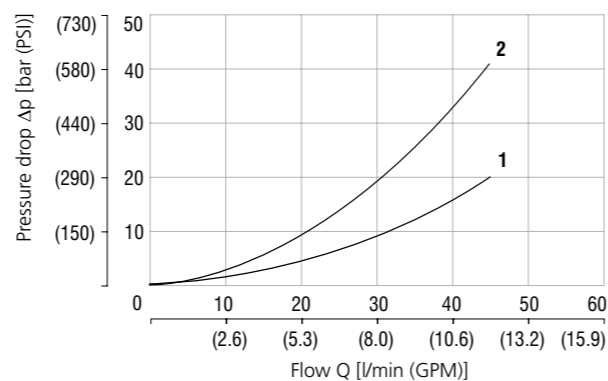
Characteristics measured at v = 32 mm²/s (156 SUS)

Operating limits

Ambient temperature 70 °C (158 °F), Voltage U_n -10% (24 VDC), Power P_n 10 W

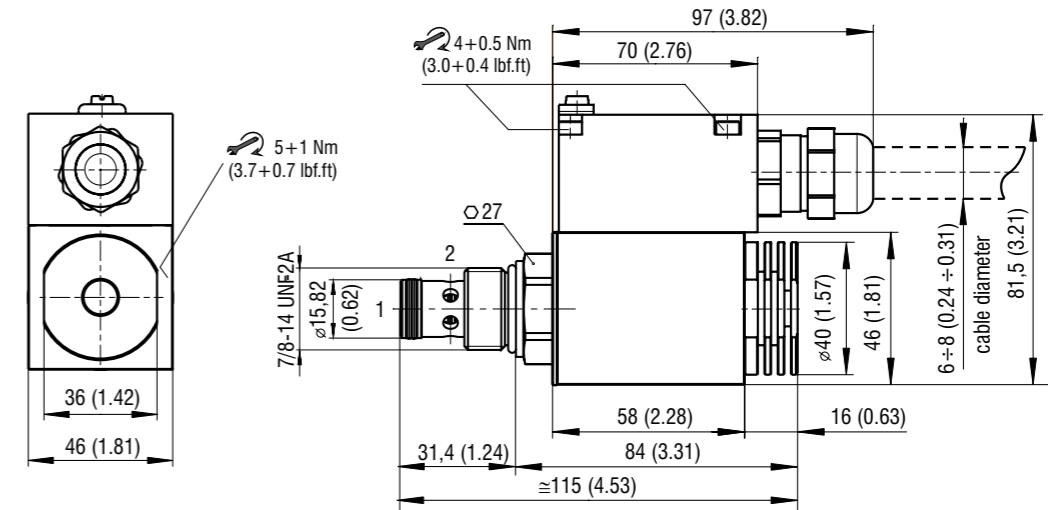


Pressure drop related to flow rate

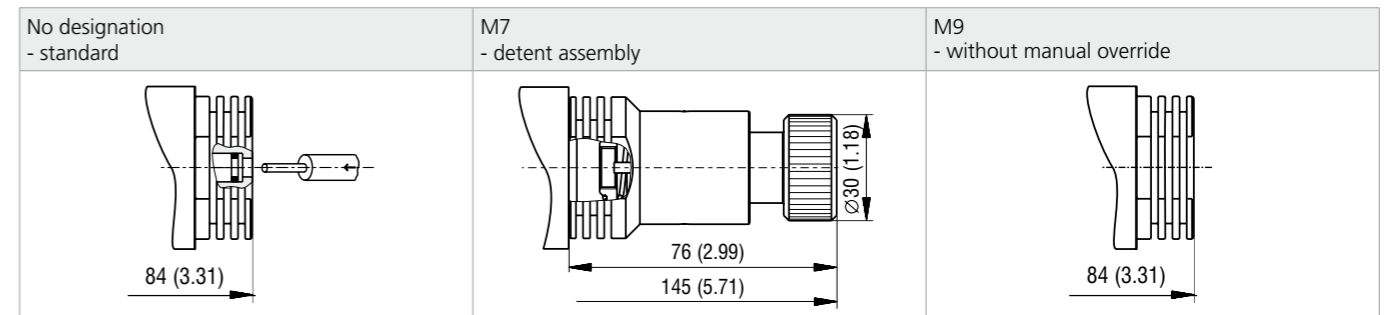


For operating limits under conditions other than shown contact the technical support.

Dimensions in millimeters (inches)



Manual Override in millimeters (inches)



In case of solenoid malfunction or power failure, the spool of the valve can be shifted by manual override. For alternative manual overrides contact our technical support.

Ordering Code

SD2EX-B2 / [] / [] / [] / [] / [] - []

Explosion proof 2/2 directional valve, solenoid operated, spool type, direct acting 7/8-14 UNF

High performance H

Model / Symbol

2111

2112

DC voltage connection box + cable gland

12 V DC / 0.75 A 01200

24 V DC / 0.39 A 02400

48 V DC / 0.19 A 04800

110 V DC / 0.094 A 11000

AC voltage 50/60 Hz, fix installed cable

110 V AC / 0.112 A 11050

230 V AC / 0.052 A 23050

Surface treatment

B zinc-coated (ZnNi), ISO 9227 (520 h)

Seals NBR

Manual override standard, detent assembly, without manual override

Cable length without cable: 3000 mm, 8000 mm

Temperature class - solenoid nominal power Class T4 - 10W, Class T6 (T5) - 10W

A4, A6

Besides the shown, commonly used valve versions other special models are available. Contact our technical support for their identification, feasibility and operating limits.

Marking Example

Solenoid Marking

74 EX18 046A A024
UN=24VDC Ig=0,34A R20=61,8Ω
IP65 CE 0408

EPS14ATEX1744 X
I M2 Ex e mb I Mb
II 2G Ex e mb IIB T4 Gb
II 2D Ex tb IIIC T135°C Db
IECEX EPS14.0064 X
Ex e mb I Mb
Ex e mb IIB T4 Gb
Ex tb IIIC T135°C Db

1234/01
02/14

-40 °C ≤ Tamb ≤ +70 °C

74 EX18 046A A024
UN=24VDC Ig=0,34A R20=61,8Ω
IP65 CE 0408

EPS14ATEX1744 X
I M2 Ex e mb I Mb
II 2G Ex e mb IIB T6 Gb
II 2D Ex tb IIIC T85°C Db
IECEX EPS14.0064 X
Ex e mb I Mb
Ex e mb IIB T6 Gb
Ex tb IIIC T85°C Db

1234/01
02/14

-40 °C ≤ Tamb ≤ +45 °C

Group I (Mining)

- ATEX mark of conformity to the 94/9CE directive and to the applicable technical norms
- I Group I for mines
- M2 High protection - equipment category
- Ex e mb Type of protection: e - increased safety, mb - encapsulated
- I Gas group (methane)
- Mb Equipment protection level - high level protection for explosive atmosphere

Group II

- ATEX mark of conformity to the 94/9CE directive and to the applicable technical norms
- II 2G Solenoid for surface plants with gas and vapors environment for zones 1 and 2
- II 2D Solenoid for surface plants with dust environment for zones 21 and 22
- Ex e mb Type of protection: e - increased safety, mb - encapsulated
- Ex tb Type of protection: tb - protection by enclosure
- IIB Equipment suitable for substances (gas) of group IIB
- IIIC Equipment suitable for conductive dust
- T6/T4 Temperature class (maximum solenoid surface temperature)
- T85/T135 Maximum solenoid surface temperature
- Gb Equipment protection level - high level protection for explosive gas atmosphere
- Db Equipment protection level - high level protection for explosive dust atmosphere

Customer Information

Initial installation

- › The ambient temperature range shall not exceed the temperatures given in chapter 2. The maximum temperature of the medium (generally hydraulic fluid) shall not exceed 70 °C (158 °F).
- › It is the user's duty to ensure free and unhindered heat emission during operation. This means that the solenoid shall neither be covered nor stored immediately adjacent to heat sources (e.g. fan heaters) during operation.
- › The solenoid shall not be subjected to direct sunlight during operation.

Installation notice - installation, mounting, demounting

- › Using the V DC type for temperature class T4 requires a cable with an operating temperature limit of at least +105 °C (221 °F), e.g. LAPP FD Robust. T5 and T6 require a cable with an operating temperature limit of at least +90 °C (194 °F). The fastening torque on the cable gland depends of the used cable and is to be determined by the installing user.
- › When installing the V DC solenoid, the fastening torque of the screws shall be [4Nm (2.95 lbf.ft)] and for the BARTEC connection box [0.4Nm (0.30 lbf.ft)].
- › When installing the V DC solenoid, an appropriate cable shoe of size M3 with a crosssectional area of 0.75 mm² with an operating temperature limit of at least +105 °C (221 °F) is to be used.
- › The user has to safeguard each solenoid with a fuse: $I_n \leq 3I_{gr}$, with trigger characteristic "slow blow". (I_{gr} values see Operating Instructions HA 4090 - Table 2). The breaking capacity of the fuse link has to be stronger than the maximum short circuit current at the user's operating area.
- › EX-secured components must be used during mounting in case the fuse and/or the interface are within the EX-range.

Safety notice - Please read carefully

- › In case the solenoid shows any signs of a defect, malfunctioning or external damage (including corrosion), the device must immediately be taken out of operation.
- › Any deposits on the surface of the device shall not obstruct heat emission.
- › To maintain legibility of the data plate, the solenoid must not be coated.

Caution

- › Always disconnect the solenoid from the power supply before any maintenance or other work on it.
- › Always exchange the complete solenoid. Do not try to repair the solenoid.
- › Under no circumstances shall any changes be made to the solenoid or the connecting cable.
- › Never operate the solenoid when disconnected from the valve body.
- › Demount the solenoid only in secure areas (not in EX-areas). If this is not possible, the solenoid must cool off for at least 10 minutes.



Explosion Proof 3/2 Directional Valve, Solenoid Operated, Spool Type, Direct Acting

SD2EX-B3

7/8-14 UNF • Q_{max} 60 l/min (16 GPM) • p_{max} 350 bar (5100 PSI)



Technical Features

- › Valve and solenoid design prevents a surface temperature capable of igniting
- › Solenoid coil in acc. with directive 94/9/EC (ATEX) for explosion-hazard zones
- › Explosion protection for gas, dust, and mining; solutions for all zones
- › Solenoid with encapsulated enclosure
- › Hardened precision parts
- › High flow capacity and high transmitted hydraulic power
- › All ports may be fully pressurised
- › Wide range of manual overrides available
- › Coils interchangeable within Argo-Hytos ATEX/IECEx product line
- › In the standard version, the valve is zinc-coated for 520 h protection acc. to ISO 9227

Technical Data

Valve size / Cartridge cavity		7/8-14 UNF-2A / B3	
Max. flow	l/min (GPM)	60 (15.9)	
Max. operating pressure	bar (PSI)	350 (5080)	
Fluid temperature range	°C (°F)	-30 ... +70 (-22 ... +158)	
Max. switching frequency	1/h	15 000	
Mass with coil	kg (lbs)	1.61 (3.55)	
Technica Data - Explosion-proof Solenoid			
Voltage type		AC 50 / 60 HZ	DC
Available voltages		V	110, 230, 12, 24, 48, 110
Available nominal power		W	10
Supply voltage tolerance		%	AC, DC ± 10
Duty cycle		S1 (100 % ED)	
Enclosure type acc. to EN 60529		IP 65	
Mass (solenoid only)		kg (lbs)	1.3 (2.87)
Ambient temperature range			
T4 / 10 W		-30 ... +70 (-22 ... +158)	
T5 / 10 W		-30 ... +55 (-22 ... +131)	
T6 / 10 W		-30 ... +45 (-22 ... +113)	

ATEX/IECEx Classification

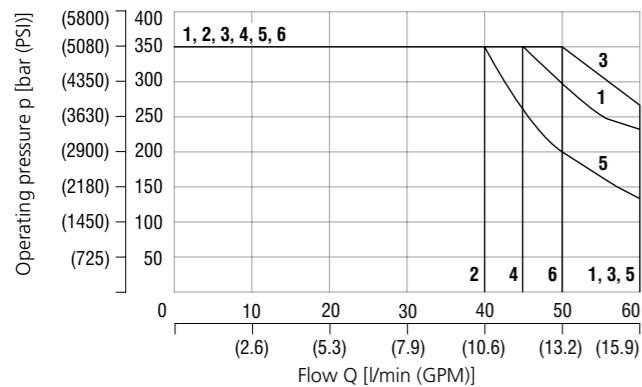
AC	EPS14ATEX1744 X
	Ex I M2 Ex mb I Mb
	Ex II 2G Ex mb IIB T4, T5, T6 Gb
	Ex II 2D Ex mb IIIC T135°C, T100°C, T85°C Db
DC	Ex I M2 Ex e mb I Mb
	Ex II 2G Ex e mb IIB T4, T5, T6 Gb
	Ex II 2D Ex tb IIIC T135°C, T100°C, T85°C Db
AC	IECEx EPS14.0064 X
	Ex mb I Mb
	Ex mb IIB T4, T5, T6 Gb
	Ex mb IIIC T135°C, T100°C, T85°C Db
DC	Ex e mb I Mb
	Ex e mb IIB T4, T5, T6 Gb
	Ex tb IIIC T135°C, T100°C, T85°C Db

General information		Datasheet	Type
		GI_0060	Products and operating conditions
Coil types		C_8007	74 EX 18
Valve bodies		In-line mounted SB_0018	SB-B3*
		Sandwich mounted SB-04(06)_0028	SB-*B3*
Cavity details / Form tools		SMT_0019	SMT-B3*
Spare parts		SP_8010	

Characteristics measured at v = 32 mm²/s (156 SUS)

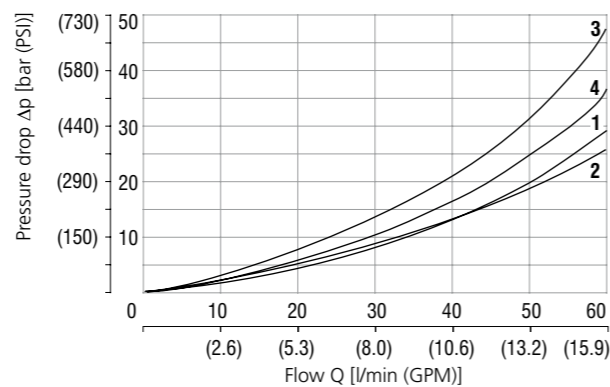
Operating limits

Ambient temperature 70 °C (158 °F), Voltage U_n -10 % (24 VDC), Power P_n 10 W



Model	Direction	Model	Direction
1	2D21 3→2	4	2D25 2→1
2	2D21 2→1	5	2D26 3→2
3	2D25 3→2	6	2D26 2→1

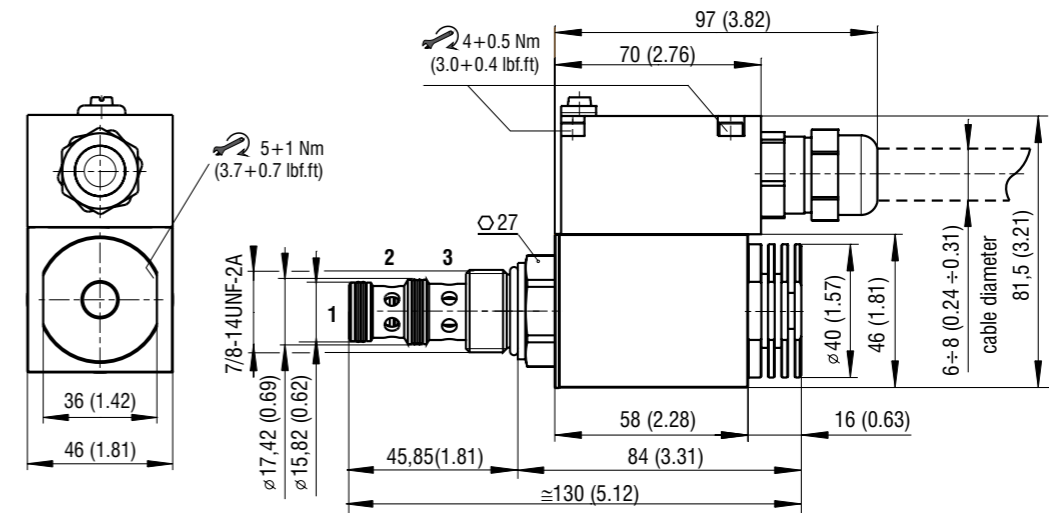
Pressure drop related to flow rate



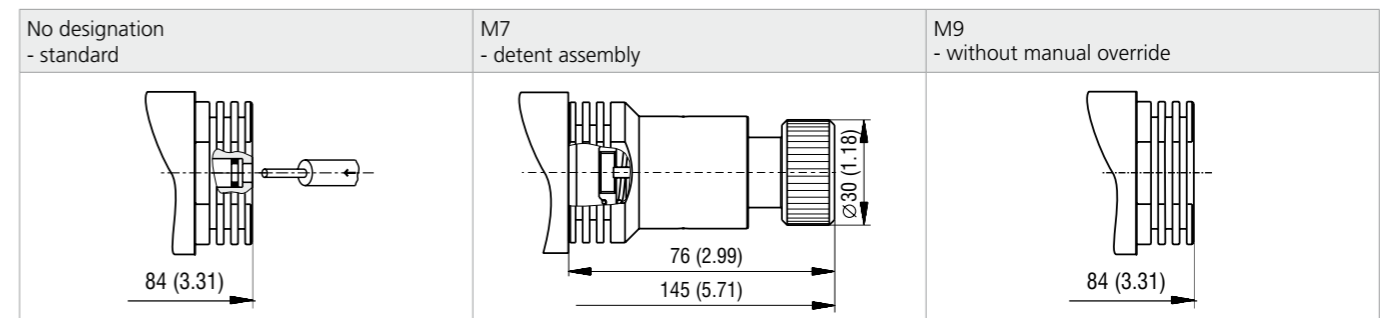
Model	Direction	Model	Direction
1	2D21 2→1	1	2D26 3→2
2	2D21 3→2	1	2D26 2→1
3	2D25 3→2	4	2D25 2→1

For operating limits under conditions other than shown contact the technical support.

Dimensions in millimeters (inches)



Manual Override in millimeters (inches)



In case of solenoid malfunction or power failure, the spool of the valve can be shifted by manual override. For alternative manual overrides contact our technical support.

Ordering Code

SD2EX-B3 / [] / [] / [] / [] / [] / [] - []

Explosion proof 3/2 directional valve, solenoid operated, spool type direct acting 7/8-14 UNF

High performance **H**

Model / Symbol

2D21, 2D25, 2D26

DC voltage connection box + cable gland

12 V DC / 0.75 A: 01200
 24 V DC / 0.39 A: 02400
 48 V DC / 0.19 A: 04800
 110 V DC / 0.094 A: 11000

AC voltage 50/60 Hz, fix installed cable

110 V AC / 0.112 A: 11050
 230 V AC / 0.052 A: 23050

Surface treatment

B zinc-coated (ZnNi), ISO 9227 (520 h)

Seals

No designation: NBR

Manual override

No designation: standard
 M7: detent assembly
 M9: without manual override

Cable length

No designation (only for DC): without cable
 3 (AC and DC version): 3000 mm
 8 (AC and DC version): 8000 mm

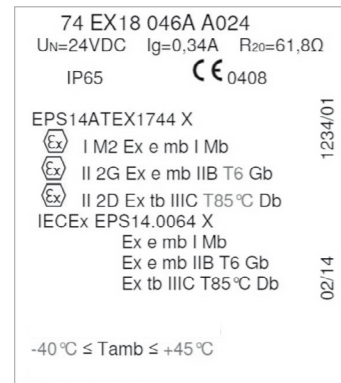
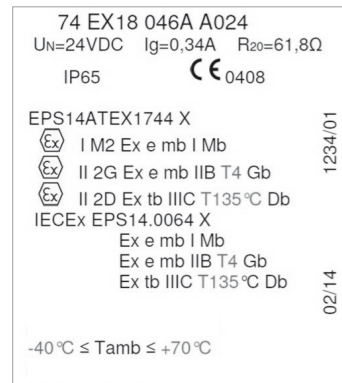
Temperature class - solenoid nominal power

A4: class T4 - 10W
 A6: class T6 (T5) - 10W

Besides the shown, commonly used valve versions other special models are available. Contact our technical support for their identification, feasibility and operating limits.

Marking Example

Solenoid Marking



Group I (Mining)

- ATEX mark of conformity to the 94/9CE directive and to the applicable technical norms
- I Group I for mines
- M2 High protection - equipment category
- Ex e mb Type of protection: e - increased safety, mb - encapsulated
- I Gas group (methane)
- Mb Equipment protection level - high level protection for explosive atmosphere

Group II

- ATEX mark of conformity to the 94/9CE directive and to the applicable technical norms
- II 2G Solenoid for surface plants with gas and vapors environment for zones 1 and 2
- II 2D Solenoid for surface plants with dust environment for zones 21 and 22
- Ex e mb Type of protection: e - increased safety, mb - encapsulated
- Ex tb Type of protection: tb - protection by enclosure
- IIB Equipment suitable for substances (gas) of group IIB
- IIIC Equipment suitable for conductive dust
- T6/T4 Temperature class (maximum solenoid surface temperature)
- T85/T135 Maximum solenoid surface temperature
- Gb Equipment protection level - high level protection for explosive gas atmosphere
- Db Equipment protection level - high level protection for explosive dust atmosphere

Customer Information

Initial installation

- › The ambient temperature range shall not exceed the temperatures given in chapter 2. The maximum temperature of the medium (generally hydraulic fluid) shall not exceed 70 °C (158 °F).
- › It is the user's duty to ensure free and unhindered heat emission during operation. This means that the solenoid shall neither be covered nor stored immediately adjacent to heat sources (e.g. fan heaters) during operation.
- › The solenoid shall not be subjected to direct sunlight during operation.

Installation notice - installation, mounting, demounting

- › Using the V DC type for temperature class T4 requires a cable with an operating temperature limit of at least +105 °C (221 °F), e.g. LAPP FD Robust. T5 and T6 require a cable with an operating temperature limit of at least +90 °C (194 °F). The fastening torque on the cable gland depends of the used cable and is to be determined by the installing user.
- › When installing the V DC solenoid, the fastening torque of the screws shall be [4 Nm (2.95 lbf.ft)] and for the BARTEC connection box [0.4 Nm (0.30 lbf.ft)].
- › When installing the V DC solenoid, an appropriate cable shoe of size M3 with a crosssectional area of 0.75 mm² with an operating temperature limit of at least +105 °C (221 °F) is to be used.
- › The user has to safeguard each solenoid with a fuse: $I_n \leq 3I_{c,r}$, with trigger characteristic "slow blow". (I_c values see Operating Instructions - Table 2). The breaking capacity of the fuse link has to be stronger than the maximum short circuit current at the user's operating area.
- › EX-secured components must be used during mounting in case the fuse and/or the interface are within the EX-range.

Safety notice - Please read carefully

- › In case the solenoid shows any signs of a defect, malfunctioning or external damage (including corrosion), the device must immediately be taken out of operation.
- › Any deposits on the surface of the device shall not obstruct heat emission.
- › To maintain legibility of the data plate, the solenoid must not be coated.

Caution

- › Always disconnect the solenoid from the power supply before any maintenance or other work on it.
- › Always exchange the complete solenoid. Do not try to repair the solenoid.
- › Under no circumstances shall any changes be made to the solenoid or the connecting cable.
- › Never operate the solenoid when disconnected from the valve body.
- › Demount the solenoid only in secure areas (not in EX-areas). If this is not possible, the solenoid must cool off for at least 10 minutes.



Explosion Proof 4/2 Directional Valve, Solenoid Operated, Spool Type, Direct Acting

SD2EX-B4

7/8-14 UNF • Q_{max} 50 l/min (13 GPM) • p_{max} 350 bar (5100 PSI)



Technical Features

- › Valve and solenoid design prevents a surface temperature capable of igniting
- › Solenoid coil in acc. with directive 94/9/EC (ATEX) for explosion-hazard zones
- › Explosion protection for gas, dust, and mining; solutions for all zones
- › Solenoid with encapsulated enclosure
- › Hardened precision parts
- › High flow capacity and high transmitted hydraulic power
- › All ports may be fully pressurised
- › Wide range of manual overrides available
- › Coils interchangeable within Argo-Hytos ATEX/IECEx product line
- › In the standard version, the valve is zinc-coated for 520 h protection acc. to ISO 9227

Technical Data

Valve size / Cartridge cavity		7/8-14 UNF-2A / B4	
Max. flow	l/min (GPM)	50 (13.2)	
Max. operating pressure	bar (PSI)	350 (5080)	
Fluid temperature range	°C (°F)	-30 ... +70 (-22 ... +158)	
Max. switching frequency	1/h	15 000	
Mass with coil	kg (lbs)	1.62 (3.57)	
Technica Data - Explosion-proof Solenoid			
Voltage type		AC 50 / 60 HZ	DC
Available voltages	V	110, 230	12, 24, 48, 110
Available nominal power	W	10	
Supply voltage tolerance	%	AC, DC ± 10	
Duty cycle		S1 (100 % ED)	
Enclosure type acc. to EN 60529		IP 65	
Mass (solenoid only)	kg (lbs)	1.3 (2.87)	
Ambient temperature range			
Temperature class / Nominal power	T4 / 10 W	-30 ... +70 (-22 ... +158)	
	T5 / 10 W	-30 ... +55 (-22 ... +131)	
	T6 / 10 W	-30 ... +45 (-22 ... +113)	

ATEX/IECEx Classification

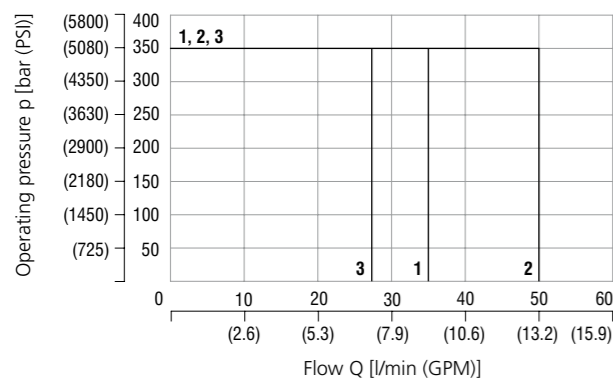
	EPS14ATEX1744 X
AC	Ex I M2 Ex mb I Mb
	Ex II 2G Ex mb IIB T4, T5, T6 Gb
	Ex II 2D Ex mb IIIC T135°C, T100°C, T85°C Db
DC	Ex I M2 Ex e mb I Mb
	Ex II 2G Ex e mb IIB T4, T5, T6 Gb
	Ex II 2D Ex tb IIIC T135°C, T100°C, T85°C Db
	IECEx EPS14.0064 X
AC	Ex mb I Mb
	Ex mb IIB T4, T5, T6 Gb
DC	Ex e mb I Mb
	Ex mb IIB T4, T5, T6 Gb
	Ex tb IIIC T135°C, T100°C, T85°C Db

	Datasheet	Type
General information	GI_0060	Products and operating conditions
Coil types	C_8007	74 EX 18
Valve bodies	In-line mounted	SB_0018
	Sandwich mounted	SB-04(06)_0028
Cavity details / Form tools	SMT_0019	SMT-B4*
Spare parts	SP_8010	

Characteristics measured at v = 32 mm²/s (156 SUS)

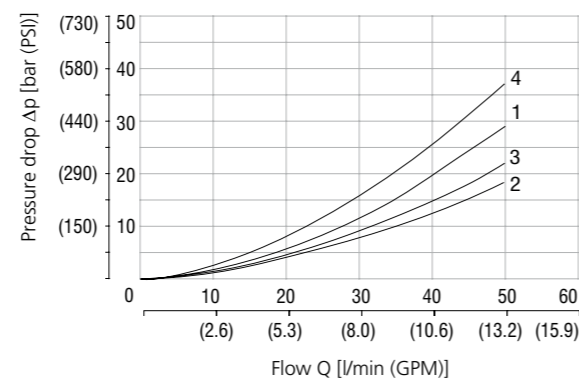
Operating limits (p-Q)

Ambient temperature 70 °C (158 °F), Voltage U_n -10 % (24 V DC), Power P_n 10 W



Model	Direction	Model	Direction		
1	2Z11	3→2, 4→1	2	2X21	3→4, 2→1
1	2Z51	3→4, 2→1	3	2X21	3→2, 4→1

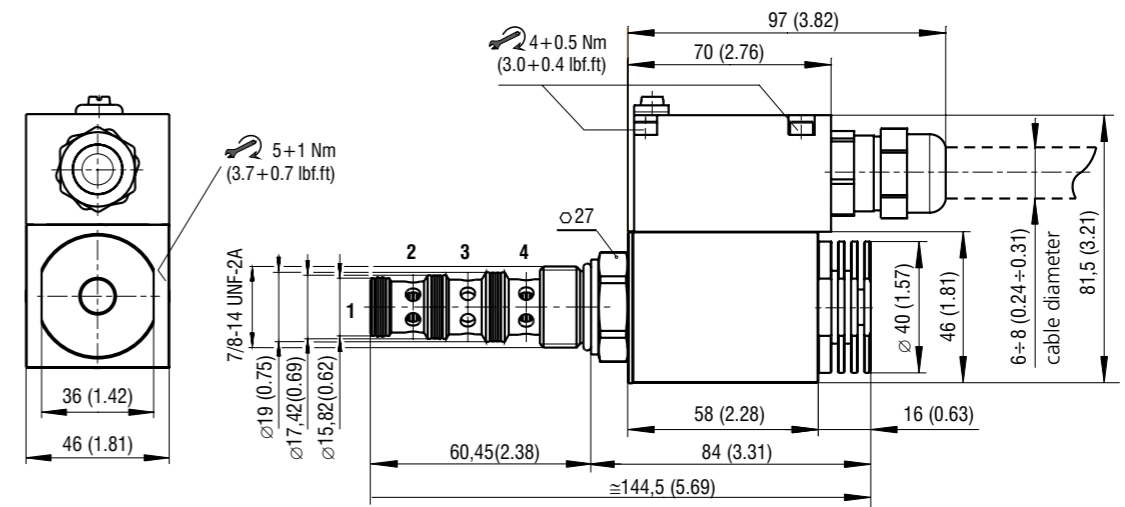
Pressure drop related to flow rate (Δp-Q)



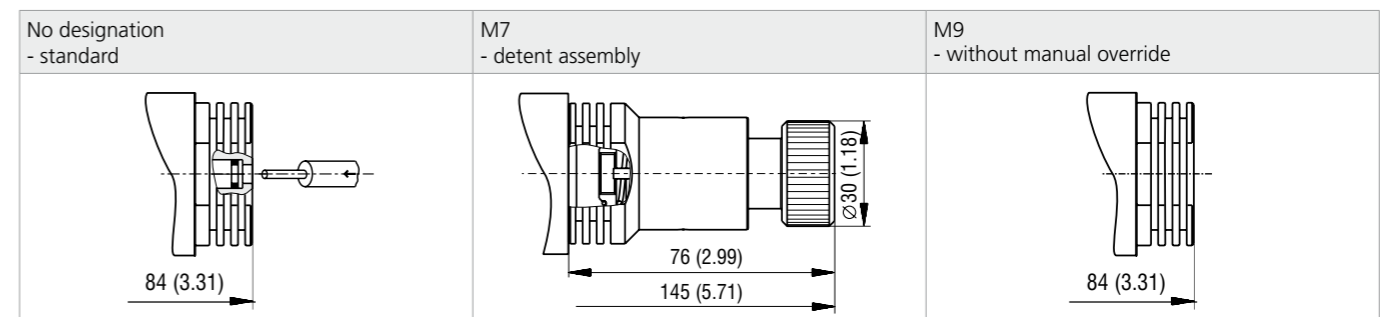
Model	Direction	Model	Direction		
1	2Z11	3→2	3	2X21	3→2
1	2Z11	4→1	4	2X21	4→1
2	2Z51	3→4	3	2X21	3→4
3	2Z51	2→1	2	2X21	2→1

For operating limits under conditions other than shown contact the technical support.

Dimensions in millimeters (inches)



Manual Override in millimeters (inches)



In case of solenoid malfunction or power failure, the spool of the valve can be shifted by manual override. For alternative manual overrides contact our technical support.

Ordering Code

SD2EX-B4 / [] / [] / [] / [] / [] / [] - []

Explosion proof 4/2 directional valve, solenoid operated, spool type, direct acting 7/8-14 UNF

High performance **H**

Model / Symbol

		2Z11
		2Z51
		2X21

DC voltage connection box + cable gland

12 V DC / 0.75 A	01200
24 V DC / 0.39 A	02400
48 V DC / 0.19 A	04800
110 V DC / 0.094 A	11000

AC voltage 50/60 Hz, fix installed cable

110 V AC / 0.112 A	11050
230 V AC / 0.052 A	23050

Surface treatment
B zinc-coated (ZnNi), ISO 9227 (520 h)

Seals
No designation NBR

Manual override
No designation standard
M7 detent assembly
M9 without manual override

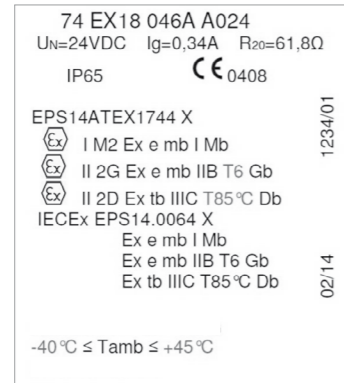
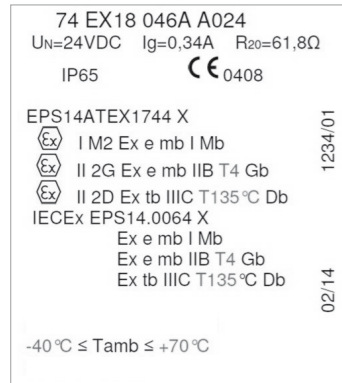
Cable length
No designation (only for DC) without cable
3 (AC and DC version) 3000 mm
8 (AC and DC version) 8000 mm

Temperature class - solenoid nominal power
A4 class T4 - 10 W
A6 class T6 (T5) - 10 W

Besides the shown, commonly used valve versions other special models are available. Contact our technical support for their identification, feasibility and operating limits.

Marking Example

Solenoid Marking



Group I (Mining)

- ATEX mark of conformity to the 94/9CE directive and to the applicable technical norms
- I Group I for mines
- M2 High protection - equipment category
- Ex e mb Type of protection: e - increased safety, mb - encapsulated
- I Gas group (methane)
- Mb Equipment protection level - high level protection for explosive atmosphere

Group II

- ATEX mark of conformity to the 94/9CE directive and to the applicable technical norms
- II 2G Solenoid for surface plants with gas and vapors environment for zones 1 and 2
- II 2D Solenoid for surface plants with dust environment for zones 21 and 22
- Ex e mb Type of protection: e - increased safety, mb - encapsulated
- Ex tb Type of protection: tb - protection by enclosure
- IIB Equipment suitable for substances (gas) of group IIB
- IIIC Equipment suitable for conductive dust
- T6/T4 Temperature class (maximum solenoid surface temperature)
- T85/T135 Maximum solenoid surface temperature
- Gb Equipment protection level - high level protection for explosive gas atmosphere
- Db Equipment protection level - high level protection for explosive dust atmosphere

Customer Information

Initial installation

- › The ambient temperature range shall not exceed the temperatures given in chapter 2. The maximum temperature of the medium (generally hydraulic fluid) shall not exceed 70 °C (158 °F).
- › It is the user's duty to ensure free and unhindered heat emission during operation. This means that the solenoid shall neither be covered nor stored immediately adjacent to heat sources (e.g. fan heaters) during operation.
- › The solenoid shall not be subjected to direct sunlight during operation.

Installation notice - installation, mounting, demounting

- › Using the V DC type for temperature class T4 requires a cable with an operating temperature limit of at least +105 °C (221 °F), e.g. LAPP FD Robust. T5 and T6 require a cable with an operating temperature limit of at least +90 °C (194 °F). The fastening torque on the cable gland depends of the used cable and is to be determined by the installing user.
- › When installing the V DC solenoid, the fastening torque of the screws shall be [4 Nm (2.95 lbf.ft)] and for the BARTEC connection box [0.4 Nm (0.30 lbf.ft)].
- › When installing the V DC solenoid, an appropriate cable shoe of size M3 with a crosssectional area of 0.75 mm² with an operating temperature limit of at least +105 °C (221 °F) is to be used.
- › The user has to safeguard each solenoid with a fuse: $I_n \leq 3 \times I_{nG}$, with trigger characteristic "slow blow". (I_{nG} values see Operating Instructions HA 4090 - Table 2). The breaking capacity of the fuse link has to be stronger than the maximum short circuit current at the user's operating area.
- › EX-secured components must be used during mounting in case the fuse and/or the interface are within the EX-range.

Safety notice - Please read carefully

- › In case the solenoid shows any signs of a defect, malfunctioning or external damage (including corrosion), the device must immediately be taken out of operation.
- › Any deposits on the surface of the device shall not obstruct heat emission.
- › To maintain legibility of the data plate, the solenoid must not be coated.

Caution

- › Always disconnect the solenoid from the power supply before any maintenance or other work on it.
- › Always exchange the complete solenoid. Do not try to repair the solenoid.
- › Under no circumstances shall any changes be made to the solenoid or the connecting cable.
- › Never operate the solenoid when disconnected from the valve body.
- › Demount the solenoid only in secure areas (not in EX-areas). If this is not possible, the solenoid must cool off for at least 10 minutes.



Explosion Proof 2/2 Directional Valve, Solenoid Operated, Poppet Type, Piloted

SD3EX-B2

7/8-14 UNF • Q_{max} 75 l/min (20 GPM) • p_{max} 420 bar (6100 PSI)



Technical Features

- › Valve and solenoid design prevents a surface temperature capable of igniting
- › Solenoid coil in acc. with directive 94/9/EC (ATEX) for explosion-hazard zones
- › Explosion protection for gas, dust, and mining; solutions for all zones
- › Solenoid with encapsulated enclosure
- › Hardened precision parts
- › High flow capacity, transmitted hydraulic power and leak-free closing up to 3 drops/min
- › All ports may be fully pressurised
- › Wide range of manual overrides available
- › Coils interchangeable within Argo-Hytos ATEX/IECEx product line
- › In the standard version, the valve is zinc-coated for 520 h protection acc. to ISO 9227

Technical Data

Valve size / Cartridge cavity		7/8-14 UNF-2A / B2	
Max. flow	l/min (GPM)	75 (19.8)	
Max. operating pressure	bar (PSI)	420 (6090)	
Fluid temperature range	°C (°F)	-30 ... +70 (-22 ... +158)	
Max. switching frequency	1/h	15 000	
Mass with coil	kg (lbs)	1.60 (3.53)	
Technica Data - Explosion proof solenoid			
Voltage type		AC 50 / 60 HZ	DC
Available voltages	V	110, 230 12, 24, 48, 110	
Available nominal power	W	10	
Supply voltage tolerance	%	AC, DC ± 10	
Duty cycle		S1 (100 % ED)	
Enclosure type acc. to EN 60529		IP 65	
Mass (solenoid only)	kg (lbs)	1.3 (2.87)	
Ambient temperature range			
Temperature class / Nominal power		T4 / 10 W	-30 ... +70 (-22 ... +158)
		T5 / 10 W	-30 ... +55 (-22 ... +131)
		T6 / 10 W	-30 ... +45 (-22 ... +113)

ATEX/IECEx Classification

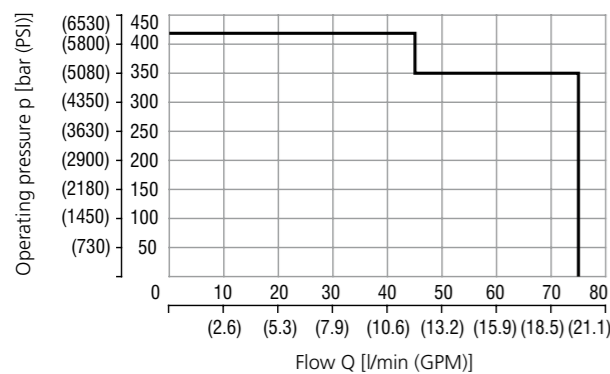
	EPS14ATEX1744 X
AC	Ex I M2 Ex mb I Mb
	Ex II 2G Ex mb IIB T4, T5, T6 Gb
	Ex II 2D Ex mb IIIC T135°C, T100°C, T85°C Db
DC	Ex I M2 Ex e mb I Mb
	Ex II 2G Ex e mb IIB T4, T5, T6 Gb
	Ex II 2D Ex tb IIIC T135°C, T100°C, T85°C Db
	IECEx EPS14.0064 X
AC	Ex mb I Mb
	Ex mb IIB T4, T5, T6 Gb
	Ex mb IIIC T135°C, T100°C, T85°C Db
DC	Ex e mb I Mb
	Ex e mb IIB T4, T5, T6 Gb
	Ex tb IIIC T135°C, T100°C, T85°C Db

	Datasheet	Type
General information	GI_0060	Products and operating conditions
Coil types	C_8007	74 EX 18
Valve bodies	In-line mounted	SB_0018 SB-B2*
	Sandwich mounted	SB-04(06)_0028 SB-*B2*
Cavity details / Form tools	SMT_0019	SMT-B2*
Spare parts	SP_8010	

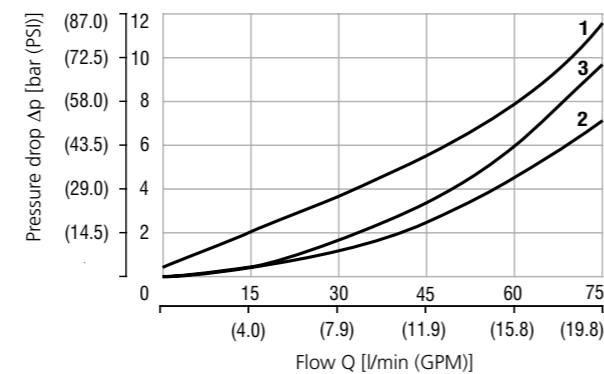
Characteristics measured at v = 32 mm²/s (156 SUS)

Operating limits

Ambient temperature 70 °C (158 °F), Voltage U_n -10 % (24 V DC), Power P_n 10 W



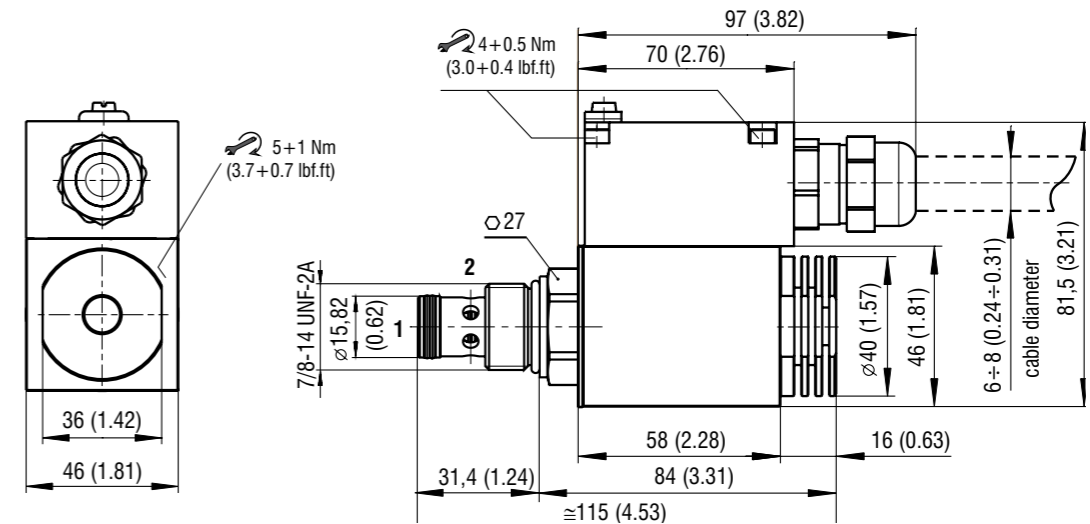
Pressure drop related to flow rate



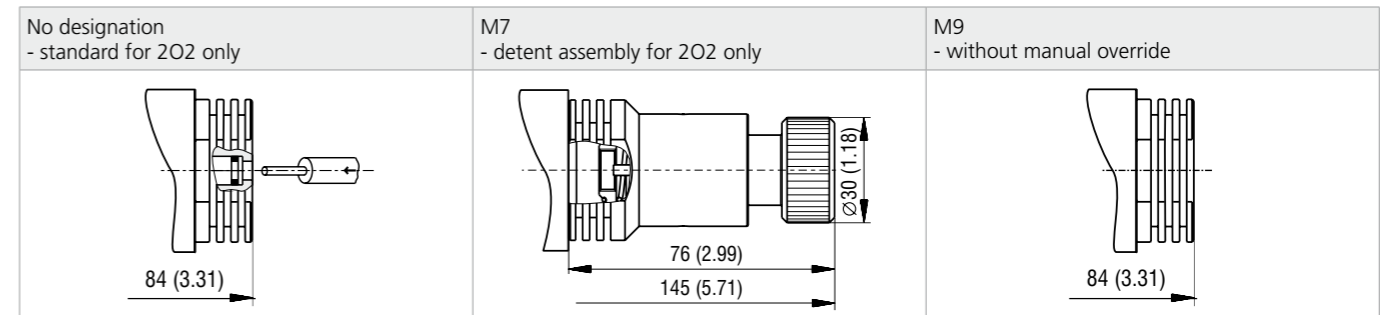
Model	Direction	Solenoid	Model	Direction	Solenoid
1 2L2	1→2	OFF	2 2O2	1→2	OFF
2 2L2	2→1	ON	3 2O2	2→1	OFF
2 2L2	1→2	ON			

For operating limits under conditions other than shown contact the technical support.

Dimensions in millimeters (inches)



Manual Override in millimeters (inches)



In case of solenoid malfunction or power failure, the spool of the valve can be shifted by manual override. For alternative manual overrides contact our technical support.

Ordering Code

SD3EX-B2 / [] / [] / [] / [] / [] - []

Explosion proof 2/2 directional valve, solenoid operated, poppet type, piloted 7/8-14 UNF

High performance **H**

Model / Symbol

202

2L2

Surface treatment
B zinc-coated (ZnNi), ISO 9227 (520 h)

Seals
No designation NBR

Manual override
No designation standard for 2O2 only
M7 detent assembly for 2O2 only
M9 without manual override

Cable length
No designation (only for DC) without cable
3 (AC and DC version) 3000 mm
8 (AC and DC version) 8000 mm

DC voltage connection box + cable gland

12 V DC / 0.75 A	01200
24 V DC / 0.39 A	02400
48 V DC / 0.19 A	04800
110 V DC / 0.094 A	11000

AC voltage 50/60 Hz, fix installed cable

110 V AC / 0.112 A	11050
230 V AC / 0.052 A	23050

Temperature class - solenoid nominal power
A4 class T4 - 10 W
A6 class T6 (T5) - 10 W

Besides the shown, commonly used valve versions other special models are available. Contact our technical support for their identification, feasibility and operating limits.

Marking Example

Solenoid Marking

74 EX18 046A A024
 UN=24VDC I_g=0,34A R₂₀=61,8Ω
 IP65 CE 0408

EPS14ATEX1744 X
 I M2 Ex e mb I Mb
 II 2G Ex e mb IIB T4 Gb
 II 2D Ex tb IIIC T135°C Db
 IECEx EPS14.0064 X
 Ex e mb I Mb
 Ex e mb IIB T4 Gb
 Ex tb IIIC T135°C Db

-40 °C ≤ Tamb ≤ +70 °C

74 EX18 046A A024
 UN=24VDC I_g=0,34A R₂₀=61,8Ω
 IP65 CE 0408

EPS14ATEX1744 X
 I M2 Ex e mb I Mb
 II 2G Ex e mb IIB T6 Gb
 II 2D Ex tb IIIC T85°C Db
 IECEx EPS14.0064 X
 Ex e mb I Mb
 Ex e mb IIB T6 Gb
 Ex tb IIIC T85°C Db

-40 °C ≤ Tamb ≤ +45 °C

Group I (Mining)

ATEX mark of conformity to the 94/9CE directive and to the applicable technical norms
 Group I for mines
 M2 High protection - equipment category
 Ex e mb Type of protection: e - increased safety, mb - encapsulated
 I Gas group (methane)
 Mb Equipment protection level - high level protection for explosive atmosphere

Group II

ATEX mark of conformity to the 94/9CE directive and to the applicable technical norms
 Solenoid for surface plants with gas and vapors environment for zones 1 and 2
 II 2D Solenoid for surface plants with dust environment for zones 21 and 22
 Ex e mb Type of protection: e - increased safety, mb - encapsulated
 Ex tb Type of protection: tb - protection by enclosure
 IIB Equipment suitable for substances (gas) of group IIB
 IIIC Equipment suitable for conductive dust
 T6/T4 Temperature class (maximum solenoid surface temperature)
 T85/T135 Maximum solenoid surface temperature
 Gb Equipment protection level - high level protection for explosive gas atmosphere
 Db Equipment protection level - high level protection for explosive dust atmosphere

Customer Information

Initial installation

- › The ambient temperature range shall not exceed the temperatures given in chapter 2. The maximum temperature of the medium (generally hydraulic fluid) shall not exceed 70 °C (158 °F).
- › It is the user's duty to ensure free and unhindered heat emission during operation. This means that the solenoid shall neither be covered nor stored immediately adjacent to heat sources (e.g. fan heaters) during operation.
- › The solenoid shall not be subjected to direct sunlight during operation.

Installation notice - installation, mounting, demounting

- › Using the V DC type for temperature class T4 requires a cable with an operating temperature limit of at least +105 °C (221 °F), e.g. LAPP FD Robust. T5 and T6 require a cable with an operating temperature limit of at least +90 °C (194 °F). The fastening torque on the cable gland depends of the used cable and is to be determined by the installing user.
- › When installing the V DC solenoid, the fastening torque of the screws shall be [4 Nm (2.95 lbf.ft)] and for the BARTEC connection box [0.4 Nm (0.30 lbf.ft)].
- › When installing the V DC solenoid, an appropriate cable shoe of size M3 with a crosssectional area of 0.75mm² with an operating temperature limit of at least +105 °C (221 °F) is to be used.
- › The user has to safeguard each solenoid with a fuse: I_n ≤ 3I_g, with trigger characteristic "slow blow". (I_g values see Operating Instructions HA 4090 - Table 2). The breaking capacity of the fuse link has to be stronger than the maximum short circuit current at the user's operating area.
- › EX-secured components must be used during mounting in case the fuse and/or the interface are within the EX-range.

Safety notice - Please read carefully

- › In case the solenoid shows any signs of a defect, malfunctioning or external damage (including corrosion), the device must immediately be taken out of operation.
- › Any deposits on the surface of the device shall not obstruct heat emission.
- › To maintain legibility of the data plate, the solenoid must not be coated.

Caution

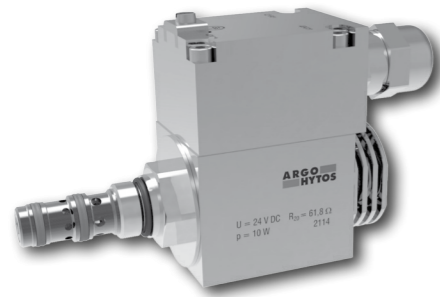
- › Always disconnect the solenoid from the power supply before any maintenance or other work on it.
- › Always exchange the complete solenoid. Do not try to repair the solenoid.
- › Under no circumstances shall any changes be made to the solenoid or the connecting cable.
- › Never operate the solenoid when disconnected from the valve body.
- › Demount the solenoid only in secure areas (not in EX-areas). If this is not possible, the solenoid must cool off for at least 10 minutes.



Explosion Proof 3/2 Directional Valve, Solenoid Operated, Poppet Type, Direct Acting

SD1EX-A3

3/4-16 UNF • Q_{max} 40 l/min (11 GPM) • p_{max} 350 bar (5100 PSI)



Technical Features

- Valve and solenoid design prevents a surface temperature capable of igniting solenoid coil in acc. with directive 94/9/EC (ATEX) for explosion-hazard zones
- Explosion protection for gas, dust, and mining; solutions for all zones
- Solenoid with encapsulated enclosure
- Hardened precision parts
- High flow capacity, transmitted hydraulic power and leak-free closing up to 3 drops/min
- All ports may be fully pressurised
- Wide range of manual overrides available
- Coils interchangeable within Argo-Hytos ATEX/IECEx product line
- In the standard version, the valve is zinc-coated for 520 h protection acc. to ISO 9227

Technical Data

Valve size / Cartridge cavity		3/4-16 UNF-2A / A3	
Max. flow	l/min (GPM)	40 (10.6)	
Max. operating pressure	bar (PSI)	350 (5080)	
Fluid temperature range	°C (°F)	-30 ... +70 (-22 ... +158)	
Max. switching frequency	1/h	15 000	
Mass with coil	kg (lbs)	1.51 (3.33)	
Technica Data - Explosion proof solenoid			
Voltage type		AC 50 / 60 HZ	DC
Available voltages	V	110, 230	12, 24, 48, 110
Available nominal power	W	10	
Supply voltage tolerance	%	AC, DC ± 10	
Duty cycle		S1 (100 % ED)	
Enclosure type acc. to EN 60529		IP 65	
Mass (solenoid only)	kg (lbs)	1.3 (2.87)	
Ambient temperature range			
Temperature class / Nominal power	T4 / 10 W	-30 ... +70 (-22 ... +158)	
	T5 / 10 W	-30 ... +55 (-22 ... +131)	
	T6 / 10 W	-30 ... +45 (-22 ... +113)	

ATEX/IECEx Classification

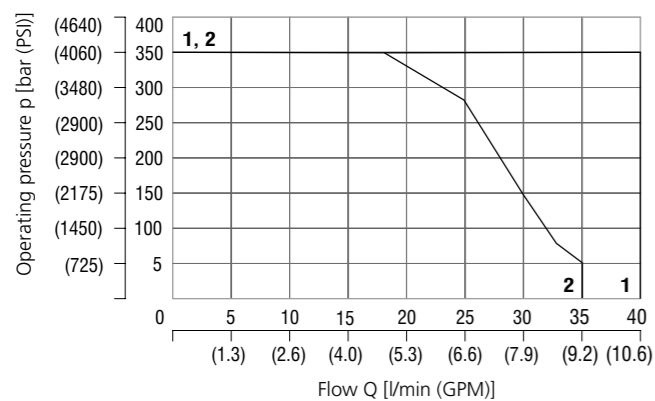
	EPS14ATEX1744 X
AC	Ex I M2 Ex mb I Mb
	Ex II 2G Ex mb IIB T4, T5, T6 Gb
	Ex II 2D Ex mb IIIC T135°C, T100°C, T85°C Db
DC	Ex I M2 Ex e mb I Mb
	Ex II 2G Ex e mb IIB T4, T5, T6 Gb
	Ex II 2D Ex tb IIIC T135°C, T100°C, T85°C Db
	IECEx EPS14.0064 X
AC	Ex mb I Mb
	Ex mb IIB T4, T5, T6 Gb
	Ex mb IIIC T135°C, T100°C, T85°C Db
DC	Ex e mb I Mb
	Ex e mb IIB T4, T5, T6 Gb
	Ex tb IIIC T135°C, T100°C, T85°C Db

	Datasheet	Type
General information	GI_0060	Products and operating conditions
Coil types	C_8007	74 EX 18
Valve bodies	In-line mounted	SB_0018
	Sandwich mounted	SB-04(06)_0028
Cavity details / Form tools	SMT_0019	SMT-A3*
Spare parts	SP_8010	

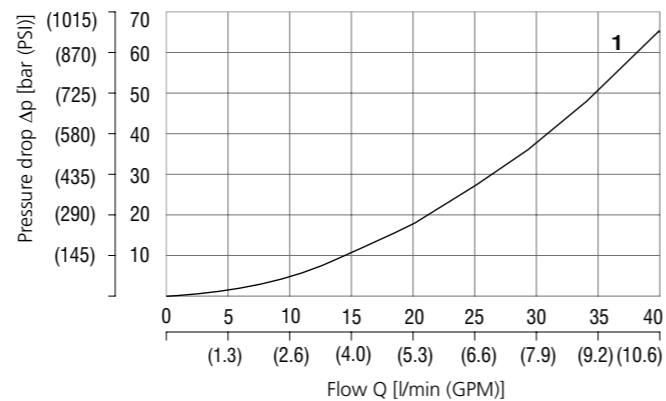
Characteristics measured at v = 32 mm³/s (156 SUS)

Operating limits

Ambient temperature 70 °C (158 °F), Voltage U_n -10 % (24 VDC), Power P_n 10 W



Pressure drop related to flow rate

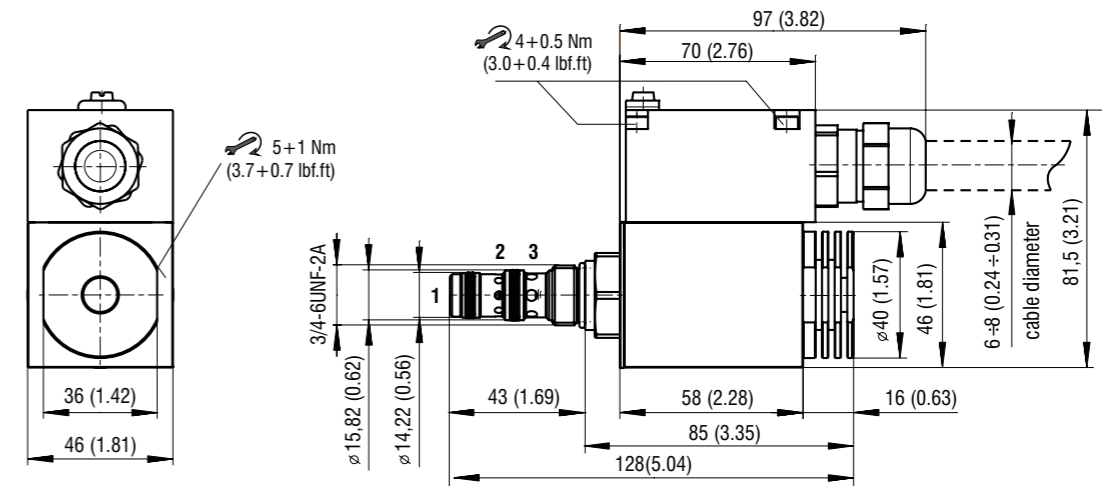


Direction	2→3	3→2	2→1	1→2
	1	2	2	2

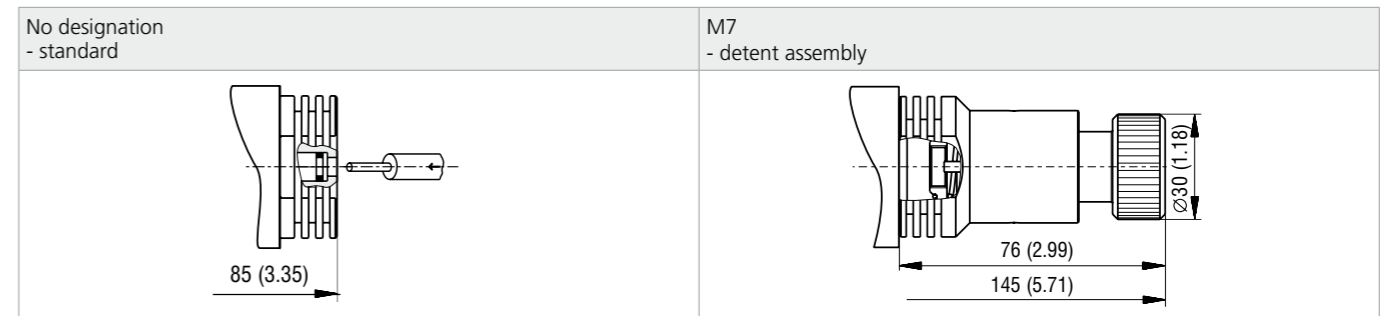
Model	Direction
1	257
	1→2, 2→1, 2→3, 3→2

For operating limits under conditions other than shown contact the technical support.

Dimensions in millimeters (inches)



Manual Override in millimeters (inches)



In case of solenoid malfunction or power failure, the spool of the valve can be shifted by manual override. For alternative manual overrides contact our technical support.

Ordering Code

SD1EX-A3 / [] / [] / [] / [] / [] - []

Explosion proof 3/2 directional valve, solenoid operated, poppet type, direct acting 3/4-16 UNF

High performance H

Model / Symbol

257

DC voltage connection box + cable gland

12 V DC / 0.75 A	01200
24 V DC / 0.39 A	02400
48 V DC / 0.19 A	04800
110 V DC / 0.094 A	11000

AC voltage 50/60 Hz, fix installed cable

110 V AC / 0.112 A	11050
230 V AC / 0.052 A	23050

Surface treatment

B zinc-coated (ZnNi), ISO 9227 (520 h)

Seals NBR

No designation

Manual override standard detent assembly

Cable length without cable

3 (AC and DC version)	3000 mm
8 (AC and DC version)	8000 mm

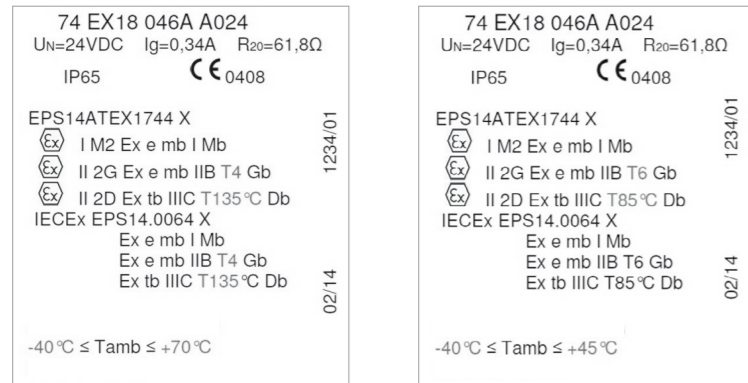
Temperature class - solenoid nominal power

A4	class T4 - 10 W
A6	class T6 (T5) - 10 W

Besides the shown, commonly used valve versions other special models are available. Contact our technical support for their identification, feasibility and operating limits.

Marking Example

Solenoid Marking



Group I (Mining)

- ATEX mark of conformity to the 94/9CE directive and to the applicable technical norms
- I Group I for mines
- M2 High protection - equipment category
- Ex e mb Type of protection: e - increased safety, mb - encapsulated
- I Gas group (methane)
- Mb Equipment protection level - high level protection for explosive atmosphere

Group II

- ATEX mark of conformity to the 94/9CE directive and to the applicable technical norms
- II 2G Solenoid for surface plants with gas and vapors environment for zones 1 and 2
- II 2D Solenoid for surface plants with dust environment for zones 21 and 22
- Ex e mb Type of protection: e - increased safety, mb - encapsulated
- Ex tb Type of protection: tb - protection by enclosure
- IIB Equipment suitable for substances (gas) of group IIB
- IIIC Equipment suitable for conductive dust
- T6/T4 Temperature class (maximum solenoid surface temperature)
- T85/T135 Maximum solenoid surface temperature
- Gb Equipment protection level - high level protection for explosive gas atmosphere
- Db Equipment protection level - high level protection for explosive dust atmosphere

Customer Information

Initial installation

- › The ambient temperature range shall not exceed the temperatures given in chapter 2. The maximum temperature of the medium (generally hydraulic fluid) shall not exceed 70 °C (158 °F).
- › It is the user's duty to ensure free and unhindered heat emission during operation. This means that the solenoid shall neither be covered nor stored immediately adjacent to heat sources (e.g. fan heaters) during operation.
- › The solenoid shall not be subjected to direct sunlight during operation.

Installation notice - installation, mounting, demounting

- › Using the V DC type for temperature class T4 requires a cable with an operating temperature limit of at least +105 °C (221 °F), e.g. LAPP FD Robust. T5 and T6 require a cable with an operating temperature limit of at least +90 °C (194 °F). The fastening torque on the cable gland depends of the used cable and is to be determined by the installing user.
- › When installing the V DC solenoid, the fastening torque of the screws shall be 4 Nm (2.95 lbf.ft) and for the BARTEC connection box 0.4 Nm (0.30 lbf.ft).
- › When installing the V DC solenoid, an appropriate cable shoe of size M3 with a crosssectional area of 0.75 mm² with an operating temperature limit of at least +105 °C (221 °F) is to be used.
- › The user has to safeguard each solenoid with a fuse: $I_n \leq 3I_{nG}$, with trigger characteristic "slow blow". (I_{nG} values see Operating Instructions HA 4090 - Table 2). The breaking capacity of the fuse link has to be stronger than the maximum short circuit current at the user's operating area.
- › EX-secured components must be used during mounting in case the fuse and/or the interface are within the EX-range.

Safety notice - Please read carefully

- › In case the solenoid shows any signs of a defect, malfunctioning or external damage (including corrosion), the device must immediately be taken out of operation.
- › Any deposits on the surface of the device shall not obstruct heat emission.
- › To maintain legibility of the data plate, the solenoid must not be coated.

Caution

- › Always disconnect the solenoid from the power supply before any maintenance or other work on it.
- › Always exchange the complete solenoid. Do not try to repair the solenoid.
- › Under no circumstances shall any changes be made to the solenoid or the connecting cable.
- › Never operate the solenoid when disconnected from the valve body.
- › Demount the solenoid only in secure areas (not in EX-areas). If this is not possible, the solenoid must cool off for at least 10 minutes.



Content

Type Code		Page	Data Sheet
Coils for Solenoid Operated Valves			
C14, C19, C22, C31		480	HA 8007
Connectors for Electrical Terminals			
K	EN 175301-803, form A	498	HA 8008

Notes

Coils for Operating Solenoids of Valves

C*

Size 03, 04, 06, 10



Technical Features

- › Wide range of coil voltages
- › Wide range of connectors and electrical connection options
- › Easy replacement of coil solenoids
- › The coils can be rotated and the required connector direction can be adjusted
- › High resistance of coils against mechanical damage
- › Coils supplied with AC current, fitted with integrated rectifier
- › Coils with protection against possible damage due to induced voltage (Transil)

Technical Data

Quantity	Unit	Value
Nominal voltage (U _N)	V	see the list of voltages
Allowable voltage fluctuation		U _N ± 10 %, if not stated otherwise in the valve data sheet
Coil current at U _N and 20°C	A	see the table of coil types
Winding resistance at 20°C	Ω	by calculation R = U _N /I
Input power of coil at 20°C	W	by calculation P = U _N x I
Max. ambient temperature	°C (°F)	50 (122), if not stated otherwise in the data sheet
Operation conditions		see the data sheets of individual types of valves
Max. winding temperature	°C (°F)	155 (311)

	Data sheet	Type
General information	GI_0060	products and general conditions
Connectors	K_8008	connectors EN 175301-803-A

Product Description

Valves designed for a change of fluid direction, such as directional control valves and poppet-type valves, are often solenoid operated. Proportional valves are another large group controlling continuously parameters in the circuit within the defined interval. Electric current flowing through the coil winding creates a magnetic field. This field acts on the armature of the solenoid part and allows its shift which is then transferred to the valve control element (spool, poppet). The excitation winding made of copper wire placed on a plastic core is the basis. The coil is inserted into the steel housing amplifying the magnetic field and to protect it against mechanical damage. Moreover, the coil is molded into the housing by plastic material. The connector part coupled with the coil is also made of the same plastic. A silicone seal protects the coil space against moisture and dust.

Coil Electrical Parameters

Standard control voltages are given in the table in the ordering code and coil currents are stated in the table of types. Electrical coil resistance is determined by the coil winding parameters. These along with input power of the coil can be calculated from the previous parameters. The coils are designed to be DC powered. When AC powered, it is necessary to use a coil with integrated rectifier or a connector plug with integrated rectifier.

i In operation, the output power of coils is influenced both by keeping the given values of power supply and the operation conditions. Temperature rise of the winding causes an increase in its electrical resistance when exceeding operation conditions. This reduces both current flowing through the winding and generated magnetomotive force, thus magnetic field strength is also decreased. Hydraulic power of the solenoid operated valve is also decreased in an appropriate manner.

Protection of Control Electronics

A coil is an inductive load in an electrical circuit. Any change in the current flowing through a coil (e.g. when switching off the coil circuit), voltage is induced according to Lenz's law and opposes the change that produced it. This poses a damage risk to the control electronics. Especially for proportional valves, it is appropriate to use a coil with an integrated quenching diode - or transient-voltage-suppression diode (e.g. Transil). Transil is a proven and reliable semiconductor element connected in parallel to the coil. If the threshold voltage is exceeded, electric current starts to flow through it, thereby converting overvoltage energy to heat.

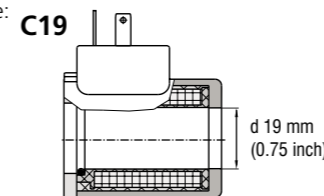
Quick disconnect

Induced voltage originating from a quick disconnect of the coil has according to Lenz's law a negative effect on OFF switching time regarding the solenoid armature. Special electronic circuit suppresses this unwanted phenomenon.

Coil sizes

Coil size	Diameter d [mm (inch)]	Valve size	Directional valves with housing		Cartridge valves		Proportional valves	
			High performance	Lightline	High performance	Lightline	Directional valves	Pressure
C14	13.4 (0.53)	Dn 03	RPEK1-03	RPEL1-04		SD2E-Ax/L SD3E-A2/L		SP4P1-B4
C19	19.0 (0.75)	Dn 04	RPE2-04 RPE3-04 SR4E2-B2	RPEL1-06	SD2E-Ax/H SD3E-A2/H SD1E-A2 SD1E-A3 ROE3	SD2E-Bx/L SD3E-B2/L	PRM2-04 PRM7-04	SR1P2-A2 SRN1P1-A2 SR4P2-B2 SRN4P1-B2 SP4P2-B3 SPN4P1-B3 PVRM1-063
C22	22.0 (0.87)	Dn 06	RPE3-06 RPEA3-06 RPEW4-06		SD2E-Bx/H SD3E-B2/H		PRM2-06 PRM7-06 PRM8-06	PVRM3-10
C31	31.0 (1.22)	Dn 10	RPE4-10 RPEW4-10				PRM6-10 PRM7-10	

Example:



For different sizes and versions of the valves, the appropriate coil sizes are used. Size designation corresponds approximately to the inner diameter of the coil.

Connector Types

Basic connectors used to connect the power supply of the coils:

- › Connector EN 175301-803-A (IP 65)
- › Connector AMP JUNIOR TIMER (IP 67)
- › Connector DEUTSCH DT04-2P (IP 67 / IP 69K)
- › Special 2-pin connector EW designed to be slipped into the wirebox
- › Loose conductors of standard length 300 mm (11.8 in)
- › Loose conductors equipped with the connector at the end

Other connector types available upon agreement with the manufacturer.



EN 175301-803-A

AMP JUNIOR TIMER

DEUTSCH DT04-2P

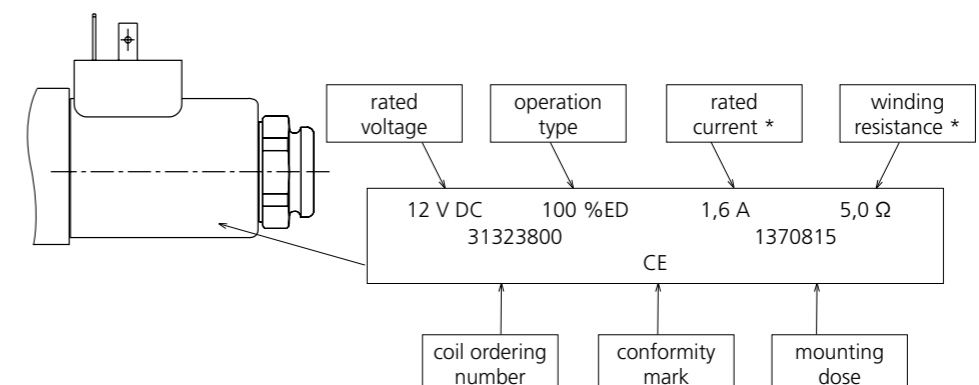
Connector EW

Loose Conductors

Identification of Coils

The CE conformity mark placed on the coil steel housing indicates that the product is in accordance with the following directives:

- › 2014/30/ES for electromagnetic compatibility
- › 2014/35/ES for low voltage equipment with rated voltage higher than 50 VAC and 75 VDC, respectively.



* Winding resistance is given only for coils used in proportional solenoids. Limit (maximum) current, which is allowed to flow continuously through the coil winding, is also stated for these coils instead of rated current.

Content

Ordering Code..... 4

Coils C14B (d = 13.4 mm (0.53 inch))..... 5
 RPEK1-03, RPEL1-04 5
 SD2E-A2/L, SD2E-A3/L, SD2E-A4/L, SD3E-A2/L 5
 SP4P1-B4 5

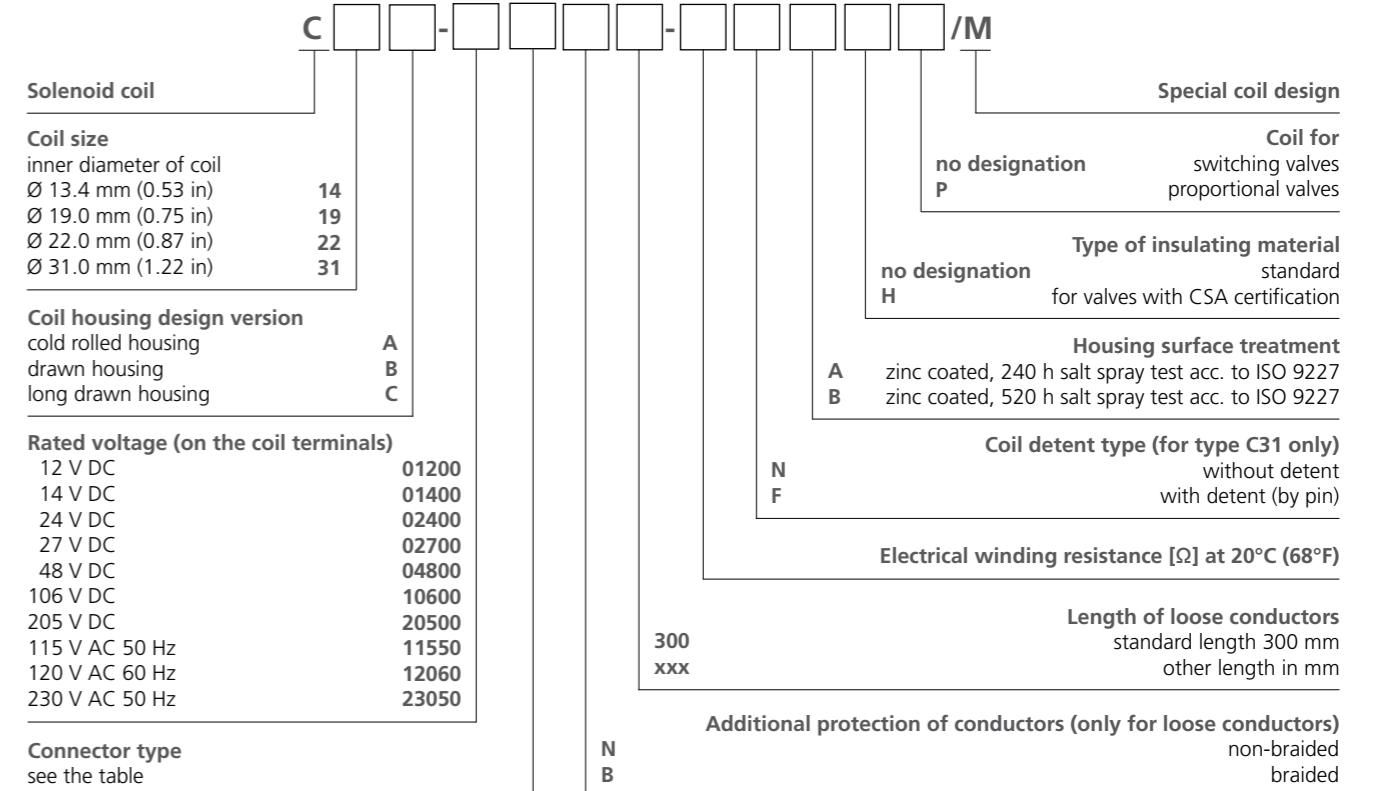
Coils C19 (d = 19 mm (0.75 inch))..... 6
 RPE2-04, RPE3-04, ROE3-04, ROE3-06, SR4E-B2 6
 SD2E-B2/L, SD2E-B3/L, SD2E-B4/L, SD3E-B2/L 6
 SD2E-A2/H, SD2E-A3/H, SD2E-A4/H, SD3E-A2/H, SD1E-A2, SD1E-A3 6
 RPE3-04 with CSA certification 7
 SD2E-A2/H, SD2E-A3/H, SD2E-A4/H, SD3E-A2/H, SD1E-A2, SD1E-A3, SR4E-B2 7
 PRM2-04, PRM7-04 8
 PRM2-04 proportional directional control valves without integrated electronic unit 8
 PRM2-04, PRM7-04 proportional directional control valves with integrated electronic unit 8
 SR1P2-A2, SRN1P1-A2, SR4P2-B2, SRN4P1-B2, SP4P2-B3, SPN4P1-B3 8
 PVRM1-063 9

Coils C22 (d = 22 mm (0.87 inch))..... 10
 RPE3-06, RPEA3-06, RPEW4-06 10
 SD2E-B2/H, SD2E-B3/H, SD2E-B4/H, SD3E-B2/H 10
 RPE3-06 with CSA certification 11
 RPEW4-06 with CSA certification 11
 SD2E-B2/H, SD2E-B3/H, SD2E-B4/H, SD3E-B2/H 12
 PRM2-06, PRM7-06, PRM8-06 12
 PRM2-06 proportional directional control valves with integrated electronic unit 12
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Coils C31 (d = 31 mm (1.22 inch))..... 14
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 RPE4-10 with CSA certification 15
 RPEW4-10 with CSA certification 15
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Dimensions in millimeters (inch) 16
Mounting / dismantling the coils 18

Ordering Code



Not all possible combinations of parameters are produced as actual coils. If the required coil is not included in the table of the standard types, please contact our technical department to verify feasibility and identification of the specific type.

Note explaining usage of coils:

Coils with supply voltage 106 VDC are intended for rectified supply voltage 120VAC / 60Hz.
 Coils with supply voltage 205 VDC are intended for rectified supply voltage 230 VAC / 60Hz.
 Coils 115 VAC / 50 Hz have a built-in rectifier and can be also used for supply voltage 120 VAC / 50 Hz or 60 Hz.
 Coils 230 VAC / 50 Hz have a built-in rectifier.

Overview of connector types and electrical connections of coils

Connector	Designation	Description
EN 175301-803-A	E1	Connector EN 175301-803-A
	E2	Connector EN 175301-803-A + quenching diode
	E5	Connector EN 175301-803-A + integrated rectifier
	E51	Connector EN 175301-803-A + integrated rectifier + quick disconnect
AMP Junior Timer	E3	Connector AMP Junior Timer (2 pins)
	E4	Connector AMP Junior Timer (2 pins) + quenching diode
AMP Junior Timer axially oriented	E3A	Axial connector AMP Junior Timer (2 pins)
	E4A	Axial connector AMP Junior Timer (2 pins) + quenching diode
Deutsch DT04-2P axially oriented	E12A	Axial connector Deutsch DT04-2P (2 pins)
	E13A	Axial connector Deutsch DT04-2P (2 pins) + quenching diode
Loose conductors	E8	Loose conductors
	E9	Loose conductors + quenching diode
Loose conductors with connector	E10	Loose conductors with connector DT04-2P (2 pins)
	E11	Loose conductors with connector DT04-2P (2 pins) + quenching diode
	E16	Loose conductors with Metri-Pack connector, series 150 (2 pins)
	E17	Loose conductors with Metri-Pack connector, series 150 (2 pins) + quenching diode
	E18	Loose conductors with Weather-Pack connector (2 pins)
	E19	Loose conductors with Weather-Pack connector (2 pins) + quenching diode
	E20	Loose conductors with Weather-Pack connector (2 jacks)
	E21	Loose conductors with Weather-Pack connector (2 jacks) + quenching diode
	E22	Loose conductors with Econoseal connector (2 pins)
	E23	Loose conductors with connector DT04-2P (2 pins) + quenching diode
	E24	Loose conductors with connector DT04-2P (2 pins)
E25	Loose conductors with connector DT04-2P (2 pins) + quenching diode	
Special connector for wirebox	EW1	Special connector for wirebox
	EW2	Special connector for wirebox + quenching diode

Coils C14B (d = 13.4 mm (0.53 inch))

	Ambient temperature °C (°F)	Fluid temperature °C (°F)	Supply voltage tolerance % z U _N
→	-30...+50 (-22...+122)	-30...+80 (-22...+176)	± 10
→	-20...+50 (-4...+122)	-20...+60 (-4...+122)	± 10

RPEK1-03, RPEL1-04 SD2E-A2/L, SD2E-A3/L, SD2E-A4/L, SD3E-A2/L	→
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Surface treatment A: 240 h salt spray test acc. to ISO 9227

Voltage [V]	Current [A]	Connector types	E1	E2	E3A	E4A	E12A	E13A
12 DC	1.83	16210300 C14B-01200E1-6.55NA	24101600 C14B-01200E2-6.55NA	28822500 C14B-01200E3A-6.55NA	28822600 C14B-01200E4A-6.55NA	29268200 C14B-01200E12A-6.55NA	29268800 C14B-01200E13A-6.55NA	29268800 C14B-01200E13A-6.55NA
14 DC	1.57	24102200 C14B-01400E1-8.91NA	on request	on request	on request	34948600 C14B-01400E12A-8.91NA	on request	on request
24 DC	0.92	16210400 C14B-02400E1-26.2NA	24101800 C14B-02400E2-26.2NA	28686400 C14B-02400E3A-26.2NA	28822400 C14B-02400E4A-26.2NA	29268900 C14B-02400E12A-26.2NA	29269000 C14B-02400E13A-26.2NA	29269000 C14B-02400E13A-26.2NA
27 DC	0.80	33565000 C14B-02700E1-33.6NA	on request	on request	34319700 C14B-02700E3A-33.6NA	on request	on request	on request

Surface treatment B: 520 h salt spray test acc. to ISO 9227

Voltage [V]	Current [A]	Connector types	E1	E2	E3A	E4A	E12A	E13A
12 DC	1.83	on request	on request	on request	on request	on request	32700900 C14B-01200E12A-6.55NB	on request
14 DC	1.57	on request	on request	on request	on request	34440200 C14B-01400E12A-8.91NB	on request	on request
24 DC	0.92	on request	on request	on request	on request	31145400 C14B-02400E12A-26.2NB	31145500 C14B-02400E13A-26.2NB	31145500 C14B-02400E13A-26.2NB

SP4P1-B4	→
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Ambient temperature °C (°F)	Fluid temperature °C (°F)
-30...+90 (-22...+194)	-30...+90 (-22...+194)

Surface treatment A: 240 h salt spray test acc. to ISO 9227

Voltage [V]	Current [A]	Connector types	E1	E3A	E12A
12 DC	max 0.7	on request	33038300 C14B-01200E3A-7.8NAP	32482500 C14B-01200E12A-7.8NAP	32482500 C14B-01200E12A-7.8NAP
24 DC	max 0.35	34056200 C14B-02400E1-29.5NAP	33038400 C14B-02400E3A-29.5NAP	32482400 C14B-02400E12A-29.5NAP	32482400 C14B-02400E12A-29.5NAP

Surface treatment B: 520 h salt spray test acc. to ISO 9227

Voltage [V]	Current [A]	Connector types	E1	E3A	E12A
24 DC	max 0.35	on request	on request	34186400 C14B-02400E12A-29.5NBP	34186400 C14B-02400E12A-29.5NBP

Coils C19 (d = 19 mm (0.75 inch))

	Ambient temperature °C (°F)	Fluid temperature °C (°F)	Supply voltage tolerance % z U _N
→	-30...+50 (-22...+122)	-30...+80 (-22...+176)	± 10
→	-20...+50 (-4...+122)	-20...+60 (-4...+122)	± 10
→	-20...+50 (-4...+122)	-20...+80 (-4...+176)	± 10
→	-20...+80 (-4...+176) *	-20...+80 (-4...+176)	± 15 *

RPE2-04, RPE3-04, ROE3-04, ROE3-06, SR4E-B2 SD2E-B2/L, SD2E-B3/L, SD2E-B4/L, SD3E-B2/L	→
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SD2E-A2/H, SD2E-A3/H, SD2E-A4/H, SD3E-A2/H, SD1E-A2, SD1E-A3	→
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Remarks concerning Coil Usage
For values SD2E-A2/H, SD2E-A3/H, SD2E-A4/H, SD3E-A2/H, SD1E-A2, SD1E-A3 coils of two different power classes may be used, depending on operating conditions (max. environmental temperature, tolerance of the supply voltage).

- › Coils of higher power listed in this table may be used for environmental temperatures between -20...+50° C (-4...+122 °F) and supply voltage fluctuations of up to ± 10 % UN. Additional coils for supply voltages of 14 VDC, 27 VDC, 205 VDC and 230 VAC/50 Hz may even be used for environmental temperatures between -20...+80 °C (-4...+176 °F) and supply voltage fluctuations of up to ± 15 % UN.
- › Coils of lower power listed in table on p.7 may be used for environmental temperatures between -20...+80 °C (-4...+176 °F) and supply voltage fluctuations of up to ± 15 % UN.

Surface treatment A: 240 h salt spray test acc. to ISO 9227

Voltage [V]	Current [A]	Connector types	E1	E2	E3	E4	E3A	E4A	E12A	E13A
12 DC	2.45	27316600 C19B-01200E1-4.9NA	27631400 C19B-01200E2-4.9NA	27330200 C19B-01200E3-4.9NA	27631600 C19B-01200E4-4.9NA	27449600 C19B-01200E3A-4.9NA	27631900 C19B-01200E4A-4.9NA	27351400 C19B-01200E12A-4.9NA	27632000 C19B-01200E13A-4.9NA	27632000 C19B-01200E13A-4.9NA
14 DC	1.70	27634100 C19B-01400E1-8.23NA	27634200 C19B-01400E2-8.23NA	27634300 C19B-01400E3-8.23NA	27634400 C19B-01400E4-8.23NA	27634500 C19B-01400E3A-8.23NA	27634600 C19B-01400E4A-8.23NA	27635000 C19B-01400E12A-8.23NA	on request	on request
24 DC	1.15	27316700 C19B-02400E1-20.8NA	27632400 C19B-02400E2-20.8NA	27330300 C19B-02400E3-20.8NA	27633200 C19B-02400E4-20.8NA	27449700 C19B-02400E3A-20.8NA	27633400 C19B-02400E4A-20.8NA	27330500 C19B-02400E12A-20.8NA	27633500 C19B-02400E13A-20.8NA	27633500 C19B-02400E13A-20.8NA
27 DC	0.89	27636100 C19B-02700E1-30.4NA	27639400 C19B-02700E2-30.4NA	27641600 C19B-02700E3-30.4NA	27641700 C19B-02700E4-30.4NA	27641800 C19B-02700E3A-30.4NA	27642100 C19B-02700E4A-30.4NA	27642400 C19B-02700E12A-30.4NA	27642500 C19B-02700E13A-30.4NA	27642500 C19B-02700E13A-30.4NA
205 DC	0.12	27382401 C19B-20500E1-1653NA	not available	not available	not available	not available	not available	not available	not available	not available
230 AC 50 Hz	0.12	27449900 C19B-23050E5-1653NA	E5	27449900 C19B-23050E5-1653NA	not available	not available	not available	not available	not available	not available

Surface treatment B: 520 h salt spray test acc. to ISO 9227

Voltage [V]	Current [A]	Connector types	E1	E2	E3A	E12A	E13A
14 DC	1.70	on request	on request	on request	on request	33212800 C19B-01400E12A-8.23NB	on request
24 DC	1.15	28829600 C19B-02400E1-20.8NB	32092500 C19B-02400E2-20.8NB	on request	on request	31330200 C19B-02400E13A-20.8NB	40052200 C19B-02700E13A-30.4NB
27 DC	0.89	on request	on request	33559000 C19B-02700E3A-30.4NB	on request	on request	on request

Coils C19 (d = 19 mm (0.75 inch))

RPE3-04 with CSA certification		
Surface treatment A: 240 h salt spray test acc. to ISO 9227		
Voltage [V]	Current [A]	Connector types
12 DC	2.41	E5 not available
24 DC	1.15	not available
115 AC 50 Hz	0.24	24140900 C19A-11550E5-433NAH
230 AC 50 Hz	0.12	24141000 C19A-23050E5-1653NAH

Ambient temperature °C (°F) -20...+80 (-4...+176) → Fluid temperature °C (°F) -20...+80 (-4...+176) Supply voltage tolerance % z U_N ± 15

SD2E-A2/H, SD2E-A3/H, SD2E-A4/H, SD3E-A2/H, SD1E-A2, SD1E-A3, SR4E-B2

Surface treatment A: 240 h salt spray test acc. to ISO 9227

Voltage [V]	Current [A]	Connector types	E1	E2	E3	E4	E4A	E12A	E13A
12 DC	2.00	27669700 C19B-01200E1-6NA	27670000 C19B-01200E3-6NA	27669900 C19B-01200E2-6NA	27670100 C19B-01200E4-6NA	on request	32829300 C19B-01200E12A-6NA	32829300 C19B-01200E12A-6NA	29871300 C19B-01200E13A-6NA
24 DC	0.93	27670600 C19B-02400E1-25.75NA	27670800 C19B-02400E3-25.75NA	27670700 C19B-02400E2-25.75NA	27670900 C19B-02400E4-25.75NA	30117800 C19B-02400E4A-25.75NA	31330000 C19B-02400E12A-25.75NA	31330000 C19B-02400E12A-25.75NA	32801600 C19B-02400E13A-25.75NA

Surface treatment B: 520 h salt spray test acc. to ISO 9227

Voltage [V]	Current [A]	Connector types	E1	E3
24 DC	0.93	30449100 C19B-02400E1-25.75NB	33090800 C19B-02400E3-25.75NB	

Coils C19 (d = 19 mm (0.75 inch))

Ambient temperature °C (°F) +50 (+176) → Fluid temperature °C (°F) -30...+80 (-22...+176)

PRM2-04, PRM7-04

PRM2-04 proportional directional control valves without integrated electronic unit

Surface treatment A: 240 h salt spray test acc. to ISO 9227

Voltage [V]	Current [A]	Connector types	E1	E2	E3	E4	E3A	E12A	E13A
12 DC	max. 1.7	27821900 C19B-01200E1-4.68NAP	27822000 C19B-01200E3-4.68NAP	27821900 C19B-01200E2-4.68NAP	27822000 C19B-01200E4-4.68NAP	on request	31688600 C19B-01200E3A-4.68NAP	27821200 C19B-01200E12A-4.68NAP	on request
24 DC	max 0.8	27824200 C19B-02400E1-20.6NAP	27824300 C19B-02400E2-20.6NAP	28145200 C19B-02400E3-20.6NAP	27824400 C19B-02400E4-20.6NAP	27824400 C19B-02400E4-20.6NAP	31891300 C19B-02400E3A-20.6NAP	30754900 C19B-02400E12A-20.6NAP	29868600 C19B-02400E13A-20.6NAP

Surface treatment B: 520 h salt spray test acc. to ISO 9227

Voltage [V]	Current [A]	Connector types	E1	E12A
24 DC	max 0.8	31805200 C19B-02400E3-20.6NBP	31805300 C19B-02400E12A-20.6NBP	

PRM2-04, PRM7-04 proportional directional control valves with integrated electronic unit

Surface treatment A: 240 h salt spray test acc. to ISO 9227

Voltage [V]	Current [A]	Connector types	E1
12 DC	max. 1.7	16186100 C19A-01200E1-4.98NAP	
24 DC	max 0.8	16186200 C19A-02400E1-21NAP	

Ambient temperature °C (°F) -20...+80 (-4...+176) → Fluid temperature °C (°F) -20...+120 (-4...+248)

SR1P2-A2, SRN1P1-A2, SR4P2-B2, SRN4P1-B2, SP4P2-B3, SPN4P1-B3

Surface treatment A: 240 h salt spray test acc. to ISO 9227

Voltage [V]	Current [A]	Connector types	E1	E2	E3	E4	E3A	E12A	E13A
12 DC	max. 1	28145500 C19B-01200E1-6.5NAP	28145600 C19B-01200E2-6.5NAP	28145700 C19B-01200E3-6.5NAP	28145800 C19B-02400E4-6.5NA	28145800 C19B-01200E3A-6.5NAP	33793900 C19B-01200E3A-6.5NAP	28184900 C19B-01200E12A-6.5NAP	29867600 C19B-02400E13A-6.5NAP
24 DC	max 0.6	27824200 C19B-02400E1-20.6NAP	27824300 C19B-02400E2-20.6NAP	28145200 C19B-02400E3-20.6NAP	27824400 C19B-02400E4-20.6NAP	27824400 C19B-02400E3A-20.6NAP	31891300 C19B-02400E3A-20.6NAP	30754900 C19B-02400E12A-20.6NAP	29868600 C19B-02400E13A-20.6NAP

Surface treatment B: 520 h salt spray test acc. to ISO 9227

Voltage [V]	Current [A]	Connector types	E1	E12A
24 DC	max 0.6	31805200 C19B-02400E3-20.6NBP	31805300 C19B-02400E12A-20.6NBP	

Coils C19 (d = 19 mm (0.75 inch))

Ambient temperature °C (°F)	Fluid temperature °C (°F)
-30...+90 (-22...+194)	-30...+90 (-22...+194)



PVRM1-063

Max. reduced pressure 20 bar (290 PSI)
Surface treatment A: 240 h salt spray test acc. to ISO 9227

Voltage [V]	Connector types
12 DC	E12A
max. 1	27821300
	C19B-01200E13A-6.85NAP

Max. reduced pressure 32 bar (470 PSI)
Surface treatment A: 240 h salt spray test acc. to ISO 9227

Voltage [V]	Connector types
12 DC	E4
max. 1.5	27785600
	C19B-01200E4-4.68NAP
	29869000
	C19B-01200E13A-4.68NAP

Max. reduced pressure 20 and 32 bar (290 and 470 PSI)
Surface treatment A: 240 h salt spray test acc. to ISO 9227

Voltage [V]	Connector types	E1	E2	E3	E3A	E4	E12A	E13A
24 DC	max 0.75	27824200	27824300	30118100	31891300	27824400	30754900	29868600
		C19B-02400E1-20.6NAP	C19B-02400E2-20.6NAP	C19B-02400E3-20.6NAP	C19B-02400E3A-20.6NAP	C19B-02400E4-20.6NAP	C19B-02400E12A-20.6NAP	C19B-02400E13A-20.6NAP

Max. reduced pressure 20 and 32 bar (290 and 470 PSI)
Surface treatment B: 520 h salt spray test acc. to ISO 9227

Voltage [V]	Connector types
24 DC	E3
max 0.75	31805200
	C19B-02400E3-20.6NBP
	31805300
	C19B-02400E12A-20.6NBP

Coils C22 (d = 22 mm (0.87 inch))

Ambient temperature °C (°F)	Fluid temperature °C (°F)	Supply voltage tolerance % z U _N
-30...+50 (-22...+122)	-30...+80 (-22...+176)	± 10
-20...+50 (-4...+122)	-20...+80 (-4...+176)	± 10



RPE3-06, RPEA3-06, RPEW4-06
SD2E-B2/H, SD2E-B3/H, SD2E-B4/H, SD3E-B2/H



Remarks concerning Coil Usage
For valves SD2E-B2/H, SD2E-B3/H, SD2E-B4/H, SD3E-B2/Hcoils of two different power classes may be used, depending on operating conditions (max. environmental temperature, tolerance of the supply voltage).
> Coils of higher power listed in this table may be used for environmental temperatures between -20...+50°C (-4...+122 °F) and supply voltage fluctuations of up to ± 10 % UN.
> Coils of lower power listed in table on p.12 may be used for environmental temperatures between -20...+80 °C (-4...+176 °F) and supply voltage fluctuations of up to ±15 % UN.

Surface treatment A: 240 h salt spray test acc. to ISO 9227

Voltage [V]	Current [A]	Connector types	E1	E2	E3A	E4A	E5	E12A	E13A
12 DC	2.72	16211400	24156100	24159700	24159600	24159700	not available	24930801	19695100
		C22B-01200E1-4.41NA	C22B-01200E2-4.41NA	C22B-01200E3A-4.41NA	C22B-01200E3A-4.41NA	C22B-01200E4A-4.41NA	not available	C22B-01200E12A-4.41NA	C22B-01200E13A-4.41NA
14 DC	2.14	24158200	24930900	27662100	27662100	27662200	not available	27663000	27663100
		C22B-01400E1-6.55NA	C22B-01400E2-6.55NA	C22B-01400E3A-6.55NA	C22B-01400E3A-6.55NA	C22B-01400E4A-6.55NA	not available	C22B-01400E12A-6.55NA	C22B-01400E13A-6.55NA
24 DC	1.29	16211600	24157400	24159800	24159800	24159900	not available	19695900	19696000
		C22B-02400E1-18.6NA	C22B-02400E2-18.6NA	C22B-02400E3A-18.6NA	C22B-02400E3A-18.6NA	C22B-02400E4A-18.6NA	not available	C22B-02400E12A-18.6NA	C22B-02400E13A-18.6NA
27 DC	1.07	16211700	24157600	19744600	19744600	19744500	not available	27663200	27663300
		C22B-02700E1-25.3NA	C22B-02700E2-25.3NA	C22B-02700E3A-25.3NA	C22B-02700E3A-25.3NA	C22B-02700E4A-25.3NA	not available	C22B-02700E12A-25.3NA	C22B-02700E13A-25.3NA
205 DC	0.15	16211500	not available	not available	not available	not available	not available	not available	not available
		C22B-20500E1-1400NA							
230 AC	0.15	not available	not available	not available	not available	not available	not available	not available	not available
50 Hz							18849000	not available	not available
							C22B-23050E5-1400NA		

Surface treatment B: 520 h salt spray test acc. to ISO 9227

Voltage [V]	Current [A]	Connector types	E1	E2	E3A	E4A	E5	E12A	E13A
12 DC	2.72	34007700	32489000	on request	on request	on request	not available	31536900	on request
		C22B-01200E1-4.41NB	C22B-01200E2-4.41NB	C22B-01200E3A-4.41NB	C22B-01200E3A-4.41NB	C22B-01200E4A-4.41NB	not available	C22B-01200E12A-4.41NB	on request
24 DC	1.29	24156800	32092900	24160200	24160300	24160300	not available	31156300	33089500
		C22B-02400E1-18.6NB	C22B-02400E2-18.6NB	C22B-02400E3A-18.6NB	C22B-02400E3A-18.6NB	C22B-02400E4A-18.6NB	not available	C22B-02400E12A-18.6NB	C22B-02400E13A-18.6NB
27 DC	1.07	33570600	on request	31802800	on request	on request	not available	31802900	on request
		C22B-02700E1-25.3NB	C22B-02700E2-25.3NB	C22B-02700E3A-25.3NB	C22B-02700E3A-25.3NB	C22B-02700E4A-25.3NB	not available	C22B-02700E12A-25.3NB	on request

RPEA3-06
Surface treatment A: 240 h salt spray test acc. to ISO 9227

Voltage [V]	Current [A]	Connector types
24 DC	0.33	E1
		24157700
		C22C-02400EW1-72NA/M
		24014000
		C22C-02400EW1-72NA/M

Coils C22 (d = 22 mm (0.87 inch))

RPEW4-06		
Surface treatment A: 240 h salt spray test acc. to ISO 9227		
Voltage [V]	Current [A]	Connector types
12 DC	2.64	EW1 16205100 C22C-01200EW1-4.54NA/M C22C-01200EW2-4.54NA/M
24 DC	1.32	EW2 16205400 C22C-01200EW2-4.54NA/M 16205500 C22C-02400EW2-18.2NA/M

RPE3-06 with CSA certification		
Surface treatment A: 240 h salt spray test acc. to ISO 9227		
Voltage [V]	Current [A]	Connector types
12 DC	2.72	E1 24154300 C22A-01200E1-4.41NAH not available
24 DC	1.29	E5 24154400 C22A-02400E1-18.6NAH not available
115 AC 50 Hz	0.30	not available 24154500 C22A-11550E5-344NAH
230 AC 50 Hz	0.15	not available 24154600 C22A-23050E5-1393NAH

RPEW4-06 with CSA certification		
Surface treatment A: 240 h salt spray test acc. to ISO 9227		
Voltage [V]	Current [A]	Connector types
12 DC	2.64	EW1 24154700 C22C-01200EW1-4.54NAH/M C22C-01200EW2-4.54NAH/M
24 DC	1.32	EW2 24155500 C22C-01200EW2-4.54NAH/M 24155300 C22C-02400EW2-18.2NAH/M
106 DC	0.27	not available 24155100 C22C-10600EW1-400NAH/M

Coils C22 (d = 22 mm (0.87 inch))

SD2E-B2/H, SD2E-B3/H, SD2E-B4/H, SD3E-B2/H → Ambient temperature °C (°F) -20...+80 (-4...+176) Fluid temperature °C (°F) -20...+80 (-4...+176) Supply voltage tolerance % z U_N ± 15

Surface treatment A: 240 h salt spray test acc. to ISO 9227									
Voltage [V]	Current [A]	Connector types	E1	E2	E3A	E4A	E5	E12A	E13A
12 DC	1.83	27222400 C22B-01200E1-6.55NA	27222500 C22B-01200E2-6.55NA	27222600 C22B-01200E3A-6.55NA	27222700 C22B-01200E4A-6.55NA	not available	not available	18815601 C22B-01200E12A-6.55NA	19909000 C22B-01200E13A-6.55NA
24 DC	0.95	27222800 C22B-02400E1-25.3NA	27222900 C22B-02400E2-25.3NA	27223000 C22B-02400E3A-25.3NA	27223100 C22B-02400E4A-25.3NA	not available	not available	19909101 C22B-02400E12A-25.3NA	19909200 C22B-02400E13A-25.3NA
205 DC	0.09	24160100 C22B-20500E1-2353NA	not available	not available	not available	not available	not available	not available	not available
230 AC 50 Hz	0.09	not available	not available	not available	not available	not available	20004200 C22B-23050E5-2353NA	not available	not available

Surface treatment B: 520 h salt spray test acc. to ISO 9227

Voltage [V]	Current [A]	Connector types
24 DC	0.95	E1 30129500 C22B-02400E1-25.3NB E13A 33028000 C22B-02400E13A-25.3NB

PRM2-06, PRM7-06, PRM8-06 → Ambient temperature °C (°F) +50 (+176) Fluid temperature °C (°F) -30...+80 (-22...+176)

PRM2-06 proportional directional control valves with integrated electronic unit		
Surface treatment A: 240 h salt spray test acc. to ISO 9227		
Voltage [V]	Current [A]	Connector types
12 DC	max 1.6	E1 16187500 C22A-01200E1-5.15NAP
24 DC	max 1	16186800 C22A-02400E1-13.4NAP

PRM2-06 proportional directional control valves without integrated electronic unit

Surface treatment A: 240 h salt spray test acc. to ISO 9227		
Voltage [V]	Current [A]	Connector types
12 DC	max 2.5	E1 18838500 C22B-01200E1-2.33NAP
24 DC	max 1	E3A 19744700 C22B-01200E3A-2.33NAP E12A 19696100 C22B-01200E12A-2.33NAP E13A 19909300 C22B-01200E13A-2.33NAP 19696200 C22B-02400E13A-13.4NAP 30691600 C22B-02400E13A-13.4NAP

Coils C22 (d = 22 mm (0.87 inch))

PRM2-06 proportional directional control valves without integrated electronic unit
Surface treatment B: 520 h salt spray test acc. to ISO 9227

Voltage [V]	Current [A]	Connector types	E1	E3A	E12A	E13A
12 DC	max 2.5	C22B-01200E1-2..33NBP	34180800	on request	on request	on request
24 DC	max 1	C22B-02400E1-13..4NBP	34184200	33288400 C22B-02400E3A-13..4NBP	on request	28811200 C22B-02400E13A-13..4NBP

PRM7-06, PRM8-06 proportional directional control valves without integrated electronic unit
Surface treatment A: 240 h salt spray test acc. to ISO 9227

Voltage [V]	Current [A]	Connector types	E1	E3A	E12A	E13A
12 DC	max 2.5	C22B-01200E1-2..33NAP	18838500	19744700 C22B-01200E3A-2..33NAP	19696100 C22B-01200E12A-2..33NAP	19909300 C22B-01200E13A-2..33NAP
24 DC	max 1	C22B-02400E1-13..4NAP	18838300	19744300 C22B-02400E3A-13..4NAP	19696200 C22B-02400E12A-13..4NAP	30691600 C22B-02400E13A-13..4NAP

PRM7-06, PRM8-06 proportional directional control valves without integrated electronic unit
Surface treatment B: 520 h salt spray test acc. to ISO 9227

Voltage [V]	Current [A]	Connector types	E1	E3A	E12A	E13A
12 DC	max 2.5	C22B-01200E1-2..33NBP	34180800	on request	on request	on request
24 DC	max 1	C22B-02400E1-13..4NBP	34184200	33288400 C22B-02400E3A-13..4NBP	on request	28811200 C22B-02400E13A-13..4NBP

PVRM3-10	Ambient temperature °C (°F)	Fluid temperature °C (°F)
	-30...+90 (-22...+194)	-30...+90 (-22...+194)

Surface treatment A: 240 h salt spray test acc. to ISO 9227

Voltage [V]	Current [A]	Connector types	EA3
12 DC	max 1.5	C22B-01200E3A-5NAP	24157900
24 DC	max 1	C22B-02400E3A-13..4NAP	19744300

Coils C31 (d = 31 mm (1.22 inch))

RPE4-10	Ambient temperature °C (°F)	Fluid temperature °C (°F)	Supply voltage tolerance % z U _N
	-30...+50 (-22...+122)	-30...+80 (-22...+176)	± 10

RPE4-10
Surface treatment A: 240 h salt spray test acc. to ISO 9227

Voltage [V]	Current [A]	Connector types	E1	E2	E3	E4	E5	E12A	E13A
12 DC	3.17	C31A-01200E1-3..78FA	16195700	27660800 C31A-01200E2-3..78FA	16197000 C31A-01200E3-3..78FA	16196900 C31A-01200E4-3..78FA	not available	33252200 C31A-01200E12A-3..78FA	on request
14 DC	2.98	C31A-01400E1-4..73FA	16195900	27660900 C31A-01400E2-4..73FA	27661100 C31A-01400E3-4..73FA	27661200 C31A-01400E4-4..73FA	not available	on request	on request
24 DC	1.73	C31A-02400E1-13..9FA	16196100	23896000 C31A-02400E2-13..9FA	16197200 C31A-02400E3-13..9FA	16197100 C31A-02400E4-13..9FA	not available	33252300 C31A-02400E12A-13..9FA	34234400 C31A-02400E13A-13..9FA
27 DC	1.52	C31A-02700E1-17..8FA	16196300	27661000 C31A-02700E2-17..8FA	27661300 C31A-02700E3-17..8FA	27661400 C31A-02700E4-17..8FA	not available	on request	33863900 C31A-02700E13A-17..8FA
205 DC	0.20	C31A-20500E1-1027FA	16196700	not available	not available	not available	not available	not available	not available
230 AC 50 Hz	0.20	not available	not available	not available	not available	not available	16195100 C31A-23050E5-1027FA	not available	not available

RPE4-10
Surface treatment B: 520 h salt spray test acc. to ISO 9227

Voltage [V]	Current [A]	Connector types	E1	E3	E4	E5	E12A
24 DC	1.73	C31A-02400E1-13..9FB	31648900	29427900 C31A-02400E3-13..9FB	33081100 C31A-02400E4-13..9FB	not available	33267000 C31A-02400E12A-13..9FB
27 DC	1.52	C31A-02700E1-17..8FB	on request	31803100 C31A-02700E3-17..8FB	on request	not available	on request
205 DC	0.20	C31A-20500E1-1027FB	34353800	not available	not available	not available	not available
230 AC 50 Hz	0.20	not available	not available	not available	not available	31884600 C31A-23050E5-1027FB	not available

Coils C31 (d = 31 mm (1.22 inch))

RPEW4-10 (Wirebox)		
Surface treatment A: 240 h salt spray test acc. to ISO 9227		
Voltage [V]	Current [A]	Connector types
12 DC	3.17	24172000 C31A-01200EW1-3.78FA/M
24 DC	1.73	24172200 C31A-02400EW1-13.9FA/M
106 DC	0.38	24172400 C31A-10600EW1-276FA/M

RPE4-10 with CSA certification		
Surface treatment A: 240 h salt spray test acc. to ISO 9227		
Voltage [V]	Current [A]	Connector types
12 DC	0.38	24172800 C31A-12060E5-276FAH

RPEW4-10 with CSA certification		
Surface treatment A: 240 h salt spray test acc. to ISO 9227		
Voltage [V]	Current [A]	Connector types
120 AC 60 Hz	0.38	24172600 C31A-10600EW1-276FAH/M

Ambient temperature °C (°F)	Fluid temperature °C (°F)
+50 (+122)	-30...+80 (-22...+176)

PRM6-10, PRM7-10

Surface treatment A: 240 h salt spray test acc. to ISO 9227			
Voltage [V]	Current [A]	Connector types	E12A
12 DC	max 1.9	16195800 C31A-01200E1-4.73FAP	33252400 C31A-01200E12A-4.73FAP
24 DC	max 1.1	16196200 C31A-02400E1-13.9FAP	33251800 C31A-02400E12A-13.9FAP

Surface treatment B: 520 h salt spray test acc. to ISO 9227		
Voltage [V]	Current [A]	Connector types
24 DC	max 1.1	33461500 C31A-02400E1-13.9FBP

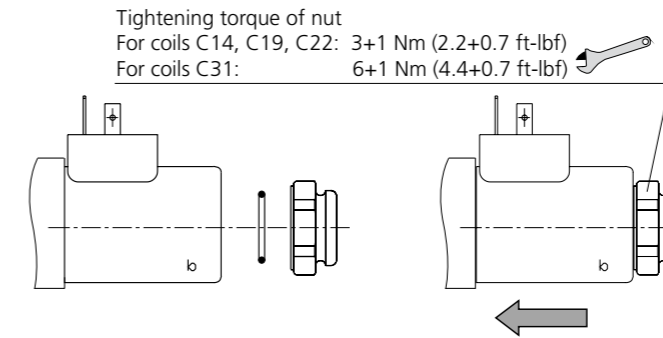
Dimensions in millimeters (inch)

C14B			
E1, E2	IP 65	E3A, E4A	IP 67
C19A			
E1, E2	IP 65	E5	IP 65
C19B			
E1, E2	IP 65	E5, E51	IP 65
E3A, EA4	IP 67	E12A, E13A	IP 67 / IP 69
C22A			
E1, E2	IP 65	E5	IP 65

Dimensions in millimeters (inch)

C22B		
E1, E2 IP 65	E5, E51 IP 65	E3A, E4A IP 67
E12A, E13A IP 67	E8, E9	
C22C		
EW1, EW2 IP 65		
C31A		
E1, E2 IP 65	E5, E51 IP 65	E3, E4 IP 67
E12A, E13A IP 67	E8, E9	EW1 IP 65

Mounting / dismantling the coils



- > Choose the correct coil type according to the valve type given in this data sheet HA 8007. When AC power supply is chosen, the connector with integrated rectifier or the connector plug with integrated rectifier must be used.
- > The coil is placed on the solenoid actuating system (as indicated in the picture) and its position is fixed by a nut. The nut must be tightened with the specified torque.
- > The connector position can be set by rotating the coil around its longitudinal axis - continuously in the range of 0-360° / by 90° for coils with a locating pin.



CAUTION

- > Coil mounting, especially the connection to power supply, must be carried out by a competent person only.



WARNING

- > Before any handling the coil must be disconnected from the power supply.
- > The hydraulic circuit must be switched off and unloaded during installation.
- > Disconnect the coil from the power supply before dismantling and let it cool down to avoid burns. The temperature may exceed 100°C (212°F) during operation.

Operation

Basic operating parameters are stated in the data sheet of the relevant solenoid operated valve and the coil description is given in the data sheet HA 8007.



CAUTION

- > Power supply parameters must correspond to the specified coil type. Switching coils are controlled by voltage. The voltage indicated on the coil is the nominal voltage. Control voltage should not deviate from nominal by more than ±10%, if not stated otherwise in the data sheet. Proportional coils are controlled by current. The current indicated on the coil is the limit (maximum) current which may continuously flow through the coil winding.
- > The coil may be energized only if correctly placed on the solenoid actuating system and properly fixed by a nut.
- > If a valve is operated by two solenoids acting in the opposite directions, the two solenoids must never be energized simultaneously.
- > Protect the coil against the effects of high temperatures and thermal shocks. The operating temperature range of hydraulic fluid and maximum ambient temperature are stated in the data sheet of the given valve. In general, there must be a sufficient heat removal from the coil so that the mean winding temperature does not exceed 155°C (311°F).
- > Protect the coil against peak voltages by a suitable overvoltage protection.
- > Protect the coil against mechanical damage, excessive vibrations and shocks.
- > Protect the coil against effects of a corrosive environment and aggressive chemicals.
- > The coil is not designed for operation immersed in fluid.



WARNING - notices regarding the residual risks

- > Damaged coils, coils with damaged parts of the power supply connector or a damaged cable must be taken out of operation immediately. There is a possibility of electric shock.
- > Don't touch the coil surface during operation. The coil becomes warm and there is a risk of burns.



Applicability of legal regulations

The following requirements apply to the coils:

- > Directive 2014/30/EU for electromagnetic compatibility of electrical equipment
- > Directive 2014/35/EU for low voltage equipment with rated voltage higher than 75 VDC and 50 VAC, respectively.

Coils are designated by the CE conformity mark and they are delivered with instructions. The declaration of conformity is issued for each item. Tests of coils according to the CSA standard are carried out together with the hydraulic part. The certification covers the complete directional control valves.

Connectors according to EN 175301-803, Form A

K*



Technical Features

- › Connectors according EN 175301-803, form A only
- › Durable angled connectors, dust and splash protected (IEC 60529 - IP65)
- › Vibration-proof locking using a central screw
- › For DC power supply available with optional electronics board with LED and protective diode
- › For AC power supply available with optional electronics board with LED, bridge rectifier and varistor
- › Common range of cable diameters from 4 mm to 8 mm using different sealings
- › Suitable for hydraulic, pneumatic, electromagnetic actuators; e.g. solenoid valves, pressure sensors, flow indicators
- › Ground pin contact position adjustable in 90° increments
- › Optional terminal box color versions, black, grey and transparent

Functional Description

Electrical connectors provide a fast and reliable interface for connecting/disconnecting to/from hydraulic and pneumatic valves, pressure switches, motor drives and other electrically driven industrial and mobil components. Innovative wire connecting methods and user-friendly assembly allow for easy installation to the electrical device. The connectors are available in many circuit versions to meet the customer's specific application requirements.

Model code	K1 and K5	K2 for voltages up to 50 V DC	K2 for voltages over 50 V DC	K3	K4
Circuit diagram					

Technical Data

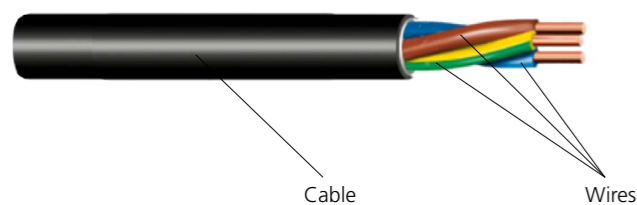
Type	Electronics design	Cable diameter mm (in)	Ambient temperature range °C (°F)
K1	without electronics	6 - 8 (0.24 - 0.32)	-25 ... +90 (-13 ... +194)
K2	LED and protective diode*	6 - 8 (0.24 - 0.32)	-25 ... +60 (-13 ... +140)
K3	bridge rectifier and varistor	6 - 8 (0.24 - 0.32)	-25 ... +90 (-13 ... +194)
K4	bridge rectifier, varistor and LED	6 - 8 (0.24 - 0.32)	-25 ... +60 (-13 ... +140)
K5	without electronics	4 - 6 (0.16 - 0.24)	-25 ... +90 (-13 ... +194)

* Diode applicable for voltages up to 50 V DC

Pressure screw torque	1.8 ± 0.2 Nm (1.33 ± 0.15 ft-lbf)
Contact screw torque	0.2 ± 0.1 Nm (0.15 ± 0.07 ft-lbf)
Central fixing screw torque	0.4 ± 0.1 Nm (0.30 ± 0.07 ft-lbf)
Wire diameter	0.5 - 1.5 mm² (0.0008 - 0.002 in²)
Degree of protection acc. to DIN EN 60529	IP65**
Number of PINs	2 poles + Ground

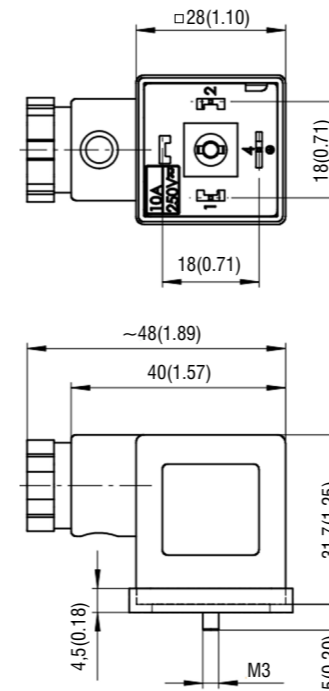
** Valid only in case of proper mounting to the socket.

Three Wire Cable

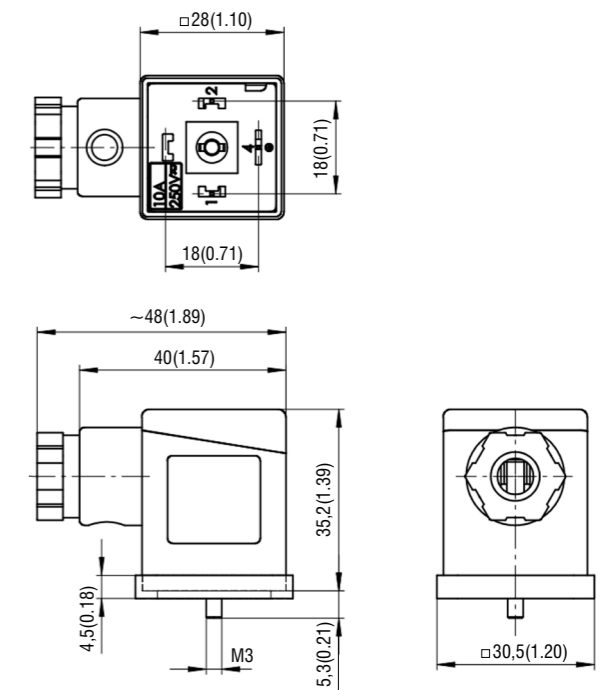


Dimensions in millimeters (inches)

Connector type K1, K2 and K5



Connector type K3 and K4



Order numbers and codes

Order code	Order number	Order code	Order number
K1-G250AC/DC-10	16202200	K3-B024AC-1.5	23928700
K1-B250AC/DC-10	16202100	K3-G250AC-1.5	16202400
K2-TG230AC/DC-1.5	23927800	K3-B250AC-1.5	16202300
K2-TB230AC/DC-1.5	23927900	K4-G230AC-1.5	16203000
K2-TG110AC/DC-10	23927600	K4-B230AC-1.5	16202900
K2-TB110AC/DC-10	23927700	K4-G110AC-1.5	23929200
K2-TG024DC-1.5	16202800	K4-B110AC-1.5	23929100
K2-TB024DC-1.5	16202700	K4-G024AC-1.5	23929000
K3-G250AC-3	23929400	K4-B024AC-1.5	23928900
K3-B250AC-3	23929300	K5-G250AC/DC-10	16202600
K3-G024AC-1.5	23928800	K5-B250AC/DC-10	16202500

Ordering Code

Connectors according to EN 175301-803, form A

Design version

- Without electronics, cable diameter 6-8 mm (0.24-0.32 in) **K1**
- With LED and protective diode*, cable diameter 6-8 mm (0.24-0.32 in) **K2**
- With bridge rectifier and varistor, cable diameter 6-8 mm (0.24-0.32 in) **K3**
- With bridge rectifier, varistor and LED, cable diameter 6-8 mm (0.24-0.32 in) **K4**
- Without electronics, cable diameter 4-6 mm (0.16-0.24 in) **K5**

*Diode applicable for voltages up to 50 V DC

Housing color

- grey **G**
- black **B**
- transparent body; gray bushing **TG**
- transparent body; black bushing **TB**

Maximal current	Type of power supply	Supply voltage range
1.5	AC only	12 V ± 15 %
3	DC only	24 V ± 15 %
10	AC or DC	110 V ± 15 %
		230 V ± 15 %
		max. 250 V

The order code is for illustrative purposes only and serves to describe the product properties. For available combinations see the table of common, preferred available versions. For other versions contact our technical support for their identification, feasibility and availability.

Content

Type Code		Page	Data Sheet
Pressure Switches, Mechanical			
TS3, MTS	CSA certified	502	HA 9202
TS4, MTS		506	HA 9204
Pressure Switches, Electronical			
TSE1		510	HA 9203
TSE2 - D	Programmable version with display	512	HA 9205

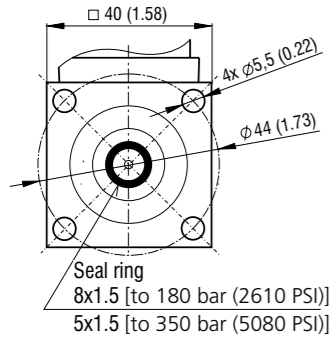
Notes

Pressure Switch, Mechanical

TS3, MTS

Size 06 (D03), 10 (D05) • p_{max} 350 bar (5100 PSI)

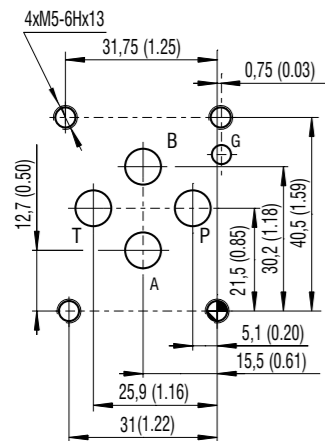
TS3



MTS

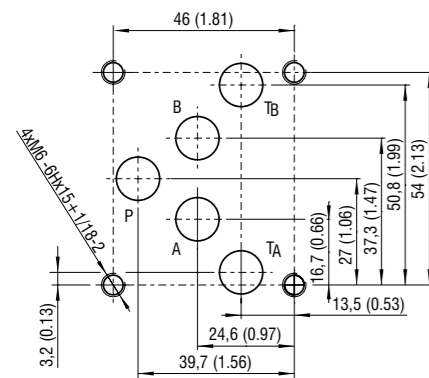


ISO 4401-03-02-0-05 (CETOP 03)



Ports P, A, B, T - max. \varnothing 7.5 mm (0.29 in)

ISO 4401-05-04-0-05 (CETOP 05)



Ports P, A, B, T - max. \varnothing 11.2 mm (0.44 in)

Technical Features

- › Piston design
- › Rugged design suitable for stationary and mobile applications
- › Wide set point pressure range up to 350 bar
- › Precise set point adjustment with Allen screw
- › Factory preset or field adjustable
- › UL, CSA certification
- › Microswitch with silver-plated contacts
- › Basic flange type expandable using connecting or modular plate
- › Subplate mounting interface acc. to ISO 4401, DIN 24340 (CETOP 03 and 05)

Functional Description

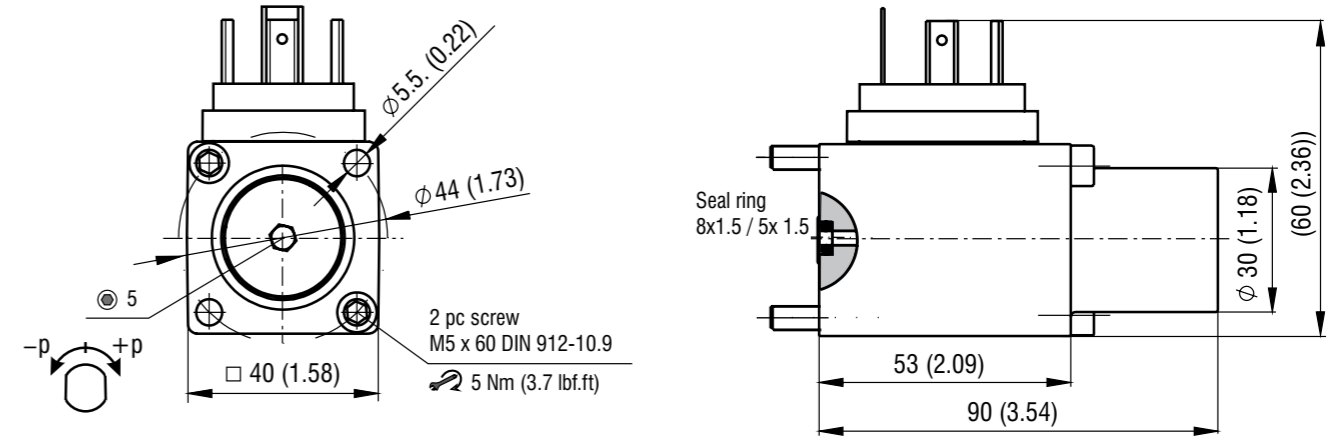
The pressure switch is intended for indication of reaching the set pressure in the hydraulic circuit. The pressure of working fluid acts on the piston face against a spring force. Pressure setting, needed for contact switching, is performed by spring compression by Allen screw turning. The built-in microswitch can be used as an opener, a closer, or a changer, depending on particular connection. There are three basic installation possibilities. The switch can be mounted with two screws on the surface of manifold (TS3-xx-0). It is also possible to use connecting plate with internal connecting thread G 1/4 (TS3-xx-1) or SAE 6 (TS3-xx-3) for fitting and with two holes for connecting screws. The third possibility is connecting to the side surface of modular plate MTS size Dn 06 or Dn 10. The switch monitors the pressure in one of the channels P, A, B. The pressure switch can be rotated by 90° steps around the longitudinal axis.

Technical Data

Sensor element		piston		
Max. operating pressure	bar (PSI)	250 (3626)	450 (6527)	
Measuring ranges (adjustable)	bar (PSI)	5 ... 180 (73 ... 2611)	50 ... 350 (725 ... 5076)	
Adjustable pressure (pressure rises)	bar (PSI)	5 ... 180 (73 ... 2611)	50 ... 350 (725 ... 5076)	
Adjustable pressure (pressure drops)	bar (PSI)	3 ... 160 (44 ... 2321)	30 ... 300 (435 ... 4351)	
Compressive strength	bar (PSI)	600 (8702)		
Hysteresis	%	≤15 range of measurement		
Max. switching frequency	min ⁻¹	60		
Repeatability	%	±1 of measuring range		
Ambient temperature	°C (°F)	-40 ... +80 (-40 ... +176)		
Max. temperature of switch	°C (°F)	+80 (+176)		
Service life	cycles	> 3 mil. switchings		
Material	housing	aluminum alloy		
	seals	NBR		
Mass	kg (lb)	0.35 (0.77) without flange		
Electrical data				
Electrical connection		connector EN 175301-803, type A		
Microswitch (voltage / current)		250 V AC / 3 A, 125 V AC / 5 A, 30 V DC / 3 A		
Switched load	A	inductive load	resistive load	
		30 V DC	3	4
		250 V DC	0.2	0.2
		250 V AC	2	3
		125 V AC	3	5
Minimum load 160 mA at 5 V DC				
Enclosure acc. to EN 60529		IP65		

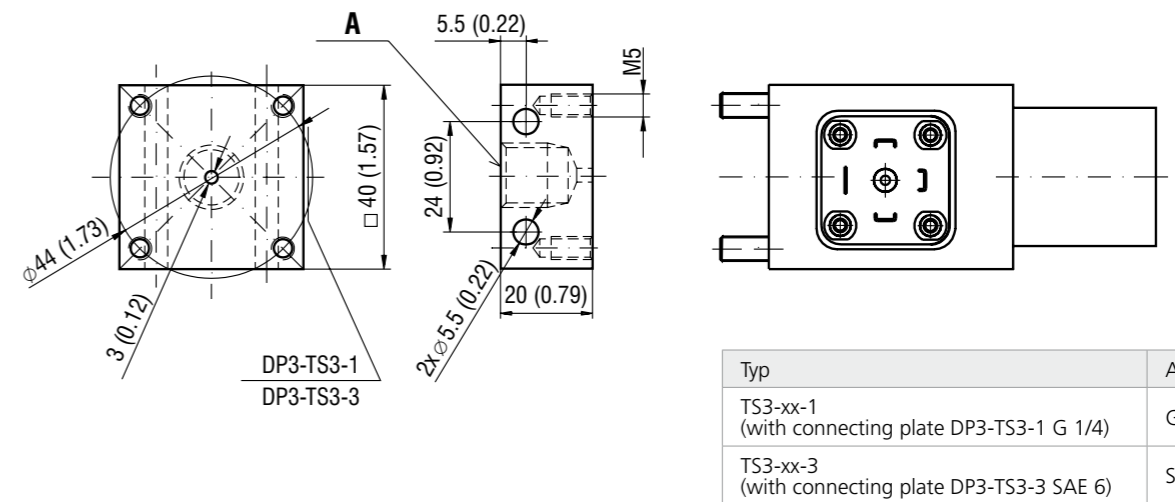
Dimensions in millimeters (inches)

Typ TS3-xx-0 (without connecting plate)

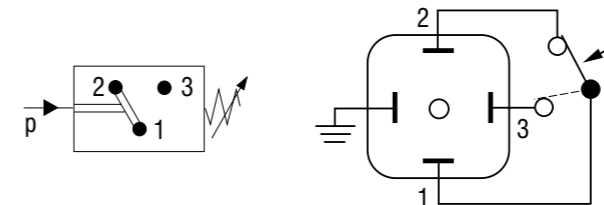


O-ring and mounting screws are supplied.

Typ TS3-xx-1 (with connecting plate DP3-TS3-1 G 1/4) / Typ TS3-xx-3 (with connecting plate DP3-TS3-3 SAE 6)

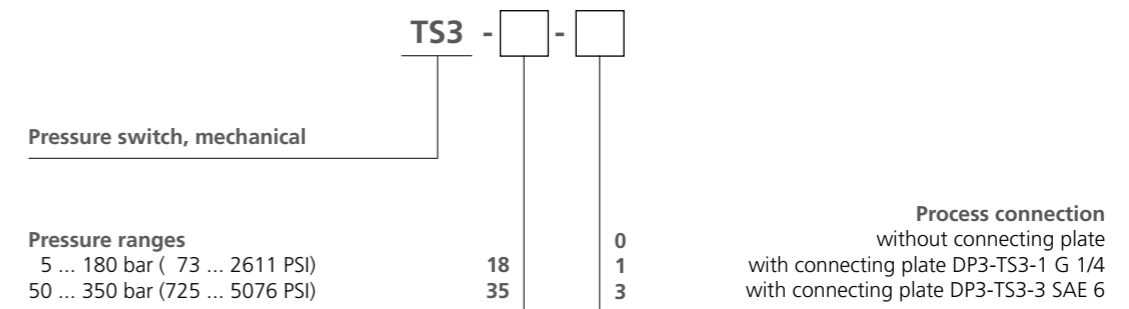


Electrical Connection



Switching functions:
with increasing pressure the change-over switch opens the connection 1 – 2 and closes the circuit between 1 – 3.

Ordering Code



Pressure Switch, Mechanical

MTS

Size 06 (D03), 10 (D05) • p_{max} 350 bar (5100 PSI)

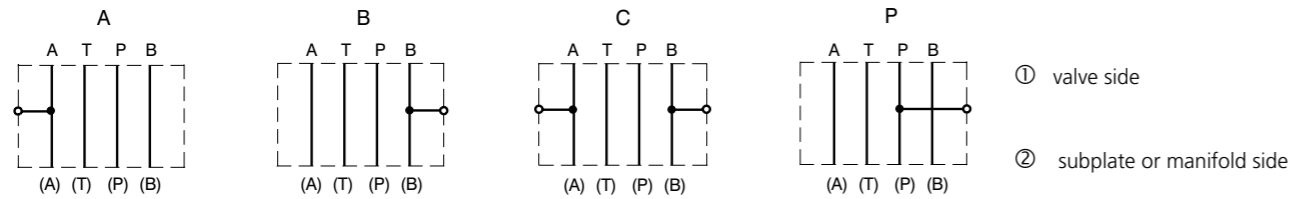


Technical Features

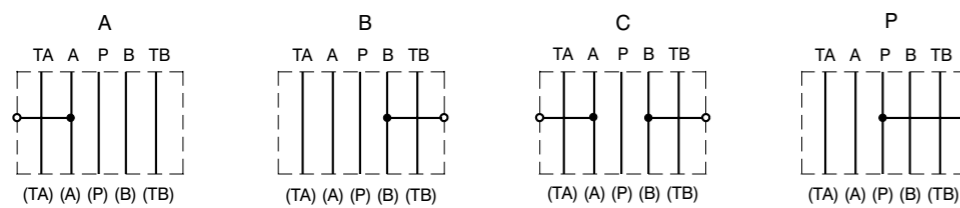
- › Subplate interface acc. to ISO 4401, DIN 24340 (CETOP 03 and 05)
- › Sandwich plate design for use in vertical stacking assemblies
- › In the standard version, the valve housing is phosphated and steel parts are zinc-coated for 240 h protection in NSS acc. to ISO 9227

Functional Symbols

MTS sandwich plates size 06



MTS sandwich plates size 10



Ordering Code

MTS - /

Modular plate for pressure switch TS3

Nominal size
ISO 4401-03-02-0-05, DIN 24340 (CETOP 03), size 06 **06**
ISO 4401-05-04-0-05, DIN 24340 (CETOP 05), size 10 **10**

No designation
A zinc-coated (ZnCr-3), ISO 9227 (240 h)
B zinc-coated (ZnNi), ISO 9227 (520 h)

Surface treatment
phosphated body

Functional symbol
connection in port A
connection in port B
connection in port A and B
connection in port P

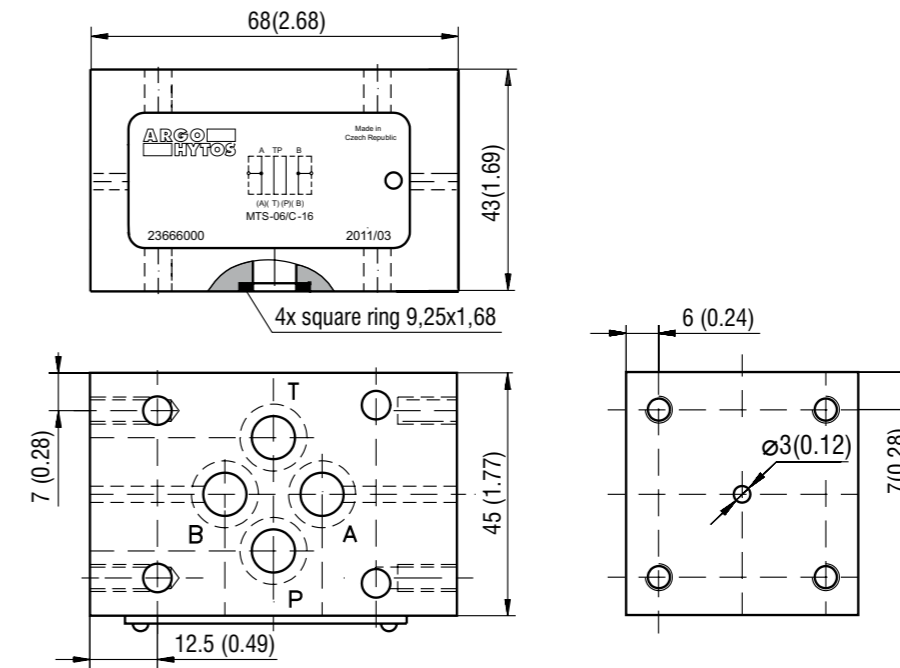
A
B
C
P

Accessories

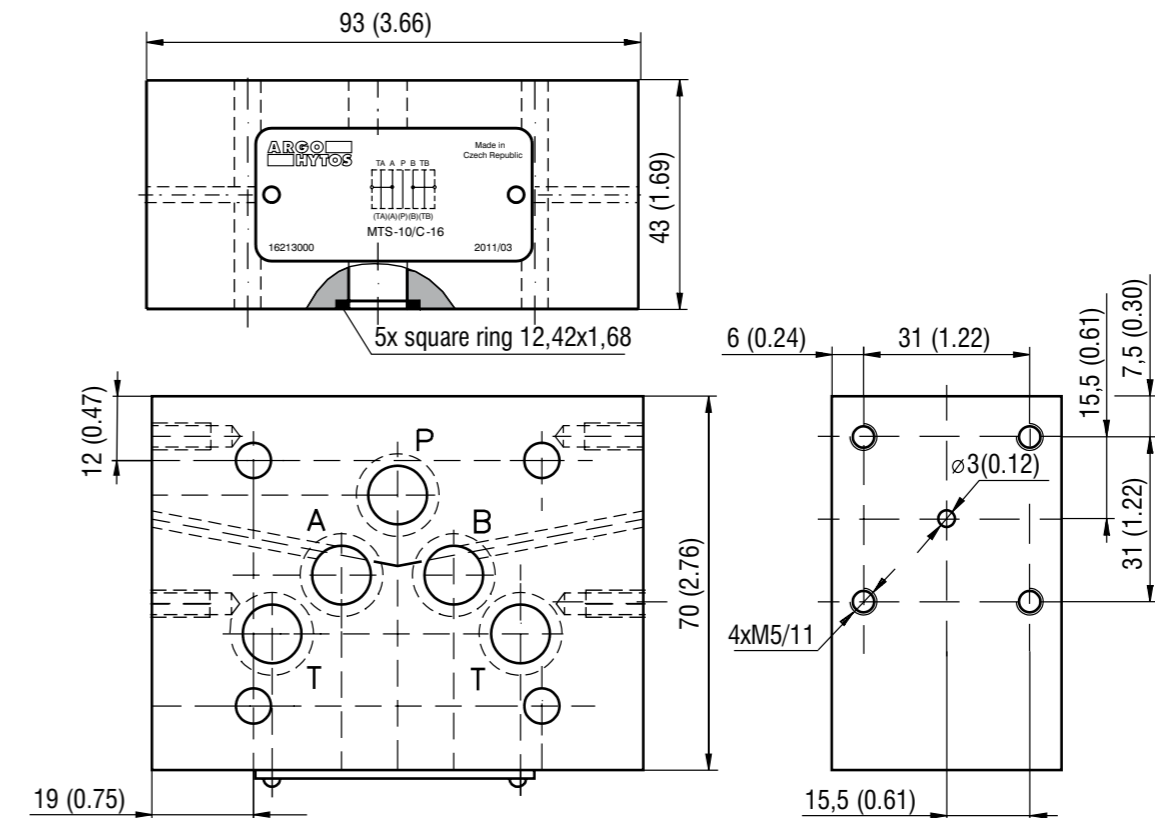
Connectors EN 175301-803-A		
Type	Solenoid connections	Ordering number
Connector	Standard	28787900

Sandwich Plate Dimensions in millimeters (inches)

MTS-06/C



MTS-10/C



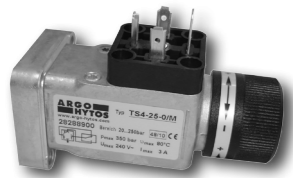
The pressure switch can be rotated by 90° steps around the longitudinal axis.

Pressure Switch, Mechanical

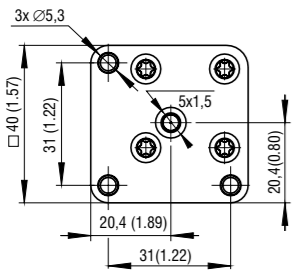
TS4, MTS

Size 06 (D03), 10 (D05) • p_{max} 350 bar (5100 PSI)

TS4



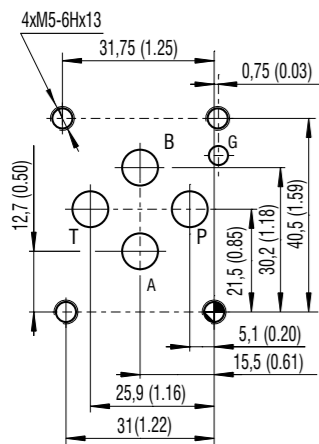
ISO 16873



MTS

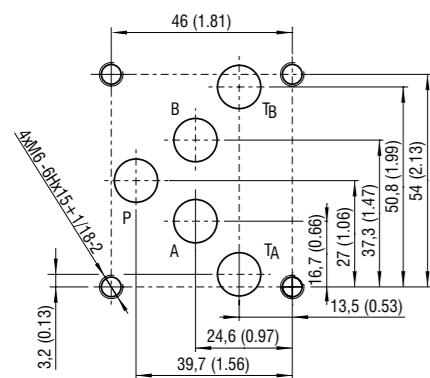


ISO 4401-03-02-0-05 (CETOP 03)



Ports P, A, B, T max. Ø 7.5 mm (0.29 in)

ISO 4401-05-04-0-05 (CETOP 05)



Ports P, A, B, T max. Ø 11.2 mm (0.44 in)

Technical Features

- › Proven design in stationary and mobile hydraulic applications
- › Rugged construction, vibration- and shock-proof, long-term stability
- › Wide setpoint pressure range
- › Available in a wide range of configurations
- › Precise setpoint adjustment
- › Factory preset or field adjustable
- › Modular concept and manifold mount
- › AC and DC power supply options
- › Fluid connection: G1/4 and vertical flange acc. to ISO 16873
- › Subplate mounting interface acc. to ISO 4401, DIN 24340 (CETOP 03 and 05)

Functional Description

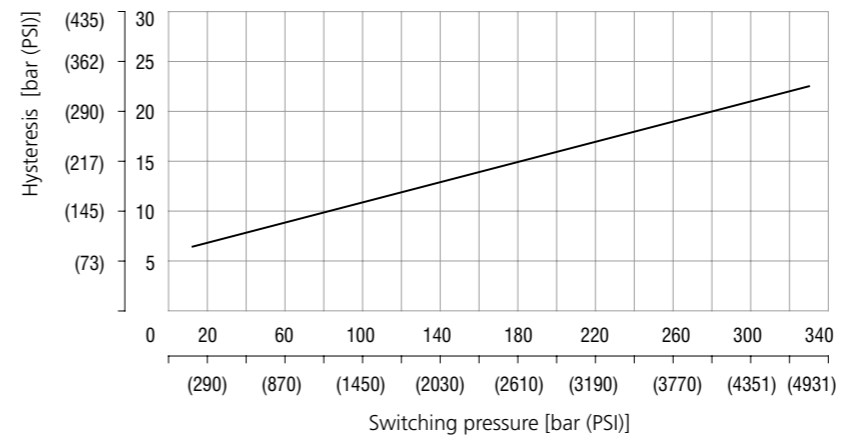
The TS pressure switch converts hydraulic signals into electrical signals. The switching point is continuously adjustable within the operating pressure range by an easy to handle adjusting knob. The adjusted switching point can be locked into position. The built-in micro switch can be used as an opener, a closer, or a changer depending on the particular wiring. The pressure switch is intended for use under normal industrial conditions in technical equipment and machines with a maximum system pressure up to 350 bar. The switches are supplied with a flange (ISO 16873) and three M5 screws, or with a versatile screwed connection. Together with the MTS vertical grouping plate of Size 06 or Size10 the pressure switch may be flanged laterally to pick-up the pressure signal in one of the channels (A,B,P). The switch can be mounted at 90° rotational increments, providing additional flexibility during installation. Optional: socket with or without LED available (see accessories).

Technical Data

Sensor element	piston			
Process connection (male)	Revolving nipple with internal thread G1/4, vertical flange ISO 16873			
Max. operating pressure	bar (PSI)	350 (5080)		
Measuring ranges (adjustable)	bar	10...80	10...160	20...250
	(PSI)	(145...1160)	(145...2320)	(290...3630) (435...4640)
Operating fluids	self-lubricating fluids like:hydraulic oils of power classes (HL, HLP) to DIN 51524, grease, light heating oil			
Viscosity range	mm ² .s ⁻¹	20 ... 100 (allowable range 12 ... 500)		
Switching frequency	min ⁻¹	100		
Repeatability of maximum operating range	%	±2		
Max. fluid temperature	°C (°F)	+80 (+176)		
Ambient temperature	°C (°F)	-10 ... +80 (14 ... +176)		
Service life	cycles	> 6 mil.switchings		
Material	housing	zinc die-cast		
	adjusting knob	aluminum, coated		
	seals	Dynamic: PTFE, Static: NBR		
Mass	kg (lb)	0.33 (0.72)		
Vibration resistance g	m.s ⁻²	10 g (10 ... 2000 Hz)		
Shock resistance g	m.s ⁻²	30		
Electrical data				
Electrical connection	acc. to EN 175301-803, Type A			
Power supply	EN 60947	AC 12	4 A	250 V AC
		AC 14	1 A	250 V AC
		DC 12	3 A	28 V DC
		DC 14	1 A	28 V DC
Enclosure acc. to EN 60529	IP65			

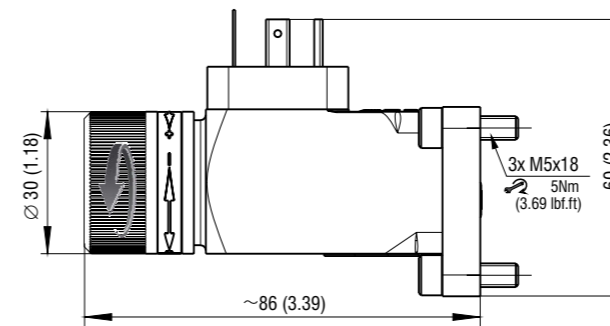
Characteristics measured at v = 32 mm²/s (156 SUS)

Differential Reset

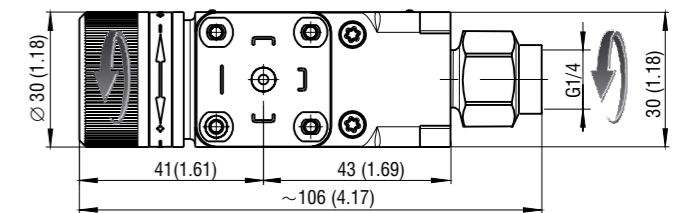


Dimensions in millimeters (inches)

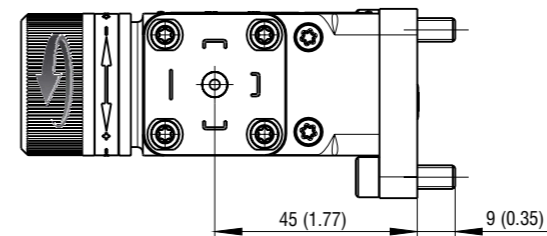
Type TS4-xx-0 (with flange DIN ISO 16873)



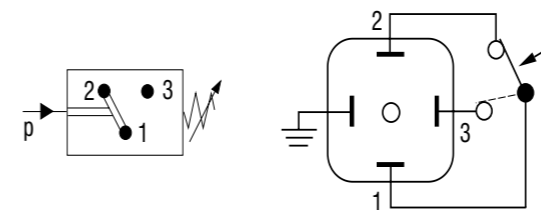
Type TS4-xx-1



Revolving nipple with internal thread G1/4.



Electrical Connection



Switching functions:
with increasing pressure the change-over switch opens the connection 1 – 2 and closes the circuit between 1 – 3

Ordering Code

TS4 -	-	-	
Pressure switch, mechanical			
Pressure ranges			
10...80 bar (145...1160 PSI)			08
10...160 bar (145...2321 PSI)			16
20...250 bar (290...3626 PSI)			25
30...320 bar (435...4641 PSI)			32
			0
			1
Process connection			
with flange ISO 16873			
with internal thread G1/4			

Pressure Switches, Mechanical

MTS

Size 06 (D03), 10 (D05) • p_{max} 350 bar (5100 PSI)

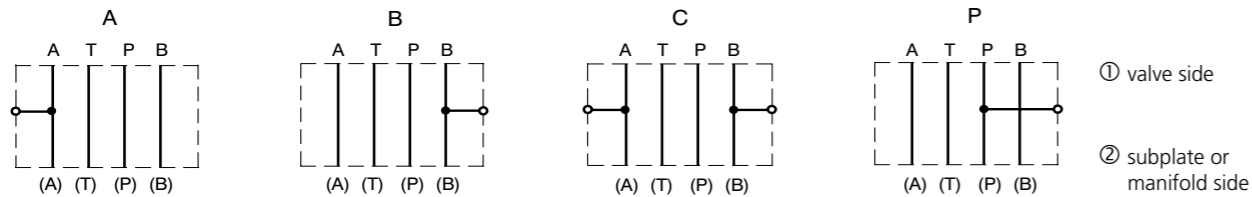


Technical Features

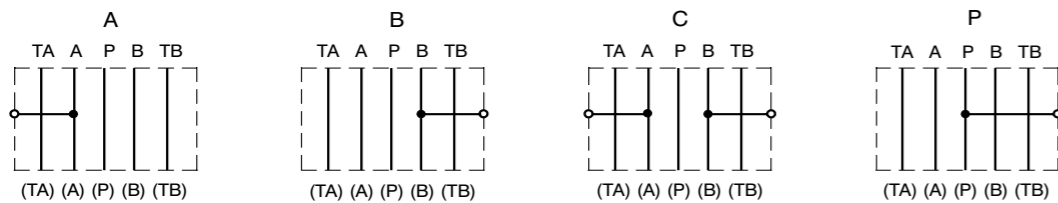
- › Subplate interface acc. to ISO 4401, DIN 24340 (CETOP 03 and 05)
- › Sandwich plate design for use in vertical stacking assemblies
- › In the standard version, the valve housing is phosphated and steel parts are zinc-coated for 240 h protection acc. to ISO 9227

Functional Symbols

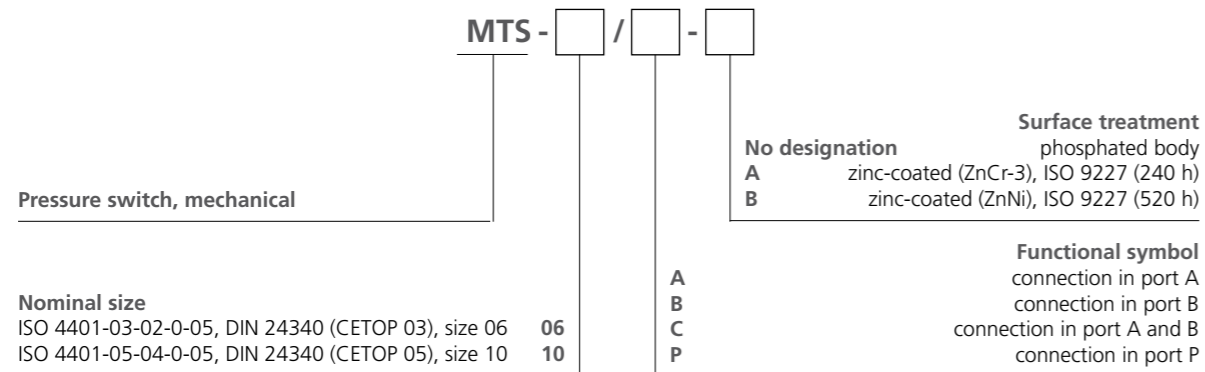
MTS sandwich plates size 06



MTS sandwich plates size 10



Ordering Code

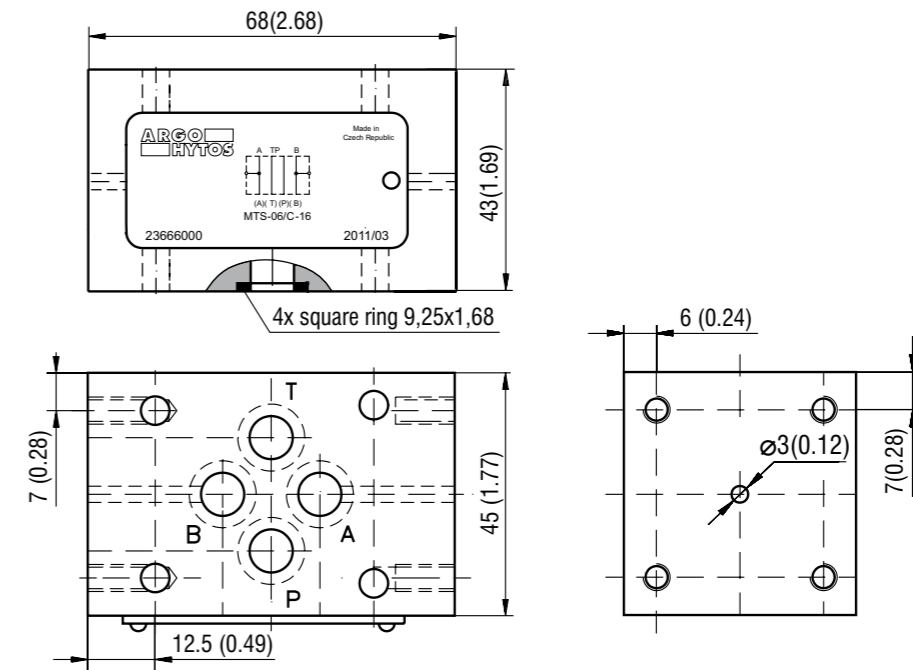


Accessories

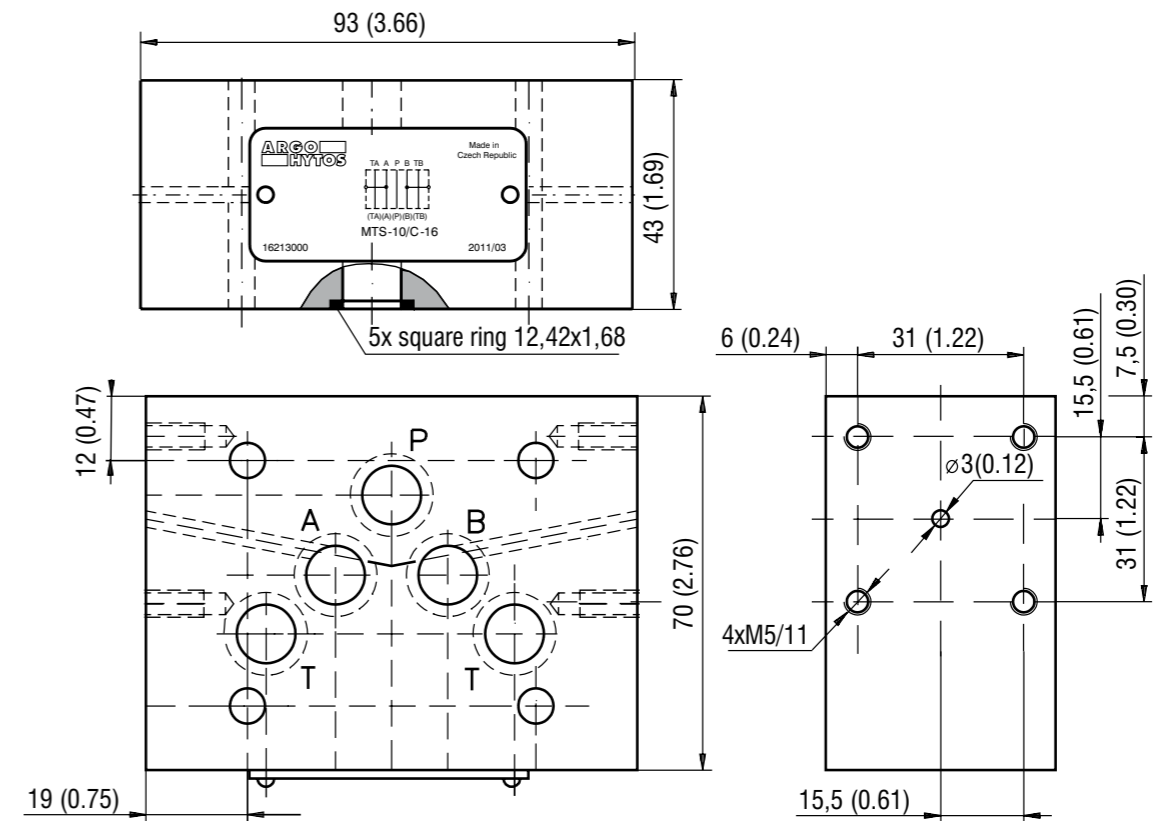
Connectors EN 175301-803-A		
Type	Solenoid connections	Ordering number
Connector	Standard	28787900

Sandwich Plate Dimensions in millimeters (inches)

MTS-06/C



MTS-10/C

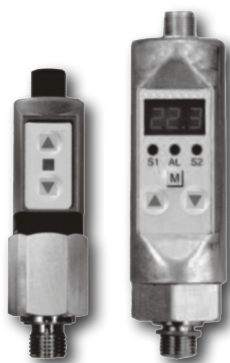


The pressure switch can be rotated by 90° steps around the longitudinal axis.

Pressure Switch, Electronical

TSE1

p_{max} up to 400 bar (5800 PSI)



phased out in 2017

Technical Features

- ▶ Pressure control with internal stainless steel diaphragm
- ▶ High accuracy (0.5 %) with fully adjustable deadband
- ▶ 2 solid state PNP contacts or 1 solid state PNP contact and 1 analog output
- ▶ Digital display readout, configurable via keypad
- ▶ Rugged construction, vibration- and shock-proof, long-term stability
- ▶ Suitable for rapid cycling (100 times per second)
- ▶ Rotatable 320° housing
- ▶ Sensor element: piezoresistive silicone device
- ▶ Microprocessor, self-monitoring with error code display, keypad lock
- ▶ cULus approved

Functional Description

The **TSE1-N Electronic Pressure Switch** provides accuracy, long life and durability with features and functions that mechanical switches cannot provide. The features include an accuracy of +/- 1 % over the full range, a pressure range from 0... 400 bar (5800 PSI), a 320° rotatable housing and either two switching outputs or 1 switching output with adjustable hysteresis. The TSE1-N allows precise, quick and easy set point adjustment, even while installed on an application. Its small size makes it perfect for applications where space is an issue, as in mobile hydraulics, hydraulic power units, machine tools, injection molding machinery and factory automation.

The **TSE1-D Electronic Pressure Switch** offers the accuracy of an electronic pressure switch in an economical package. The electronic pressure switch is available in two different configurations: as a dual pressure switch or as a single switch with an integrated 4... 20 mA analog output. Setpoints and deadband are easily adjusted through the keypad and the user-friendly menu. The analog transducer output is scalable from 25 % to 100 % of the full adjustable range. A 10-bit microprocessor provides built-in self diagnostics and allows for switch time delays and pressure cycling up to 100 times per second.

Technical Data

		TSE1-N	TSE1-D
Sensor element		Piezoresistive silicone sensor	
Process connection (male)		G1/4	
Measuring ranges		bar (PSI) 0... 100 (0... 1500) / 0... 400 (0... 6000)	
Proof pressure		150 (2200) / 600 (8700)	
Linearity error at 25 °C (77 °F)		%	
		±5	±0.5
Repeatability		%	
		±1	±0.1
Fluid temperature range		°C (°F) -25... +100 (-13... +212)	
Ambient temperature range		°C (°F) -10... +70 (+14... +158)	
Compensation range		°C (°F) -10... +70 (+14... +158)	
Storage temperature		°C (°F) -30... +80 (-22... +176)	
Temperature influence		%	
		±0.2	
Mass		kg (lbs)	
		0.15 (0.33)	0.2 (0.44)
Material	wetted parts	Stainless steel, passivated, Al ₂ O ₃	
	housing	PA 6.6	Aluminum
	seals	Viton (FPM fluorelastomer)	
Approvals, tests		vibration: 10 g / 20 to 2000 Hz shock: 100 g / 11 ms	
Certification cULus		file No. E42816	
Electrical data			
Electrical connection		Plug M12x1; 4-pin	
Supply voltage (reverse polarity protected)		V DC 15... 32, reverse polarity protected (SELV, PELV)	
Current consumption (without load)		mA approx. 50	
Local operating interface		2 push buttons	3 push buttons
Enclosure type acc. to EN 60529*		IP65 (indoor only)	
Switching outputs (PNP)			
Adjustment range and hysteresis		%	
		0... 100	0... 125
Switching frequency		Hz 100	
Contact rating (switching current)		mA	
		200 (short-circuit proof)	400 (short-circuit proof)

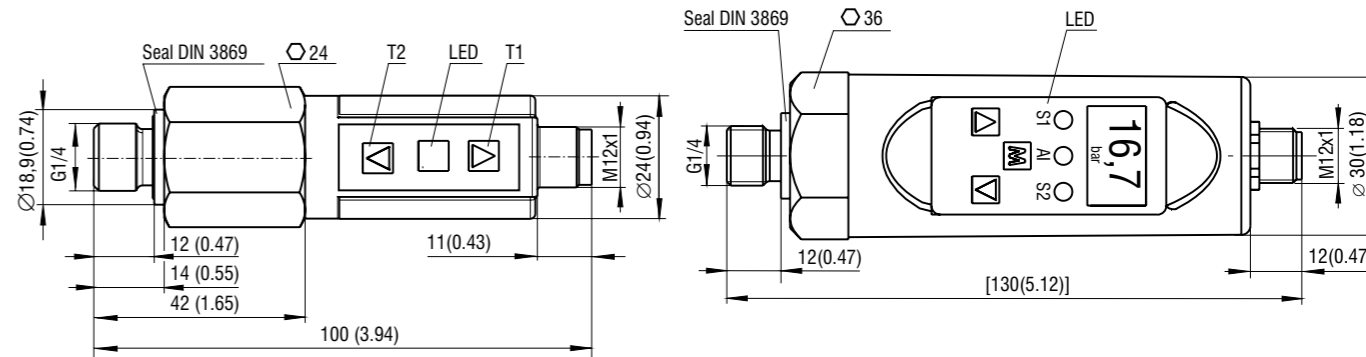
*The indicated IP protection level is reached only if the connector is properly mounted.

		TSE1-D
A/D-Converter		
Resolution		10 bit (1.024 steps per measure span)
Refresh rate		1/s 200 (for peak value memory)
Analog output		
Current output		mA 4... 20
Max. load resistance		Ω $R_L = (U_b - 12 V) / 20 mA$ $R_L = 600 \Omega$ at 24 V DC
Load influence		0.3 % / 100 Ω
Scanning rate		ms 5
Voltage output		V DC 0... 10
Rating (short circuit-proof)		mA max. 10
Adjustment range		% 25... 100
Transistor switching output(s) PNP		normally open / normally closed
Switching function		standard / window-mode
Digital display		3-digit 7-segment LED display, height 10 mm, (0.39 in), red
Display range		-1 to 999
Display rate		1/s 20
Delay (adjustable)		s 0.0... 9.9
Status display(s)		green LED (s)
Error display		orange LED (alarm)

Dimension in millimeters (inches)

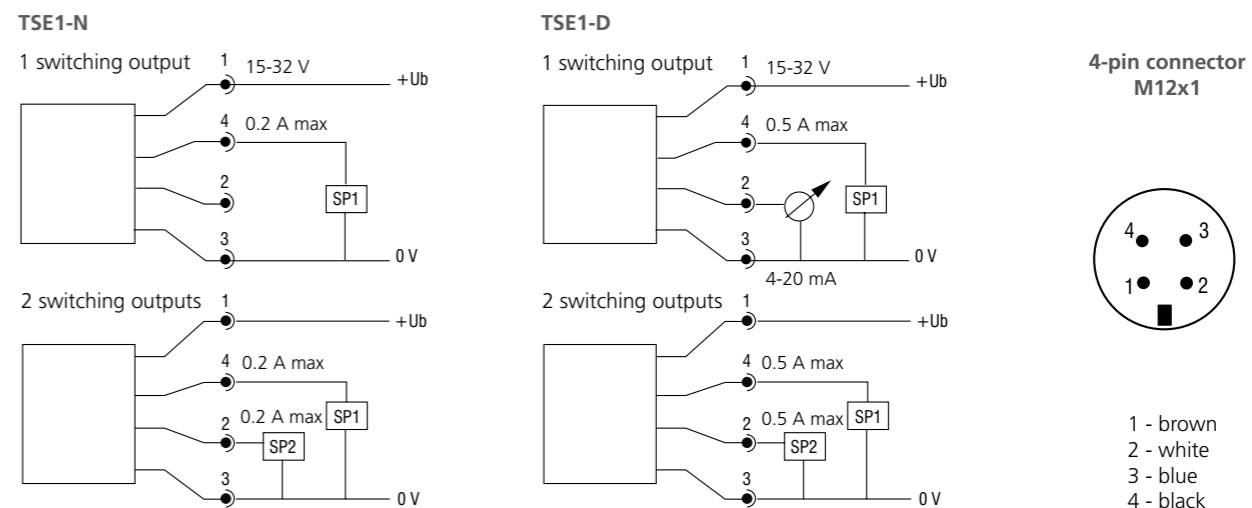
TSE1-N

TSE1-D

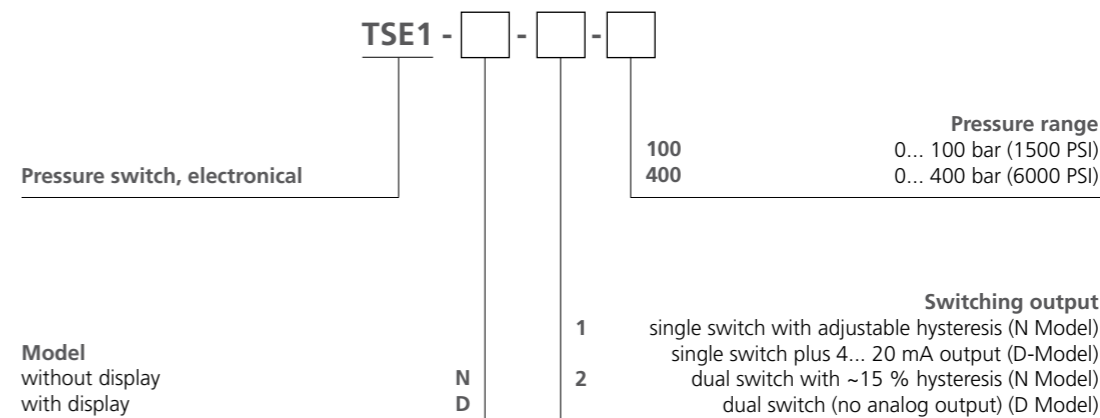


Standard versions / accessories	Ordering number	
1 Switching output with adjustable hysteresis	27878300	TSE1-N-1-400
2 Switching outputs with 15 % hysteresis	27940400	TSE1-N-2-400
1 Switching output and 1 analog output 4... 20 mA	27878600	TSE1-D-1-400
2 Switching outputs	27878500	TSE1-D-2-400
Adapter G1/4 male thread IG G1/4 for optimum alignment of pressure switch	27885100	
Plug connector M12x1, 4-pin, with screw terminals, foldet	27940900	
Plug connector M12x1, 4-pin, with screw terminals, straight	27940800	

Electrical Connection Schematic



Ordering Code



Electronic Pressure Switches

TSE2-D

p_{max} up to 400 bar (5800 PSI)



Technical Features

- › Suitable for indoor and outdoor applications, thanks to anticorrosive treatment
- › Digital display indicating actual system pressure
- › Rotatable 320° display
- › Rotatable 320° steel body with connection
- › Two adjustable pressure switch points
- › Analogue output signal 4 - 20 mA
- › High accuracy ceramic sensor
- › Rugged design, vibration-and shock proof
- › High immunity to electromagnetic radiation
- › 12 bit self-monitoring microprocessor with error code display

Functional Description

The pressure switch is intended for indication reaching the set pressure in the hydraulic circuit. The digital display allows visual pressure monitoring. Electronic pressure switch TSE2-D with a digital display is fully programmable using three integrated buttons, also out of hydraulic circuit. Twelve bit processor provides contact switching with the frequency up to 100 Hz and a time shifted switching. The analogue output signal can be set from 25 to 100 %.

The pressure switch is produced in three basic versions:

- single pressure switch with an analogue output 4... 20 mA
- dual pressure switch
- dual pressure switch with an analogue output 4... 20 mA

Technical Data

Sensor element		Ceramic sensor	
Materials	Electronics housing	Stainless steel, mat. no. V2A, PA	
	Wetted parts	Stainless steel, mat. no. 1.4301	
	Seals	FKM	
Process connection (external)		G1/4	
Measuring ranges	bar (PSI)	0... 100 (0... 1500)	0... 400 (0... 6000)
Proof pressure	bar (PSI)	150 (2200)	600 (8700)
Operating elements		3 easy-response pushbuttons	
System of protection EN 60529		IP65	
Protection class		III	
Electrical connection		Plug M12x1 (4-pin / 5-pin see el. connection)	
Mass	kg (lbs)	0.3 (0.66)	
Electrical data			
A/D converter		12 bit	
Resolution		4096 steps per measuring span	
Scanning rate		1000/s	
Linearity error		< ±0.5 % v. f. s. at 25 °C (77 °F)	
Temperature influence		< ±0.2 % v.f.s. / 10K	
Compensation range	°C (°F)	-10... +70 (+14... +158)	
Repeatability		±0.1 % v. f. s.	
Temperature range:			
Medium	°C (°F)	-25... +100 (-13... +212)	
Electronics		-10... +70 (+14... +158)	
Storage		-30... +80 (-22... +176)	
Power supply	V DC	15... 32, reversed polarity protected (SELV, PELV)	
Digital display		4-digit 14-segment LED display, red, digit height 9 mm	
Error display		LED red and alphanumeric display	
Power consumption	mA	approx. 50 (without load)	
Analog output		4... 20 mA	
Scanning rate		2 ms	
Adjustment range		25... 100 % f.s.	
Transistor switching outputs PNP			
Switching function		normally open / normally closed, standard / window mode and diagnosis function adjustable	
Adjustment range for switching point and hysteresis		0... 125 % f. s.	
Max. switching frequency	Hz	100	
Load		max. 500 mA, short-circuit proof	
Delay		0... 50 s adjustable	

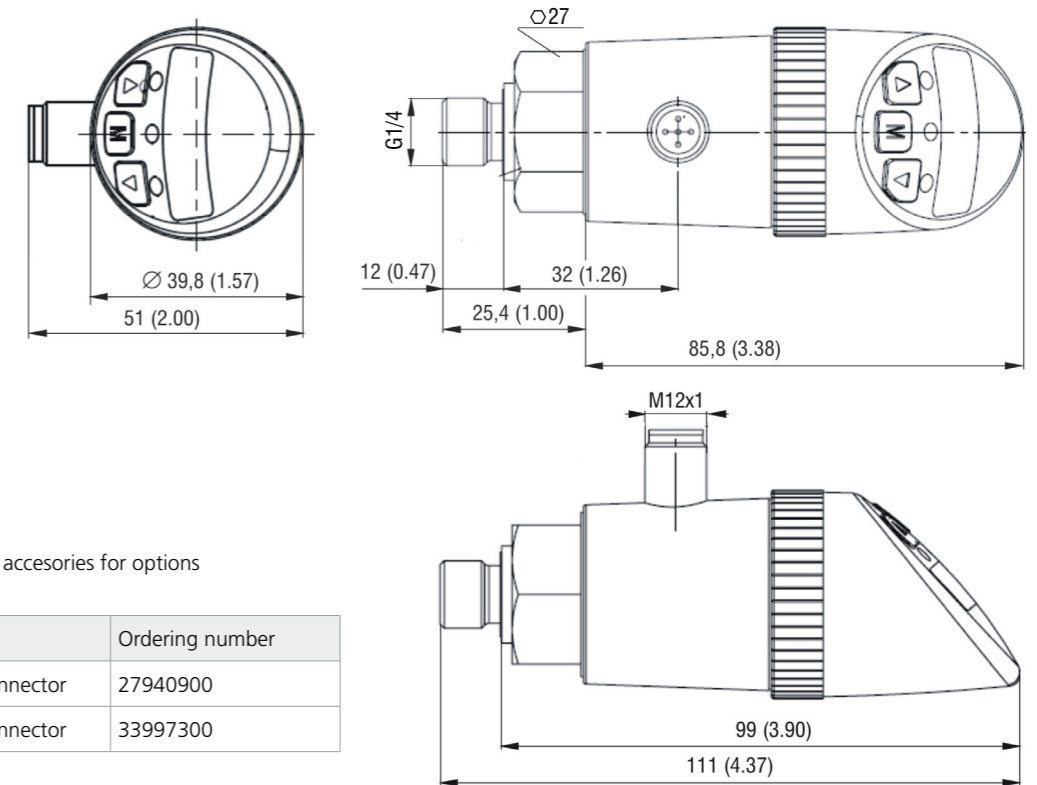
Approvals

EMV	
EN 61000-4-2 ESD	4 kV DC/8 kW AD
EN 61000-4-3 HF radiated	10 V/m
EN 61000-4-4 Burst	2 kV
EN 61000-4-5 Surge	0.5/1 kV
EN 61000-4-6 HF conducted	10 V
Mechanical shock and vibration	
DIN EN 60028-2-27 shock resistance	50 g (11 ms)
DIN EN 60028-2-26 vibrations resistance	20 g (10... 2000 Hz)
certification cULus	E42816

In the pressure inlet a damping screw made of brass is mounted. This screw can be removed, if required, e.g. in the case of soiled medium or material incompatibility, using a slotted screw driver [max. width 3 mm (0.12 in)]. The pressure switch is less resistant to pressure peaks when the damping screw has been removed.

Dimensions in millimeters (inches)

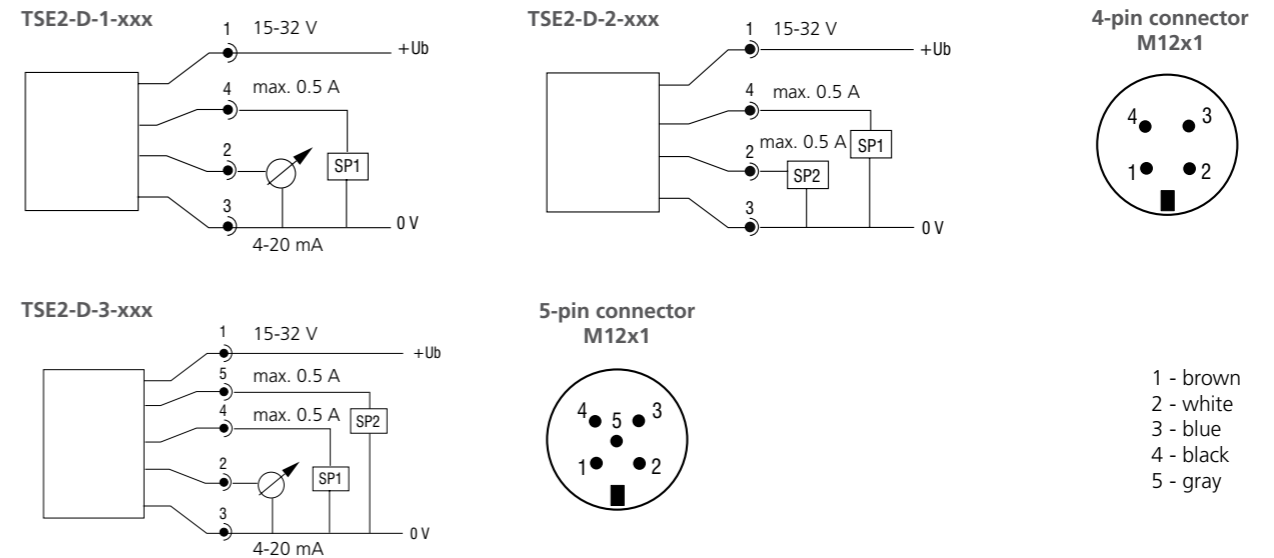
TSE2-D



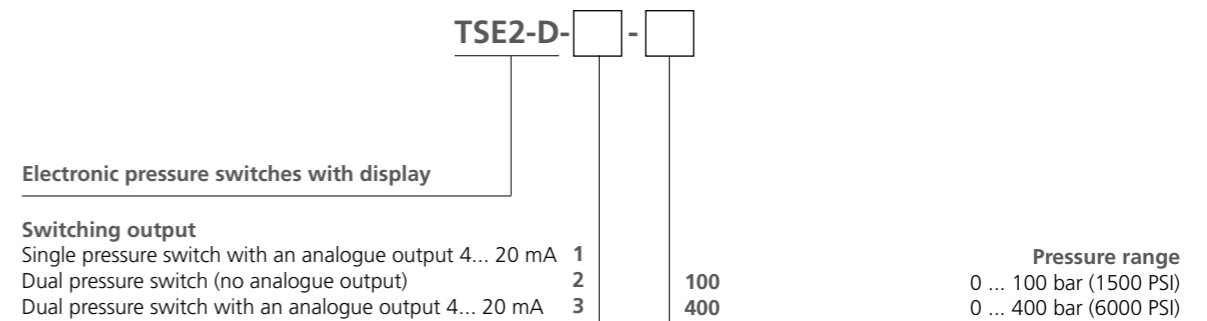
Mating connector not included, see accessories for options

Accessories	Ordering number
4 pin M12x1 female right angle connector	27940900
5 pin M12x1 female right angle connector	33997300

Electrical Connection Schematic



Ordering Code



Content

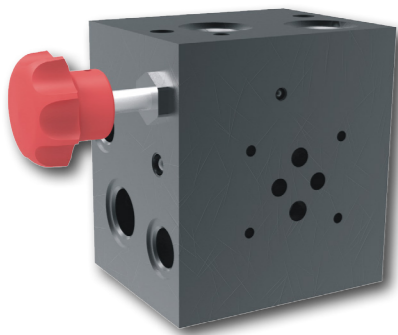
Type Code		Page	Data Sheet
Base Plates with Pressure Relief Valve			
DP6	SA4 Power pack base plate for valves, size 06, 10 (D03, D05)	516	HA 0012
ZB06	SA4 Power pack base plate for serial plates PD06 and valves, size 06 (D03)	518	HA 0010
ZB10	SA4 Power pack base plate for serial plates PD10 and valves, size 10 (D05)	522	HA 0021
Serial Plates for ISO 4401 Modular Valves			
DR1-04	Non stackable serial plate for valves, size 04 (D02)	528	HA 0017
PD04	Stackable serial plate for valves, size 04 (D02)	530	HA 0005
DR2-06	Non stackable serial plate for valves, size 06 (D03)	536	HA 0026
PD06	Stackable serial plate for valves, size 06 (D03)	538	HA 0006
PD10	Stackable serial plate for valves, size 10 (D05)	544	HA 0008
Sandwich Plates for ISO 4401 Modular Valves			
SB-04 (06,10)		550	HA 0028
Sub-Plates for ISO 4401 Modular Valves			
DP-04 (06,10)		562	HA 0002
Blanking Plates for ISO 4401 Modular Valves			
DK1-04 (06,10)		570	HA 0003
In-Line Bodies for Screw In Cartridge Valves			
SB		572	HA 0018

Notes

Base Plate with Pressure Relief Valve for Serial Plate Assemblies

ZB06

Size 06 (D03) • p_{max} 320 bar (4600 PSI)



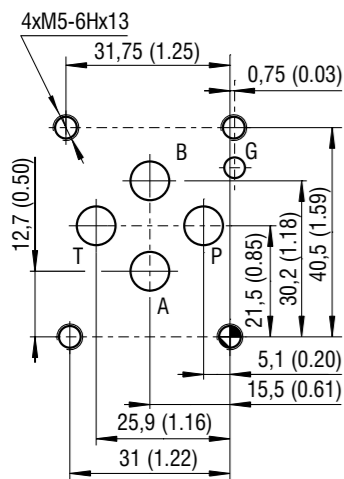
Technical Features

- › Tank cover mounted base manifold for hydraulic power packs which require one directional valve, optionally stackable with PD06-Z6 (Cat. 0006) serial plates
- › Designed for flange mounted valves with pattern acc. to ISO 4401-03 (CETOP 03)
- › Simplified models ZB06L* for cost effective circuit design and assembly with stackable serial PD06-Z6 plates
- › Integrated functions for circuit unloading drain, main circuit check and pressure relief valves
- › Suitable for mounting the pump drive unit horizontally on the tank cover, or for vertical arrangement with the pump situated in the tank under the oil level
- › Variety of models support the build-up of systems with constant or regulated pumps
- › In the standard version, the ZB06A(B) plate housing is phosphated and the steel parts are zinc-coated for 240 h protection acc. to ISO 9227
- › In the standard version, the ZB06L plate housing is without surface treatment (blank)

Technical Data

Modular valves mounting surface		06 (D03)	
Cartridge cavity		M28x1.5 / QP2	
Max. operating pressure	bar (PSI)	aluminium 250 (3626)	
	bar (PSI)	steel 320 (4640)	
Max. flow	l/min (GPM)	50 (13.2)	
Port dimensions		ZB06A(B)	ZB06L
		P, P1, T, T1, T2 ... G1/2	P, T ... G1/2
		A, B, PP2, D2 ... G3/8	D2, T1, T2 ... G3/8
		L2 ... G1/8	-
Mass	ZB06A(B)	kg (lbs)	steel 4.7 (10.4)
	ZB06L		aluminium 1.5 (3.31)
Data sheet		Type	
General information	GI_0060	Products and operating conditions	
Cavity details / Mounting interface	SMT_0019	SMT-QP2* Size 06 / CETOP 03	
Studs and nuts for vertical stacking assemblies - Dn04,06,10_0020			

ISO 4401-03-02-0-05 (CETOP 03)



Ports P, A, B, T max \varnothing 7.5 mm (0.29 in)

Ordering Code

ZB06 - **QP2** - - **K** -

Base manifold with pressure relief valve for PD serial plates assembly

Size, mounting interface of serial plates base plate for PD06-Z6 serial plates

Models with one mounting interface acc. to ISO 4401, DIN 24340 (CETOP 03) with check valve without check valve A
B

Models without mounting interface acc. to ISO 4401, DIN 24340 (CETOP 03) without check valve L

Pressure relief valve cavity M28x1.5 / QP2 (VPP1-06 / VPP2-06)* QP2

*Pressure relief valve is not supplied with the ZB block see catalogue HA_5061 (VPP1-06), HA_5062(VPP2-06)

Surface treatment
No designation phosphated (steel plate)
without threatment (aluminium plate)

Seals
K seal plate for oil tank cover assembly

Material of base manifold
aluminium, EN AW-7075 T6
steel*
*only for „ZB06A(B)“ models

Design models for ZB06L types
1 T return line from plate side
2 T return line from bottom side
3 two T return lines from plate and bottom side

Design models for ZB06A(B) - list of combinations

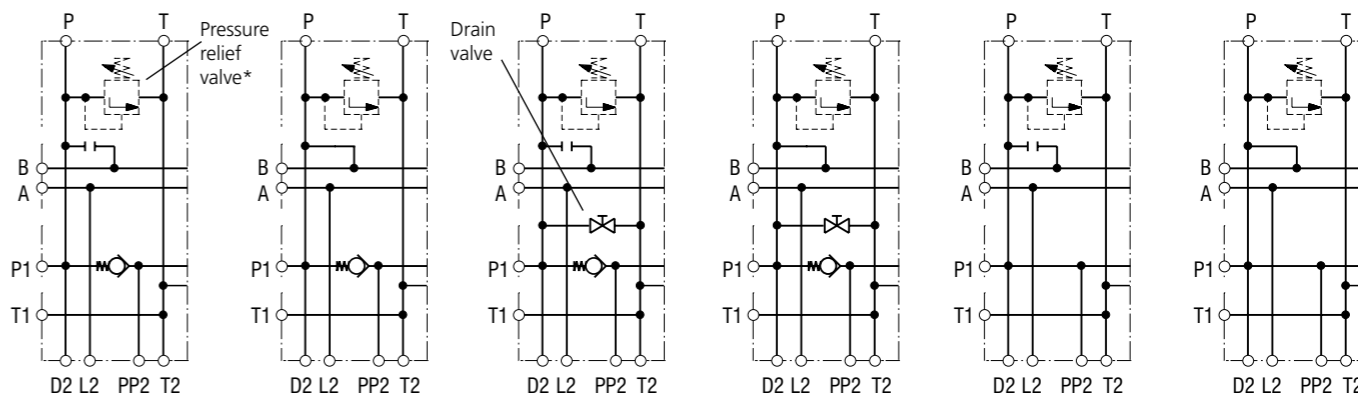
11	Drain valve option without drain valve	+	Connection P-B without P-B ports connection
12	without drain valve		with P-B ports connection
21	with drain valve		without P-B ports connection
22	with drain valve		with P-B ports connection

Functional Symbols

Models for flange mounted valves with pattern acc. to ISO 4401-03 (CETOP 03)

with check valve				without check valve	
ZB06A*-11	ZB06A*-12	ZB06A*-21	ZB06A*-22	ZB06B*-11	ZB06B*-12

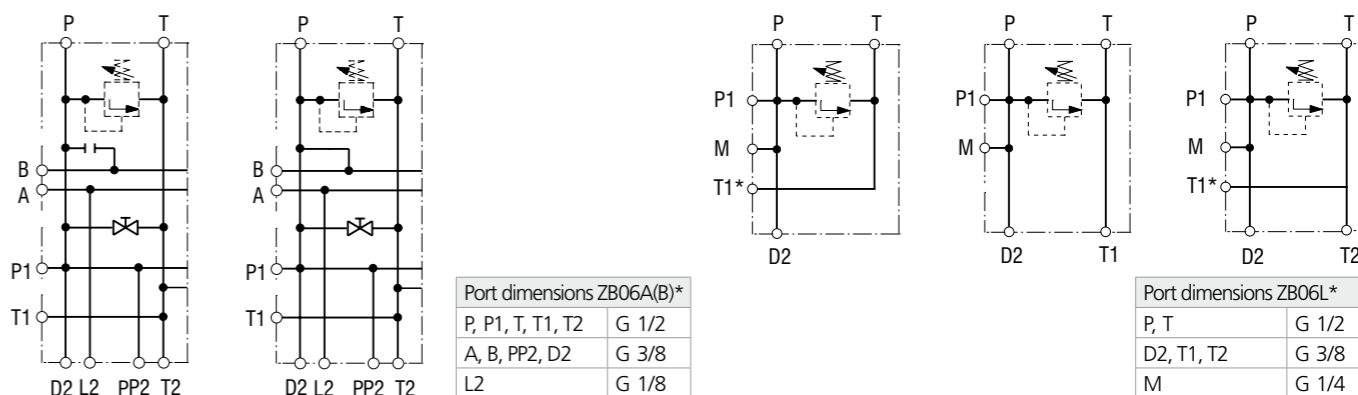
mounting interface of PD06-Z6 (Cat. 0006) serial plates



Models for flange mounted valves with pattern acc. to ISO 4401-03 (CETOP 03) without check valve

ZB06B*-21		ZB06B*-22		Simplified models ZB06L* without mounting pattern for modular valve	
ZB06L*-1	ZB06L*-2	ZB06L*-3			

mounting interface of PD06-Z6 (cat. 0006) serial plates



Pressure relief valve is not supplied with the ZB block

Available types

Tab. 1	ZB06A(B)*ST, phosphated		
Ordering number	Type	Pressure [bar (PSI)]	Weight [kg (lbs)]
23686401	ZB06A-QP2-11-STK	320 (4640)	cca 4.7 (10.4)
23686501	ZB06A-QP2-21-STK	320 (4640)	
23686601	ZB06A-QP2-12-STK	320 (4640)	
23686701	ZB06A-QP2-22-STK	320 (4640)	
23687001	ZB06B-QP2-11-STK	320 (4640)	
23687201	ZB06B-QP2-21-STK	320 (4640)	
23687401	ZB06B-QP2-12-STK	320 (4640)	
23687501	ZB06B-QP2-22-STK	320 (4640)	

Tab. 2	ZB06A(B)*AL, aluminium versions		
Ordering number	Type	Pressure [bar (PSI)]	Weight [kg (lbs)]
30849400	ZB06A-QP2-11-ALK	250 (3626)	cca 1.7 (3.75)
30849500	ZB06A-QP2-12-ALK	250 (3626)	
30849600	ZB06A-QP2-21-ALK	250 (3626)	
30849700	ZB06A-QP2-22-ALK	250 (3626)	
30849800	ZB06B-QP2-11-ALK	250 (3626)	
30849900	ZB06B-QP2-12-ALK	250 (3626)	
30850100	ZB06B-QP2-21-ALK	250 (3626)	
30850200	ZB06B-QP2-22-ALK	250 (3626)	

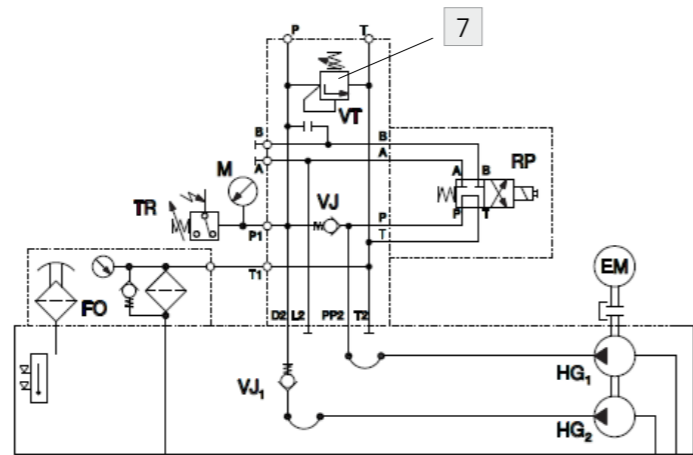
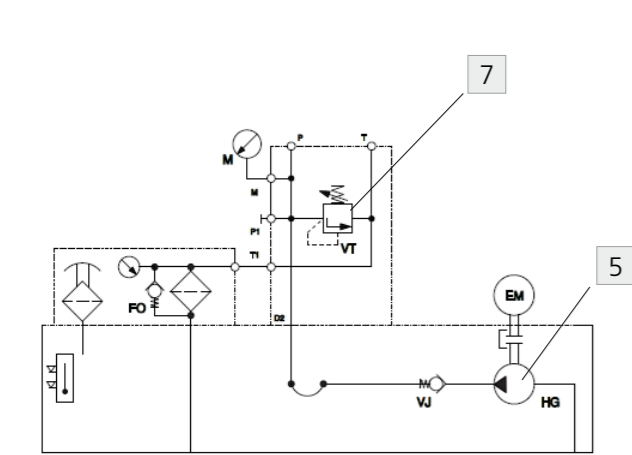
Tab. 3	ZB06L*AL, aluminium versions		
Ordering number	Type	Pressure [bar (PSI)]	Weight [kg (lbs)]
23439800	ZB06L-QP2-1-ALK	250 (3626)	cca 1.6 (3.5)
23439900	ZB06L-QP2-2-ALK	250 (3626)	
31785200	ZB06L-QP2-3-ALK	250 (3626)	

Application

Typical circuit This block enables a great number of circuit arrangements. The shown example represents only one of many possible variants.

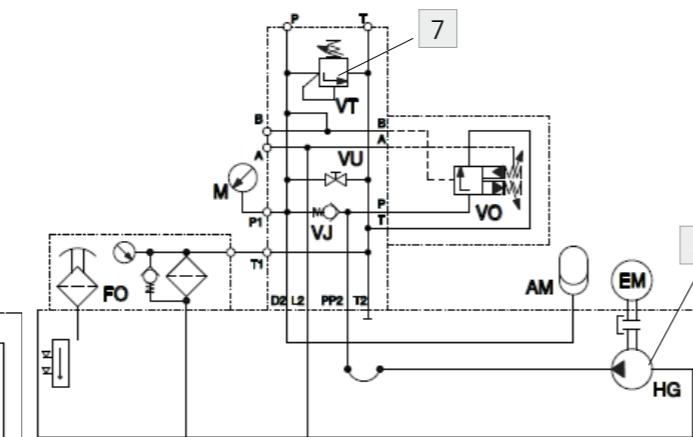
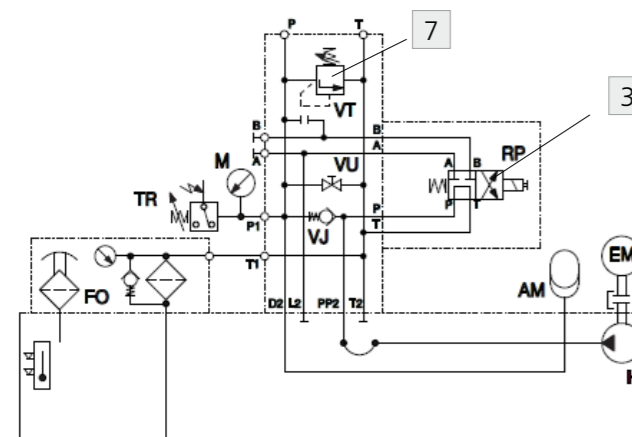
ZB06L*-1 Basic pressure circuit protection and connection with gear pump and return filter

ZB06A*-11 Basic pressure circuit protection and connection with tandem gear pump and return filter with one pump tank unload



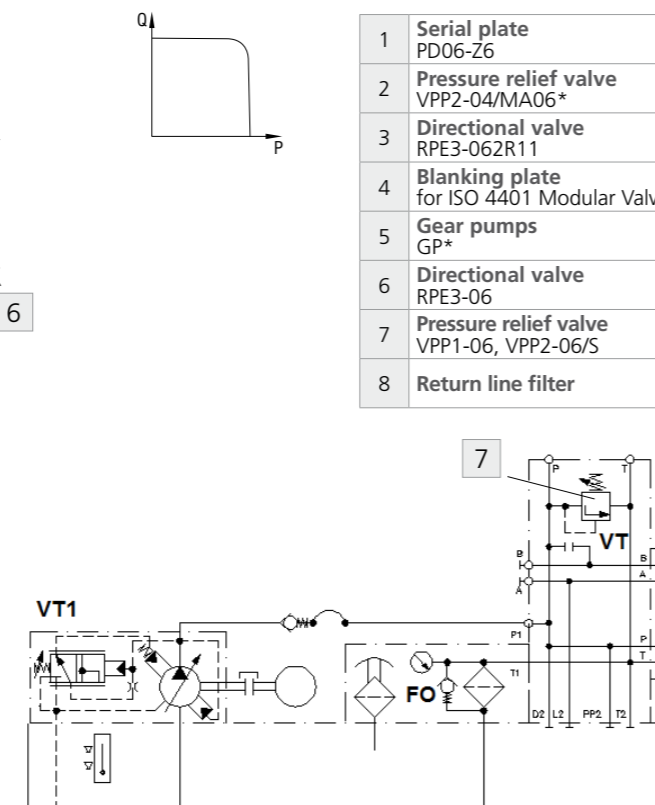
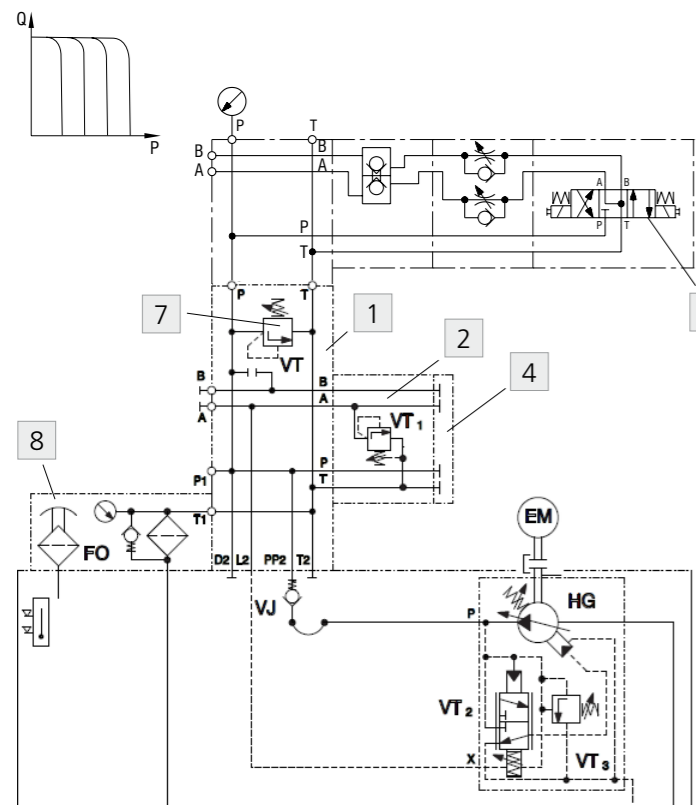
ZB06A*-21 System with accumulator

ZB06A*-22 System with accumulator and accumulator charging valve



ZB06B* Regulation for constant pressure, remote control

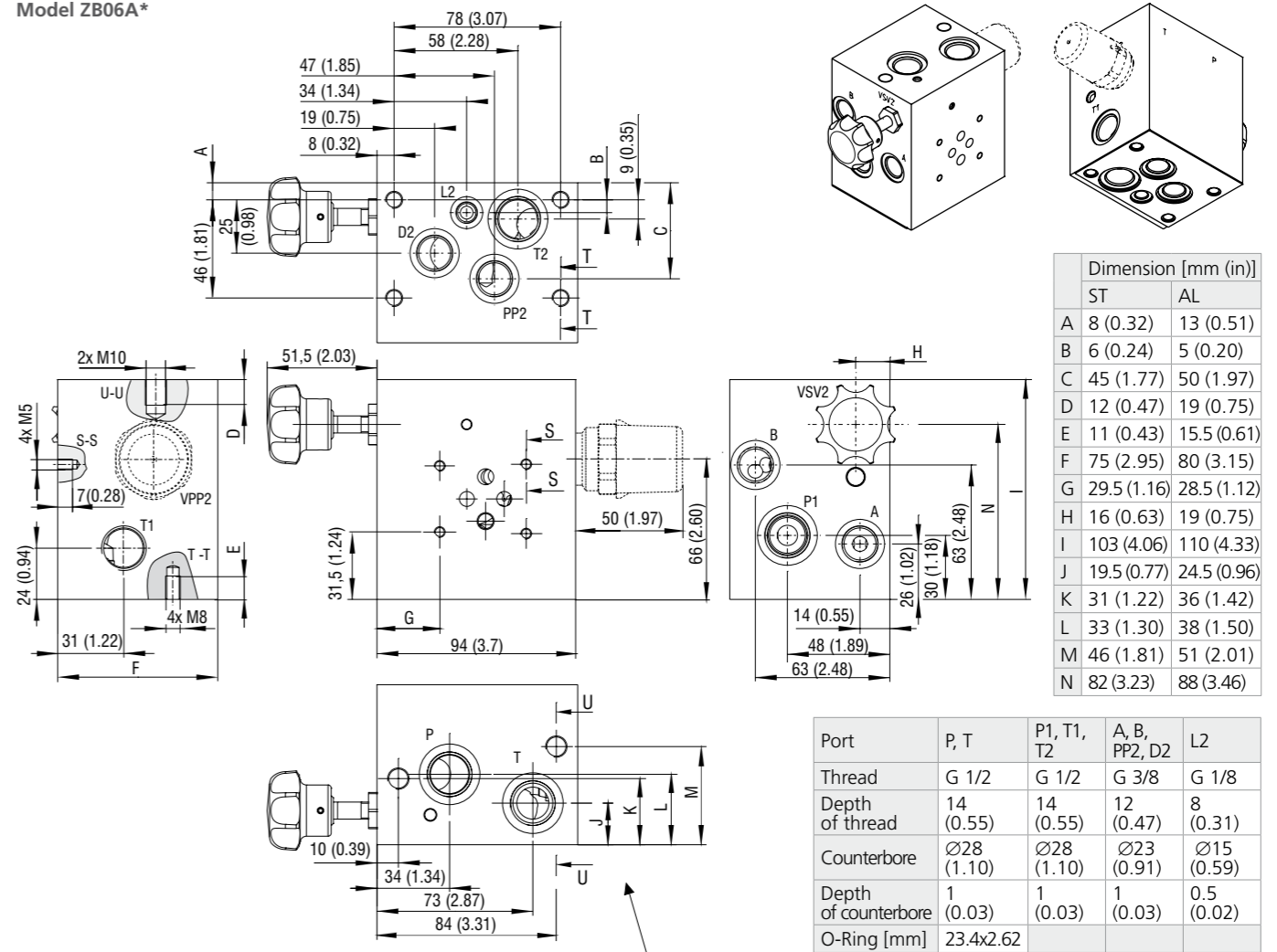
ZB06B* Regulation for constant pressure (pump valve)



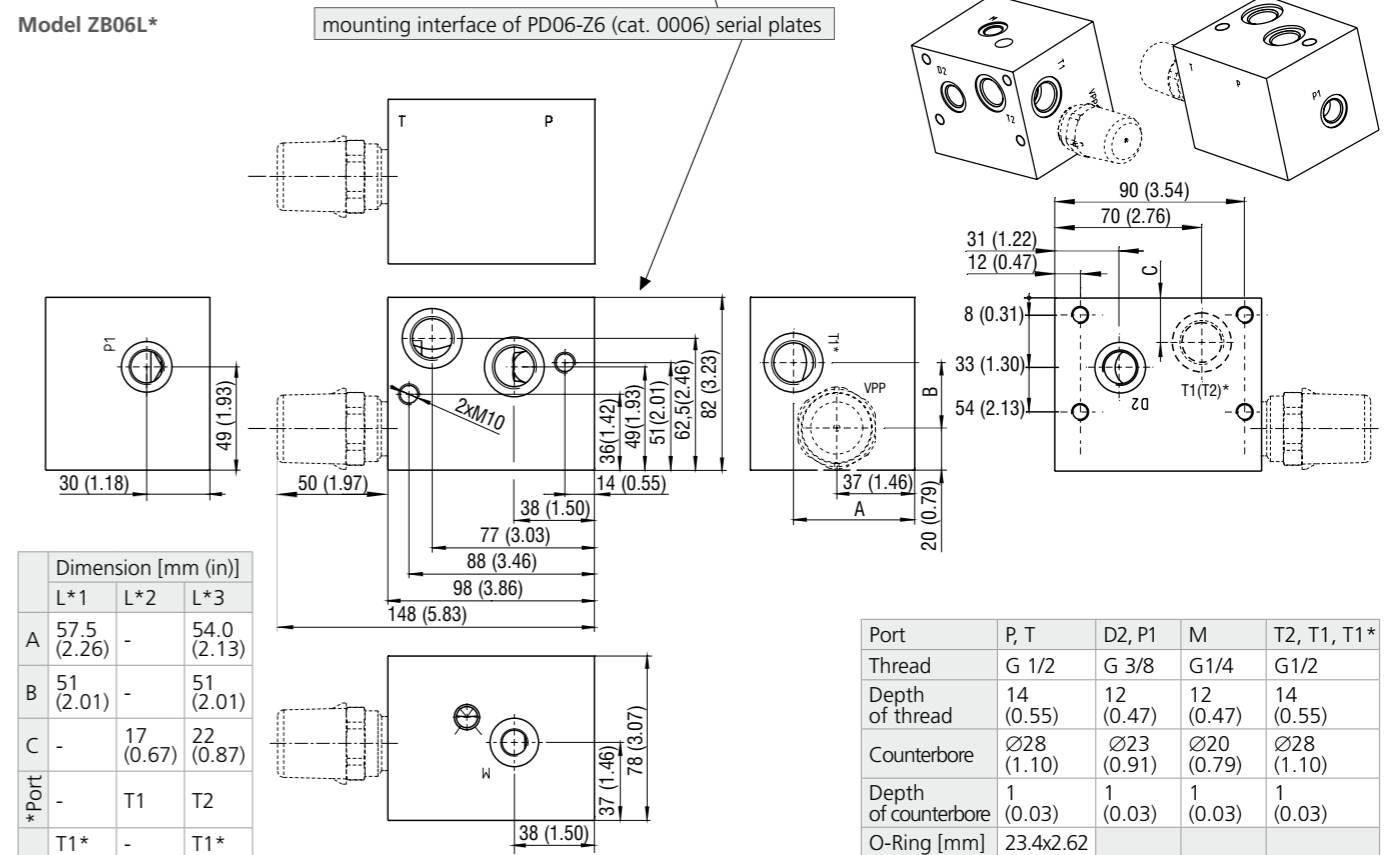
- 1 Serial plate PD06-Z6
- 2 Pressure relief valve VPP2-04/MA06*
- 3 Directional valve RPE3-062R11
- 4 Blanking plate for ISO 4401 Modular Valve
- 5 Gear pumps GP*
- 6 Directional valve RPE3-06
- 7 Pressure relief valve VPP1-06, VPP2-06/S
- 8 Return line filter

Dimensions in millimeters (inches)

Model ZB06A*



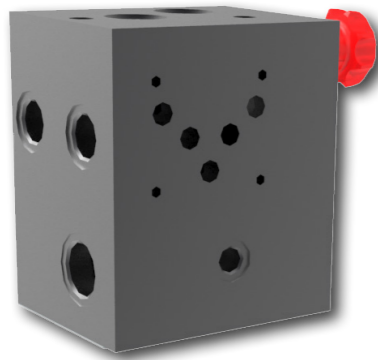
Model ZB06L*



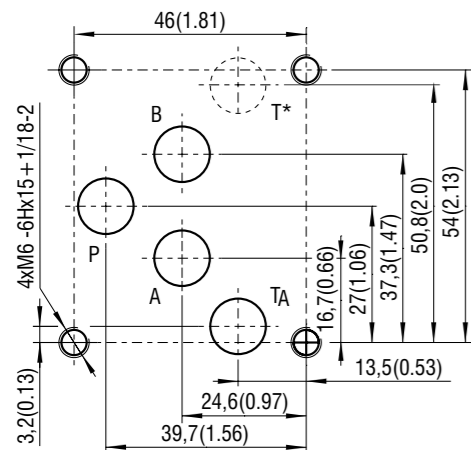
Base Plate with with Pressure Relief Valve for Serial Plates Assemblies

ZB10

Size 10 (D05) • p_{max} 320 bar (4600 PSI)



ISO 4401-05 (CETOP 05)



Ports P, A, B, T - max Ø11.2 mm (0.44 in)

Port T only with model ZB10A(B)-QT2

Technical Features

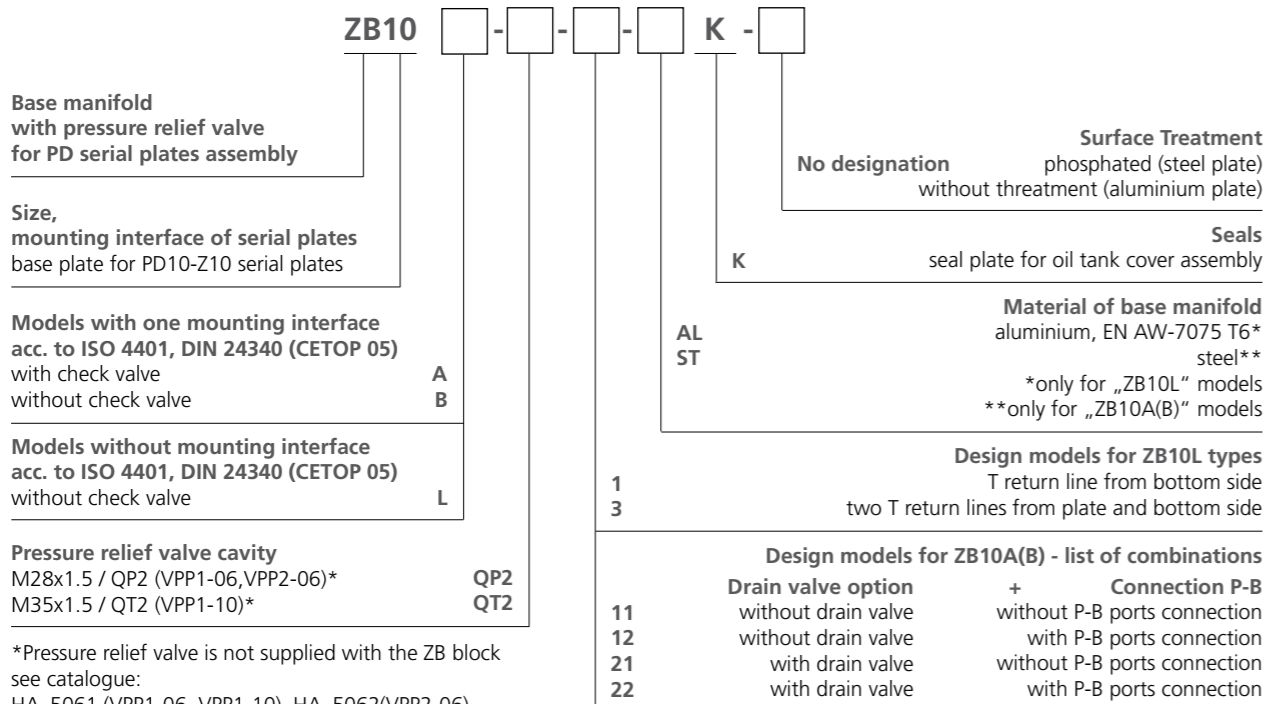
- › Tank cover mounted base manifold for hydraulic power packs which require one directional valve, optionally stackable with PD10-Z10 (Cat. 0008) serial plates
- › Designed for flange mounted valves with pattern acc. to ISO 4401-05 (CETOP 05)
- › Simplified models ZB10L* for cost effective circuit design and assembly with stackable serial PD10-Z10 plates
- › Integrated functions for circuit unloading drain, main circuit check and pressure relief valves
- › Suitable for mounting the pump drive unit horizontally on the tank cover, or for vertical arrangement with the pump situated in the tank under the oil level
- › Variety of models support the build-up of systems with constant or regulated pumps
- › In the standard version, the ZB10A(B) plate housing is phosphated and the steel parts are zinc-coated for 240 h protection acc. to ISO 9227
- › In the standard version, the ZB10L plate housing is without surface treatment (blank)

Technical Data

Modular valves mounting surface	10 (D05)	
Cartridge cavity	M28x1.5 / QP2, M35x1.5 / QT2	
Max. flow	l/min (GPM)	50 (13.2) for QP2, 120 (31.7) for QT2
Max. operating pressure	bar (PSI)	aluminium 250 (3626)
	bar (PSI)	steel 320 (4640)
Port dimensions		ZB10A(B)-QP2(QT2)*ST* / ZB10L-QT2*AL*
	Base plate	Simplified base plate
	P1 ... G3/4	T1 ... G3/4
	A, B, P, T, PP2, D2, T1, T2, T3... G1/2	P, T, P1, D2, T2 ... G1/2
Mass	ZB10A(B)	kg (lbs)
	ZB10L	kg (lbs)
		steel 6.3 (13.9) / aluminium 2.5 (5.5)

	Data sheet	Type
General information	GI_0060	Products and operating conditions
Cavity details / Mounting interface	SMT_0019	SMT-QP2*, SMT-QT2*
		Size 10 / CETOP 05
Studs and nuts for vertical stacking assemblies - Dn 04, 06, 10_0020		

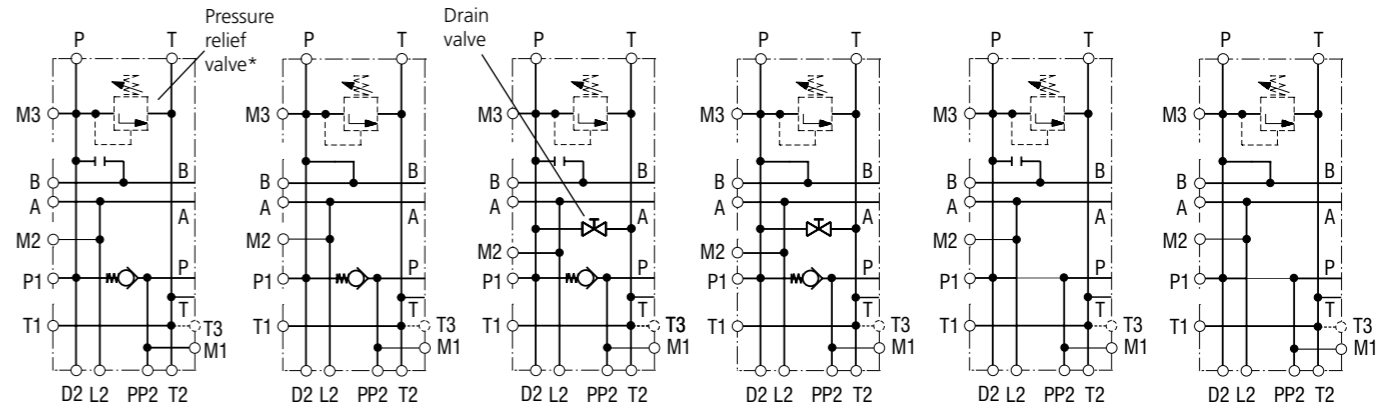
Ordering Code



Functional Symbols

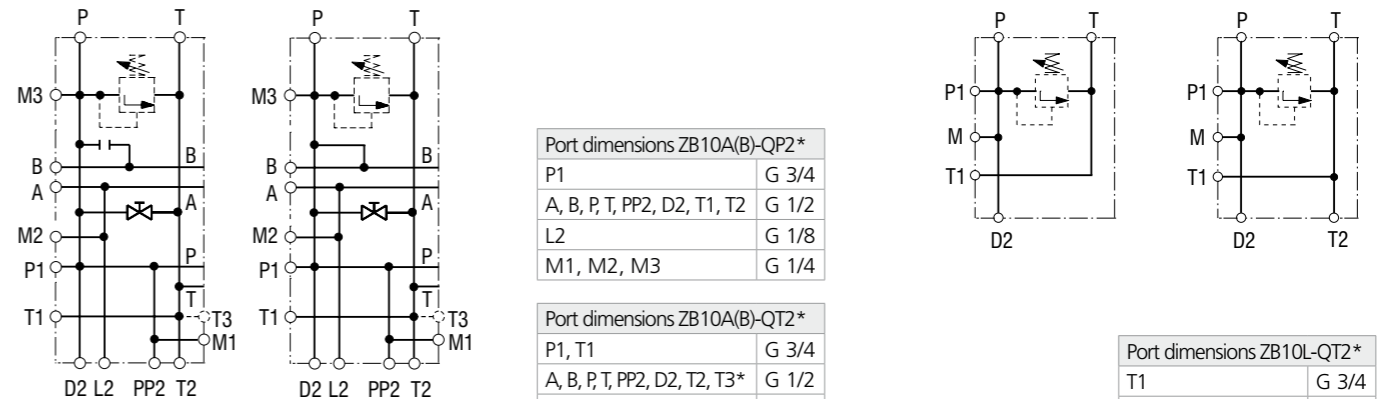
Models for flange mounted valves with pattern acc. to ISO 4401-05 (CETOP 05)

with check valve				without check valve	
ZB10A*-11	ZB10A*-12	ZB10A*-21	ZB10A*-22	ZB10B*-11	ZB10B*-12
mounting interface of PD10-Z10 (cat. 0008) serial plates					



Models for flange mounted valves with pattern acc. to ISO 4401-05 (CETOP 05)

without check valve			Simplified models ZB10L* without mounting pattern for modular valve	
ZB10B*-21	ZB10B*-22		ZB10L*-1	ZB10L*-3
mounting interface of PD10-Z10 (cat. 0008) serial plates				



Port dimensions ZB10A(B)-QP2*

P1	G 3/4
A, B, P, T, PP2, D2, T1, T2	G 1/2
L2	G 1/8
M1, M2, M3	G 1/4

Port dimensions ZB10A(B)-QT2*

P1, T1	G 3/4
A, B, P, T, PP2, D2, T2, T3*	G 1/2
L2	G 1/8
M1, M2, M3	G 1/4

Port dimensions ZB10L-QT2*

T1	G 3/4
P, T, P1, D2, T2,	G 1/2
M	G 1/4

*Port T3 only with model ZB10A(B)-QT2

Pressure relief valve is not supplied with the ZB block

Application

Tab. 1	ZB10A(B)QP2*ST, phosphated			
Ordering number	Type	Pressure [bar]	Weight [kg]	
23442001	ZB10A-QP2-11-STK	320	cca 6.3	
23440601	ZB10A-QP2-21-STK	320		
30843100	ZB10A-QP2-12-STK	320		
30843200	ZB10A-QP2-22-STK	320		
23440501	ZB10B-QP2-11-STK	320		
23441801	ZB10B-QP2-21-STK	320		
30843300	ZB10B-QP2-12-STK	320		
30843400	ZB10B-QP2-22-STK	320		

Tab. 2	ZB10A(B)QT2*ST, phosphated			
Ordering number	Type	Pressure [bar]	Weight [kg]	
32861900	ZB10A-QT2-11-STK	320	cca 9.3	
34046400	ZB10A-QT2-21-STK	320		
34046600	ZB10A-QT2-12-STK	320		
34046900	ZB10A-QT2-22-STK	320		
34047400	ZB10B-QT2-11-STK	320		
34047700	ZB10B-QT2-21-STK	320		
34047800	ZB10B-QT2-12-STK	320		
34047900	ZB10B-QT2-22-STK	320		

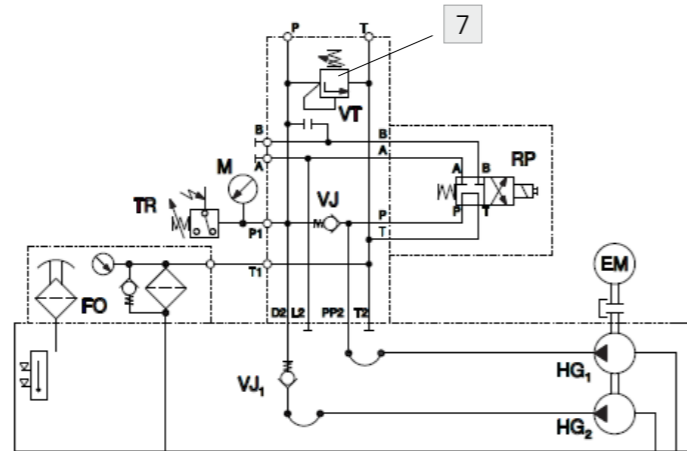
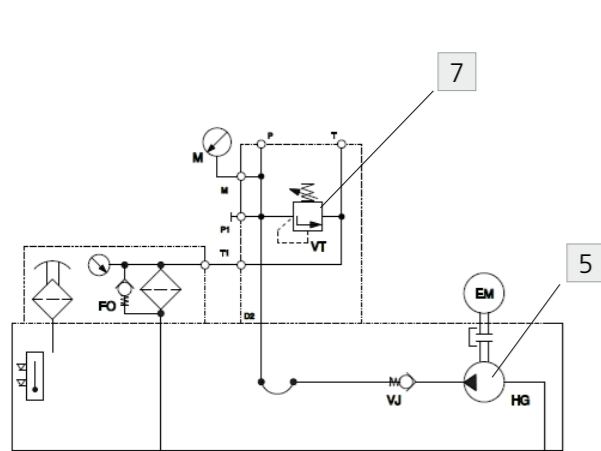
Tab. 3	ZB10LQT2* AL, aluminium versions			
Ordering number	Type	Pressure [bar]	Weight [kg]	
34048000	ZB10L-QT2-1-AL	250	cca 2.3	
31785300	ZB10L-QT2-3-AL	250		

Available types

Typical circuit This block enables a great number of circuit arrangements. The shown example represents only one of many possible variants.

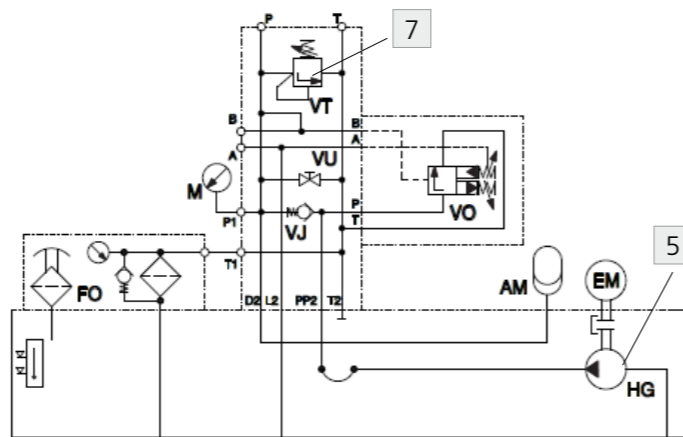
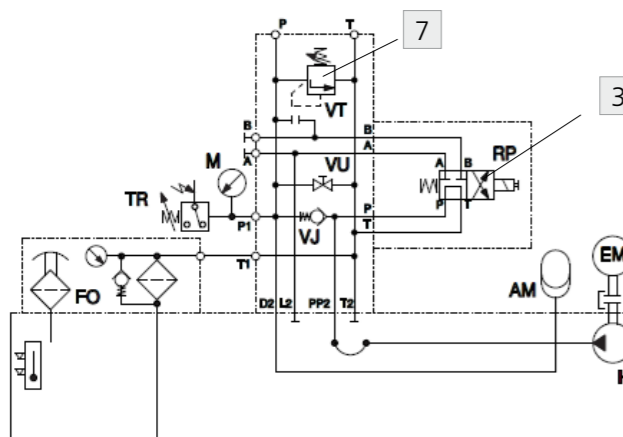
ZB10L*-1 Basic pressure circuit protection and connection with gear pump and return filter

ZB10A*-11 Basic pressure circuit protection and connection with tandem gear pump and return filter with one pump tank unload



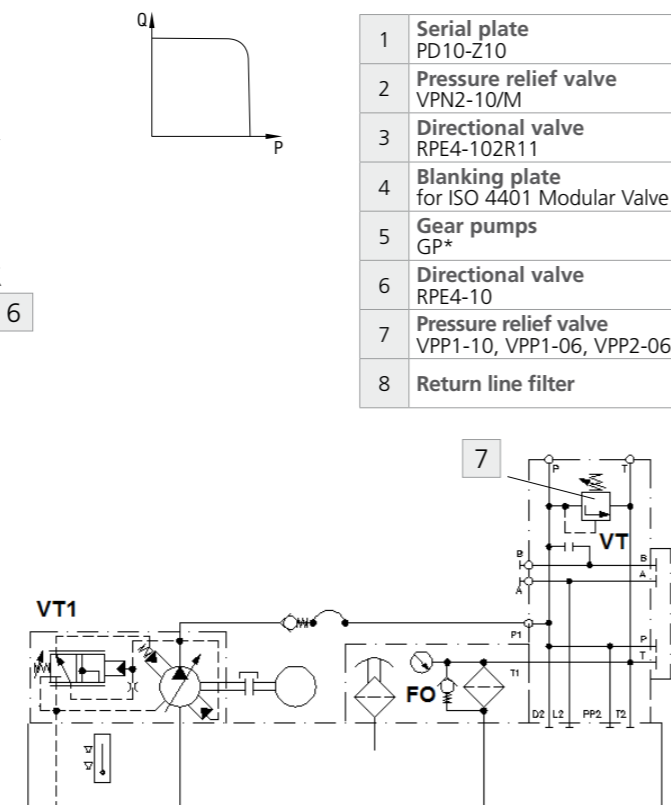
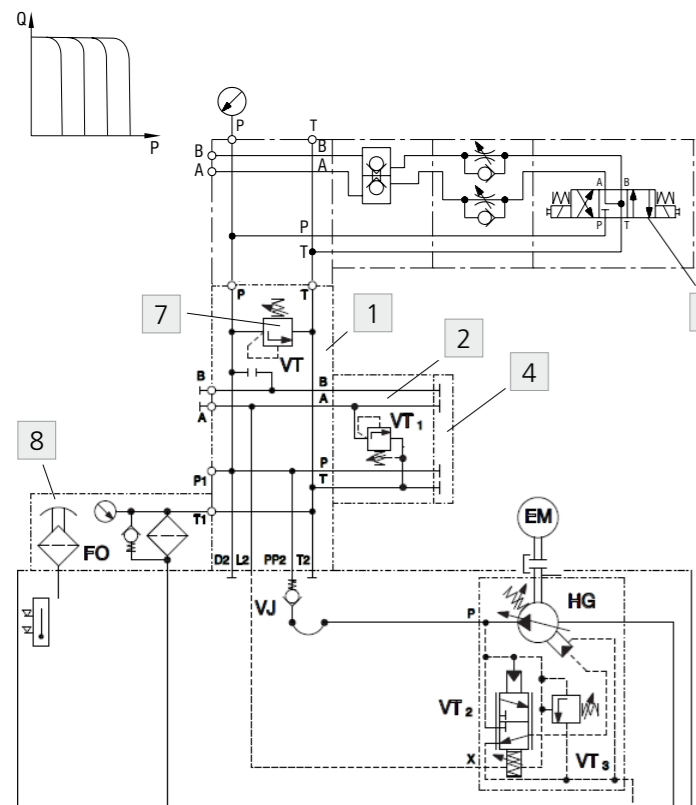
ZB10A*-21 System with accumulator

ZB10A*-22 System with accumulator and accumulator charging valve



ZB10B* Regulation for constant pressure, remote control

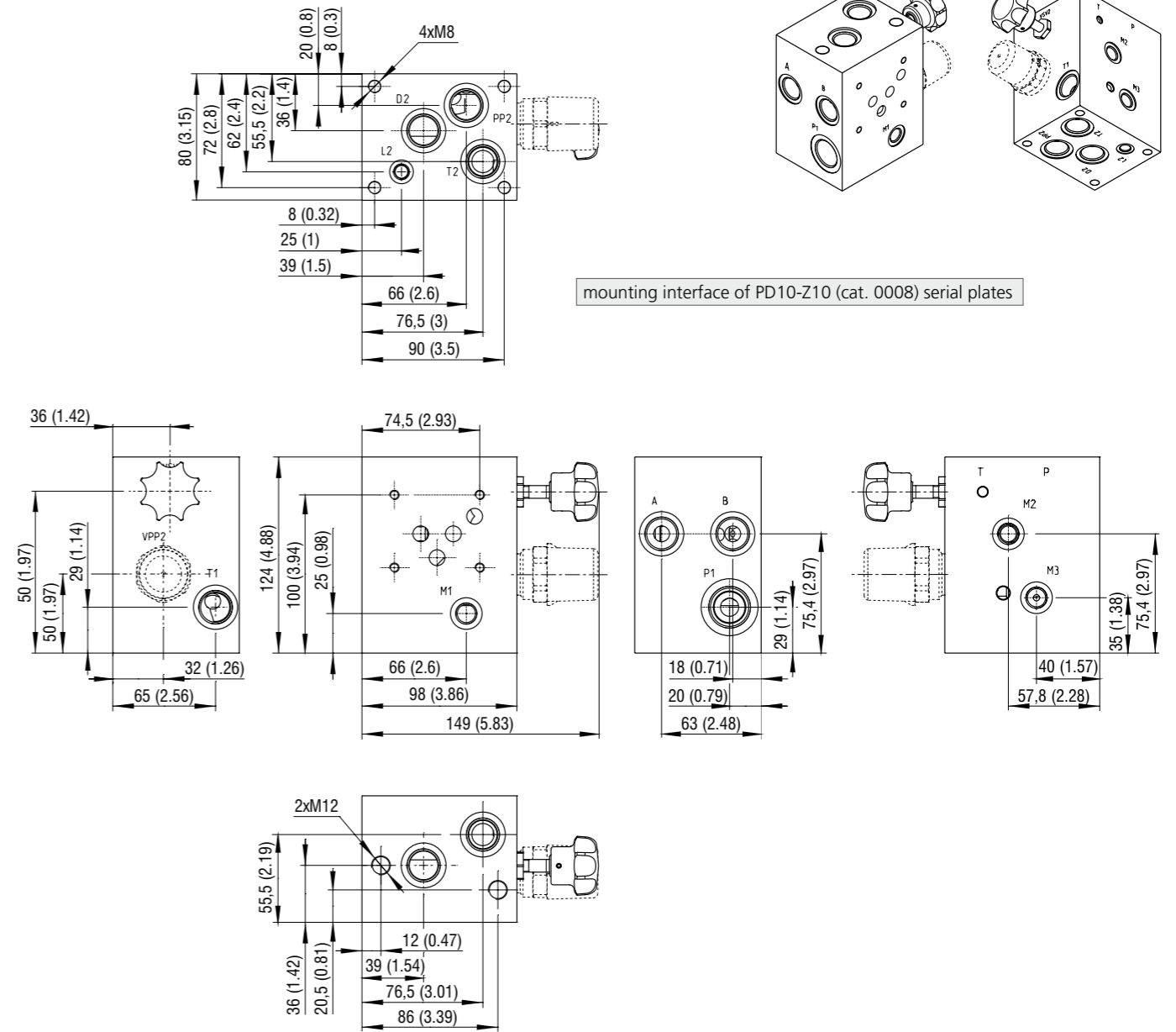
ZB10B* Regulation for constant pressure (pump valve)



- 1 Serial plate PD10-Z10
- 2 Pressure relief valve VPN2-10/M
- 3 Directional valve RPE4-102R11
- 4 Blanking plate for ISO 4401 Modular Valve
- 5 Gear pumps GP*
- 6 Directional valve RPE4-10
- 7 Pressure relief valve VPP1-10, VPP1-06, VPP2-06
- 8 Return line filter

Dimensions in millimeters (inches)

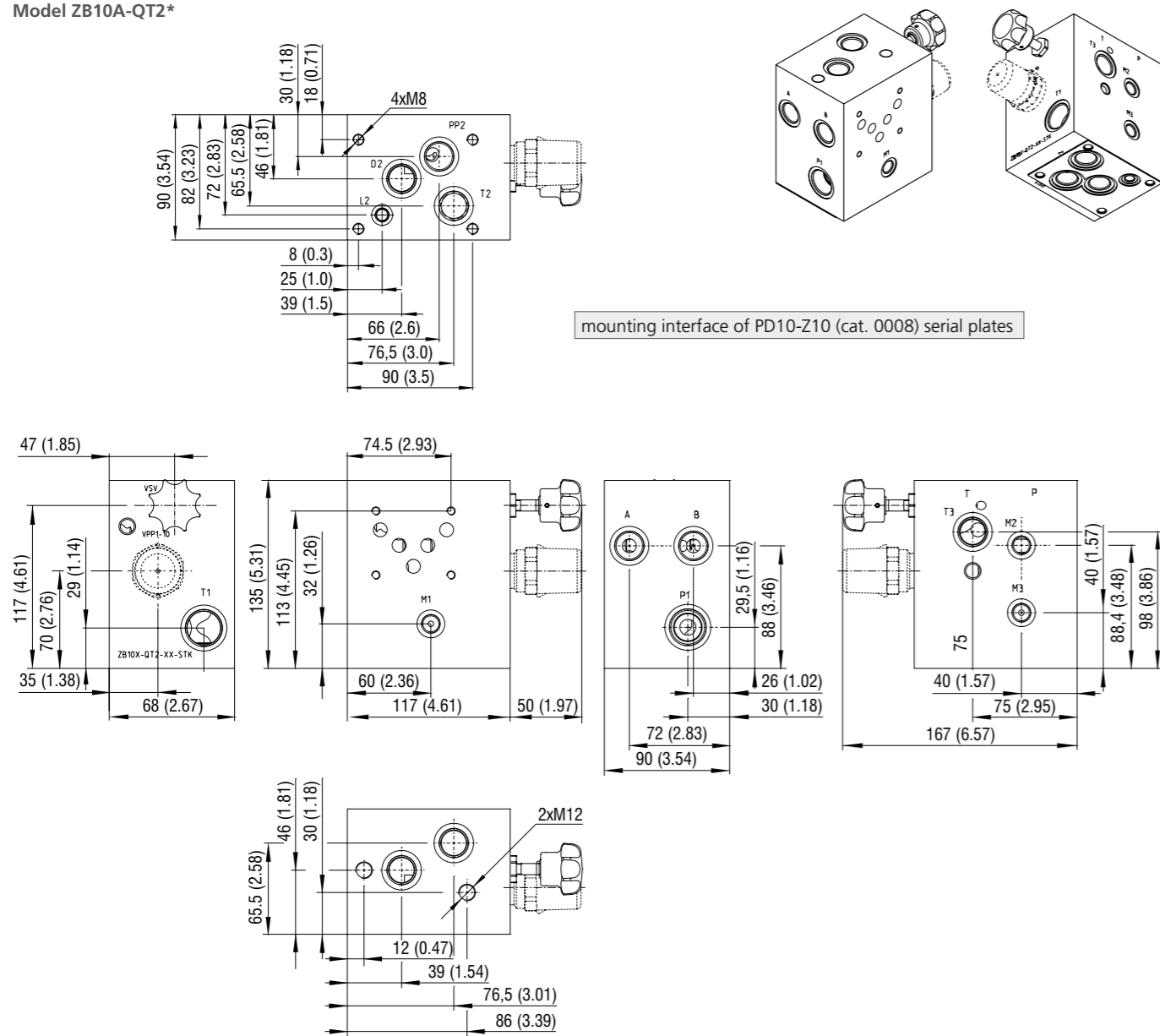
Model ZB10A-QP2*



mounting interface of PD10-Z10 (cat. 0008) serial plates

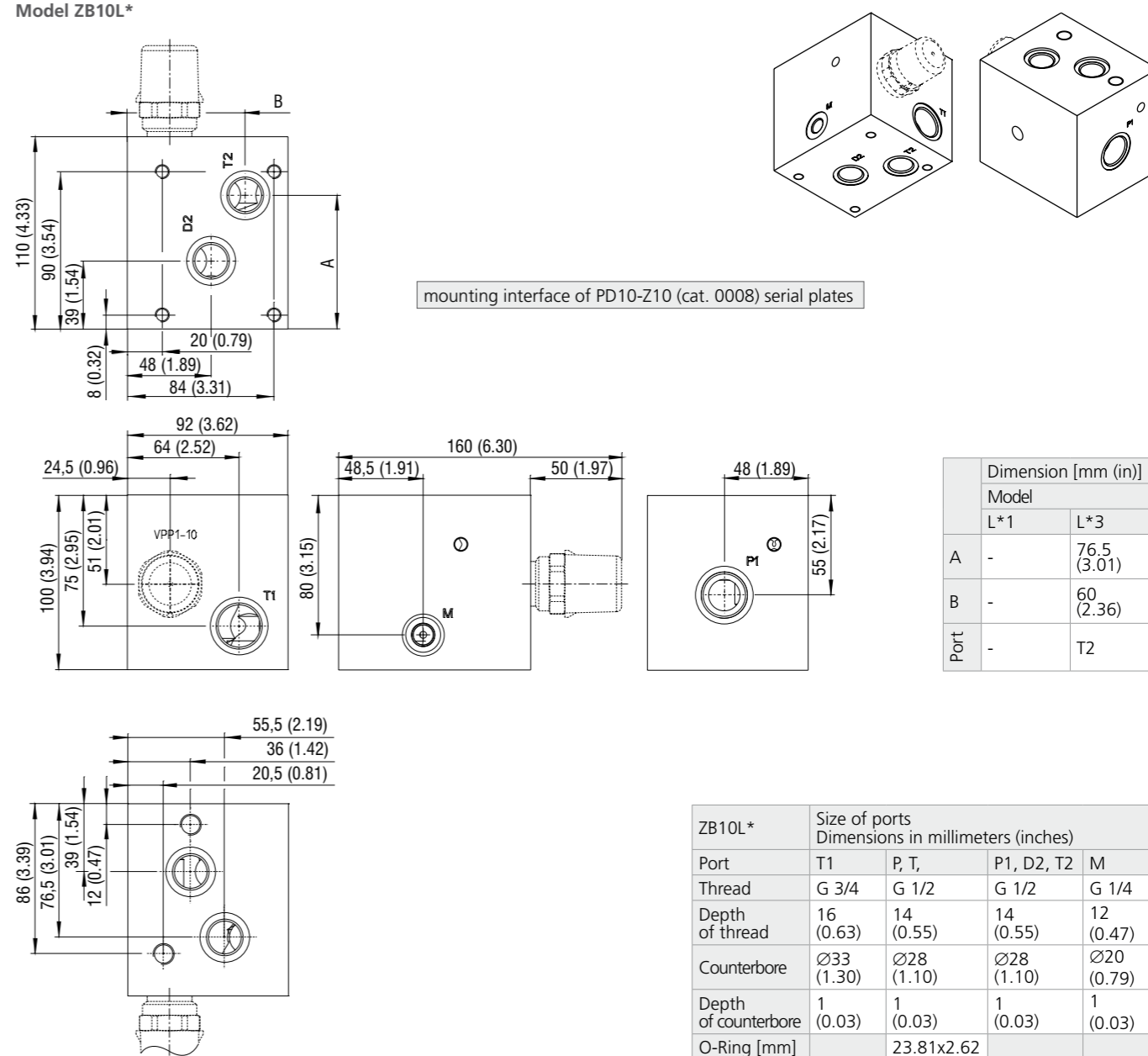
ZB10A(B)*	Size of ports Dimensions in millimeters (inches)					
Port	P1	P, T	L2	M1, M2, M3	A, B, PP2, D2, T2, T3	T1
Thread	G 3/4	G 1/2	G 1/8	G 1/4	G 1/2	G 1/2
Depth of thread	16 (0.63)	14 (0.55)	8 (0.31)	12 (0.47)	14 (0.55)	14 (0.55)
Counterbore	Ø33 (1.30)	Ø28 (1.10)	Ø15 (0.59)	Ø20 (0.79)	Ø28 (1.10)	Ø28 (1.10)
Depth of counterbore	1 (0.03)	1 (0.03)	0,5 (0.02)	1 (0.03)	1 (0.03)	1 (0.03)
O-Ring [mm]	23.81x2.62					

Model ZB10A-QT2*



ZB10A(B)*	Size of ports Dimensions in millimeters (inches)					
Port	P1	P, T,	L2	M1, M2, M3	A, B, PP2, D2, T2, T3	T1
Thread	G 3/4	G 1/2	G 1/8	G 1/4	G 1/2	G 3/4
Depth of thread	16 (0.63)	14 (0.55)	8 (0.31)	12 (0.47)	14 (0.55)	16 (0.63)
Counterbore	∅33 (1.30)	∅28 (1.10)	∅15 (0.59)	∅20 (0.79)	∅28 (1.10)	∅33 (1.30)
Depth of counterbore	1 (0.03)	1 (0.03)	0,5 (0.02)	1 (0.03)	1 (0.03)	1 (0.03)
O-Ring [mm]	23.81x2.62					

Model ZB10L*



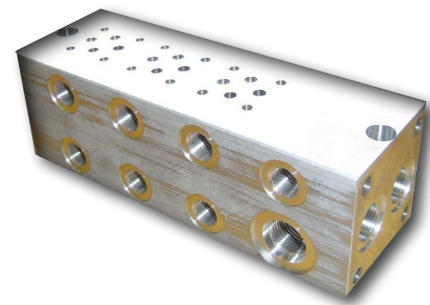
Port	Dimension [mm (in)]	
	L*1	L*3
A	-	76,5 (3,01)
B	-	60 (2,36)
Port	-	T2

ZB10L*	Size of ports Dimensions in millimeters (inches)			
Port	T1	P, T,	P1, D2, T2	M
Thread	G 3/4	G 1/2	G 1/2	G 1/4
Depth of thread	16 (0.63)	14 (0.55)	14 (0.55)	12 (0.47)
Counterbore	∅33 (1.30)	∅28 (1.10)	∅28 (1.10)	∅20 (0.79)
Depth of counterbore	1 (0.03)	1 (0.03)	1 (0.03)	1 (0.03)
O-Ring [mm]	23.81x2.62			

Serial Plates for ISO 4401-02 Valve with Side Ports

DR1-04

Size 04 (D02) • p_{max} 320 bar (4600 PSI)



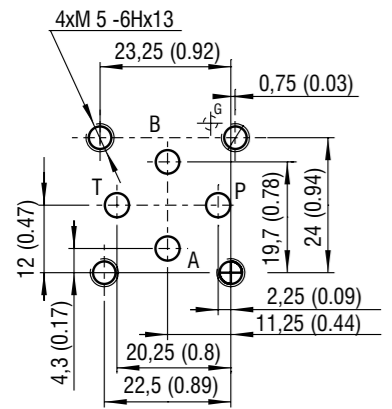
Technical Features

- › Designed to connect in parallel two or more ISO 4401-02 (CETOP 02) valves with integrated unloading and pressure relief valve cavity with interface 3/4-16 UNF-2A
- › Compact design with reduced plate dimensions for production cost saving
- › Maximum 8 parallel modular valve sections
- › Consumer ports A and B positioned on the side of the sub-plate
- › Maximum flow rate can be increased up to twice the output if the sub-plates are powered at both ends
- › Serial plates are available in aluminium EN AW - 7075 T6
- › In the standard version, the aluminium serial plate is without surface protection

Technical Data

Modular valves mounting surface		04 (D02)
Cartridge cavity		A2
Max. operating pressure (aluminium)	bar (PSI)	320 (4640)
Port dimensions P		G3/8
Port dimensions T		G3/8
Port dimensions A, B		G1/4
Port dimensions M		G1/4
Mass (model 0, 1, 2)	kg (lbs)	see table
Data Sheet		Type
General information	GI_0060	Products and operating conditions
Cavity details	SMT_0019	SMT_A2*
Mounting interface	SMT_0019	Size 04
Studs and nuts for vertical stacking assemblies		HA_0020

ISO 4401-02-01-0-05

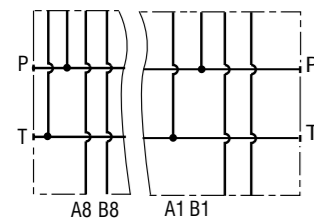


Ports P, A, B, T - max \varnothing 4.5 mm (0.18 in)

Connection

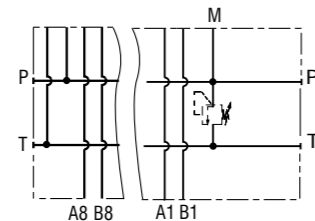
DR1-04/ 0

P, TG3/8
A, BG1/4



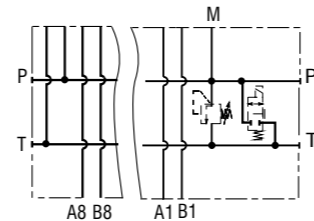
DR1-04/ 1

P, TG3/8
A, B, MG1/4
valve cavity 3/4-16 UNF

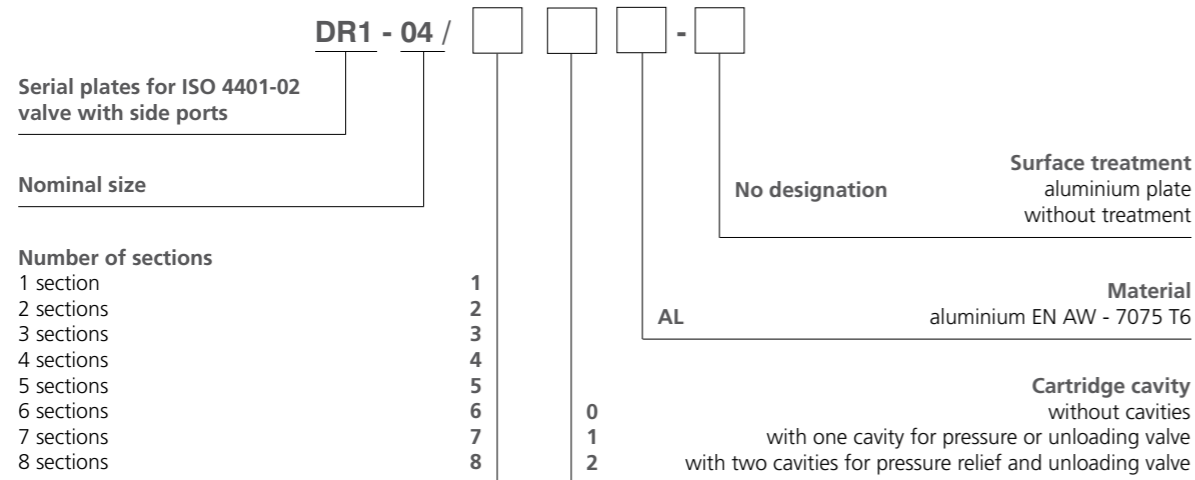


DR1-04/ 2

P, TG3/8
A, B, MG1/4
2 valve cavities 3/4-6 UNF

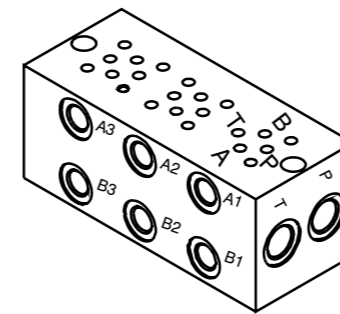


Ordering Code

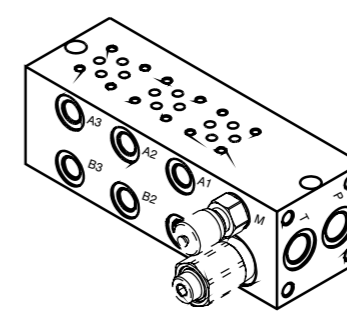


Dimensions in millimeters (inches)

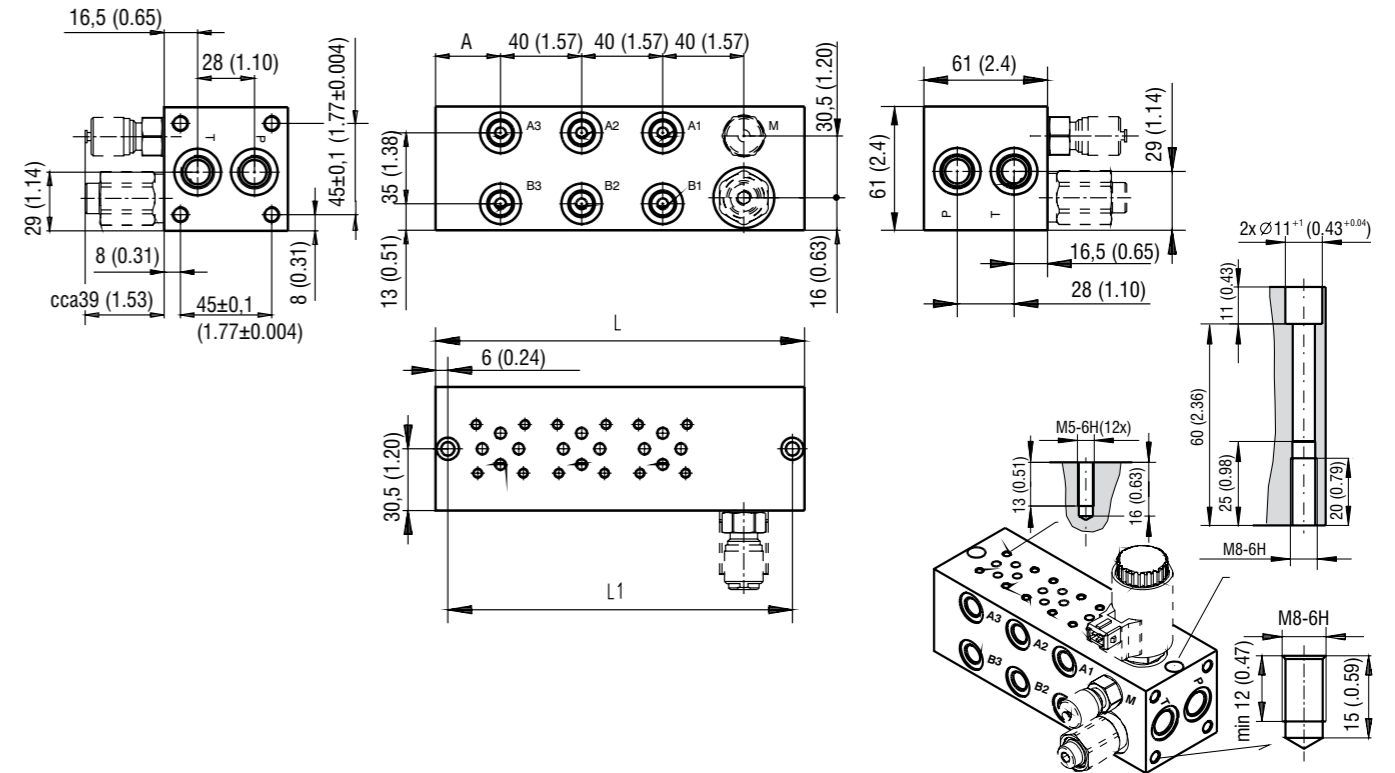
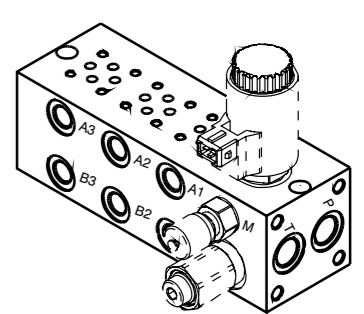
DR1-04/ 0



DR1-04/ 1



DR1-04/ 2



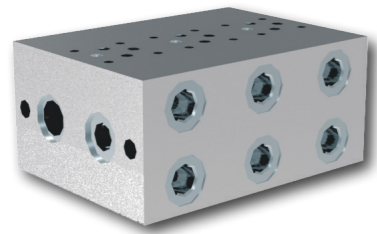
DR1-04	/*0		/*1(2)		/*0		/*1(2)	
Number of sec.	L [mm (in)]	L1 [mm (in)]	L [mm (in)]	L1 [mm (in)]	A [mm (in)]	A [mm (in)]	A [mm (in)]	A [mm (in)]
1	-	102 (4.02)	-	90 (3.54)	32.5 (1.28)	32 (1.26)	32.5 (1.28)	32 (1.26)
2	105 (4.13)	142 (5.59)	91 (3.58)	130 (5.12)	32.5 (1.28)	32 (1.26)	32.5 (1.28)	32 (1.26)
3	145 (5.71)	182 (7.17)	131 (5.16)	170 (6.69)	32.5 (1.28)	32 (1.26)	32.5 (1.28)	32 (1.26)
4	185 (7.28)	222 (8.74)	171 (6.73)	210 (8.27)	32.5 (1.28)	32 (1.26)	32.5 (1.28)	32 (1.26)
5	225 (8.86)	262 (10.31)	211 (8.31)	250 (9.84)	32.5 (1.28)	32 (1.26)	32.5 (1.28)	32 (1.26)
6	265 (10.43)	302 (11.89)	251 (9.88)	290 (11.42)	32.5 (1.28)	32 (1.26)	32.5 (1.28)	32 (1.26)
7	305 (12.01)	342 (13.46)	291 (11.46)	330 (12.99)	32.5 (1.28)	32 (1.26)	32.5 (1.28)	32 (1.26)
8	345 (13.58)	382 (15.04)	331 (13.03)	370 (14.57)	32.5 (1.28)	32 (1.26)	32.5 (1.28)	32 (1.26)

Number of sec.	DR1-04/*0		DR1-04/*1		DR1-04/*2	
	Ordering number	Mass [kg (lb)]	Ordering number	Mass [kg (lb)]	Ordering number	Mass [kg (lb)]
1	-	-	16113500	0.90 (2.0)	23693100	0.90 (2.0)
2	16112800	0.95 (2.1)	16113600	1.25 (2.8)	23693200	1.35 (3.0)
3	16112900	1.30 (2.9)	16113700	1.40 (3.1)	23693300	1.60 (3.5)
4	16113000	1.70 (3.8)	16113800	2.00 (4.4)	23693400	2.00 (4.4)
5	16113100	2.05 (4.5)	16113900	2.35 (5.2)	16772000	2.35 (5.2)
6	16113200	2.40 (5.3)	16114000	2.75 (6.1)	23693600	2.70 (6.0)
7	16113300	2.80 (6.2)	16114100	3.10 (6.8)	23693700	3.10 (6.8)
8	16113400	3.15 (6.9)	16114200	3.45 (7.6)	23693800	3.45 (7.6)

Serial Plates with Side Ports for ISO 4401-02 Valve

PD04

Size 04 (D02) • p_{max} 250 bar (3600 PSI)



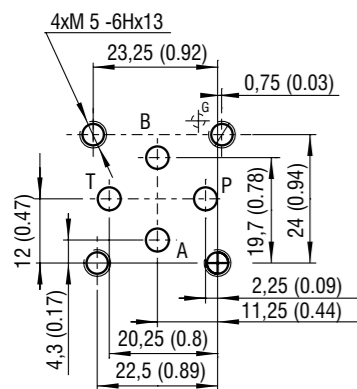
Technical Features

- › Designed to connect in parallel two or more ISO 4401-02 (CETOP 02) valves to build compact hydraulics on each axis vertically
- › Stackable models (Version S5) with mounting interface for SMA05 hydraulic power unit central block
- › Flexible design of various stackable plates enables simple creation of circuits without the use of pipes and fittings
- › Maximum 8 parallel modular valve sections may be installed. Optional selection for A and B consumer ports position
- › Maximum flow rate can be increased up to double the output if the sub-plates are powered at both ends
- › Serial plates are available in aluminium. For other materials consult our technical department for their identification and feasibility
- › Includes mounting stud kits for horizontal plate assembly
- › BSP and SAE porting
- › In the standard version, the aluminium serial plate is without surface protection

Technical Data

Modular valves mounting surface		04 (D02)
Max. operating pressure (aluminium)	bar (PSI)	250 (3630)
Port threads (depending on model)		see table
Mass (depending on model)	kg (lbs)	see table
	Data Sheet	Type
General information	GI_0060	Products and operating conditions
Mounting surface	SMT_0019	Size 04 (D02)
Studs and nuts for vertical stacking assemblies		HA_0020

ISO 4401-02-01-0-05

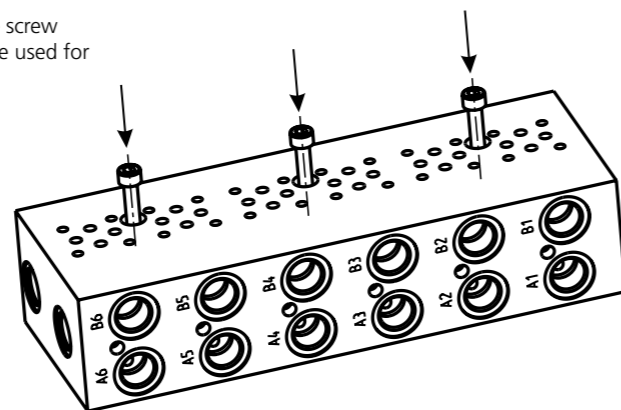


Ports P, A, B, T - max Ø4.5mm (0.18 in)

Functional Description

Design version NS (Not Stackable)

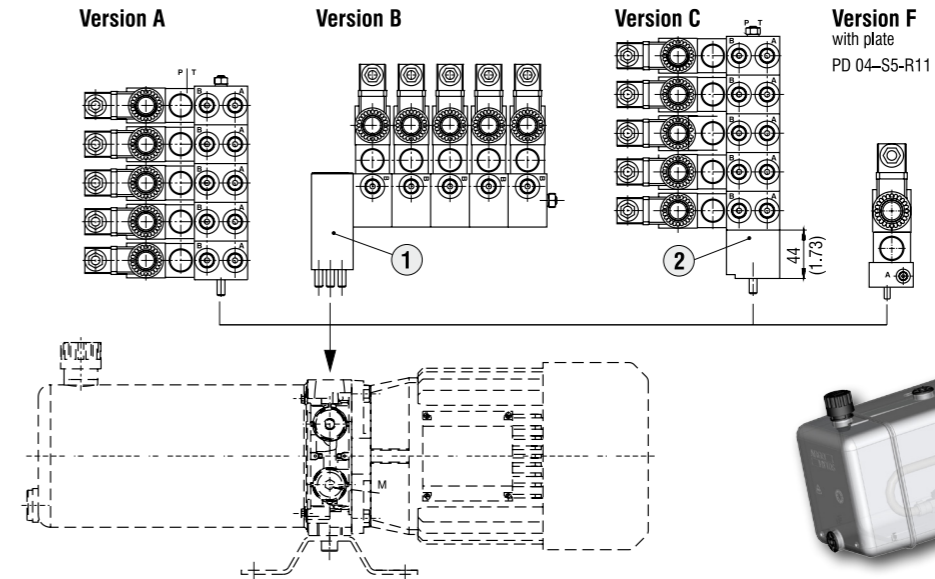
The plates of design version NS have from 1 up to 8 sections. They can be used only separately because they do not have any holes for studs. Outputs P1, T1, P, T on both sides have a countersink for a sealing ring. NS plates have vertical holes for M6 screws. The holes have a countersink for the screw head on one side and feature a connecting M8 thread on the other side. They are used for fixing the plates to a base or a frame.



Six-section plate PD04-NS-A6/G3AI. The plate can be fixed to a base or a frame with M6 or M8 screws.

Design version S5 (Stackable for SMA05)

The version S5 is intended for assembly onto the central manifold of power pack SMA05 to extend the control functions. Plates with 1 up to 5 sections have two horizontal through-holes of diameter D 8.4 mm for M8 studs. Side outputs P1, T1 (on the side of the 1st section) have a countersink for a sealing ring. There are four possibilities to connect to the SMA central block (for more details see SMA data sheet 7212). For some types of tanks it is necessary to use a connecting plate due to space requirements.



		SAP No.
1	Connecting plate B	16094500
2	Connecting plate C	16094700

Ordering Code

PD04 - [] - [] / [] - AL [] - []

Serial plates for ISO 4401-02 (CETOP 02) valves

Nominal size

Design version
Non stackable NS
Stackable - for SMA05 power unit central block S5

Functional symbol (section)
A C E R1

Plates PD04-NS are produced only with functional symbol A. Plates with functional symbols C, E and R1 are produced only as a one section plates. (PD04-S5-C1, PD04-S5-E1, PD04-S5-R11)

Number of sections

1 section	1
2 sections	2
3 sections	3
4 sections	4
5 sections	5
6 sections	6
7 sections	7
8 sections	8

Port threads

Designation	P	T	A	B	Used for version
G1	G1/4	G1/4	G1/4	G1/4	S5
G2	G1/4	G1/4	G3/8	G3/8	S5
G3	G3/8	G3/8	G3/8	G3/8	NS 1-8 sections, S5-E1
U1	9/16-18 UNF	9/16-18 UNF	9/16-18 UNF	9/16-18 UNF	S5

Surface Treatment
No designation aluminium plate without treatment

Seals
No designation without seal rings NBR

Material
AL aluminium

Side location for A and B consumer ports, and valve position

Design version PD04-NS, PD04-S5

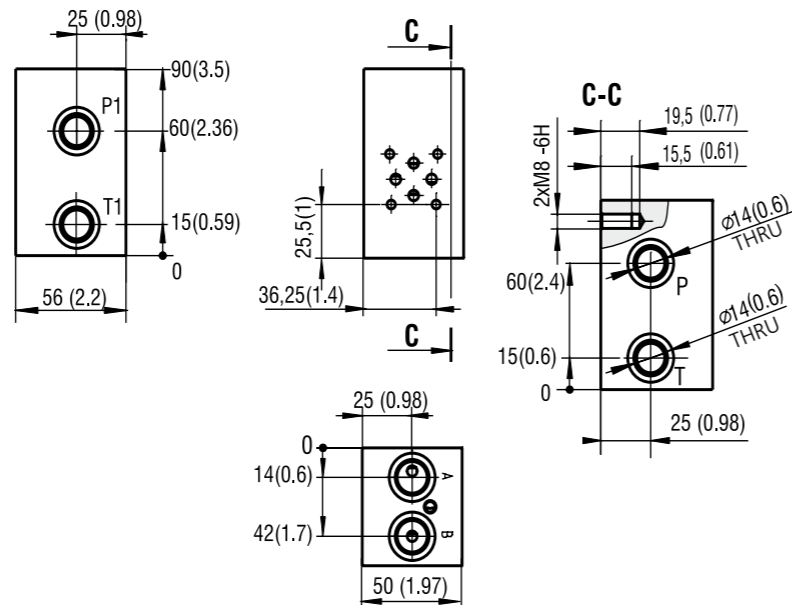
AI

BI

A

Dimensions in millimeters (inches)

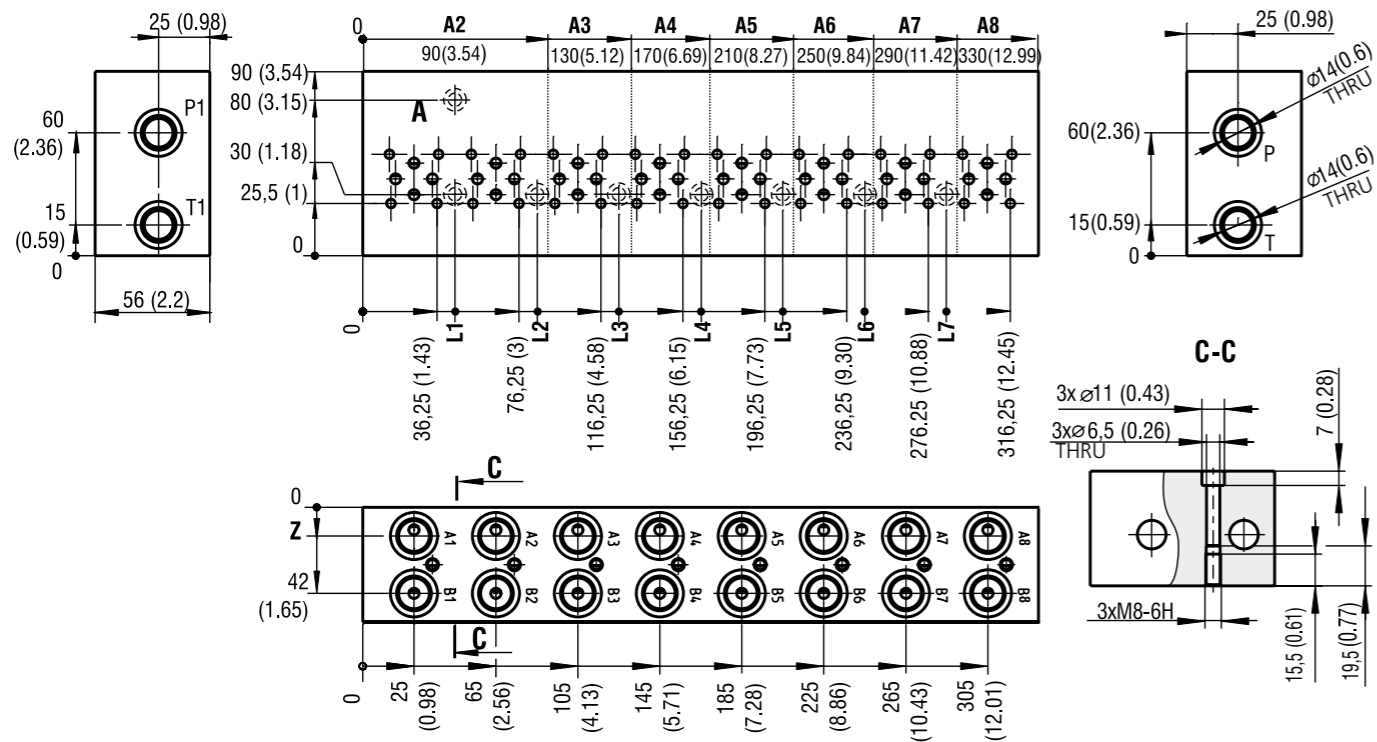
Plate PD04-NS-A1



List of standardised types

Design version	Plate - type	SAP
NS	PD04-NS-A1/G3AI-AL	16105700
	PD04-NS-A2/G3AI-AL	16105800
	PD04-NS-A3/G3AI-AL	16105900
	PD04-NS-A4/G3AI-AL	16106100
	PD04-NS-A5/G3AI-AL	16106300
	PD04-NS-A6/G3AI-AL	16106500
	PD04-NS-A7G3AI-AL	on request only
	PD04-NS-A8/G3AI-AL	16106600

Plates PD04-NS-A2 A8



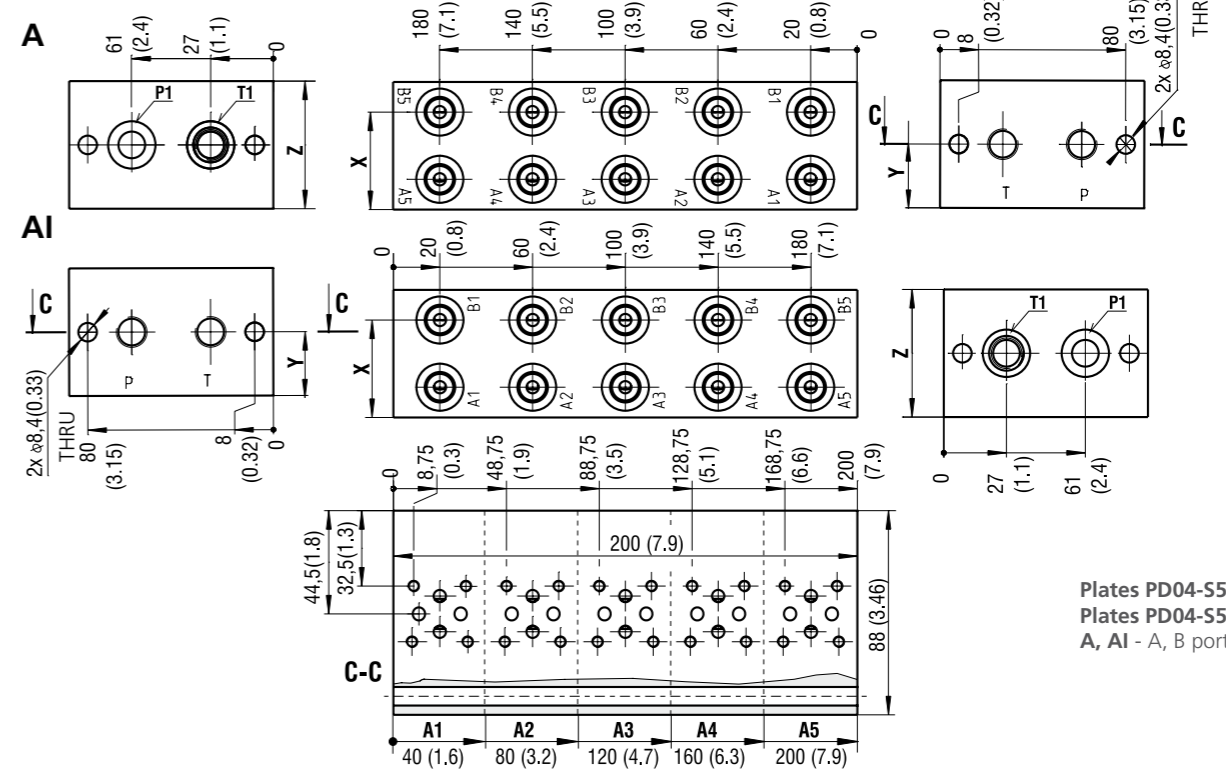
Plates with 1 ...8 sections Dimensions in millimeters (inches)

	L1	L2	L3	L4	L5	L6	L7	Z	Mass of Plates	kg (lbs)
A1	-	-	-	-	-	-	-	-	A1	0.6 (1.32)
A2	-	85 (3.35)	-	-	-	-	-	14 (0.55)	A2	1.4 (3.11)
A3	-	-	-	-	-	-	-	14 (0.55)	A3	2.1 (4.66)
A4	-	-	125 (4.92)	-	-	-	-	14 (0.55)	A4	2.8 (6.21)
A5	45 (1.77)	-	-	165 (6.50)	-	-	-	14 (0.55)	A5	3.5 (7.77)
A6	-	-	125 (4.92)	-	205 (8.07)	-	-	14 (0.55)	A6	4.2 (9.33)
A7	-	-	-	165 (6.50)	-	245 (9.65)	-	14 (0.55)	A7	4.9 (10.19)
A8	-	-	125 (4.92)	-	205 (8.07)	-	285 (11.22)	11 (0.43)	A8	5.6 (12.22)

Plates with 1 ...8 sections

Port threads - designation		G3
Port	A1...A7, B1...B7	P, T, P1, T1
Thread	G3/8	G3/8
Depth of thread	12	12
Counterbore	Ø23	Ø23
Depth of counterbore	1	1

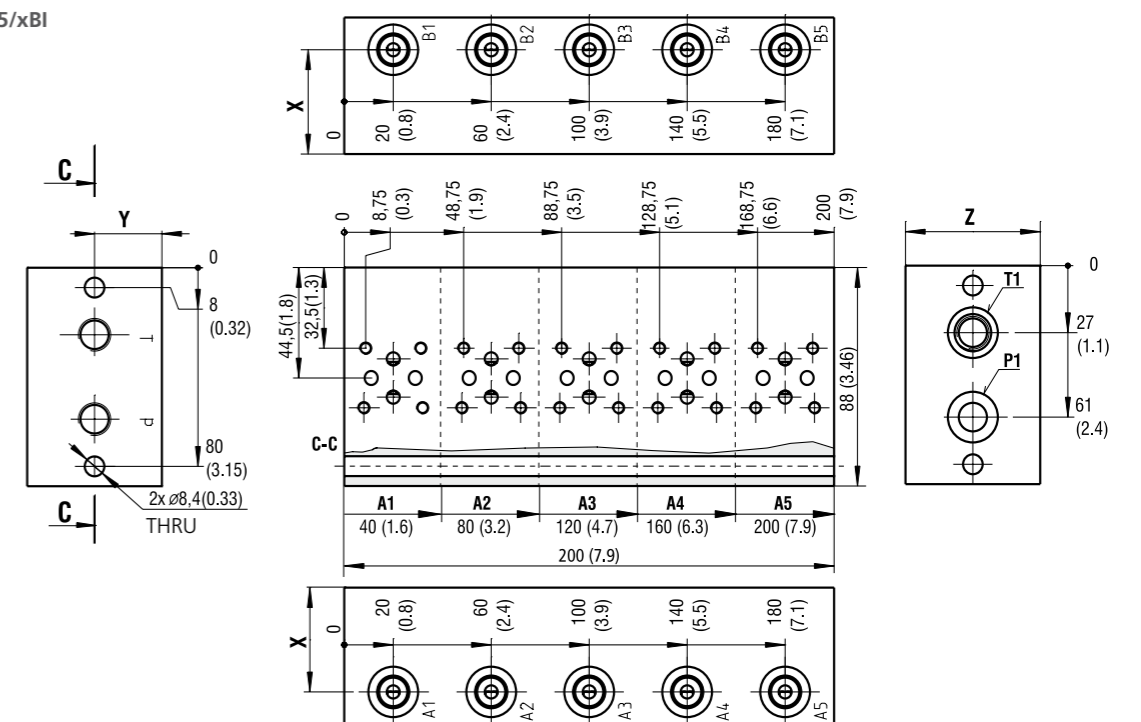
Dimensions in millimeters (inches)



Plates PD04-S5-A1 A5/xA
Plates PD04-S5-A1 A5/xAI
A, AI - A, B ports on one side

Plates PD04-S5-A1 A5/xBI

BI - A port on one side,
B port on other side

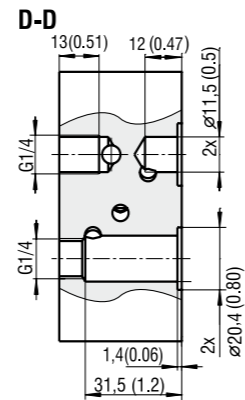
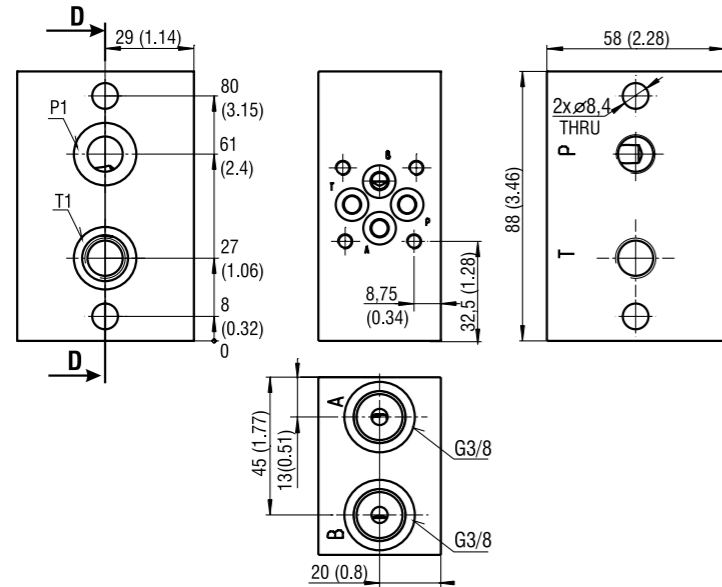


A1 - A5 Port size (side location A, AI or BI)	Dimensions mm (in)			Mass of Plates	kg (lbs)
	Y	X	Z		
G1	55 (2.17)	42 (1.65)	27.5 (1.08)	A1	0.6 (1.32)
G2	58 (2.28)	45 (1.77)	29 (1.14)	A2	1.2 (2.65)
U1	55 (2.17)	42 (1.65)	27.5 (1.08)	A3	1.8 (3.96)
				A4	2.4 (5.29)

A1 - A5 (side location A, AI or BI)	Port size			A1...A5, B1...B5	P, T	P1, T1	A1...A5, B1...B5	P, T	P1, T1
Thread	G 1/4	G 1/4	G 3/8	G 1/4			9/16-18		
Depth of thread	13.5 (0.53)	13 (0.51)	13.5 (0.53)	13 (0.51)			12.7		
Counterbore	Ø20		Ø23			Ø20.4	Ø25		Ø20.4
Depth of counterbore	0.5+0.5		0.5+0.5			1.4	0.5+0.5	0	1.4
O-Ring [mm]	G1		G2			17.17x1.68 NBR70	U1		17.17x1.68 NBR70

Dimensions in millimeters (inches)

Plate PD04-S5-C1



Mass of Block	kg (lbs)
PD04-S5-C1	0.49 (1.08)
PD04-S5-E1	0.49 (1.08)

Plate PD04-S5-E1

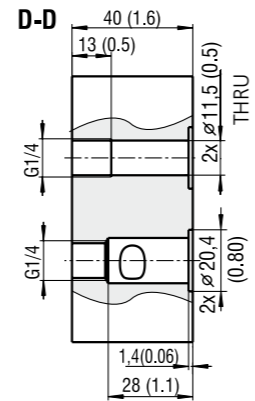
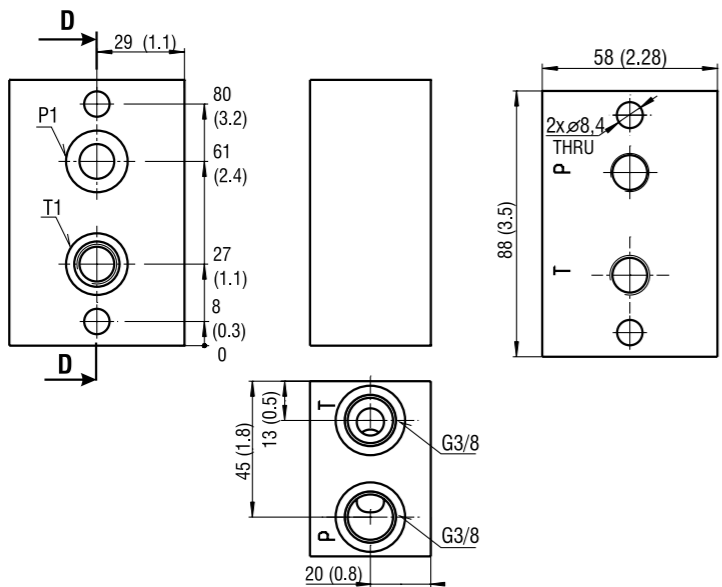
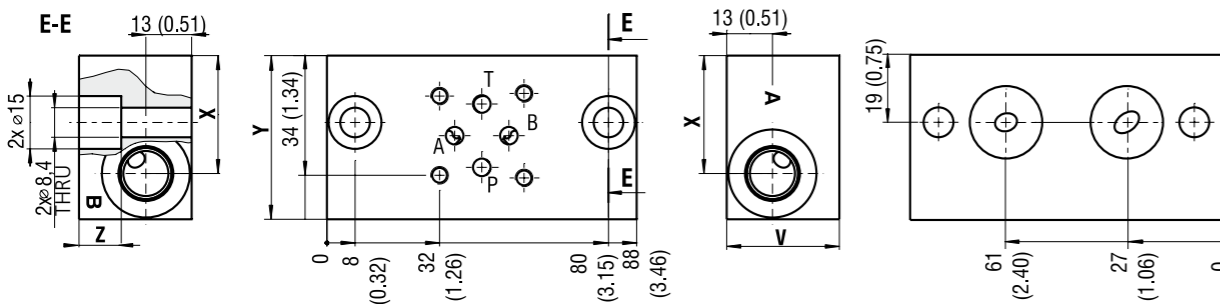


Plate PD04-S5-R11



R1 Port size	Dimensions mm (in)				Mass of Plates	kg (lbs)
	V	Y	X	Z		
G1	30 (1.18)	46 (1.81)	33 (1.30)	10 (0.39)	PD04-S5 R1	0.3 (0.66)
U1	32 (1.26)	46.5 (1.83)	33.5 (1.32)	12 (0.47)	PD04-S5 R1	0.3 (0.66)

R1 Port size	Port size			
	A, B	P, T	A, B	P, T
Thread	G 1/4		9/16-18	
Depth of thread	12 (0.47)		12.7	
Counterbore	∅20	∅20.4	∅25	∅20.4
Depth of counterbore	1	1.4	1	1.4
O-Ring [mm]	G1	17.17x1.68 NBR70	U1	17.17x1.68 NBR70

List of standardised types

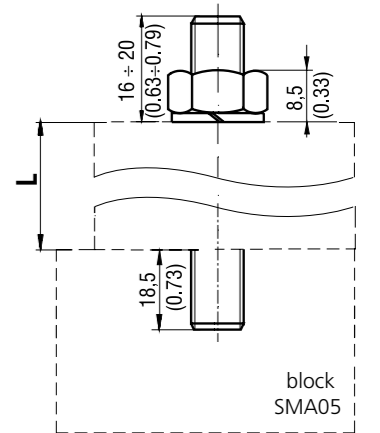
Design version S5

Plate - type	SAP	Plate - type	SAP	Plate - type	SAP
PD04-S5-A1/G1AI-ALN	16095000	PD04-S5-A4/G1BI-ALN	23474900	PD04-S5-A2/U1BI-ALN	23484700
PD04-S5-A2/G1AI-ALN	16095100	PD04-S5-A5/G1BI-ALN	23475000	PD04-S5-A3/U1BI-ALN	23484800
PD04-S5-A3/G1AI-ALN	16095200	PD04-S5-A1/G2BI-ALN	16095300	PD04-S5-A4/U1BI-ALN	23484900
PD04-S5-A4/G1AI-ALN	23473900	PD04-S5-A2/G2BI-ALN	23475200	PD04-S5-A5/U1BI-ALN	23485000
PD04-S5-A5/G1AI-ALN	16770200	PD04-S5-A3/G2BI-ALN	23475300	PD04-S5-A1/G1A-AL	30672100
PD04-S5-A1/G2AI-ALN	16666600	PD04-S5-A4/G2BI-ALN	23475400	PD04-S5-A2/G1A-AL	30670800
PD04-S5-A2/G2AI-ALN	16666700	PD04-S5-A5/G2BI-ALN	23475500	PD04-S5-A3/G1A-AL	on request only
PD04-S5-A3/G2AI-ALN	23474300	PD04-S5-A1/U1AI-ALN	23484100	PD04-S5-A4/G1A-AL	28618200
PD04-S5-A4/G2AI-ALN	16666800	PD04-S5-A2/U1AI-ALN	23484200	PD04-S5-A5/G1A-AL	on request only
PD04-S5-A5/G2AI-ALN	23474500	PD04-S5-A3/U1AI-ALN	23484300	PD04-S5-C1/G2AI-AL	32195200
PD04-S5-A1/G1BI-ALN	23474600	PD04-S5-A4/U1AI-ALN	23484400	PD04-S5-E1/G3-AL	32195300
PD04-S5-A2/G1BI-ALN	23474700	PD04-S5-A5/U1AI-ALN	23484500	PD04-S5-R11/G1-ALN	16666900
PD04-S5-A3/G1BI-ALN	23474800	PD04-S5-A1/U1BI-ALN	23484600	PD04-S5-R11/U1-ALN	23476000

Assembly of PD04-S5 plates

One threaded end of an M8 stud is screwed into the aluminium block, the plate is connected to the block with a nut and a washer. The set consists of two studs, spring washers and nuts. The torque for the nut is 18 Nm (13.3 ft-lbf).

Number of section	Total block length L [mm (in)]	Version A and B		Version C	
		Stud	Set SAP No.	Stud	Set SAP No.
1	40	M8x73	16095900	M8x117	16096100
2	80	M8x113	16096000	M8x157	16667600
3	120	M8x153	16667300	M8x197	16667700
4	160	M8x193	16667400	M8x237	16667800
5	200	M8x233	16667500	M8x277	16667900



Serial Plates for ISO 4401-03 Valve with Side Ports

DR2-06

Size 06 (D03) • p_{max} (AL) 320 bar (4600 PSI) • p_{max} (ST) 350 bar (5100 PSI)



Technical Features

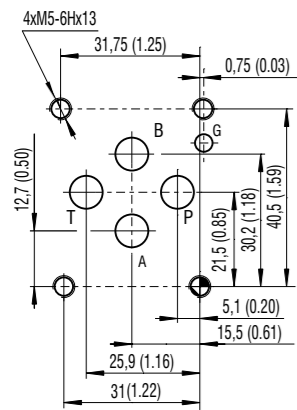
- › Designed to connect in parallel two or more ISO 4401-03 (CETOP 03) valves with integrated unloading and pressure relief valve cavity with interface 7/8-14-UNF-2A
- › Compact design with reduced plate dimensions for production cost saving
- › Maximum 8 parallel modular valve sections
- › Consumer ports A and B positioned on the side of the sub-plate
- › Maximum flow rate can be increased up to twice the output if the sub-plates are powered at both ends
- › Serial plates are available in aluminium EN AW - 7075 T6 and steel
- › In the standard version, the aluminium serial plate is without surface protection and the steel plate is zinc-coated for 520 h protection acc. to ISO 9227

Technical Data

Modular valves mounting surface		06 (D03)
Cartridge cavity		B2
Max. operating pressure (aluminium)	bar (PSI)	320 (4640)
Max. operating pressure (steel)	bar (PSI)	350 (5080)
Port dimensions P		G1/2
Port dimensions T		G1/2
Port dimensions A, B		G3/8
Port dimensions M		G1/4
Mass (model 0, 1, 2)	kg (lbs)	see table

	Data Sheet	Type
General information	GI_0060	Products and operating conditions
Cavity details	SMT_0019	SMT_B2*
Mounting interface / tolerances	SMT_0019	Size 06
Studs and nuts for vertical stacking assemblies		HA_0020

ISO 4401-03-02-0-05

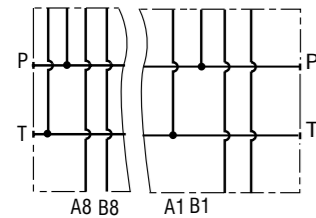


Ports P, A, B, T - max Ø 7.5 mm (0.29 in)

Connection

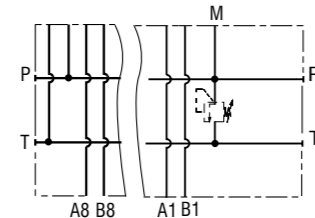
DR2-06/ □ 0

P, TG1/2
A, BG3/8



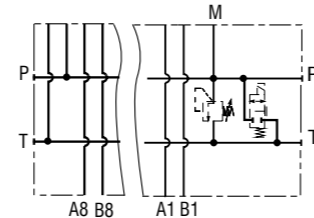
DR2-06/ □ 1

P, TG1/2
A, BG3/8
MG1/4
valve cavity 7/8-14 UNF

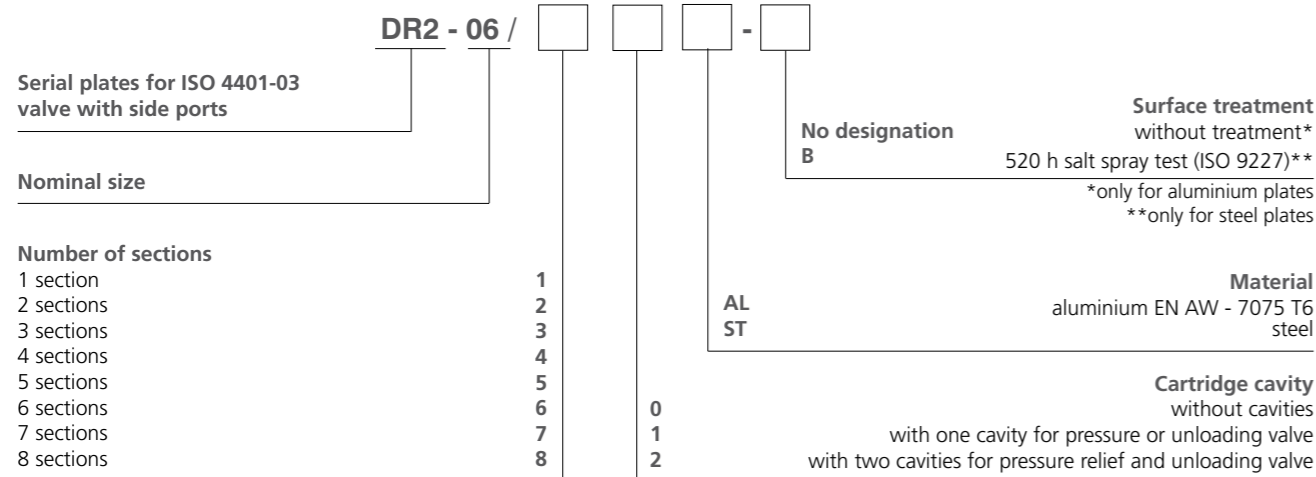


DR2-06/ □ 2

P, TG1/2
A, BG3/8
MG1/4
2 valve cavities 7/8-14 UNF

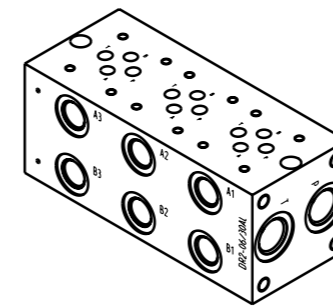


Ordering Code

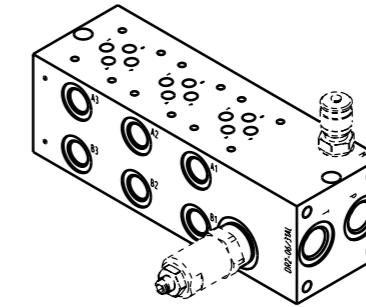


Dimensions in millimeters (inches)

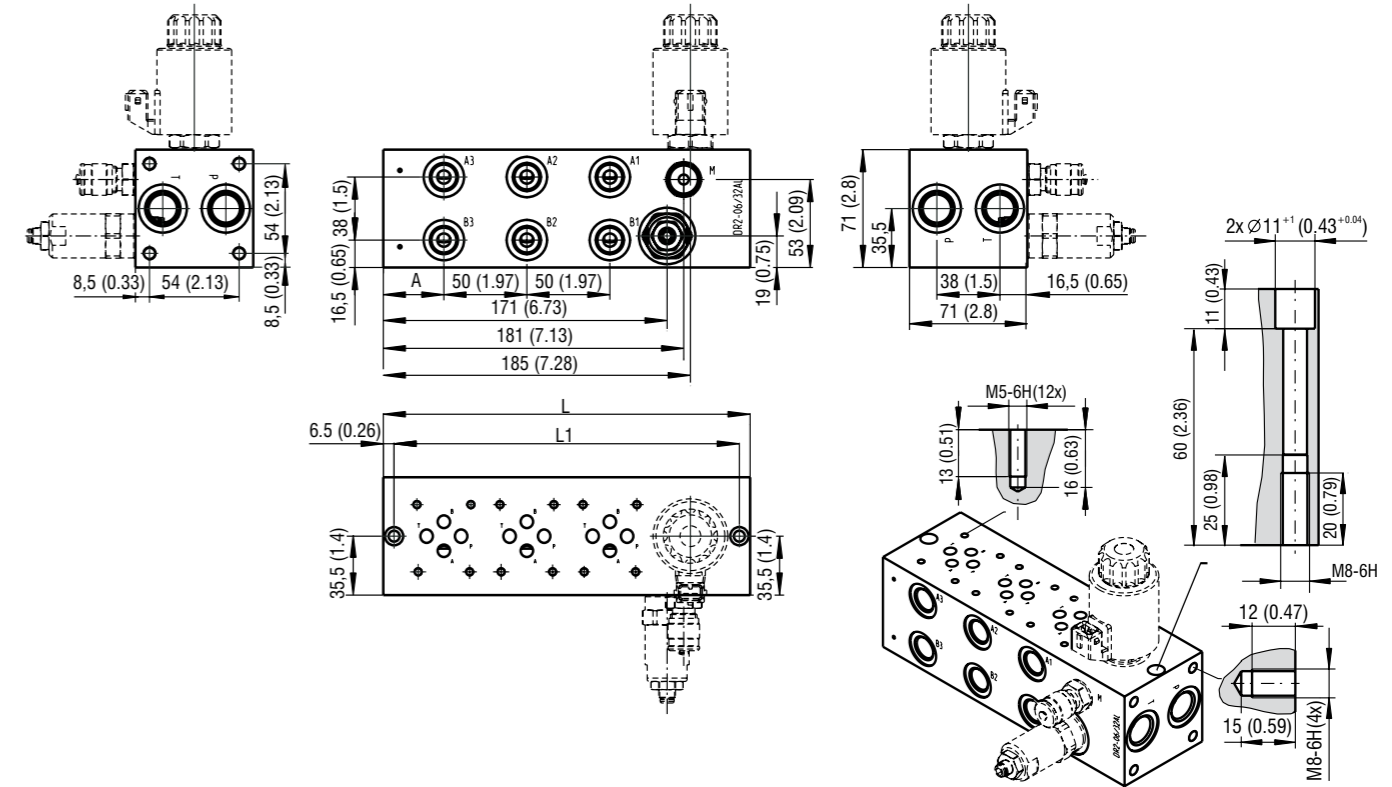
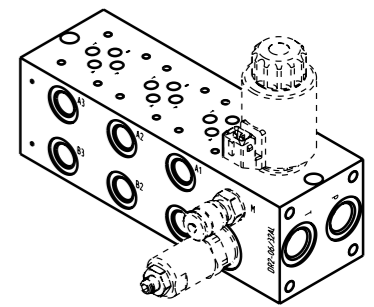
DR2-06/ □ 0



DR2-06/ □ 1



DR2-06/ □ 2



DR2-06	/ *0	/ *1(2)	/ *0	/ *1(2)	/ *0	/ *1(2)	AL - DR2-06/*0	ST - DR2-06/*0		
Number of sec.	L [mm (in)]	L1 [mm (in)]	A [mm (in)]	Ordering number	Mass [kg (lb)]	Ordering number	Mass [kg (lb)]	Ordering number	Mass [kg (lb)]	
1	71 (2.80)	121 (4.76)	58 (2.28)	108 (4.25)	35.5 (1.40)	36.5 (1.44)	27562600	0.83 (1.8)	28262900	2.33 (5.1)
2	121 (4.76)	171 (6.73)	108 (4.25)	158 (6.22)	35.5 (1.40)	36.5 (1.44)	27562700	1.43 (3.2)	28263000	4.15 (9.2)
3	171 (6.73)	221 (8.70)	158 (6.22)	208 (8.19)	35.5 (1.40)	36.5 (1.44)	27562800	2.03 (4.5)	28263100	5.70 (12.6)
4	221 (8.70)	271 (10.67)	208 (8.19)	258 (10.16)	35.5 (1.40)	36.5 (1.44)	27562900	2.63 (5.8)	28263200	7.38 (16.3)
5	271 (10.67)	321 (12.64)	258 (10.16)	308 (12.13)	35.5 (1.40)	36.5 (1.44)	27563000	3.23 (7.1)	28263300	9.07 (20.0)
6	321 (12.64)	371 (14.61)	308 (12.13)	358 (14.09)	35.5 (1.40)	36.5 (1.44)	27563100	3.83 (8.4)	28263400	10.75 (3.7)
7	371 (14.61)	421 (16.57)	358 (14.09)	408 (16.06)	35.5 (1.40)	36.5 (1.44)	27563200	4.43 (9.8)	28263500	12.43 (27.4)
8	421 (16.57)	471 (18.54)	408 (16.06)	458 (18.03)	35.5 (1.40)	36.5 (1.44)	27563400	5.03 (11.1)	28263600	14.12 (31.1)

Number of sec.	AL - DR2-06/*1		ST - DR2-06/*1	
	Ordering number	Mass [kg (lb)]	Ordering number	Mass [kg (lb)]
1	27563500	1.43 (3.2)	28263700	4.02 (8.9)
2	27563600	2.03 (4.5)	28263800	5.70 (12.6)
3	27563700	2.63 (5.8)	28263900	7.38 (16.3)
4	27563800	3.23 (7.1)	28264000	9.06 (20.0)
5	27563900	3.83 (8.4)	28264100	10.72 (23.6)
6	27564000	4.42 (9.7)	28264200	12.43 (27.4)
7	27564100	5.02 (11.1)	28264300	14.12 (31.1)
8	27564200	5.62 (12.4)	28264400	15.80 (34.8)

Number of sec.	AL - DR2-06/*2		ST - DR2-06/*2	
	Ordering number	Mass [kg (lb)]	Ordering number	Mass [kg (lb)]
1	27632300	1.38 (3.0)	28269600	3.88 (8.6)
2	27632500	1.98 (4.4)	28269700	5.57 (12.3)
3	27632600	2.58 (5.7)	28269800	7.25 (16.0)
4	27632700	3.18 (7.0)	28269900	8.94 (19.7)
5	27632800	3.78 (8.3)	28270000	10.62 (23.4)
6	27632900	4.38 (9.7)	28270100	12.30 (27.1)
7	27633000	4.98 (11.0)	28270200	13.99 (30.8)
8	27633100	5.58 (12.3)	28270300	15.67 (34.6)

Serial Plates with Side Ports for ISO 4401-03 Valves

PD06

Size 06 (D03) • p_{max} 250 bar (3600 PSI)



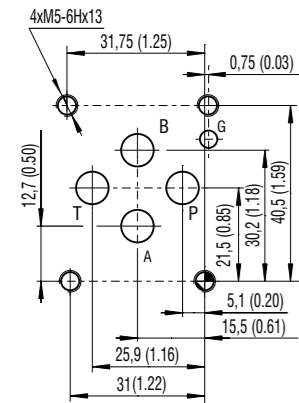
Technical Features

- Designed to connect in parallel two or more ISO 4401-03 (CETOP 03) valves to build compact hydraulics on each axis vertically
- Stackable models (Version S5 and Z6) with mounting interface for SMA05 or ZB06 hydraulic power unit central block
- Flexible design of various stackable plates enables simple creation of circuits without the use of pipes and fittings
- Maximum 6 parallel modular valve sections may be installed. Optional selection for A and B consumer port positions
- Maximum flow rate can be increased up to double the output if the sub-plates are powered at both ends
- Serial plates are available in aluminium. For other material consult our technical department for their identification and feasibility.
- Includes mounting stud kits for horizontal plate assembly
- BSP and SAE porting
- In the standard version, the aluminium serial plate is without surface protection

Technical Data

Modular valves mounting surface		06 (D03)
Max. operating pressure (aluminium)	bar (PSI)	250 (3630)
Port threads (according to model)		see table
Mass (according to model)	kg (lbs)	see table
	Data Sheet	Type
General information	GI_0060	Products and operating conditions
Mounting interface	SMT_0019	Size 06
Studs and nuts for vertical stacking assemblies		HA_0020

ISO 4401-03-02-0-05



Ports P, A, B, T - max Ø7.5 mm (0.29 in)

Functional Description

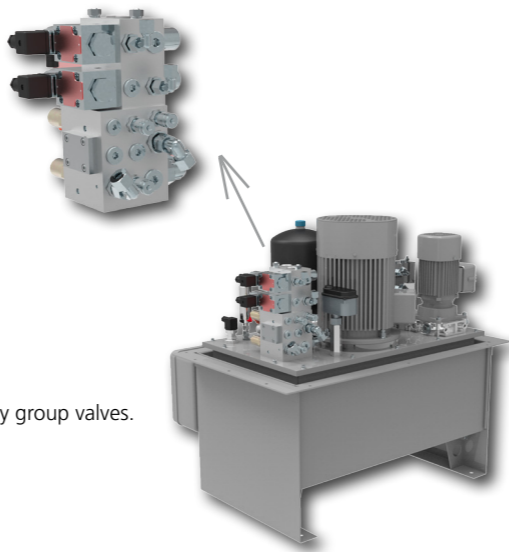
Design version Z6 (Stackable for ZB06)

The plates of design version Z6 are intended for assembly on the top surface of the manifold ZB06 on power packs SA to extend the control functions or can be used as a separate manifold. Plates with 1 up to 4 sections are provided with two horizontal through-holes of diameter D 10.5 mm for studs M10. Plates of up to 10 sections can be created by horizontal grouping. Side outputs P1, T1 (on the side of the last section) have a countersink for a sealing ring.

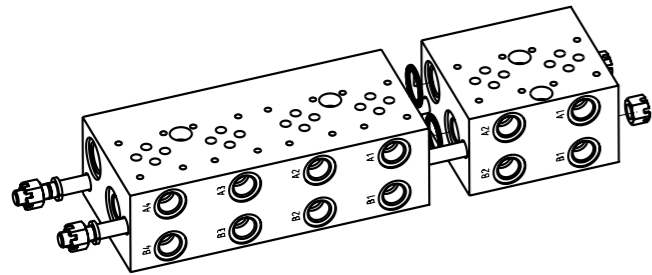
Design version NS (Not Stackable)

The plates of design version NS are similar but with 5 or 6 sections. They can be used only separately because they do not have any holes for studs. Outputs P1, T1, P, T on both sides have a countersink for a sealing ring.

NS plates have 3 vertical holes (Z6 plates 2 holes) for M8 screws. The holes have a countersink for the screw head on one side and a connecting M10 thread on the second side. They are used for fixing the plates to a base or a frame.



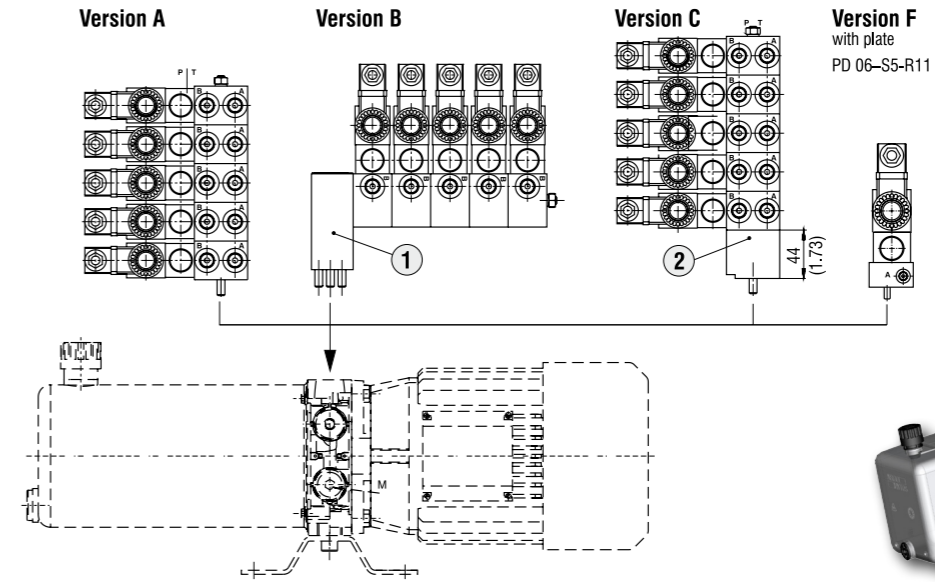
Control circuit of SA power pack extended by plate PD06-Z6-A2 with a possibility to vertically group valves.



Separate six-section plate created by horizontal grouping of plates PD06-Z6-A4 and PD06-Z6-A2, connected by two studs M10. The plate can be fixed to a base or a frame with M8 or M10 screws.

Design version S5 (Stackable for SMA 05)

The version S5 is intended for assembly onto the central manifold of power pack SMA 05 to extend the control functions. Plates with 1 up to 5 sections have two horizontal through-holes of diameter D8.4 mm for M8 studs. Side outputs P1, T1 (here on the side of the 1st section) have a countersink for a sealing ring. There are four possibilities to connect to the SMA central block (for more details see SMA data sheet 7212). For some types of tanks it is necessary to use a connecting plate due to space requirements.



		SAP No.
1	Connecting plate B	16094500
2	Connecting plate C	16094700

Ordering Code

PD06 - [] - [] / [] - AL [] - []

Serial plates for ISO 4401-03 (CETOP 03) valves

Nominal size
 Stackable – for ZB06 base plate **Z6**
 Non stackable **NS**
 Stackable - for SMA 05 power unit central block **S5**

Functional symbol (section)

A B C R1

Plate with functional symbol R1 is produced only as a one section type PD06-S5-R11

Number of sections

1 section	2
2 sections	1 - 4
3 sections	3
4 sections	5 - 6
5 sections	5
6 sections	6

Number of sections	Design version
1 - 4	Z6
5 - 6	NS
1 - 5	S5

Port threads

Designation	P	T	A	B	Used for version
G1	G1/4	G1/4	G1/4	G1/4	S5
G2	G1/4	G1/4	G3/8	G3/8	S5
G4	G3/8	G1/2	G3/8	G3/8	NS and Z6
G5	G1/2	G1/2	G3/8	G3/8	NS
U1	9/16-18 UNF	9/16-18 UNF	9/16-18 UNF	9/16-18 UNF	S5

Surface Treatment
 No designation aluminium plate without treatment

Seals
 No designation without seal rings
 N NBR

Material
 AL aluminium

Side location for A and B consumer ports, and valve position

AI PD06-S5

BI PD06-S5

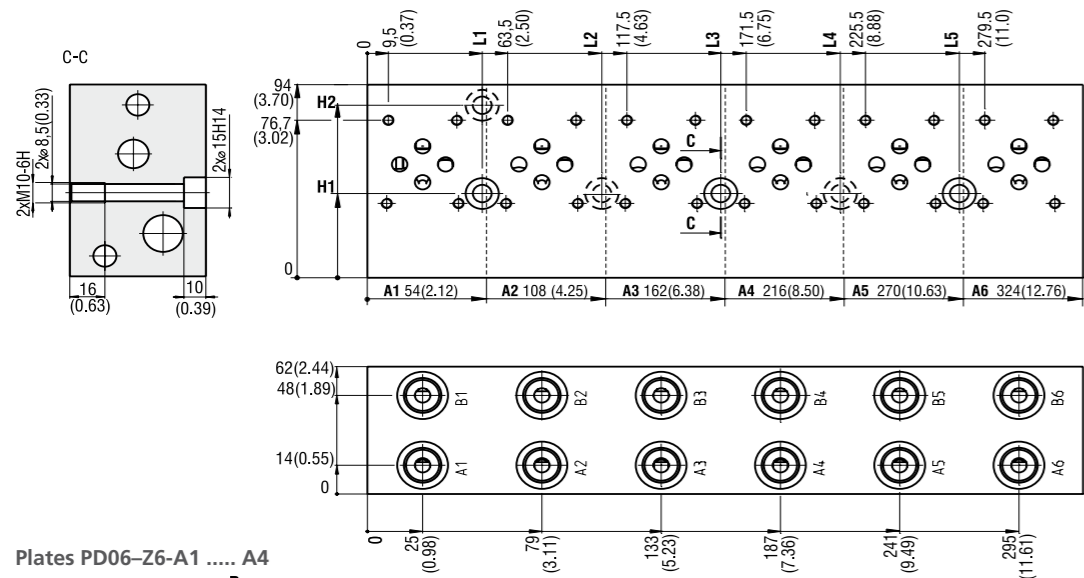
DIR PD06-Z6, PD06-NS

The standardised PD plates, listed in this data sheet, are available. For other plate versions contact our technical department for their identification and feasibility.

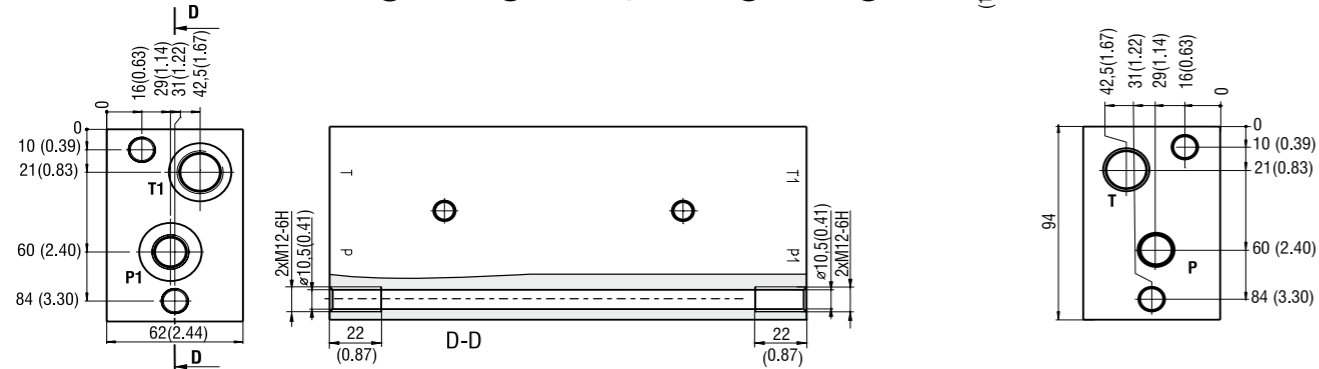
Dimensions in millimeters (inches)

Plates PD06-Z6 and PD06-NS

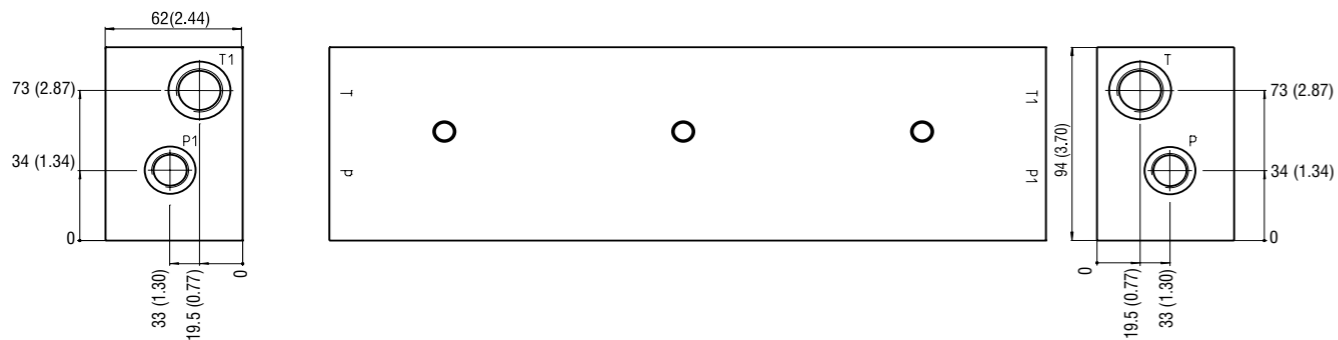
Plates with 1, 2, 3 and 4 sections enable combinations up to 10 sections



Plates PD06-Z6-A1 A4



Plates PD06-NS-A5 A6



Plates with 1 ...6 sections Dimensions in millimeters (inches)

	L1	L2	L3	L4	L5	H1	H2	Plate mass	kg (lbs)
A1								A1	0.7 (1.57)
A2							84 (3.31)	A2	1.4 (3.11)
A3		106 (4.17)						A3	2.1 (4.66)
A4	52 (2.04)					41 (1.61)		A4	2.8 (6.21)
A5			160 (6.30)	214 (8.43)				A5	3.5 (7.77)
A6					268 (10.6)			A6	4.2 (9.33)

Plates with 1 ...6 sections Port size Dimensions in millimeters (inches)

Port threads - designation	G4					G4, G5			
Port	A1...A4, B1...B4	P	T	P1	T1	A5...A6, B5...B6	T, T1	G4	G5
Thread	G 3/8	G 3/8	G 1/2	G 3/8	G 1/2	G 3/8	G 1/2	G 3/8	G 1/2
Depth of thread	12 (0.47)	12 (0.47)	14 (0.55)	12 (0.47)	14 (0.55)	12 (0.47)	14 (0.55)	14 (0.55)	14 (0.55)
Counterbore	Ø23			Ø28.4	Ø28.4	Ø23	Ø28	Ø23	Ø28
Depth of counterbore	1(0.03)			2.1 (0.8)	2.1 (0.8)	1(0.03)			
O-Ring [mm]				23.4 x 2.62	23.4 x 2.62				

List of standardised types

Design version	Plate - type	SAP	Design version	Plate - type	SAP
Z6	PD06-Z6-A1/G4DIR-ALN	16102300	NS	PD06-NS-A5/G4DIR-AL	16102700
	PD06-Z6-A2/G4DIR-ALN	16102400		PD06-NS-A6/G4DIR-AL	16102800
	PD06-Z6-A3/G4DIR-ALN	16102500			
	PD06-Z6-A4/G4DIR-ALN	16102600			
	PD06-Z6-B1/G4DIR-ALN	16102900			
	PD06-Z6-C1/G4DIR-ALN	16103000			

Assembly of PD06-Z6 plates

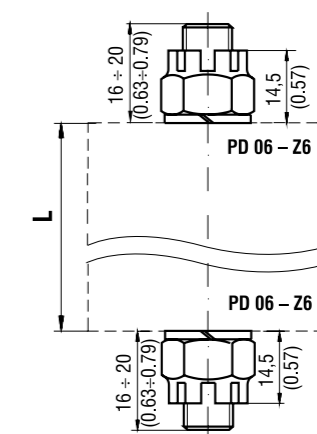
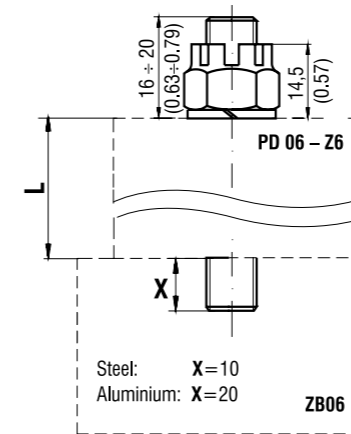
One threaded end of an M10 stud is screwed into the basic block, the plate is connected to the block with a nut and a washer. The connecting set consists of two studs, spring washers and crown nuts. For an assembly of separate plates use the stud set for aluminium basic block + nut set. The nut set consists of two nuts and spring washers. The torque of the nut is 35+3 Nm (25.8+2.2 lbf.ft).

Number of section	Total block length L [mm (in)]	Steel basic block		Aluminium basic block	
		Stud	Set SAP No.	Stud	Set SAP No.
1	54 (2.13)	M10x67	23676000	M10x70	23675900
2	108 (4.25)	M10x138	23676100	M10x143	23676800
3	162 (6.38)	M10x192	16103200	M10x199	23676900
4	216 (8.50)	M10x246	23676300	M10x259	23677000
5	270 (10.63)	M10x300	23676400	M10x314	23677100
6	324 (12.76)	M10x354	23676500	M10x374	23677200
7	378 (14.88)	M10x408	23676600	M10x424	16103300
8	432 (17.00)	M10x462	23676700	M10x474	16103400
9	486 (19.13)			M10x526	23677500
10	540 (21.26)			M10x584	23677600

Nut set	Set includes	Set SAP No.
	2x crown nut M10 + 2x spring washer 10.2	23440400

Plate / plates PD06-Z6 assembled to the basic block of an SA power pack.

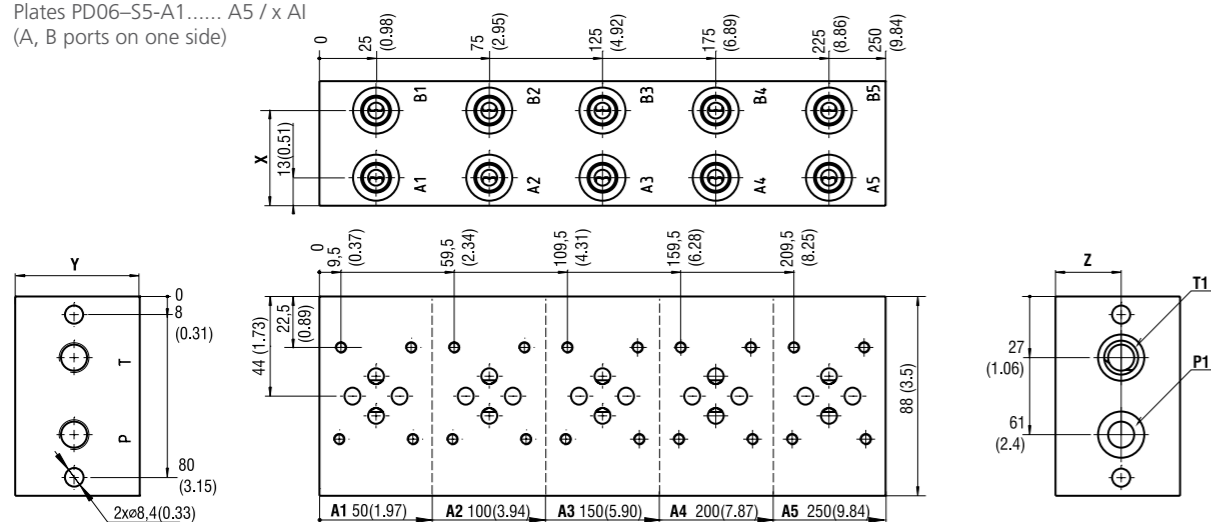
Grouped plates PD06-Z6 used as a separate compact block.



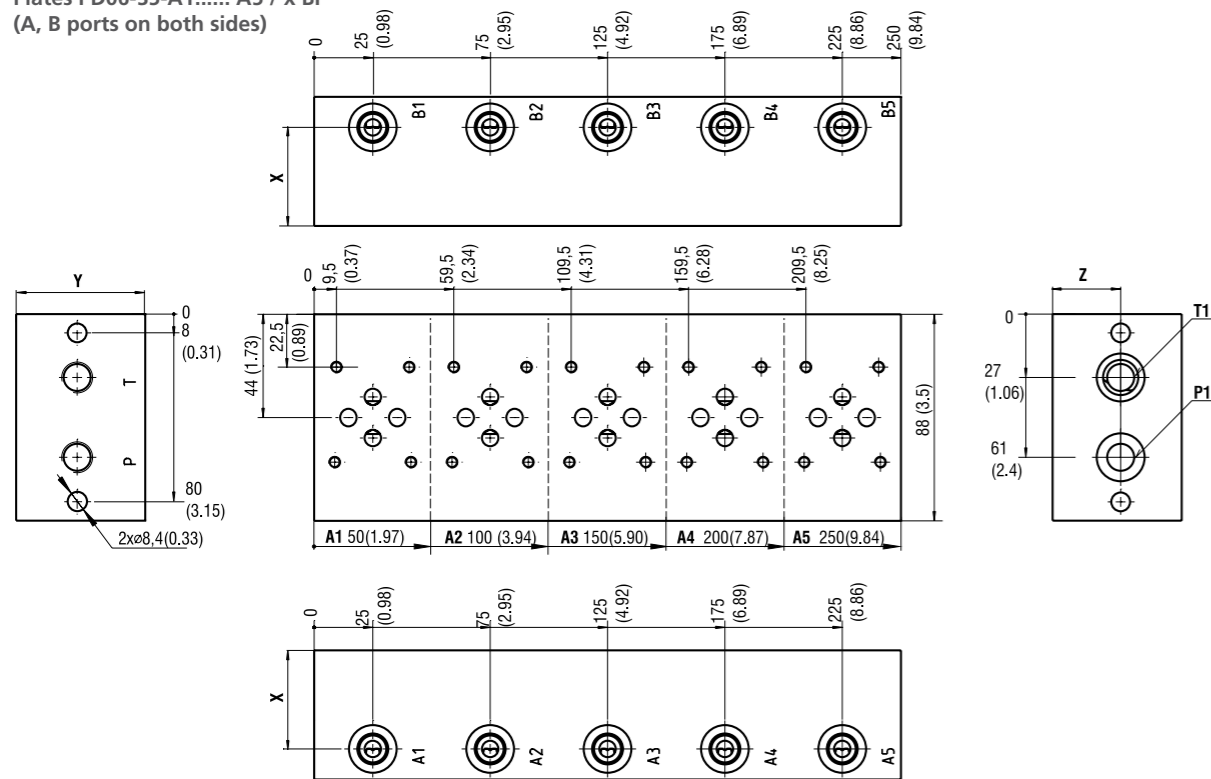
Dimensions in millimeters (inches)

Plates PD06-S5

Plates PD06-S5-A1..... A5 / x AI
(A, B ports on one side)



Plates PD06-S5-A1..... A5 / x BI
(A, B ports on both sides)

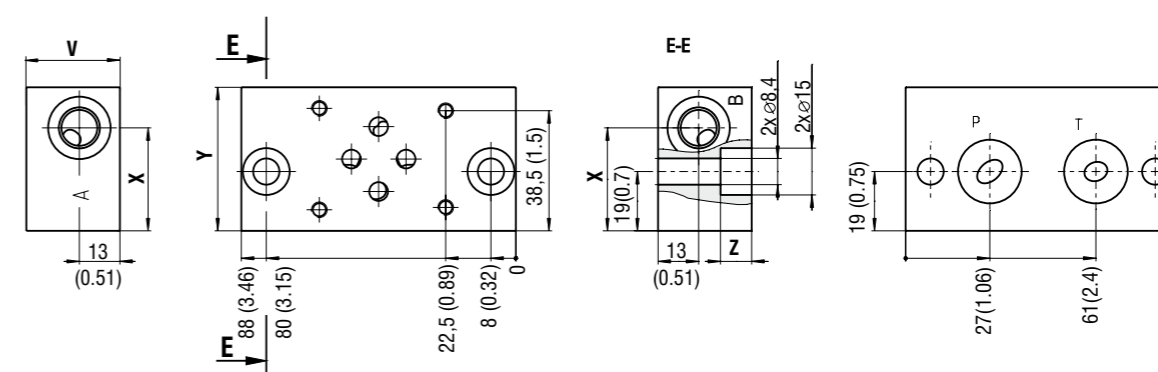


A1 - A5 Port size (side location AI or BI)	Dimensions mm (in)			Plate mass	kg (lbs)
	Y	X	Z		
G1	55 (2.17)	42 (1.65)	27.5 (1.08)	A1	0.6 (1.32)
G2	58 (2.28)	45 (1.77)	29 (1.14)	A2	1.2 (2.65)
U1	55 (2.17)	42 (1.65)	27.5 (1.08)	A3	1.8 (3.96)
				A4	2.4 (5.29)
				A5	3.0 (6.61)

A1 - A5 (side location AI or BI)	Port size			
	A1...A5, B1...B5	P, T	P1, T1	A1...A5, B1...B5
Thread	G 1/4	G 1/4		G 3/8
Depth of thread	13.5 (0.53)	13 (0.51)		13.5 (0.53)
Counterbore	Ø20		Ø20.4	Ø23
Depth of counterbore	0.5+0.5		1.4	0.5+0.5
O-Ring [mm]	G1		17.17x1.68 NBR70	G2
				U1

Dimensions in millimeters (inches)

Plate PD06-S5-R11



R1 Port size	Dimensions mm (in)				Plate mass	kg (lbs)
	V	Y	X	Z		
G1	30 (1.18)	46 (1.81)	33 (1.30)	10 (0.39)	R1	0.3 (0.66)
U1	32 (1.26)	46.5 (1.83)	33.5 (1.32)	12 (0.47)	R1	0.3 (0.66)

R1 Port size	Port size			
	A, B	P, T	A, B	P, T
Thread	G 1/4		9/16-18	
Depth of thread	12 (0.47)		12.7	
Counterbore	Ø20	Ø20.4	Ø25	Ø20.4
Depth of counterbore	1	1.4	1	1.4
O-Ring [mm]	G1	17.17x1.68 NBR70	U1	17.17x1.68 NBR70

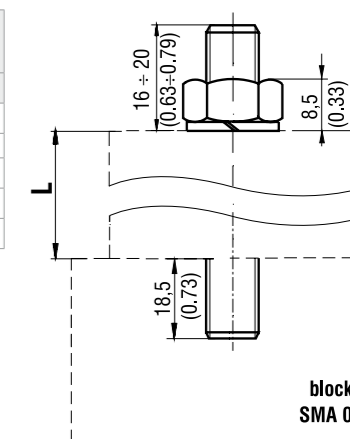
List of standardised types

Design version S5					
Plate - type	SAP	Plate - type	SAP	Plate - type	SAP
PD06-S5-A1/G1AI-ALN	16094900	PD06-S5-A2/G2AI-ALN	16769900	PD06-S5-A1/U1AI-ALN	23485100
PD06-S5-A2/G1AI-ALN	17084600	PD06-S5-A3/G2AI-ALN	16770000	PD06-S5-A2/U1AI-ALN	23485200
PD06-S5-A3/G1AI-ALN	23471800	PD06-S5-A4/G2AI-ALN	16666500	PD06-S5-A3/U1AI-ALN	23485300
PD06-S5-A4/G1AI-ALN	23471900	PD06-S5-A5/G2AI-ALN	16770100	PD06-S5-A4/U1AI-ALN	23485400
PD06-S5-A5/G1AI-ALN	23472000	PD06-S5-A1/G2BI-ALN	23473100	PD06-S5-A5/U1AI-ALN	23485500
PD06-S5-A1/G1BI-ALN	23472600	PD06-S5-A2/G2BI-ALN	23473200	PD06-S5-A1/U1BI-ALN	23485600
PD06-S5-A2/G1BI-ALN	23472700	PD06-S5-A3/G2BI-ALN	23473300	PD06-S5-A2/U1BI-ALN	23485700
PD06-S5-A3/G1BI-ALN	23472800	PD06-S5-A4/G2BI-ALN	23473400	PD06-S5-A3/U1BI-ALN	23485800
PD06-S5-A4/G1BI-ALN	23472900	PD06-S5-A5/G2BI-ALN	23473500	PD06-S5-A4/U1BI-ALN	23485900
PD06-S5-A5/G1BI-ALN	17236800	PD06-S5-B1/G1AI-ALN	29767700	PD06-S5-A5/U1BI-ALN	23486000
PD06-S5-A1/G2AI-ALN	16666400	PD06-S5-R11/G1-ALN	16095400	PD06-S5-R11/U1-ALN	23476100

Assembly of PD06-S5 plates

One threaded end of an M8 stud is screwed in the aluminium block, the plate is connected to the block with a nut and a washer. The set consists of two studs, spring washers and nuts. The torque for the nut is 18 Nm (13.3 lbf.ft).

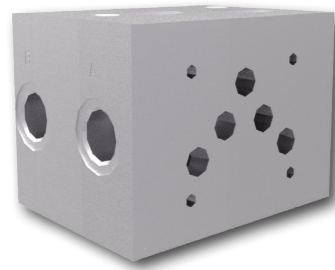
Number of section	Total block length L [mm (in)]	Version A and B		Version C	
		Stud	Set SAP No.	Stud	Set SAP No.
1	50 (1.96)	M8x83	16096200	M8x127	16668000
2	100 (3.93)	M8x133	16096300	M8x177	16668100
3	150 (5.90)	M8x185	16096400	M8x227	16668200
4	200 (7.87)	M8x233	16667500	M8x277	16667900
5	250 (9.84)	M8x285	16096500	M8x327	16668300



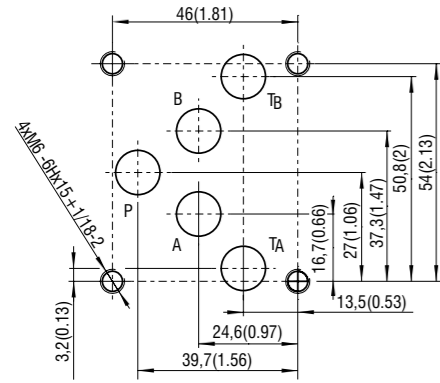
Serial Plates with Side Ports for ISO 4401-05 Valves

PD10

Size 10 (D05) • p_{max} 250 bar (3600 PSI)



ISO 4401-05-04-0-05



Ports P, A, B, T - max Ø11.2 mm (0.44 in)

Technical Features

- › Designed to connect in parallel two or more ISO 4401-05 (CETOP 05) valves to build compact hydraulics on each axis vertically
- › Stackable models (version Z6 and Z10) with mounting interface for ZB06 or ZB10 hydraulic power unit.
- › Flexible design of various stackable plates enables simple creation of circuits without the use of pipes and fittings.
- › Maximum 6 parallel modular valve sections may be installed. Maximum flow rate can be increased up to double the output if the sub-plates are powered at both ends.
- › Serial plates are available in aluminium. For other material consult our technical department for their identification and feasibility.
- › Includes mounting stud kits for plate assembly
- › In the standard version, the aluminium serial plate is without surface protection

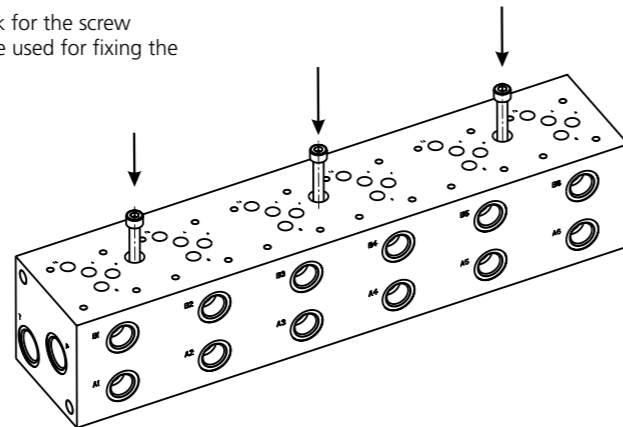
Technical Data

Modular valves mounting surface		10 (D05)
Max. operating pressure (aluminium)	bar (PSI)	250 (3630)
Port threads (depending on model)		see table
Mass (depending on model)	kg (lbs)	see table
	Data Sheet	Type
General information	GI_0060	Products and operating conditions
Mounting surface	SMT_0019	Size 10 (D05)
Studs and nuts for vertical stacking assemblies		HA_0020

Functional Description

Design version NS (Not Stackable)

The plates of design version NS have from 1 up to 6 sections. They can be used only separately because they do not have any holes for studs. Outputs P1, T1, P, T on both sides have a countersink for a sealing ring. NS plates have vertical holes for M8 screws. The holes have a countersink for the screw head on one side and connecting M10 thread on the other side. They are used for fixing the plates to a base or a frame.



Six-section plate PD10-NS-A6/G10Al. The plate can be fixed to a base or a frame with M8 or M10 screws.

Design version Z6 (Stackable for ZB06)

The plates of design version Z6 are intended for an assembly onto the top surface of manifold ZB06 of power packs SA4 to extend the control functions. Plates with 1 up to 2 section are provided with two horizontal through-holes of diameter D 10.2 mm for M10 studs. Side outputs P1, T1 (on side of the last section) have a countersink for a sealing ring.

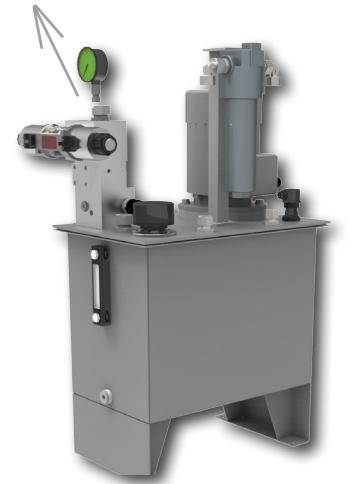


PD10-Z6-A2

Control circuit of SA power pack extended by plate PD10-Z6-A2 with a possibility to vertically group valves.

Design version Z10 (Stackable for ZB10)

The plates of design version Z10 are intended for an assembly onto the top surface of manifold ZB10 of power packs SA4 to extend the control functions. Plates with one section are provided with two horizontal through going holes of diameter D13 mm for M12 screws. Side outputs P1, T1 have a countersink for a sealing ring.



Ordering Code

PD10 - [] - [] / [] - AL [] - []

Serial plates for ISO 4401-05 (CETOP 05) valves

Nominal size

Design version

- Non stackable **NS**
- Stackable – for ZB06 base plate **Z6**
- Stackable – for ZB10 base plate **Z10**

Surface treatment

- aluminium plate without treatment
- No designation

Seals

- without seal rings
- NBR
- No designation **N**

Material

- aluminium
- AL

Side location for A and B consumer ports, and valve position

- Design version
- NS, Z6, Z10
- AI

Functional symbol (section)

A C BAS

Plate with functional symbol C is produced only as a one section type PD10-Z6-C1

Number of sections

1 section	1
2 sections	2
3 sections	1 - 6
4 sections	1 - 2
5 sections	1
6 sections	1

Number of sections	Design version
1 - 6	NS
1 - 2	Z6
1	Z10

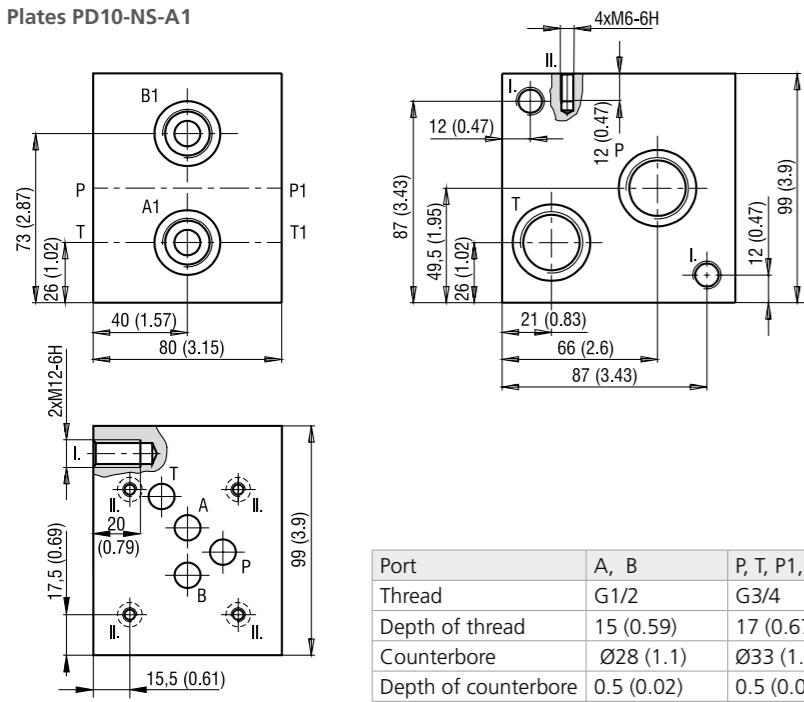
Port threads

Designation	P	T	A	B	Used for version
G8	G3/8	G1/2	G1/2	G1/2	Z6
G9	G1/2	G1/2	G1/2	G1/2	Z10, BAS
G10	G3/4	G3/4	G1/2	G1/2	NS

The standardised PD plates, listed in this data sheet, are available. For other plate versions contact our technical department for their identification and feasibility.

Dimensions in millimeters (inches)

Plates PD10-NS-A1

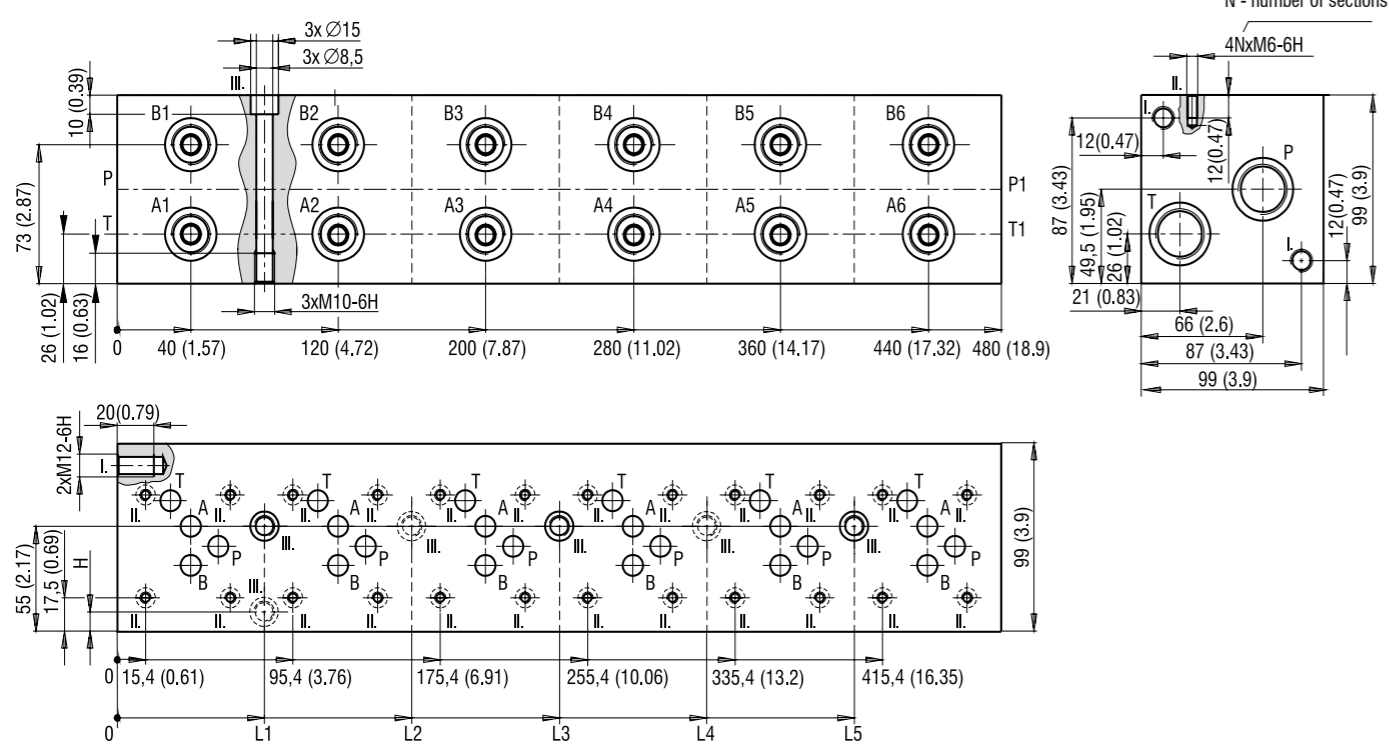


List of standardised types

Design version	Plate - type	SAP
NS	PD10-NS-A1/G10AI-AL	16108400
	PD10-NS-A2/G10AI-AL	16108500
	PD10-NS-A3/G10AI-AL	16108600
	PD10-NS-A4/G10AI-AL	16108700
	PD10-NS-A5/G10AI-AL	16108800
	PD10-NS-A6/G10AI-AL	16108900

Port	A, B	P, T, P1, T1
Thread	G1/2	G3/4
Depth of thread	15 (0.59)	17 (0.67)
Counterbore	Ø28 (1.1)	Ø33 (1.3)
Depth of counterbore	0.5 (0.02)	0.5 (0.02)

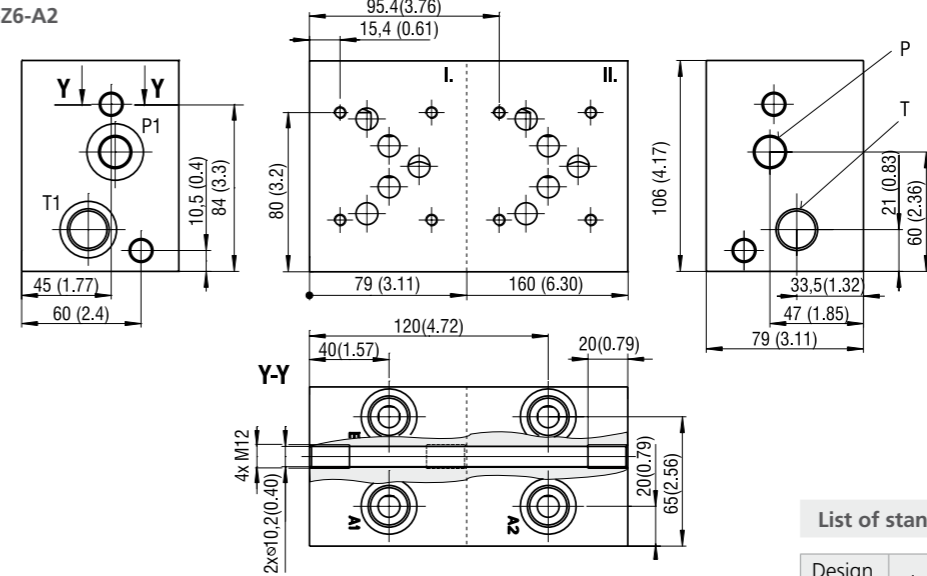
Plates PD10-NS-A2 A6



Number of sections	L1	L2	L3	L4	L5	H	Mass of plates kg [lbs]
PD10A1-AL							2.32 (5.11)
PD10A2-AL	80	-	-	-	-	10	4.48 (9.88)
PD10A3-AL	80	160	-	-	-	-	6.62 (14.59)
PD10A4-AL	80	-	240	-	-	-	8.85 (19.51)
PD10A5-AL	80	-	240	320	-	-	11.03 (24.32)
PD10A6-AL	80	-	240	-	400	-	13.21 (29.12)

Plate Dimensions in millimeters (inches)

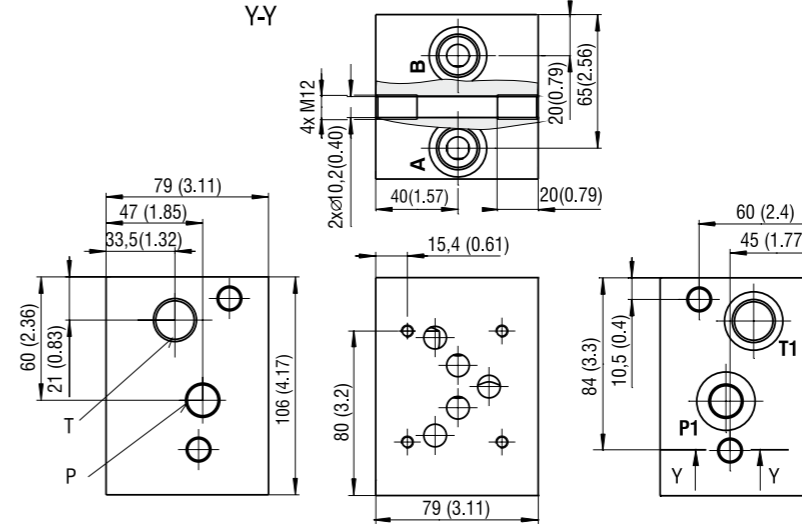
Stackable with mounting interface for ZB06 base plates
- PD10-Z6-A1
- PD10-Z6-A2



List of standardised types

Design version	Plate - type	SAP
Z6	PD10-Z6-A1/G8AI-AL	23698700
	PD10-Z6-A2/G8AI-AL	24608100
	PD10-Z6-C1/G8AI-AL	17954300

Stackable with mounting interface for ZB06 base plate
- PD10-Z6-C1



Section	Dimensions in millimeters (inches)				
Section	A1, A2, C	P	T	P1	T1
Port	A, B				
Thread	G 1/2	G 3/8	G 1/2	G 3/8	G 1/2
Depth of thread	15 (0.59)	15 (0.59)	15 (0.59)	15 (0.59)	15 (0.59)
Counterbore	Ø28 (1.1)			Ø28.4 (1.12)	Ø28.4 (1.12)
Depth of counterbore	0.5 (0.02)			2.1 (0.8)	2.1 (0.8)
O-Ring [mm]				23.4x2.62	23.4x2.62

Assembly of PD10-Z6 plates

One threaded end of an M10 stud is screwed into the basic block, the plate is connected to the block with a nut and washer. The connecting set consists of two studs, spring washers and crown nuts. The torque of the nut is 35+3 Nm (25.8+2.2 ft-lbf).

Number of section	Total plate length L [mm (in)]	Steel basic block			
		Screw	SAP No.	Washer	SAP No.
1	79 (3.11)	M10x90 (2x)	20243300	D10.2 (2x)	20256100
		Stud			Set SAP No. 16103200
2	160 (6.30)	Aluminium basic block			
		Screw	SAP No.	Washer	SAP No.
1	79 (3.11)	M10x100 (2x)	20243400	D10.2 (2x)	20256100
		Stud			Set SAP No. 23676900
2	160 (6.30)	M10x199			23676900

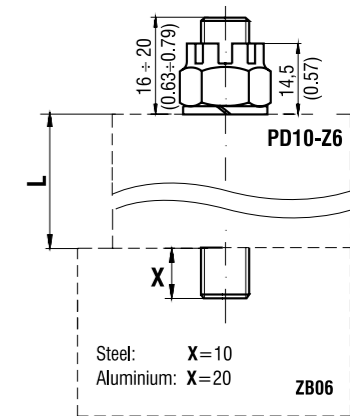
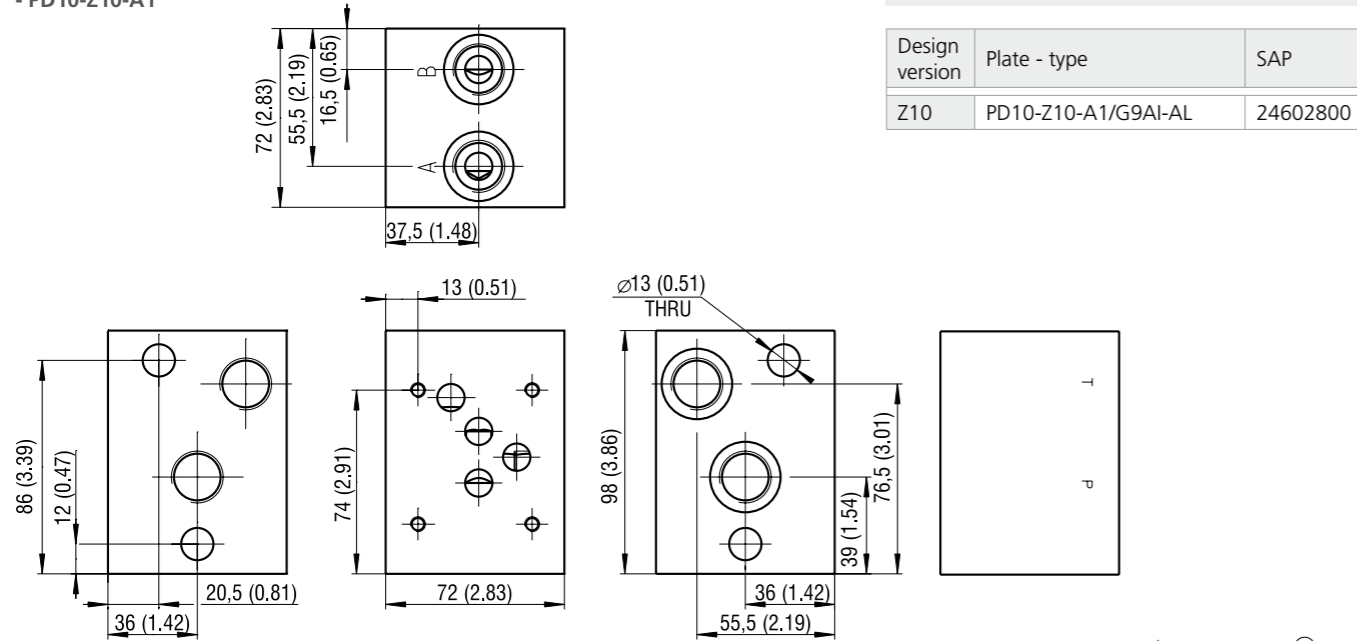


Plate Dimensions in millimeters (inches)

Stackable with mounting interface for ZB10 base plate
- PD10-Z10-A1



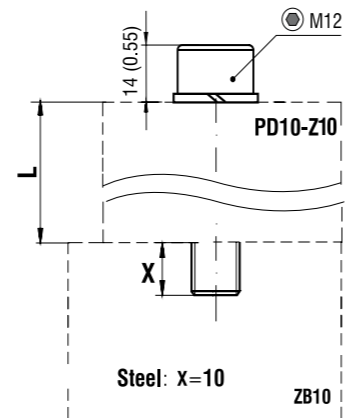
List of standardised types

Design version	Plate - type	SAP
Z10	PD10-Z10-A1/G9AI-AL	24602800

Assembly of PD10-Z10 plates

One section plate is connected to the basic block with two screws and washers. The torque for the M12 screws is 52+3 Nm (38.4+2.2 ft-lbf).

Number of section	Total plate length L [mm (in)]	Steel basic block Connecting set			
		Screw	SAP No.	Washer	SAP No.
1	72 (3.11)	M12x90 (2x)	20244500	D12.2 (2x)	20256200



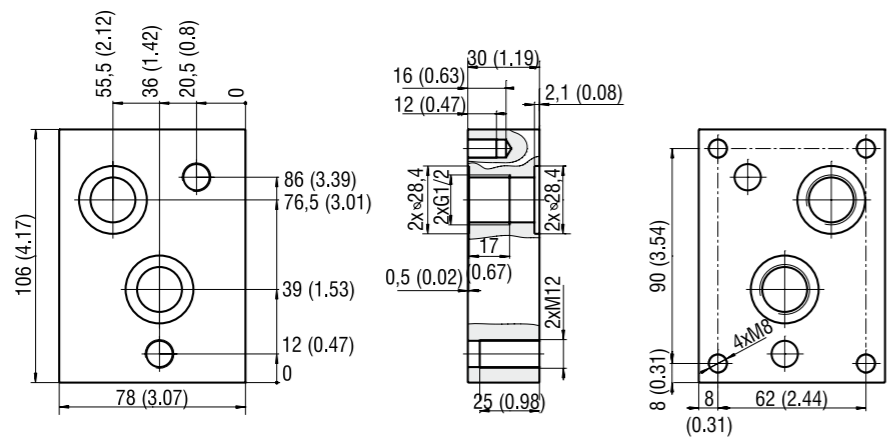
Connecting plate BAS for PD10-Z10 plates

The connecting plate BAS can be used instead the basic block ZB10. The plate is mounted onto the surface of tank cover with 4 M8 screws. Two threaded openings are intended for M12 studs to connect PD10 plate. The BAS plate is connected to hydraulic circuit (P, T) with pipes or hoses on the underside.

PD10-Z10-BAS

List of standardised types

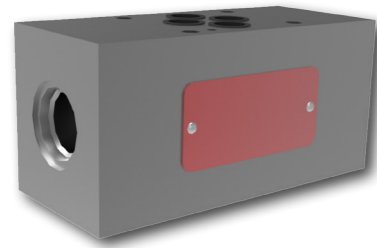
Design version	Plate - type	SAP
BAS	PD10-Z10-BAS/G9-ST-A	24600700



Sandwich Plates for Valves

SB-04 (06, 10)

Size 04, 06, 10 (D02, D03, D05) • p_{max} (G) 350 bar (5100 PSI) • p_{max} (ST) 420 bar (6100 PSI)



Technical Features

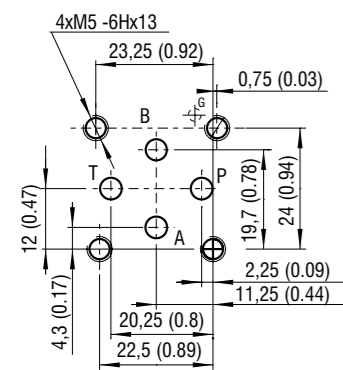
- › Designed for vertical assembly of built-in two-way and three-way valves in hydraulic circuits
- › Subplate mounting interface acc. to ISO 4401, DIN 24340 (CETOP 02, 03 and 05) Size 04, 06 and 10
- › Wide range of functional versions available for standard ISO 4401, UNF or metric threaded cavities
- › All versions stackable on PD04, (06, 10) and DR04 (06) serial plates
- › Sandwich plates are available in cast iron and steel
- › In the standard version, cast iron plates are zinc-coated for 520 h protection acc. to ISO 9227, steel plates are phosphated

Technical Data

Valve size	04 (D02)	06 (D03)	10 (D05)
Max. operating pressure	bar (PSI) cast iron - 350 (5080), steel - 420 (6100)		
Mass	see page 4-12		

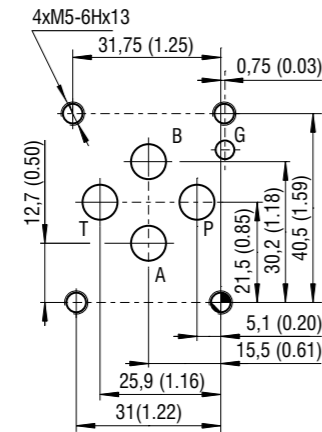
	Data Sheet	Type
General information	GI_0060	Products and operating conditions
Cavity details	SMT_0019	SMT_A2*, A3*, B2*, B3*, Q3*, QG2*, QH2*, R3*
Spare parts	SP_8010	

ISO 4401-02-01-0-05



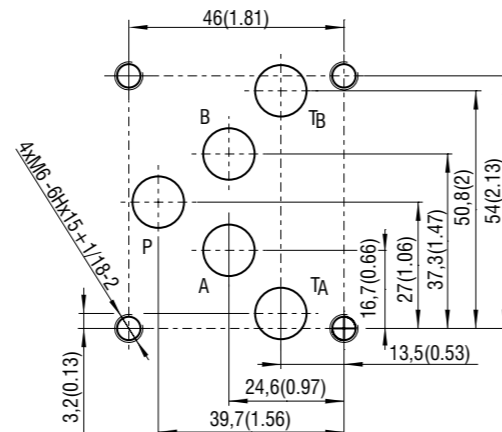
Ports P, A, B, T - max. \varnothing 4.5 mm (0.18 in)

ISO 4401-03-02-0-05



Ports P, A, B, T - max. \varnothing 7.5 mm (0.29 in)

ISO 4401-05-04-0-05



Ports P, A, B, T - max. \varnothing 11.2 mm (0.44 in)

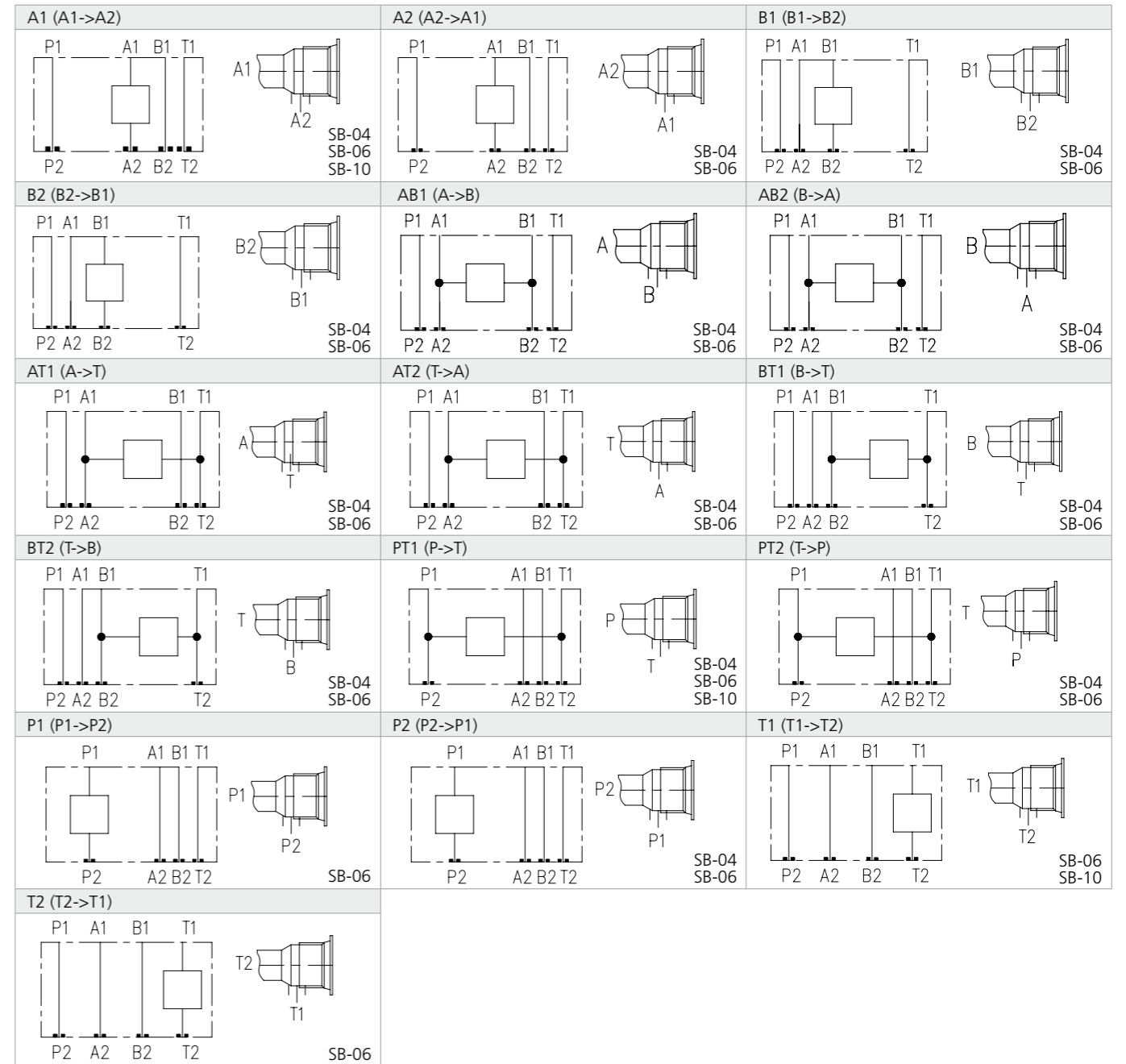
Ordering Code

SB -									
Sandwich plates for valves									
Nominal size	04	06	10						
Cavity	A2	A3	B2	B3	Q3	QG2	QH2	R3	
3/4-16UNF*									
3/4-16UNF*									
7/8-14UNF*									
7/8-14UNF*									
M20x1,5*									
M22x1,5*									
M24x1,5*									
M27x1,5*									
*See cavity datasheet HA 0019									
Number of valves in sandwich plates	1	2							
Surface treatment	P	A	B	No designation	V				
phosphated									
zinc-coated (ZnCr-3), ISO 9227 (240 h)									
zinc-coated (ZnNi), ISO 9227 (520 h)									
Seals									
NBR									
FPM (Viton)									
Body material									
cast iron (350 bar (5080 PSI))									
steel (420 bar (6100 PSI))									
Functional Symbols									
see functional symbols pages 2 and 3									

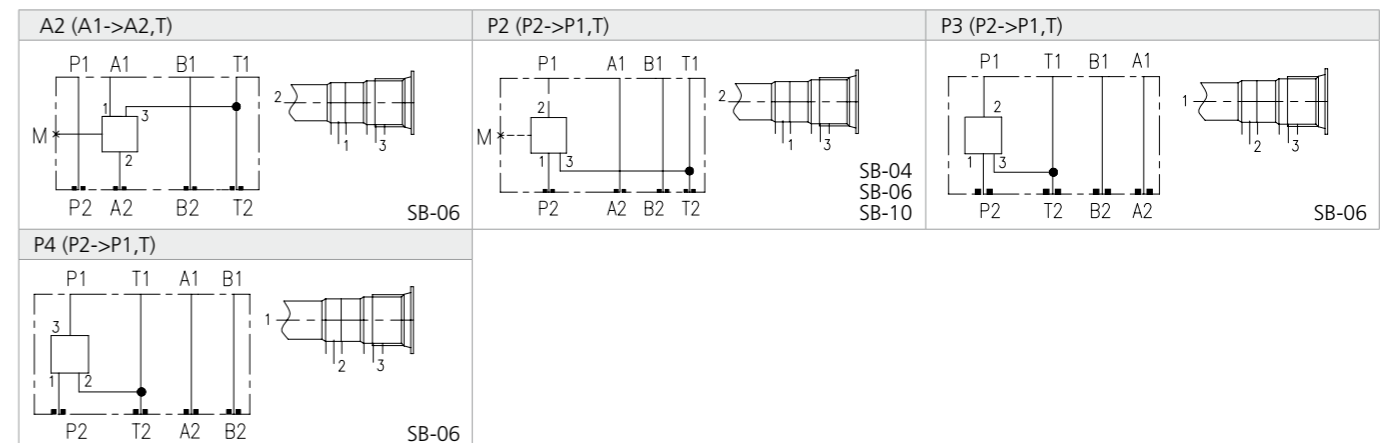
Not all combination of features are available as actual products. The standard versions are listed on pages 4 and 12
For the identification and feasibility of other body versions consult our technical department.

Functional symbols

Single valve installation, 2-Way

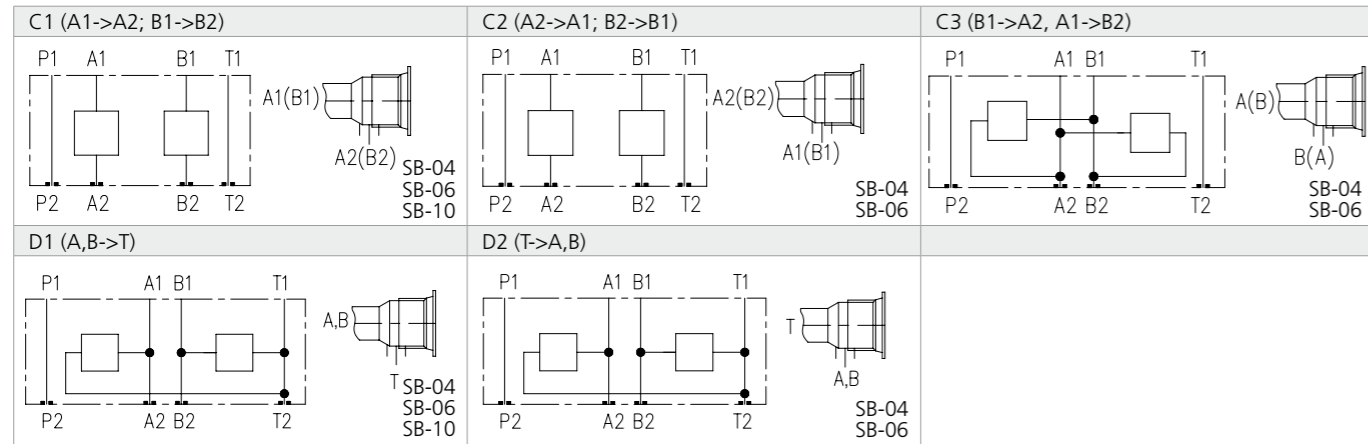


Single valve installation, 3-Way

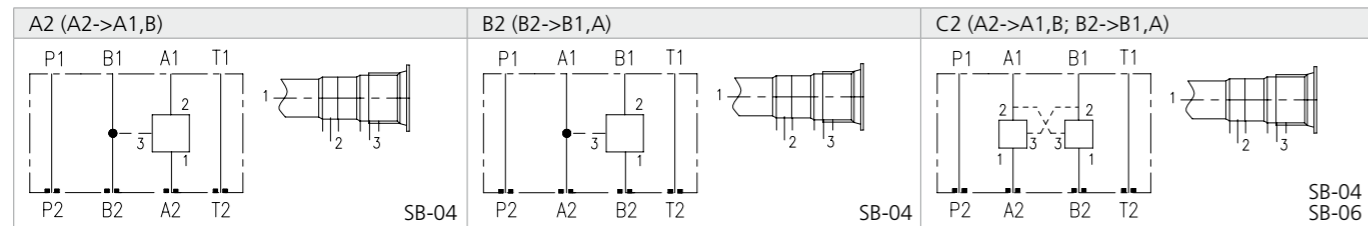


Functional symbols

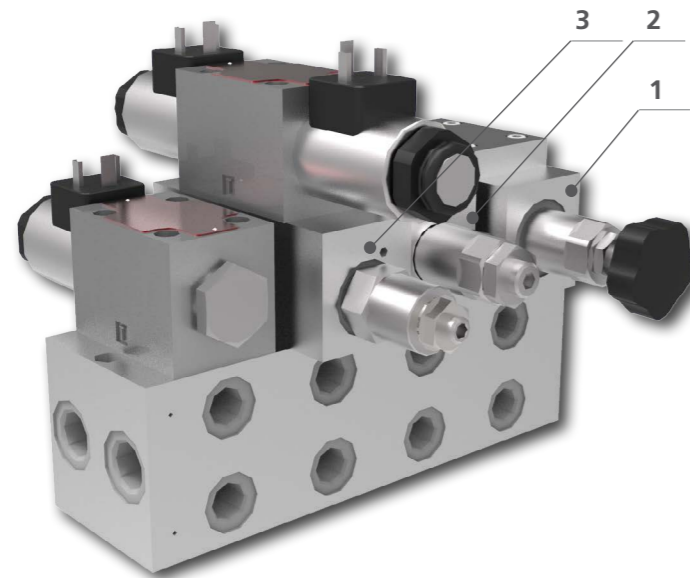
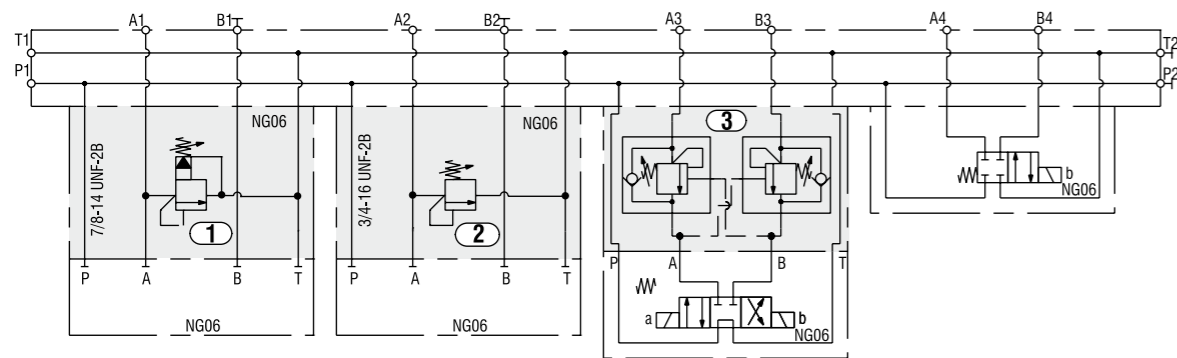
Dual valve installation, 2-Way



Piloted valve installation, 3-Way



An Example of Sandwich Plate Installations



Pos.	Ordering code
1	SB-06B2-AT1-GV-B
2	SB-06A2-AT1-GV-B
3	SB-06Q3-2C2-GV-B

Dimensions in millimeters (inches)

Single valve installation, 2-Way

3D picture shown is for illustration purpose only.

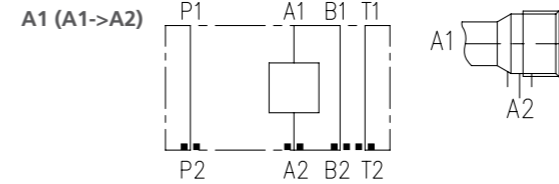


Plate size	Cavity size	Cavity thread	Ordering code	Ordering code - former	Plate material	Pressure bar (PSI)	Dimensions AxBxC/D mm (in)	Mass kg (lbs)	Ordering No.
04	A2	3/4-16 UNF	SB-04A2-1A1-GV-B		cast iron	350 (5080)	36x40x74/37 (1.41x1.57x2.91/1.46)	0.70 (1.54)	30978800
	QG2	M22x1.5	SB-04QG2-1A1-ST-P	MA04-ROE3	steel	420 (6090)	35x40x76/36 (1.42x1.56x2.99/1.42)	0.70 (1.54)	15652600
	QG2	M22x1.5	SB-04QG2-1A1-STV-P	MA04-ROE3/V	steel	420 (6090)	35x40x76/36 (1.42x1.56x2.99/1.42)	0.70 (1.54)	28592100
06	A2	3/4-16 UNF	SB-06A2-1A1-GV-B		cast iron	350 (5080)	45x50x73,5/19 (1.77x1.97x2.89/0.75)	1.05 (2.32)	28063500
	B2	7/8-14 UNF	SB-06B2-1A1-GV-B		cast iron	350 (5080)	45x50x86/30,5 (1.77x1.97x3.39/1.20)	1.22 (2.68)	30021500
	QG2	M22x1.5	SB-06QG2-1A1-ST-P	MA06-ROE3	steel	420 (6090)	38x40x80/28 (1.50x1.56x3.15/1.10)	0.95 (2.10)	15649200
	QG2	M22x1.5	SB-06QG2-1A1-STV-P	MA06-ROE3/V	steel	420 (6090)	38x40x80/28 (1.50x1.56x3.15/1.10)	0.95 (2.10)	28593400
10	B2	7/8-14 UNF	SB-06QH2-1A1-ST-A		steel	420 (6090)	45x44,3x109,5/56 (1.77x1.74x4.31/2.21)	1.29 (2.84)	On Request
			SB-10B2-1A1-GV-B		cast iron	350 (5080)	70x50x84/15 (2.76x1.97x3.31/0.59)	1.89 (4.17)	34249300

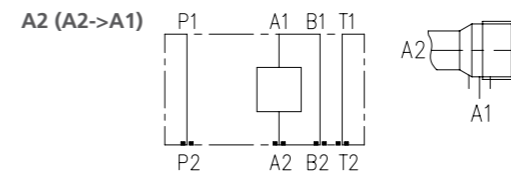


Plate size	Cavity size	Cavity thread	Ordering code	Ordering code - former	Plate material	Pressure bar (PSI)	Dimensions AxBxC/D mm (in)	Mass kg (lbs)	Ordering No.
04	A2	3/4-16 UNF	SB-04A2-1A2-GV-B		cast iron	350 (5080)	36x40x74/37 (1.41x1.57x2.91/1.46)	0.68 (1.50)	32360000
06	A2	3/4-16 UNF	SB-06A2-1A2-GV-B		cast iron	350 (5080)	45x50x73,5/19 (1.77x1.97x2.89/0.75)	1.05 (2.32)	32184500
	B2	7/8-14 UNF	SB-06B2-1A2-GV-B		cast iron	350 (5080)	45x50x86/30,5 (1.77x1.97x3.39/1.20)	1.22 (2.68)	32067900

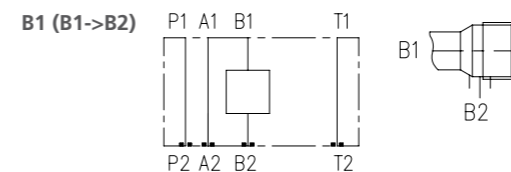


Plate size	Cavity size	Cavity thread	Ordering code	Ordering code - former	Plate material	Pressure bar (PSI)	Dimensions AxBxC/D mm (in)	Mass kg (lbs)	Ordering No.
04	A2	3/4-16 UNF	SB-04A2-1B1-GV-B		cast iron	350 (5080)	45x44,3x109,5/56 (1.77x1.74x4.31/2.21)	0.68 (1.50)	31113000
	QG2	M22x1.5	SB-04QG2-1B1-ST-P	MB04-ROE3	steel	420 (6090)	35x40x76/36 (1.42x1.56x2.99/1.42)	0.70 (1.54)	15652800
	QG2	M22x1.5	SB-04QG2-1B1-STV-P	MB04-ROE3/V	steel	420 (6090)	35x40x76/36 (1.42x1.56x2.99/1.42)	0.70 (1.54)	28592500
06	A2	3/4-16 UNF	SB-06A2-1B1-GV-B		cast iron	350 (5080)	35x40x76/36 (1.42x1.56x2.99/1.42)	1.06 (2.35)	30677500
	B2	7/8-14 UNF	SB-06B2-1B1-GV-B		cast iron	350 (5080)	45x50x86/30,5 (1.77x1.97x3.39/1.20)	1.22 (2.68)	30708100
	QG2	M22x1.5	SB-06QG2-1B1-ST-P	MB06-ROE3	steel	420 (6090)	38x40x80/28 (1.50x1.56x3.15/1.10)	0.70 (1.54)	15649300
	QG2	M22x1.5	SB-06QG2-1B1-STV-P	MB06-ROE3/V	steel	420 (6090)	38x40x80/28 (1.50x1.56x3.15/1.10)	0.70 (1.54)	28593700

Single valve installation, 2-Way

3D picture shown is for illustration purpose only.

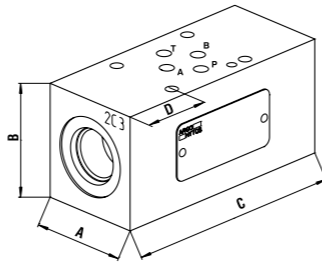
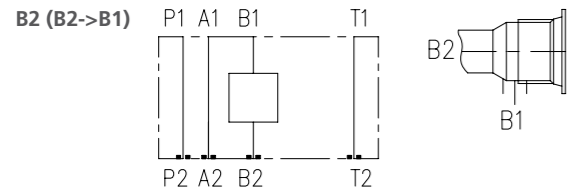


Plate size	Cavity size	Cavity thread	Ordering code	Ordering code - former	Plate material	Pressure bar (PSI)	Dimensions AxBxC/D mm (in)	Mass kg (lbs)	Ordering No.
04	A2	3/4-16 UNF	SB-04A2-1B2-GV-B		cast iron	350 (5080)	36x40x74/18,5 (1.41x 1.57x2.91/0.73)	0.70 (1.54)	On Request
06	A2	3/4-16 UNF	SB-06A2-1B2-GV-B		cast iron	350 (5080)	45x50x73,5/18 (1.77x1.97x2.89/0.71)	0.70 (1.54)	On Request
	B2	7/8-14 UNF	SB-06B2-1B2-GV-B		cast iron	350 (5080)	45x50x86/30,5 (1.77x1.97x3.39/1.20)	0.90 (1.98)	31062900

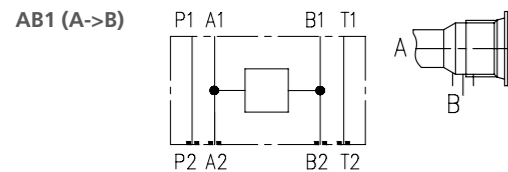


Plate size	Cavity size	Cavity thread	Ordering code	Ordering code - former	Plate material	Pressure bar (PSI)	Dimensions AxBxC/D mm (in)	Mass kg (lbs)	Ordering No.
04	A2	3/4-16 UNF	SB-04A2-1AB1-GV-B		cast iron	350 (5080)	36x40x74/18,5 (1.41x 1.57x2.91/0.73)	0.80 (1.76)	32016600
06	A2	3/4-16 UNF	SB-06A2-1AB1-GV-B		cast iron	350 (5080)	45x50x73,5/18 (1.77x1.97x2.89/0.71)	1.06 (2.34)	32702000
	B2	7/8-14 UNF	SB-06B2-1AB1-GV-B		cast iron	350 (5080)	45x50x86/30,5 (1.77x1.97x3.39/1.20)	1.25 (2.76)	30380500

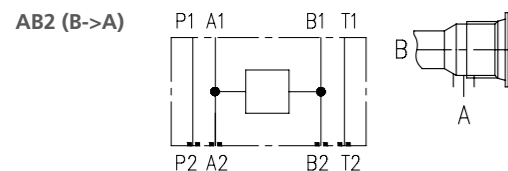


Plate size	Cavity size	Cavity thread	Ordering code	Ordering code - former	Plate material	Pressure bar (PSI)	Dimensions AxBxC/D mm (in)	Mass kg (lbs)	Ordering No.
04	A2	3/4-16 UNF	SB-04A2-1AB2-GV-B		cast iron	350 (5080)	36x40x74/18,5 (1.41x 1.57x2.91/0.73)	0.67 (1.48)	31509300
	QG2	M22x1.5	SB-04QG2-1AB2-ST-P	MX04-ROE3	steel	420 (6090)	29x35x76/36 (1.14x1.39x2.99/1.42)	0.70 (1.54)	15652900
	QG2	M22x1.5	SB-04QG2-1AB2-STV-P	MX04-ROE3/V	steel	420 (6090)	29x35x76/36 (1.14x1.39x2.99/1.42)	0.70 (1.54)	28592600
06	A2	3/4-16 UNF	SB-06A2-1AB2-GV-B		cast iron	350 (5080)	45x50x73,5/18 (1.77x1.97x2.89/0.71)	1.05 (2.32)	30122800
	B2	7/8-14 UNF	SB-06B2-1AB2-GV-B		cast iron	350 (5080)	45x50x86/30,5 (1.77x1.97x3.39/1.20)	1.25 (2.76)	30987000
	QG2	M22x1.5	SB-06QG2-1AB2-ST-P	MX06-ROE3	steel	420 (6090)	38x40x80/28 (1.50x1.56x3.15/1.10)	0.70 (1.54)	15649400
	QG2	M22x1.5	SB-06QG2-1AB2-STV-P	MX06-ROE3/V	steel	420 (6090)	38x40x80/28 (1.50x1.56x3.15/1.10)	0.70 (1.54)	28594000

Single valve installation, 2-Way

3D picture shown is for illustration purpose only.

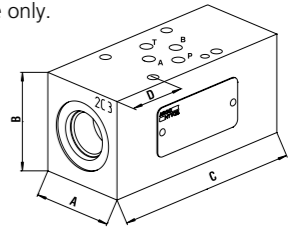
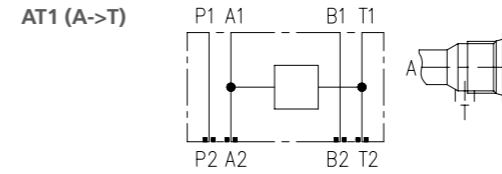


Plate size	Cavity size	Cavity thread	Ordering code	Ordering code - former	Plate material	Pressure bar (PSI)	Dimensions AxBxC/D mm (in)	Mass kg (lbs)	Ordering No.
04	A2	3/4-16 UNF	SB-04A2-1AT1-GV-B		cast iron	350 (5080)	36x40x74/18,5 (1.41x 1.57x2.91/0.73)	0.65 (1.43)	30138300
	QG2	M22x1.5	SB-04QG2-1AT1-ST-P	MA04-VP	steel	420 (6090)	35x34,6x80/40 (1.38x1.36x3.15/1.57)	0.70 (1.54)	15907500
	QG2	M22x1.5	SB-04QG2-1AT1-STV-P	MA04-VP/V	steel	420 (6090)	35x34,6x80/40 (1.38x1.36x3.15/1.57)	0.70 (1.54)	22501800
06	A2	3/4-16 UNF	SB-06A2-1AT1-GV-B		cast iron	350 (5080)	45x50x73,5/18 (1.77x1.97x2.89/0.71)	1.05 (2.32)	29513200
	B2	7/8-14 UNF	SB-06B2-1AT1-GV-B		cast iron	350 (5080)	45x50x86/30,5 (1.77x1.97x3.39/1.20)	1.25 (2.76)	30003800
	QG2	M22x1.5	SB-06QG2-1AT1-ST-P	MA06-VP	steel	420 (6090)	45x40x80/25,5 (1.77x1.57x3.15/1.01)	0.95 (2.09)	15988600
	QG2	M22x1.5	SB-06QG2-1AT1-STV-P	MA06-VP/V	steel	420 (6090)	45x40x80/25,5 (1.77x1.57x3.15/1.01)	0.95 (2.09)	22949600

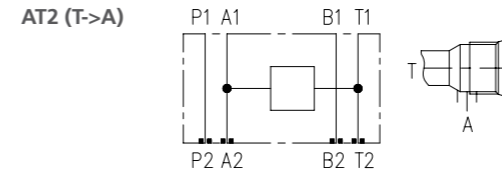


Plate size	Cavity size	Cavity thread	Ordering code	Ordering code - former	Plate material	Pressure bar (PSI)	Dimensions AxBxC/D mm (in)	Mass kg (lbs)	Ordering No.
04	A2	3/4-16 UNF	SB-04A2-1AT2-GV-B		cast iron	350 (5080)	36x40x74/18,5 (1.41x 1.57x2.91/0.73)	0.70 (1.54)	30150000
	QG2	M22x1.5	SB-04QG2-1AT2-ST-P	MD04-ROE3	steel	420 (6090)	45x50x73,5/18 (1.77x1.97x2.89/0.71)	0.70 (1.54)	15653000
	QG2	M22x1.5	SB-04QG2-1AT2-STV-P	MD04-ROE3/V	steel	420 (6090)	45x50x73,5/18 (1.77x1.97x2.89/0.71)	0.70 (1.54)	28592700
06	A2	3/4-16 UNF	SB-06A2-1AT2-GV-B		cast iron	350 (5080)	45x50x73,5/18 (1.77x1.97x2.89/0.71)	1.05 (2.32)	30159400
	B2	7/8-14 UNF	SB-06B2-1AT2-GV-B		cast iron	350 (5080)	45x50x86/30,5 (1.77x1.97x3.39/1.20)	1.25 (2.76)	30568900
	QG2	M22x1.5	SB-06QG2-1AT2-ST-P	MD06-ROE3	steel	420 (6090)	45x40x80/28 (1.77x1.57x3.15/1.10)	0.95 (2.09)	16687400
	QG2	M22x1.5	SB-06QG2-1AT2-STV-P	MD06-ROE3/V	steel	420 (6090)	45x40x80/28 (1.77x1.57x3.15/1.10)	0.95 (2.09)	28594300

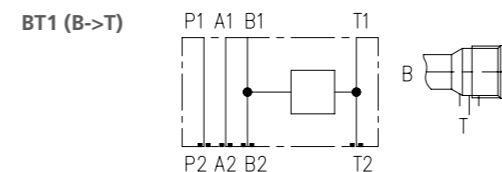


Plate size	Cavity size	Cavity thread	Ordering code	Ordering code - former	Plate material	Pressure bar (PSI)	Dimensions AxBxC/D mm (in)	Mass kg (lbs)	Ordering No.
04	A2	3/4-16 UNF	SB-04A2-1BT1-GV-B		cast iron	350 (5080)	36x40x74/18,5 (1.41x 1.57x2.91/0.73)	0.65 (1.43)	29230100
	QG2	M22x1.5	SB-04QG2-1BT1-ST-P	MB04-VP	steel	420 (6090)	35x35x80/40 (1.38x1.38x3.15/1.57)	0.70 (1.54)	15907600
	QG2	M22x1.5	SB-04QG2-1BT1-STV-P	MB04-VP/V	steel	420 (6090)	35x35x80/40 (1.38x1.38x3.15/1.57)	0.70 (1.54)	22501900
06	A2	3/4-16 UNF	SB-06A2-1BT1-GV-B		cast iron	350 (5080)	45x50x73,5/18 (1.77x1.97x2.89/0.71)	1.05 (2.31)	29527400
	B2	7/8-14 UNF	SB-06B2-1BT1-GV-B		cast iron	350 (5080)	45x50x86/30,5 (1.77x1.97x3.39/1.20)	1.22 (2.25)	30021200
	QG2	M22x1.5	SB-06QG2-1BT1-ST-P	MB06-VP	steel	420 (6090)	45x40x80/28 (1.77x1.57x3.15/1.10)	0.95 (2.09)	15988800
	QG2	M22x1.5	SB-06QG2-1BT1-STV-P	MB06-VP/V	steel	420 (6090)	45x40x80/28 (1.77x1.57x3.15/1.10)	0.95 (2.09)	16661700

Single valve installation, 2-Way

3D picture shown is for illustration purpose only.

BT2 (T->B)

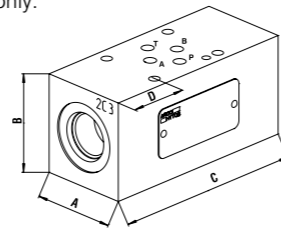
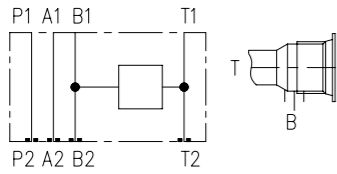


Plate size	Cavity size	Cavity thread	Ordering code	Ordering code - former	Plate material	Pressure bar (PSI)	Dimensions AxBxC/D mm (in)	Mass kg (lbs)	Ordering No.
04	A2	3/4-16 UNF	SB-04A2-1BT2-GV-B		cast iron	350 (5080)	36x40x74/18,5 (1.41x1.57x2.91/0.73)	0.70 (1.54)	31509500
	QG2	M22x1.5	SB-04QG2-1BT2-ST-P	ME04-ROE3	steel	420 (6090)	35x40x76/36 (1.38x1.57x2.99/1.42)	0.70 (1.54)	15653100
	QG2	M22x1.5	SB-04QG2-1BT2-STV-P	ME04-ROE3/V	steel	420 (6090)	35x40x76/36 (1.38x1.57x2.99/1.42)	0.70 (1.54)	28593000
06	A2	3/4-16 UNF	SB-06A2-1BT2-GV-B		cast iron	350 (5080)	45x50x73,5/18 (1.77x1.97x2.89/0.71)	1.07 (2.37)	30677800
	QG2	M22x1.5	SB-06QG2-1BT2-ST-P	ME06-ROE3	steel	420 (6090)	45x40x80/28 (1.77x1.57x3.15/1.10)	0.95 (2.09)	15649600
	QG2	M22x1.5	SB-06QG2-1BT2-STV-P	ME06-ROE3/V	steel	420 (6090)	45x40x80/28 (1.77x1.57x3.15/1.10)	0.95 (2.09)	28594400
	B2	7/8-14 UNF	SB-06B2-1BT2-GV-B		cast iron	350 (5080)	45x50x86/30,5 (1.77x1.97x3.39/1.20)	1.25 (2.76)	30708400

PT1 (P->T)

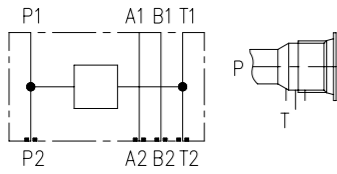


Plate size	Cavity size	Cavity thread	Ordering code	Ordering code - former	Plate material	Pressure bar (PSI)	Dimensions AxBxC/D mm (in)	Mass kg (lbs)	Ordering No.
04	A2	3/4-16 UNF	SB-04A2-1PT1-GV-B		cast iron	350 (5080)	36x40x74/31,5 (1.42x1.57x2.91/1.24)	0.70 (1.54)	30979100
	QG2	M22x1.5	SB-04QG2-1PT1-ST-P	MP04-VP	steel	420 (6090)	35x34,6x80/40 (1.38x1.36x3.15/1.57)	0.65 (1.43)	15907700
	QG2	M22x1.5	SB-04QG2-1PT1-STV-P	MP04-VP/V	steel	420 (6090)	35x34,6x80/40 (1.38x1.36x3.15/1.57)	0.65 (1.43)	22502000
06	A2	3/4-16 UNF	SB-06A2-1PT1-GV-B		cast iron	350 (5080)	45x50x73,5/18 (1.77x1.97x2.89/0.71)	1.05 (2.32)	29527600
	B2	7/8-14 UNF	SB-06B2-1PT1-GV-B		cast iron	350 (5080)	45x50x86/30,5 (1.77x1.97x3.39/1.20)	1.20 (2.65)	30003600
	QG2	M22x1.5	SB-06QG2-1PT1-ST-P	MP06-VP	steel	420 (6090)	45x40x80/28 (1.77x1.57x3.15/1.10)	0.82 (1.81)	15989000
	QG2	M22x1.5	SB-06QG2-1PT1-STV-P	MP06-VP/V	steel	420 (6090)	45x40x80/28 (1.77x1.57x3.15/1.10)	0.82 (1.81)	22949800
10	B2	7/8-14 UNF	SB-10B2-1PT1-GV-B		cast iron	350 (5080)	70x50x84/15 (2.76x1.97x3.31/0.59)	1.85 (4.08)	30568300

PT2 (T->P)

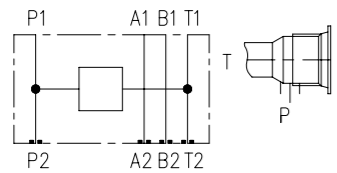


Plate size	Cavity size	Cavity thread	Ordering code	Ordering code - former	Plate material	Pressure bar (PSI)	Dimensions AxBxC/D mm (in)	Mass kg (lbs)	Ordering No.
04	A2	3/4-16 UNF	SB-04A2-1PT2-GV-B		cast iron	350 (5080)	36x40x74/31,5 (1.42x1.57x2.91/1.24)	0.70 (1.54)	31509800
	QG2	M22x1.5	SB-04QG2-1PT2-ST-P	MG04-ROE3	steel	420 (6090)	35x40x76/36 (1.38x1.57x2.99/1.42)	0.70 (1.54)	15653800
	QG2	M22x1.5	SB-04QG2-1PT2-STV-P	MG04-ROE3/V	steel	420 (6090)	35x40x76/36 (1.38x1.57x2.99/1.42)	0.70 (1.54)	20717800
06	A2	3/4-16 UNF	SB-06A2-1PT2-GV-B		cast iron	350 (5080)	45x50x73,5/18 (1.77x1.97x2.89/0.71)	1.08 (2.39)	31474200
	B2	7/8-14 UNF	SB-06B2-1PT2-GV-B		cast iron	350 (5080)	45x50x86/30,5 (1.77x1.97x3.39/1.20)	1.25 (2.76)	30052800
	QG2	M22x1.5	SB-06QG2-1PT2-ST-P	MG06-ROE3	steel	420 (6090)	45x40x80/28 (1.77x1.57x3.15/1.10)	0.95 (2.09)	15649900
	QG2	M22x1.5	SB-06QG2-1PT2-STV-P	MG06-ROE3/V	steel	420 (6090)	45x40x80/28 (1.77x1.57x3.15/1.10)	0.95 (2.09)	20690500

Single valve installation, 2-Way

3D picture shown is for illustration purpose only.

P1 (P1->P2)

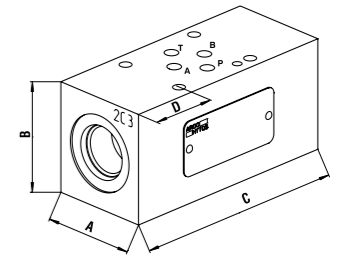
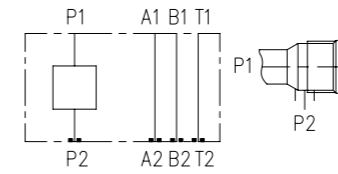


Plate size	Cavity size	Cavity thread	Ordering code	Ordering code - former	Plate material	Pressure bar (PSI)	Dimensions AxBxC/D mm (in)	Mass kg (lbs)	Ordering No.
06	A2	3/4-16 UNF	SB-06A2-1P1-GV-B		cast iron	350 (5080)	45x50x73,5/18 (1.77x1.97x2.89/0.71)	1.20 (2.65)	30970100
	B2	7/8-14 UNF	SB-06B2-1P1-GV-B		cast iron	350 (5080)	45x50x86/30,5 (1.77x1.97x3.39/1.20)	1.25 (2.76)	30069500
	QG2	M22x1.5	SB-06QG2-1P1-ST-P	MP06-ROE3	steel	420 (6090)	45x40x80/28 (1.77x1.57x3.15/1.10)	0.95 (2.09)	16687500
	QG2	M22x1.5	SB-06QG2-1P1-STV-P	MP06-ROE3/V	steel	420 (6090)	45x40x80/28 (1.77x1.57x3.15/1.10)	0.95 (2.09)	20690800

P2 (P2->P1)

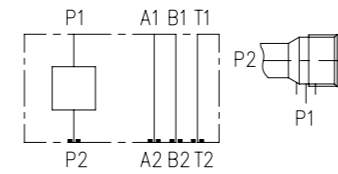


Plate size	Cavity size	Cavity thread	Ordering code	Ordering code - former	Plate material	Pressure bar (PSI)	Dimensions AxBxC/D mm (in)	Mass kg (lbs)	Ordering No.
04	A2	3/4-16 UNF	SB-04A2-1P2-GV-B		cast iron	350 (5080)	36x40x74/31,5 (1.42x1.57x2.91/1.24)	0.68 (1.50)	31850600
	B2	7/8-14 UNF	SB-04B2-1P2-GV-B		cast iron	350 (5080)	36x40x74/31,5 (1.42x1.57x2.91/1.24)	0.68 (1.50)	29897000
06	A2	3/4-16 UNF	SB-06A2-1P2-GV-B		cast iron	350 (5080)	45x50x73,5/18 (1.77x1.97x2.89/0.71)	1.10 (2.43)	30800900
	B2	7/8-14 UNF	SB-06B2-1P2-GV-B		cast iron	350 (5080)	45x50x86/30,5 (1.77x1.97x3.39/1.20)	1.25 (2.76)	30018100

T1 (T1->T2)

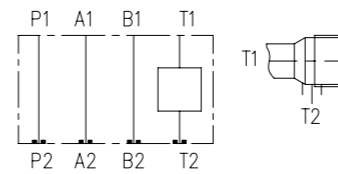


Plate size	Cavity size	Cavity thread	Ordering code	Ordering code - former	Plate material	Pressure bar (PSI)	Dimensions AxBxC/D mm (in)	Mass kg (lbs)	Ordering No.
06	A2	3/4-16 UNF	SB-06A2-1T1-GV-B		cast iron	350 (5080)	45x50x73,5/18 (1.77x1.97x2.89/0.71)	1.06 (2.34)	31396300
	B2	7/8-14 UNF	SB-06B2-1T1-GV-B		cast iron	350 (5080)	45x50x86/30,5 (1.77x1.97x3.39/1.20)	1.20 (2.65)	31648000
10	B2	7/8-14 UNF	SB-10B2-1T1-GV-B		cast iron	350 (5080)	70x50x84/15 (2.76x1.97x3.31/0.59)	1.85 (4.08)	32504500

T2 (T2->T1)

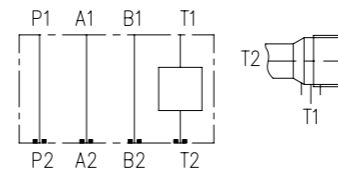


Plate size	Cavity size	Cavity thread	Ordering code	Ordering code - former	Plate material	Pressure bar (PSI)	Dimensions AxBxC/D mm (in)	Mass kg (lbs)	Ordering No.
06	B2	7/8-14 UNF	SB-06B2-1T2-GV-B		cast iron	350 (5080)	45x50x86/30,5 (1.77x1.97x3.39/1.20)	1.20 (2.65)	30453800

Single valve installation, 3-Way

3D picture shown is for illustration purpose only.

A2 (A1->A2,T)

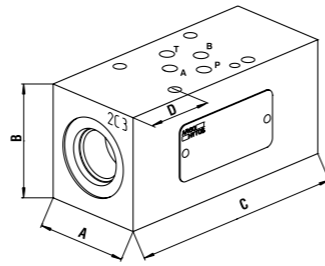
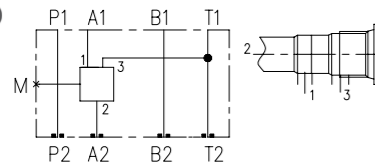


Plate size	Cavity size	Cavity thread	Ordering code	Ordering code - former	Plate material	Pressure bar (PSI)	Dimensions AxBxC/D mm (in)	Mass kg (lbs)	Ordering No.
06	A3	3/4-16 UNF	SB-06A3-1A2-GV-B		cast iron	350 (5080)	45x50x80/18 (1.77x1.97x3.15/0.71)	1.16 (2.56)	28063900
	B3	7/8-14 UNF	SB-06B3-1A2-GV-B		cast iron	350 (5080)	45x50x86/25,5 (1.77x1.97x3.39/1.01)	1.20 (2.65)	28064400

P2 (P2->P1,T)

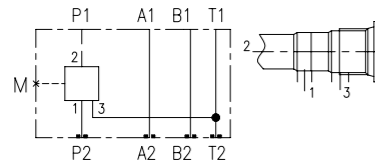


Plate size	Cavity size	Cavity thread	Ordering code	Ordering code - former	Plate material	Pressure bar (PSI)	Dimensions AxBxC/D mm (in)	Mass kg (lbs)	Ordering No.
04	A3	3/4-16 UNF	SB-04A3-1P2-GV-B		cast iron	350 (5080)	45x50x100/31,5 (1.77x1.97x3.94/1.24)	1.15 (2.54)	31665200
06	A3	3/4-16 UNF	SB-06A3-1P2-GV-B		cast iron	350 (5080)	45x50x75/7,5 (1.77x1.97x2.95/0.30)	1.02 (2.26)	28063800
	B3	7/8-14 UNF	SB-06B3-1P2-GV-B		cast iron	350 (5080)	45x50x98/42,5 (1.77x1.97x3.86/1.67)	1.40 (3.09)	30786400
10	B3	7/8-14 UNF	SB-10B3-1P2-GV-B		cast iron	350 (5080)	70x50x84/15 (2.76x1.97x3.31/0.59)	1.85 (4.07)	30533700

P3 (P2->P1,T)

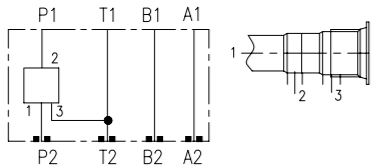


Plate size	Cavity size	Cavity thread	Ordering code	Ordering code - former	Plate material	Pressure bar (PSI)	Dimensions AxBxC/D mm (in)	Mass kg (lbs)	Ordering No.
06	A3	3/4-16 UNF	SB-06A3-1P3-GV-B		cast iron	350 (5080)	45x50x75/7,5 (1.77x1.97x2.95/0.30)	1.08 (2.38)	31627600
	B3	7/8-14 UNF	SB-06B3-1P3-GV-B		cast iron	350 (5080)	45x60x98/43 (1.77x2.36x3.86/1.69)	1.70 (3.74)	32234600

P4 (P2->P1,T)

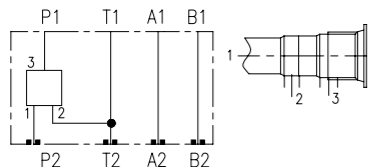


Plate size	Cavity size	Cavity thread	Ordering code	Ordering code - former	Plate material	Pressure bar (PSI)	Dimensions AxBxC/D mm (in)	Mass kg (lbs)	Ordering No.
06	B3	7/8-14 UNF	SB-06B3-1P4-GV-B		cast iron	350 (5080)	45x60x98/43 (1.77x2.36x3.86/1.69)	1.66 (3.66)	33881200

Dual valve installation, 2-Way

3D picture shown is for illustration purpose only.

C1 (A1->A2; B1->B2)

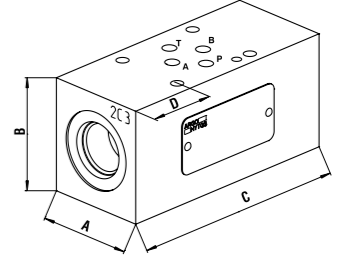
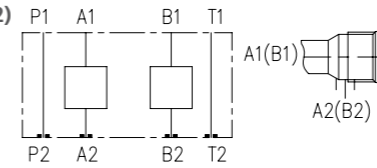


Plate size	Cavity size	Cavity thread	Ordering code	Ordering code - former	Plate material	Pressure bar (PSI)	Dimensions AxBxC/D mm (in)	Mass kg (lbs)	Ordering No.
04	A2	3/4-16 UNF	SB-04A2-2C1-GV-B		cast iron	350 (5080)	36x40x98/37 (1.42x1.57x3.86/1.46)	0.80 (1.76)	28063300
	QG2	M22x1.5	SB-04QG2-2C1-ST-P	MC04-ROE3	steel	420 (6090)	35x40x96/36 (1.38x1.57x3.78/1.42)	0.80 (1.76)	15653200
06	A2	3/4-16 UNF	SB-06A2-2C1-GV-B		cast iron	350 (5080)	45x50x104/30,5 (1.77x1.97x4.09/1.20)	1.50 (3.31)	28063600
	B2	7/8-14 UNF	SB-06B2-2C1-GV-B		cast iron	350 (5080)	45x50x104/30,5 (1.77x1.97x4.09/1.20)	1.45 (3.20)	30119500
06	QG2	M22x1.5	SB-06QG2-2C1-ST-P	MC06-ROE3	steel	420 (6090)	45x40x94/25,5 (1.77x1.57x3.70/1.01)	1.00 (2.21)	15649700
	QG2	M22x1.5	SB-06QG2-2C1-STV-P	MC06-ROE3/V	steel	420 (6090)	45x40x94/25,5 (1.77x1.57x3.70/1.01)	1.00 (2.21)	28594500
10	B2	7/8-14 UNF	SB-10B2-2C1-GV-B		cast iron	350 (5080)	70x50x92/19 (2.76x1.97x3.62/0.75)	3.64 (8.03)	34528800
	QH2	M24x1,5	SB-10QH2-2C1-ST-A		steel	420 (6090)	45x40x94/25,5 (1.77x1.57x3.70/1.01)	3.68 (8.10)	On Request

C2 (A2->A1; B2->B1)

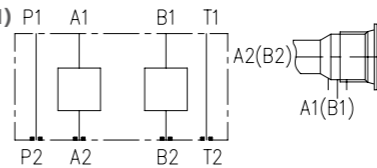


Plate size	Cavity size	Cavity thread	Ordering code	Ordering code - former	Plate material	Pressure bar (PSI)	Dimensions AxBxC/D mm (in)	Mass kg (lbs)	Ordering No.
04	A2	3/4-16 UNF	SB-04A2-2C2-GV-B		cast iron	350 (5080)	36x40x98/37 (1.42x1.57x3.86/1.46)	0.90 (1.98)	30727200
06	A2	3/4-16 UNF	SB-06A2-2C2-GV-B		cast iron	350 (5080)	45x50x104/30,5 (1.77x1.97x4.09/1.20)	1.48 (3.26)	32265200
	B2	7/8-14 UNF	SB-06B2-2C2-GV-B		cast iron	350 (5080)	45x50x104/30,5 (1.77x1.97x4.09/1.20)	1.43 (3.16)	31761100

C3 (B1->A2, A1->B2)

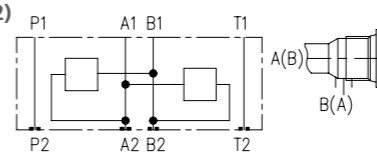


Plate size	Cavity size	Cavity thread	Ordering code	Ordering code - former	Plate material	Pressure bar (PSI)	Dimensions AxBxC/D mm (in)	Mass kg (lbs)	Ordering No.
04	A2	3/4-16 UNF	SB-04A2-2C3-GV-B		cast iron	350 (5080)	36x40x98/37 (1.42x1.57x3.86/1.46)	0.65 (1.43)	30353600
	QG2	M22x1.5	SB-04QG2-2C3-ST-P	MC04-VP	steel	420 (6090)	35x34,6x104/40 (1.38x1.36x4.09/1.57)	0.75 (1.65)	15907800
06	A2	3/4-16 UNF	SB-06A2-2C3-GV-B		cast iron	350 (5080)	45x50x104/30,5 (1.77x1.97x4.09/1.57)	1.51 (3.33)	30122200
	B2	7/8-14 UNF	SB-06B2-2C3-GV-B		cast iron	350 (5080)	45x50x104/30,5 (1.77x1.97x4.09/1.57)	1.45 (3.20)	28064300
06	QG2	M22x1.5	SB-06QG2-2C3-ST-P	MC06-VP	steel	420 (6090)	45x40x94/25,5 (1.77x1.57x3.70/1.01)	1.05 (2.32)	15989200
	QG2	M22x1.5	SB-06QG2-2C3-STV-P	MC06-VP/V	steel	420 (6090)	45x40x94/25,5 (1.77x1.57x3.70/1.01)	1.05 (2.32)	16758800

Dual valve installation, 2-Way

3D picture shown is for illustration purpose only.

D1 (A,B->T)

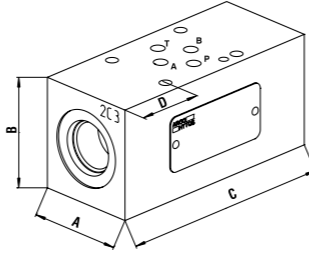
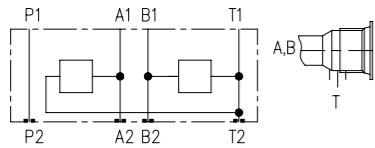


Plate size	Cavity size	Cavity thread	Ordering code	Ordering code - former	Plate material	Pressure bar (PSI)	Dimensions AxBxC/D mm (in)	Mass kg (lbs)	Ordering No.
04	A2	3/4-16 UNF	SB-04A2-2D1-GV-B		cast iron	350 (5080)	36x40x98/37 (1.42x1.57x3.86/1.46)	0.85 (1.87)	29992200
	QG2	M22x1.5	SB-04QG2-2D1-ST-P	MD04-VP	steel	420 (6090)	35x34,6x104/40 (1.38x1.36x4.09/1.57)	0.75 (1.65)	15907900
	QG2	M22x1.5	SB-04QG2-2D1-STV-P	MD04-VP/V	steel	420 (6090)	35x34,6x104/40 (1.38x1.36x4.09/1.57)	0.75 (1.65)	22502200
06	A2	3/4-16 UNF	SB-06A2-2D1-GV-B		cast iron	350 (5080)	45x50x104/30,5 (1.77x1.97x4.09/1.20)	1.50 (3.31)	28591400
	B2	7/8-14 UNF	SB-06B2-2D1-GV-B		cast iron	350 (5080)	45x50x104/30,5 (1.77x1.97x4.09/1.20)	1.00 (2.21)	30755800
	QG2	M22x1.5	SB-06QG2-2D1-ST-P	MD06-VP	steel	420 (6090)	45x40x94/25,5 (1.77x1.57x3.70/1.01)	1.05 (2.32)	15989300
	QG2	M22x1.5	SB-06QG2-2D1-STV-P	MD06-VP/V	steel	420 (6090)	45x40x94/25,5 (1.77x1.57x3.70/1.01)	1.05 (2.32)	22950100
10	B2	7/8-14 UNF	SB-10B2-2D1-GV-B		cast iron	350 (5080)	45x50x100/23 (1.77x1.97x3.94/0.91)	2.21 (4.88)	34568000

D2 (T->A,B)

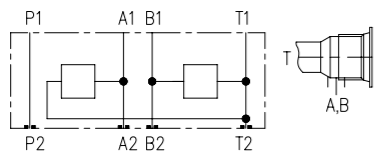


Plate size	Cavity size	Cavity thread	Ordering code	Ordering code - former	Plate material	Pressure bar (PSI)	Dimensions AxBxC/D mm (in)	Mass kg (lbs)	Ordering No.
04	A2	3/4-16 UNF	SB-04A2-2D2-GV-B		cast iron	350 (5080)	36x40x98/37 (1.42x1.57x3.86/1.46)	0.50 (3.31)	28229200
	QG2	M22x1.5	SB-04QG2-2D2-ST-P	MF04-ROE3	steel	420 (6090)	35x40x96/36 (1.38x1.57x3.78/1.46)	0.85 (1.87)	15653300
	QG2	M22x1.5	SB-04QG2-2D2-STV-P	MF04-ROE3/V	steel	420 (6090)	35x40x96/36 (1.38x1.57x3.78/1.46)	0.82 (1.81)	28593200
06	A2	3/4-16 UNF	SB-06A2-2D2-GV-B		cast iron	350 (5080)	45x50x68/12,5 (1.77x1.97x2.68/0.49)	0.93 (2.05)	30855200
	B2	7/8-14 UNF	SB-06B2-2D2-GV-B		cast iron	350 (5080)	45x50x104/30,5 (1.77x1.97x4.09/1.20)	1.40 (3.09)	30143800
	QG2	M22x1.5	SB-06QG2-2D2-ST-P	MF06-ROE3	steel	420 (6090)	45x40x94/25,5 (1.77x1.57x3.70/1.01)	1.05 (2.32)	15649800
	QG2	M22x1.5	SB-06QG2-2D2-STV-P	MF06-ROE3/V	steel	420 (6090)	45x40x94/25,5 (1.77x1.57x3.70/1.01)	1.05 (2.32)	20690300

Piloted valve installation, 3-Way

3D picture shown is for illustration purpose only.

A2 (A2->A1,B)

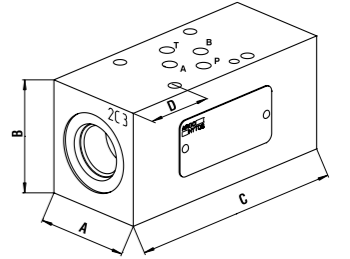
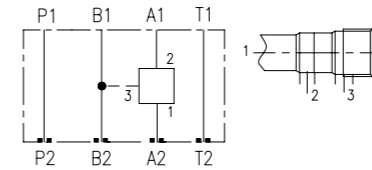


Plate size	Cavity size	Cavity thread	Ordering code	Ordering code - former	Plate material	Pressure bar (PSI)	Dimensions AxBxC/D mm (in)	Mass kg (lbs)	Ordering No.
04	Q3	M20x1,5	SB-04Q3-1A2-GV-B		cast iron	350 (5080)	30x50x82/50 (1.18x1.97x3.23/1.97)	1.35 (2.98)	32475000

B2 (B2->B1,A)

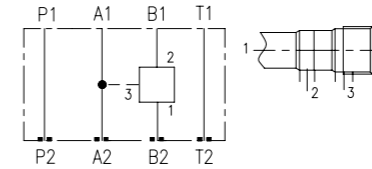


Plate size	Cavity size	Cavity thread	Ordering code	Ordering code - former	Plate material	Pressure bar (PSI)	Dimensions AxBxC/D mm (in)	Mass kg (lbs)	Ordering No.
04	Q3	M20x1,5	SB-04Q3-1B2-GV-B		cast iron	350 (5080)	30x50x82/8 (1.18x1.97x3.23/0.32)	1.35 (2.98)	32043900

C2 (A2->A1,B; B2->B1,A)

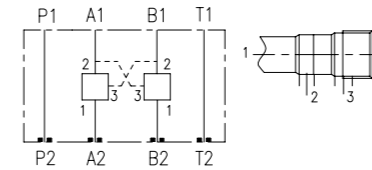
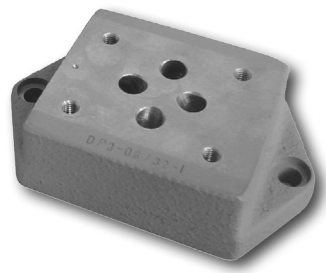


Plate size	Cavity size	Cavity thread	Ordering code	Ordering code - former	Plate material	Pressure bar (PSI)	Dimensions AxBxC/D mm (in)	Mass kg (lbs)	Ordering No.
04	Q3	M20x1,5	SB-04Q3-2C2-GV-B		cast iron	350 (5080)	38x48,5x120/48 (1.50x1.91x4.72/1.89)	1.35 (2.98)	30846300
06	Q3	M20x1,5	SB-06Q3-2C2-GV-B		cast iron	350 (5080)	43,5x48,5x110/33,5 (1.71x1.91x4.33/1.32)	1.43 (3.16)	30851700
	R3	M27x1,5	SB-06R3-2C2-GV-B		cast iron	350 (5080)	46x70x150/49,5 (1.81x2.76x5.91/1.95)	2.90 (6.28)	30818000

Subplates for ISO 4401 Modular Valves

DP-04 (06, 10)

Size 04, 06, 10 (D02, D03, D05) • p_{max} 350 bar (5100 PSI)

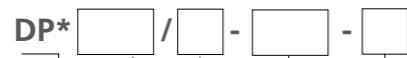


Technical Features

- Subplates for individual mounting of hydraulic components in hydraulic circuits with connections realized by tubes or hoses
- Universal subplates to connect any components with installation dimensions acc. to ISO 4401, (DIN 24340 and CETOP)
- installation dimensions of Size 04: ISO 4401-02-01-0-05, (CETOP 02 - RP121H)
- installation dimensions of Size 06: ISO 4401-03-02-0-05, (DIN 24340-A6)
- installation dimensions of Size 10: ISO 4401-05-04-0-05, (DIN 24340-A10)
- Special subplates - see survey of applications
- The subplate surface is phosphated

Models overview	Rated pressure bar (PSI)	Mounting interface	Product example / Datasheet No.
DP1-04/32-A* DP1-04/32-B*	320 (4640)	ISO 4401-AA-02-4-A DIN 24340-A4	RPE2-04* / (4012)
DP3-04/32-A* DP4-04/32-A*	320 (4640)	ISO 4401-02-01-0-05 CETOP 02 - RP121H	RPE3-04* / (4014)
DP2-06/35-A* DP2-06/35-B* DP2-06/35-C*	350 (5080)	ISO 4401-03-02-0-05 DIN 24340-A6 CETOP 03	RPE3-06* / (4010)
DP1-10/35-A* DP1-10/35-B* DP1-10/35-C*	350 (5080)	ISO 4401-05-04-0-05 DIN 24340-A10 CETOP 05	RPE4-10* / (4039)

Ordering Code



Subplates for ISO 4401 modular valve

Design version, plate size mounting interface

ISO 4401-AA-02-4-A (DIN 24340-A4)	1 - 04
ISO 4401-02-01-0-05 (CETOP 02)	3 - 04
ISO 4401-02-01-0-05 (CETOP 02)	4 - 04
ISO 4401-03-02-0-05 (CETOP 03)	2 - 06
ISO 4401-03-02-0-05 (CETOP 03)	3 - 06
ISO 4401-05-04-0-05 (CETOP 05)	1 - 10

No designation	Surface treatment
B	phosphated zinc-coated (ZnNi), ISO 9227 (520 h)

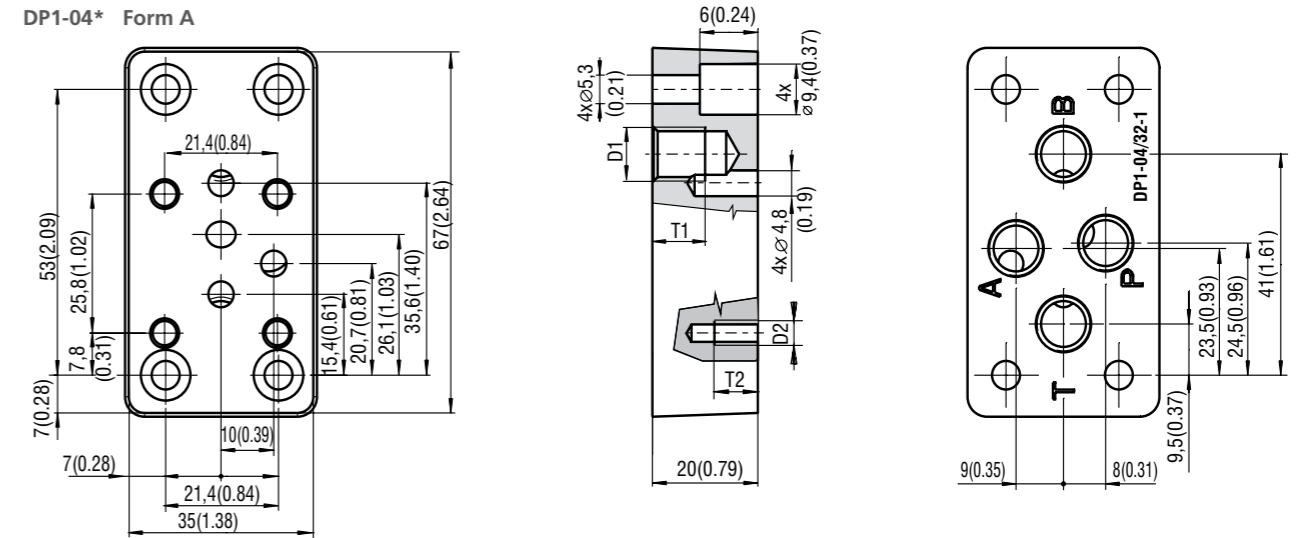
Rated pressure

DP*04	320 bar (4640 PSI)	32
DP*06(10)	350 bar (5076 PSI)	35

Model	Thread size										
	M10x1.5	M12x1.5	M14x1.5	M16x1.5	M18x1.5	M22x1.5	G1/4	G3/8	G3/4	G1/2	
Designation of form (A-D) thread (1-22) (see dimensional drawing)											
DP1-04*	A1	B1									
DP3-04*								A10			
DP4-04*		A3						A4			
DP2-06*		A1		A2							
DP3-06*		A1	A2, D18	B3	B4	C5	A7	B8		C9, D19	
DP1-10*					C6				B2	A1	
NPT 1/4 NPT 3/8 NPT 1/2 SAE-6; 9/16-18UNF SAE-8; 3/4-16UNF SAE-10; 7/8-14UNF											
DP1-04*											
DP3-04*					A21						
DP4-04*				A20							
DP2-06*				A20	A21						
DP3-06*	A15	B16	C17	A11	B12, C13		C22				

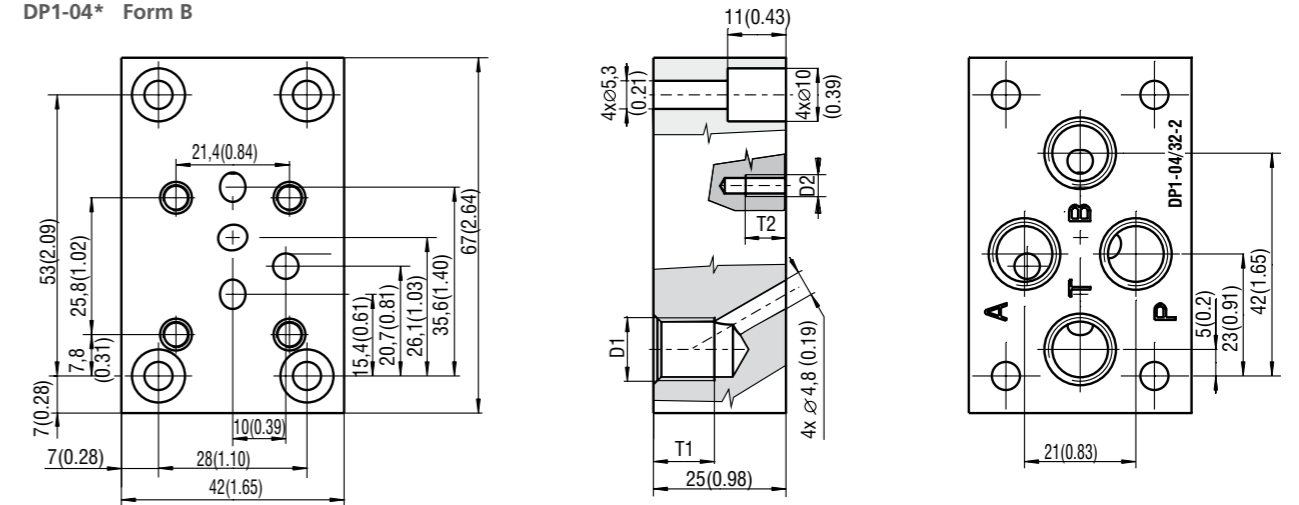
Subplates Size 04 Dimensions in millimeters (inches)

DP1-04* Form A



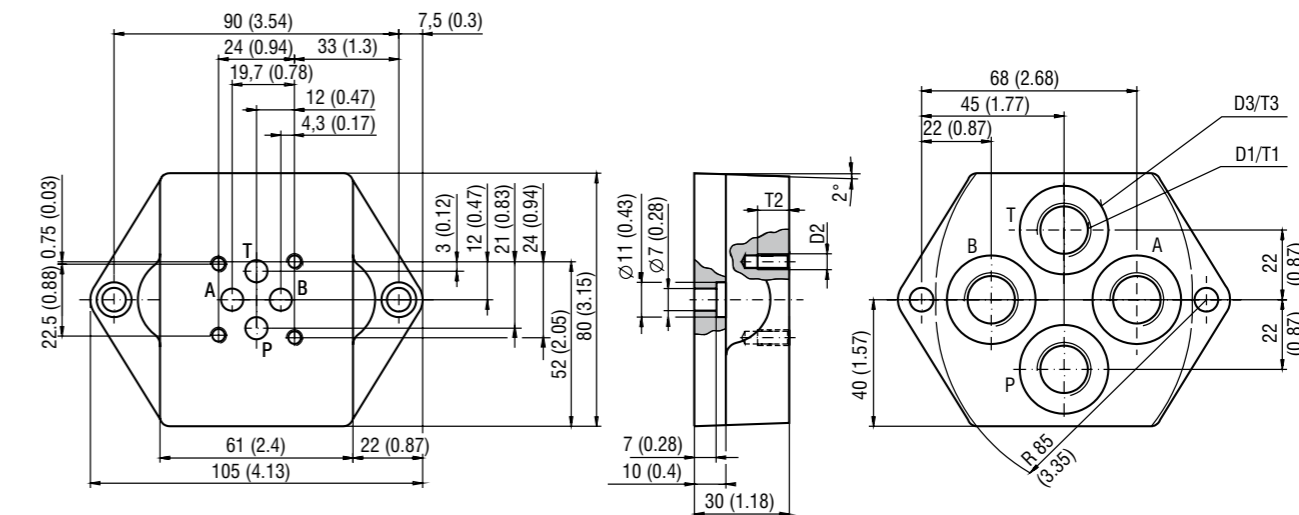
Ordering code	D1	T1	D2	T2	Mass [kg (lbs)]
DP1-04/32-A1	M10x1.5	10 (0.39)	M5	10 (0.39)	0.9 (1.98)

DP1-04* Form B



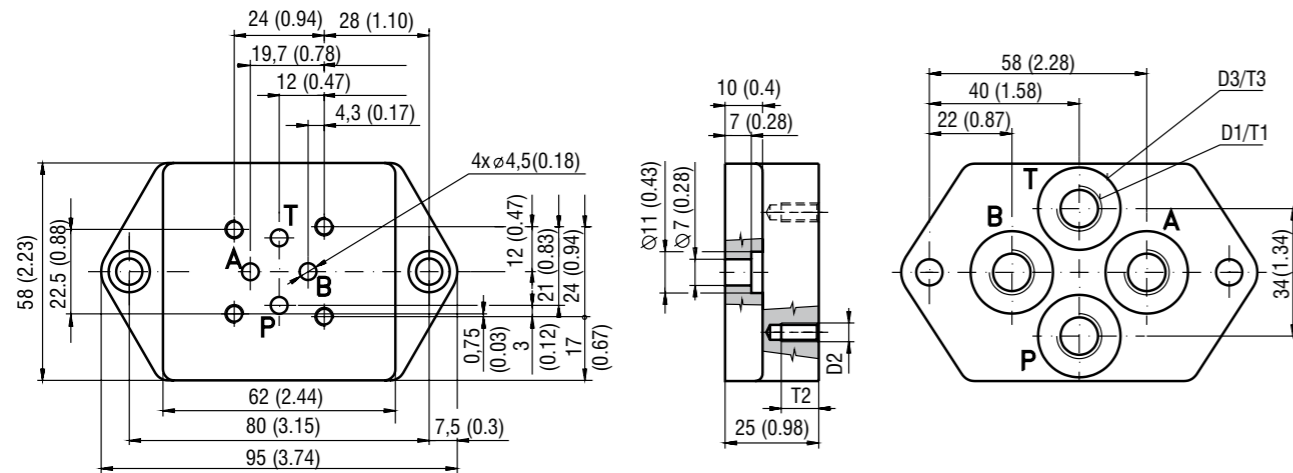
Ordering code	D1	T1	D2	T2	Mass [kg (lbs)]
DP1-04/32-B1	M12x1.5	11.5 (0.45)	M5	10 (0.39)	0.9 (1.98)

DP3-04* Form A



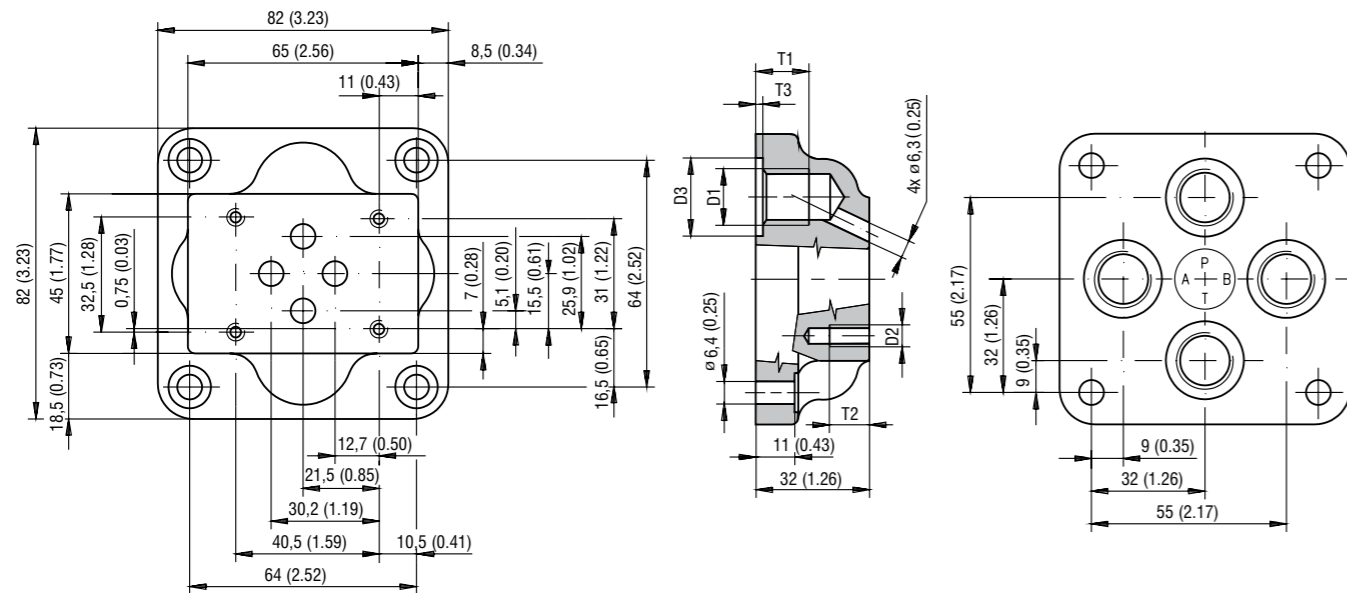
Ordering code	D1	T1	D2	T2	D3	T3	Mass [kg (lbs)]
DP3-04/32-A10	G3/8	12 (0.47)	M5	10 (0.39)	Ø28 (1.1)	1 (0.04)	0.9 (1.98)
DP3-04/32-A21	SAE-8; 3/4-16UNF	12 (0.47)	10-24 UNC	10 (0.39)	Ø28 (1.1)	1 (0.04)	0.9 (1.98)

DP4-04* Form A



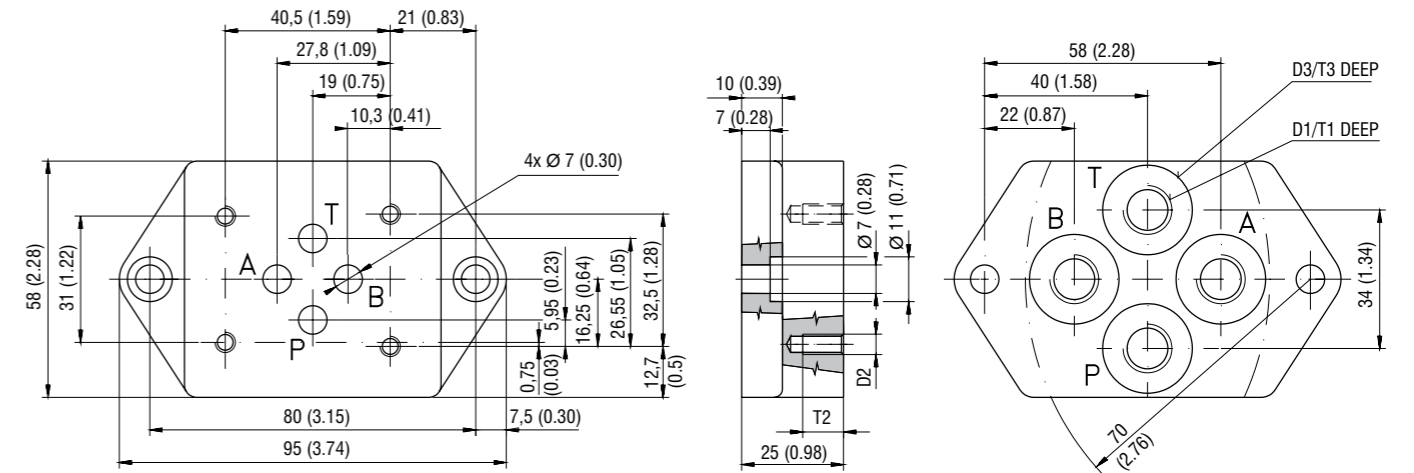
Ordering code	D1	T1	D2	T2	D3	T3	Mass [kg (lbs)]
DP4-04/32-A3	M12x1.5	13 (0.51)	M5	10 (0.39)	Ø22 (0.87)	1 (0.04)	0.6 (1.32)
DP4-04/32-A4	G1/4						
DP4-04/32-A20	SAE-6; 9/16-18UNF	13 (0.51)	10-24 UNC	10 (0.39)	Ø22 (0.87)	0.8 (0.31)	

DP2-06* Form A



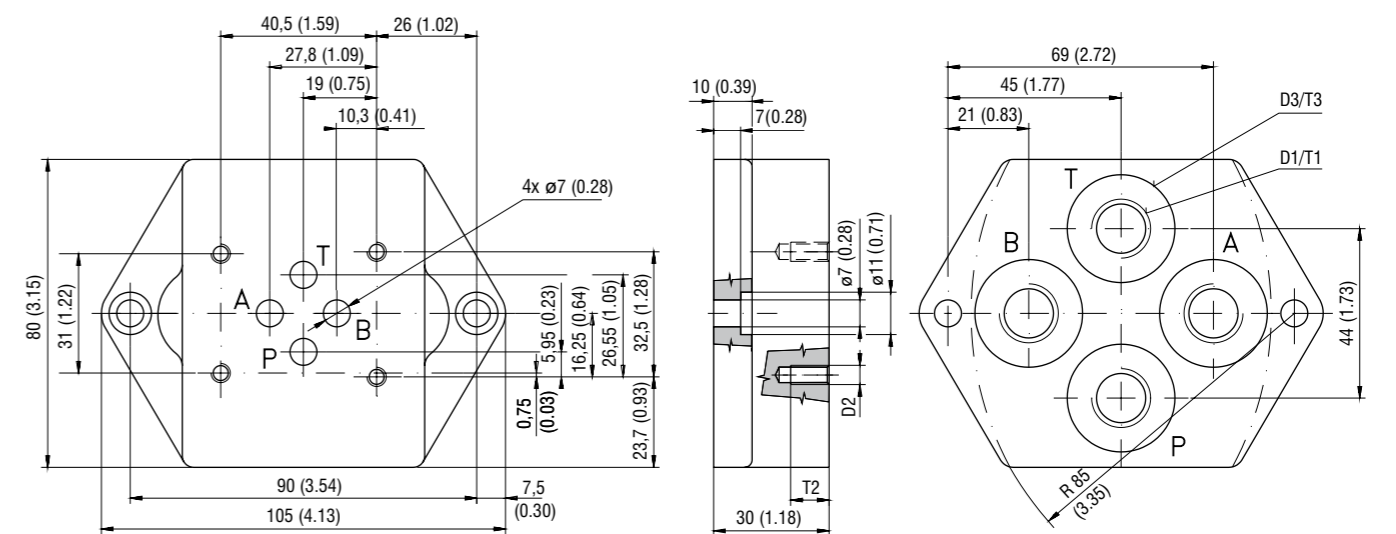
Ordering code	D1	T1	D2	T2	D3	T3	Mass [kg (lbs)]
DP2-06/35-A1	M12x1.5	15 (0.59)	M5	11 (0.43)	Ø18 (0.71)	2 (0.79)	0.95 (2.09)
DP2-06/35-A2	M16x1.5	17 (0.67)					
DP2-06/35-A20	SAE-6; 9/16-18UNF	13 (0.51)	10-24 UNC	10 (0.39)	Ø25 (0.98)	1.6 (0.06)	
DP2-06/35-A21	SAE-8; 3/4-16UNF	15 (0.59)	10-24 UNC	10 (0.39)	Ø30 (1.18)	2.4 (0.09)	

DP3-06* Form A



Ordering code	D1	T1	D2	T2	D3	T3	Mass [kg (lbs)]
DP3-06/35-A1	M12x1.5	13 (0.51)	M5	10 (0.39)	Ø22 (0.87)	1 (0.04)	0.6 (1.32)
DP3-06/35-A2	M14x1.5						
DP3-06/35-A7	G1/4						
DP3-06/35-A15	NPT 1/4	10 (0.39)	10-24 UNC				
DP3-06/35-A11	SAE-6; 9/16-18	13 (0.51)					

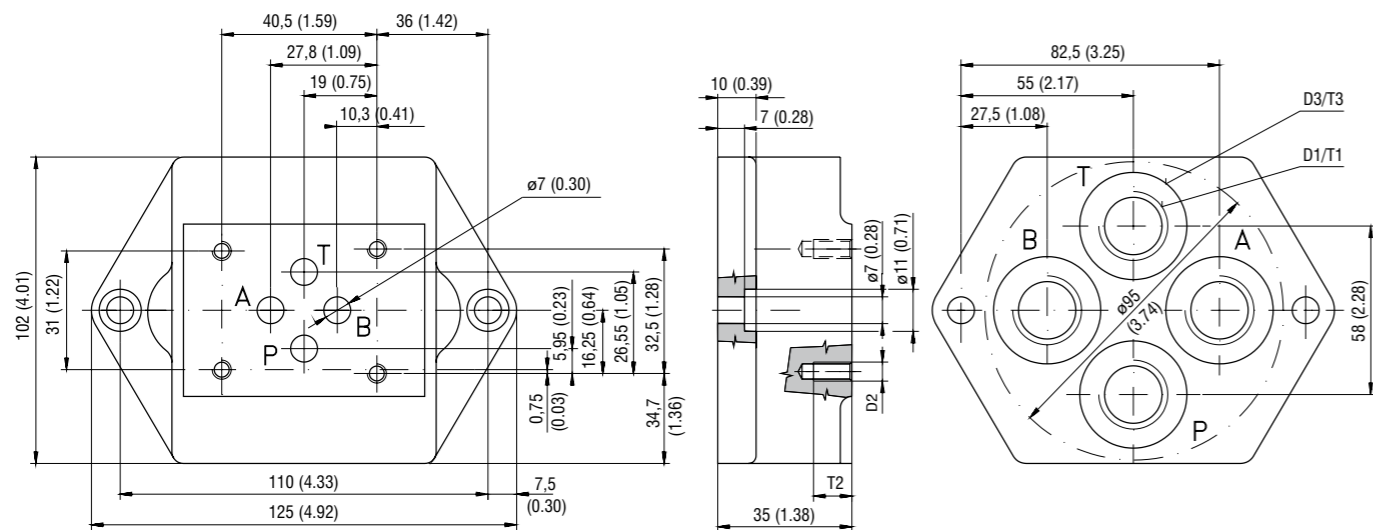
DP3-06* Form B



Ordering code	D1	T1	D2	T2	D3	T3	Mass [kg (lbs)]
DP3-06/35-B3	M16x1.5	13 (0.51)	M5	10 (0.39)	Ø28 (1.10)	1 (0.04)	1.1 (2.43)
DP3-06/35-B4	M18x1.5						
DP3-06/35-B8	G3/8						
DP3-06/35-B16	NPT 3/8	10.3 (0.41)	10-24 UNC				
DP3-06/35-B12	SAE-8; 3/4-16UNF	15 (0.59)					

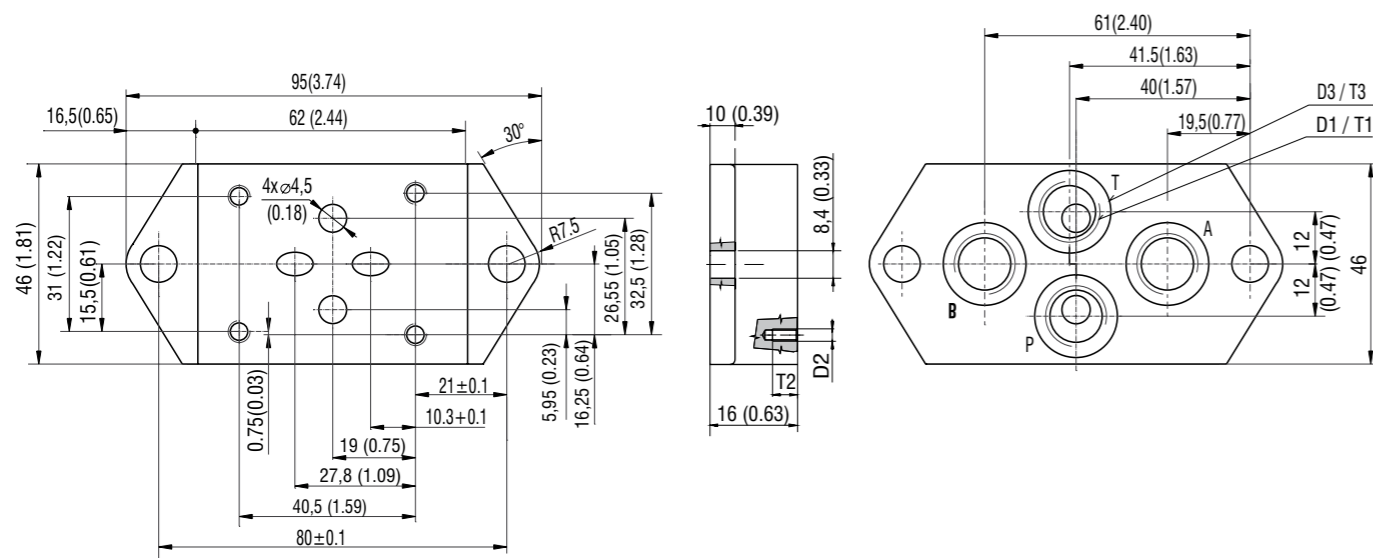
Subplates Size 06 Dimensions in millimeters (inches)

DP3-06* Form C



Ordering code	D1	T1	D2	T2	D3	T3	Mass [kg (lbs)]
DP3-06/35-C5	M22x1.5	14 (0.55)	M5	10 (0.39)	Ø34 (1.34)	1 (0.04)	1.9 (4.19)
DP3-06/35-C9	G1/2				-	-	
DP3-06/35-C17	NPT 1/2	15 (0.59)	10-24 UNC		Ø30 (1.18)	0.8 (0.03)	
DP3-06/35-C13	SAE-8; 3/4-16UNF				Ø34 (1.34)	2.4 (0.09)	
DP3-06/35-C22	SAE-10; 7/8-14UNF	17 (0.67)					

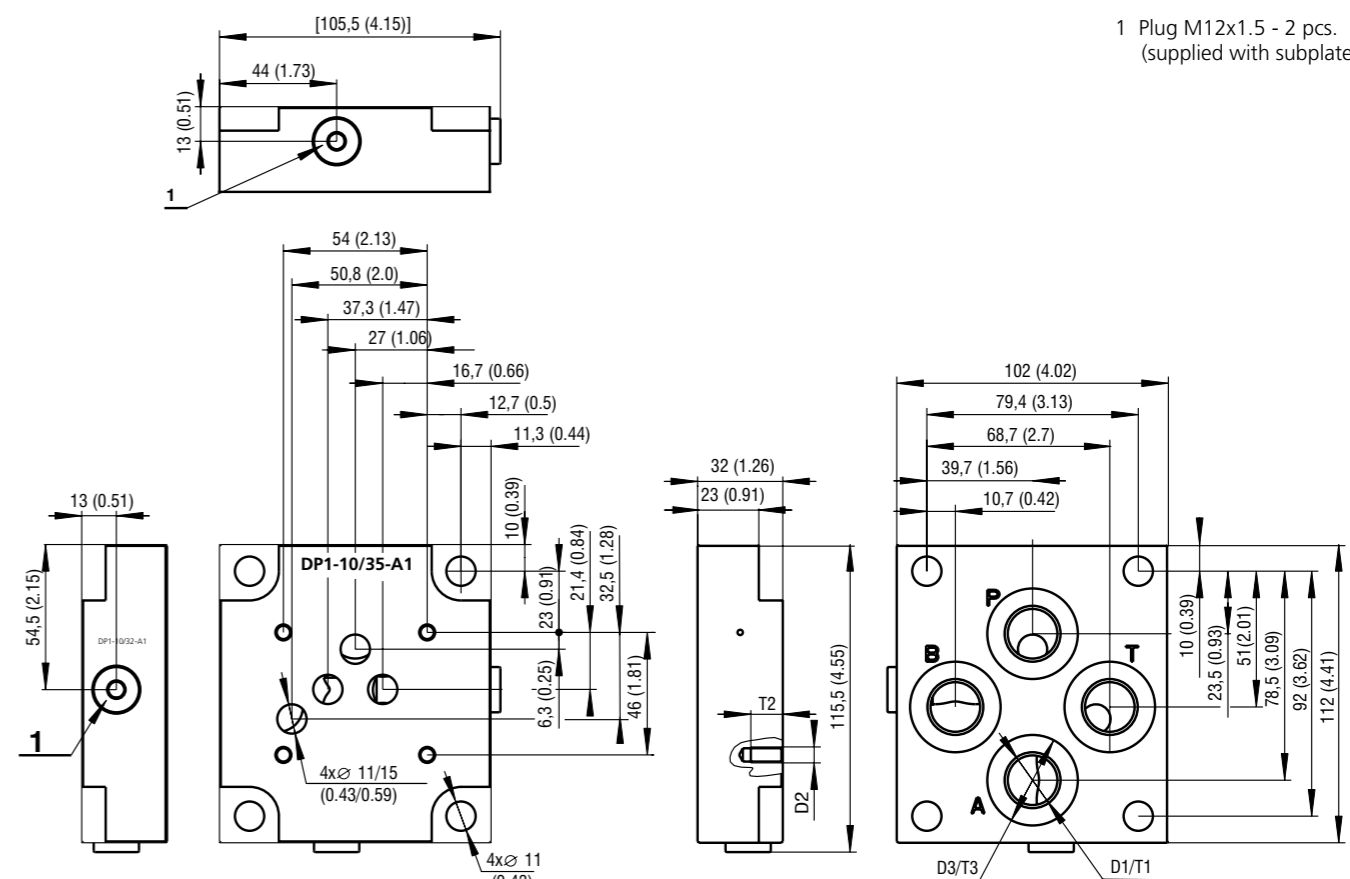
DP3-06* Form D



Ordering code	D1	T1	D2	T2	D3	T3	Mass [kg (lbs)]
DP3-06/35-D18	M14x1.5	13.5 (0.53)	M5	10 (0.39)	Ø19 (0.75)	0.5 (0.02)	1.8 (3.97)
DP3-06/35-D19	G1/2						

Subplates Size 10 Dimensions in millimeters (inches)

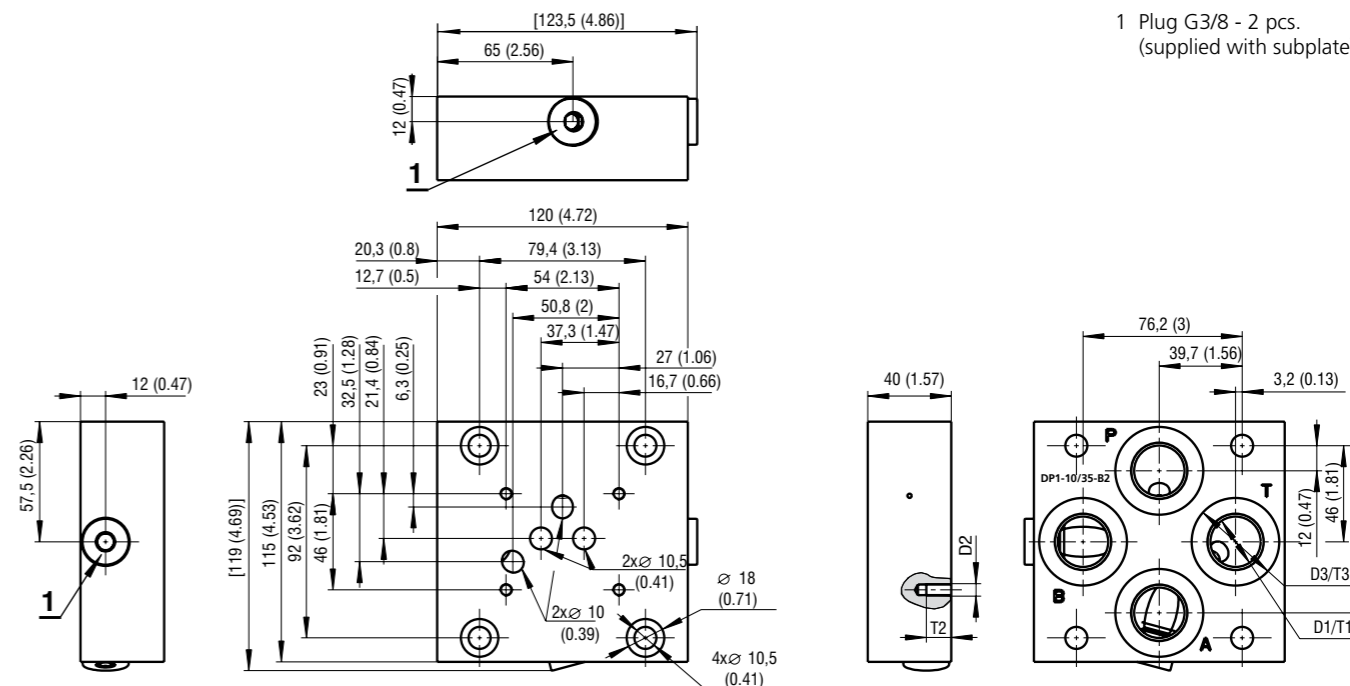
DP1-10* Form A



1 Plug M12x1.5 - 2 pcs.
(supplied with subplate)

Ordering code	D1	T1	D2	T2	D3	T3	Mass [kg (lbs)]
DP1-10/35-A1	BSPP 1/2	14 (0.55)	M6	12 (0.47)	Ø34 (1.34)	1 (0.04)	2.3 (5.07)

DP1-10* Form B



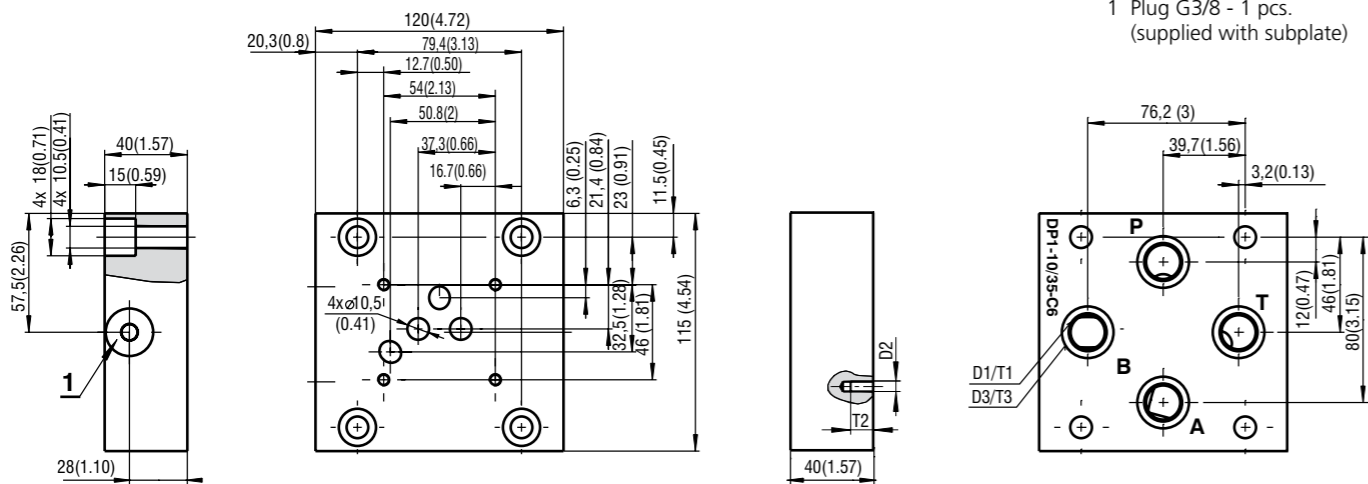
1 Plug G3/8 - 2 pcs.
(supplied with subplate)

Ordering code	D1	T1	D2	T2	D3	T3	Mass [kg (lbs)]
DP1-10/35-B2	BSPP 3/4	16 (0.63)	M6	12 (0.47)	Ø42 (1.65)	1 (0.04)	2.5 (5.51)

10

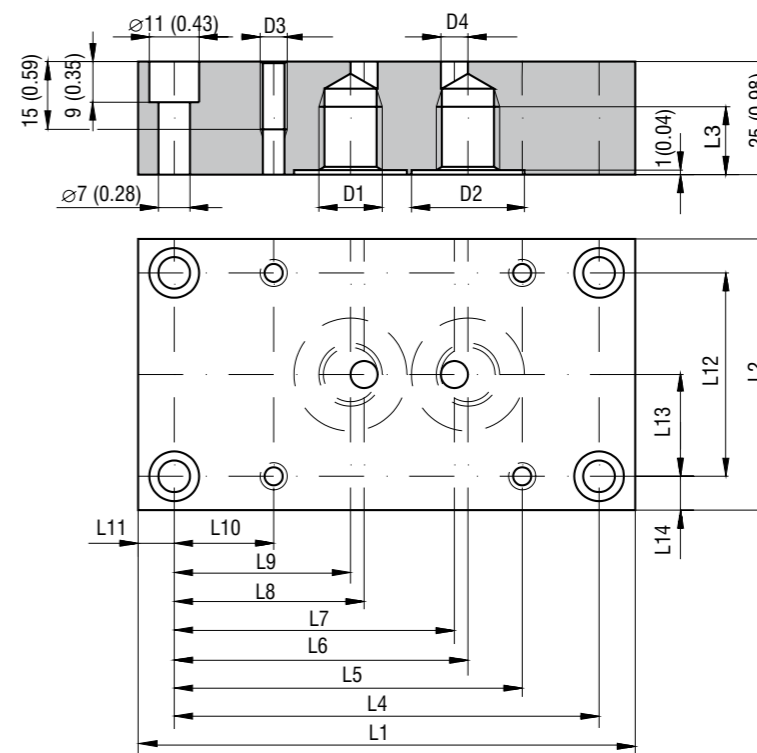
10

DP1-10* Form C



1 Plug G3/8 - 1 pcs.
(supplied with subplate)

Ordering code	D1	T1	D2	T2	D3	T3	Mass [kg (lbs)]
DP1-10/35-C6	M18x1.5	12 (0.47)	M6	12 (0.47)	Ø25 (0.98)	1 (0.04)	2.5 (5.51)



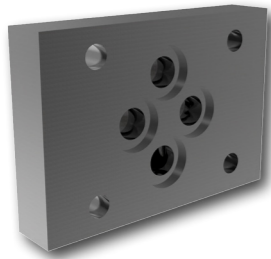
Ordering code	D1	ØD2	D3	ØD4	L1	L2	L3	L4	L5
D-06M/VPP1	M14x1.5	25 (0.98)	M6	6 (0.24)	110 (4.33)	60 (2.36)	15 (0.59)	94 (3.70)	77 (3.03)
D-06G/VPP1	G1/4		1/4-20 UNC				13 (0.51)		
D-06S/VPP1	9/16-18UNF-2B	28 (1.10)	M8	10 (0.39)	135 (5.32)	80 (3.15)	16 (0.63)	115 (4.53)	97.5 (3.84)
D-08M/VPP1	M18x1.5		5/16-18 UNC-2B				17.5 (0.69)		
D-08G/VPP1	G3/8		M8				16 (0.63)		
D-08S/VPP1	3/4-16 UNF-2B	34 (1.34)	M8	10 (0.39)	135 (5.32)	80 (3.15)	16 (0.63)	115 (4.53)	97.5 (3.84)
D-10M/VPP1	M22x1.5						17.5 (0.69)		
D-10G/VPP1	G1/2	30 (1.18)	5/16-18 UNC-2B	10 (0.39)	135 (5.32)	80 (3.15)	16 (0.63)	115 (4.53)	97.5 (3.84)
D-10S/VPP1	3/4-16 UNF-2B						17.5 (0.69)		

Ordering code	L6	L7	L8	L9	L10	L11	L12	L13	L14
D-06M/VPP1	65 (2.56)	62 (2.44)	42 (1.65)	39 (1.54)	22 (0.87)	8 (0.31)	45 (1.77)	22.5 (0.89)	7.5 (0.29)
D-06G/VPP1									
D-06S/VPP1									
D-08M/VPP1	80.5 (3.17)	72.5 (2.85)	48.5 (1.91)	40.5 (1.60)	27.5 (1.08)	10 (0.39)	60 (2.36)	30 (1.18)	10 (0.39)
D-08G/VPP1									
D-08S/VPP1									
D-10M/VPP1									
D-10G/VPP1									
D-10S/VPP1									

Blanking Plates for ISO 4401 Modular Valve

DK1-04 (06, 10)

Size 04, 06, 10 (D02, D03, D05) • p_{max} 320 bar (4700 PSI)



Technical Features

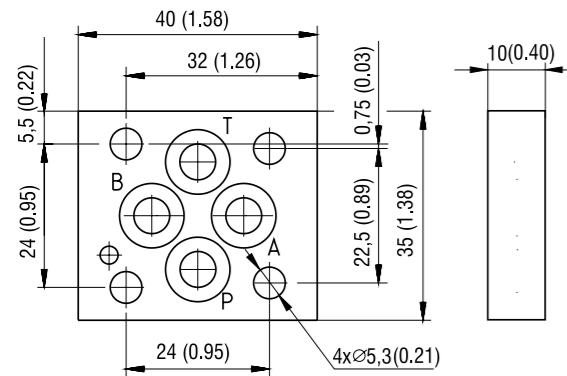
- › Mounting interface acc. to ISO 4401, DIN 24340 (CETOP 02, 03, 05)
- › Wide range of hydraulic connections
- › NBR and Viton seals
- › Enhanced surface protection for mobile sector up to 520 h salt spray acc. to ISO 9227

Functional Symbols

DK1-04(06)/32-1 	DK1-04(06)/32-2 	DK1-04(06)/32-3 	DK1-04(06)/32-4 	DK1-04(06)/32-5 	DK1-04(06)/32-6
DK1-04(06)/32-7 	DK1-04(06)/32-8 	DK1-04(06)/32-9 	DK1-04(06)/32-10 	DK1-04(06)/32-11 	DK1-10/32-2

Dimensions in millimeters (inches)

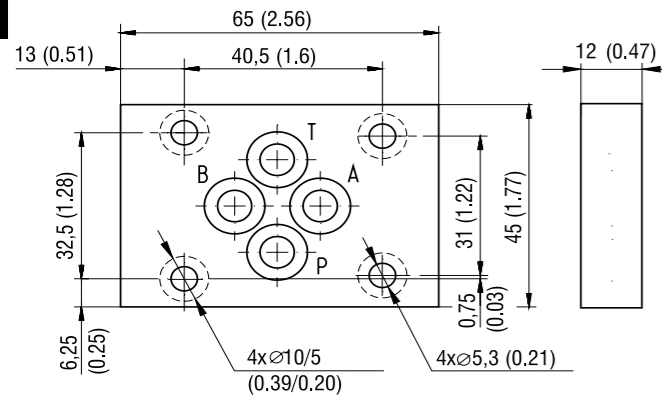
DK1-043/32*



Sealing rings NBR / FPM (Viton)	Plate mass [kg (lbs)]
4 pcs. square rings 7.65x1.68 NBR70	0.10 (0.22)
4 pcs. square rings 7.5x1.8 V75	

Sealing rings are delivered with each plate (quantity and dimensions see the table above).

DK1-06/32*

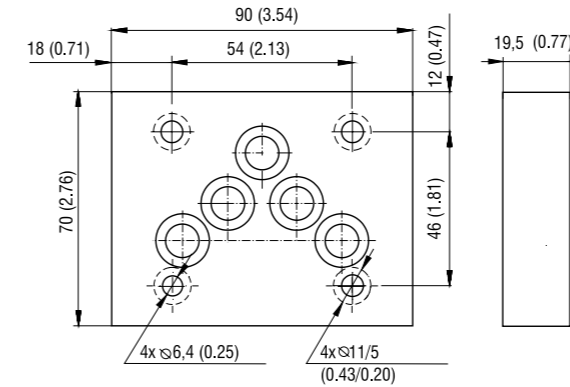


Sealing rings NBR / FPM (Viton)	Plate mass [kg (lbs)]
4 pcs. square rings 9.25x1.68 NBR70	0.32 (0.71)
4 pcs. square rings 9.25x1.78 V90	

Sealing rings are delivered with each plate (quantity and dimensions see the table above).

Dimensions in millimeters (inches)

DK1-10/32*



Sealing rings NBR / FPM (Viton)	Plate mass [kg (lbs)]
5 pcs. square rings 12.42x1.68 NBR70	1.00 (2.20)
5 pcs. square rings 12.42x1.68 V90	

Sealing rings are delivered with each plate (quantity and dimensions see the table above).

Ordering Code

Blanking plates for ISO 4401 modular valves

Size, mounting interface acc. to
 ISO 4401-02-01-0-05, DIN 24340 (CETOP 02) **04**
 ISO 4401-03-02-0-05, DIN 24340 (CETOP 03) **06**
 ISO 4401-05-04-0-05, DIN 24340 (CETOP 05) **10**

Functional symbol, port connections

A - B / P, T closed*	1
All ports closed	2
P - A / B, T closed*	3
P - A / B - T *	4
P - B / A, T closed*	5
P - B / A - T *	6
P - T / A, B closed*	7
A - B - T / P closed*	8
P - A - B / T closed*	9
A - T / P, B closed*	10
B - T / P, A closed*	11

Surface treatment
B zinc-coated (ZnNi), ISO 9227 (520 h)

Seals
NBR
FPM (Viton)

No designation V

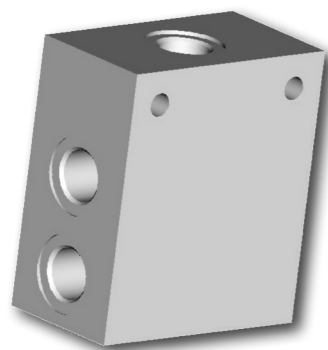
DK1 - [] /32- [] - []

* only available for Sizes 04 / 06

In-Line Bodies for Screw-In Cartridge Valves

SB

p_{max} (AL) 250 bar (3600 PSI) • p_{max} (G) 350 bar (5080 PSI) • p_{max} (ST) 420 bar (6100 PSI)



Technical Features

- In-line bodies designed to accommodate different cartridge valves and thus provide highly versatile solutions to hydraulic control functions
- Different valve functions in the same body are possible due to standardised cavities and valve housings across a wide range of cartridge valves
- Various cavities with SAE and ISO metric threads available
- Connecting ports for pipes with SAE and BSP threads available
- Bodies are available in aluminium, steel and cast iron. In the standard version, aluminium bodies are without surface treatment, steel bodies are zinc-coated for 240 h protection acc. to ISO 9227 and cast iron bodies are phosphated
- Cast iron body versions additionally feature a gauge port

Ordering Code

SB - [] - [] [] [] [] [] [] - []

In-Line Bodies for Screw-In Cartridge Valves

Cavity*

- 3/4-16 UNF-2B, 2-Way
- 3/4-16 UNF-2B, 3-Way
- 3/4-16 UNF-2B, 4-Way
- 7/8-14 UNF-2B, 2-Way
- 7/8-14 UNF-2B, 3-Way
- 7/8-14 UNF-2B, 4-Way
- 1-1/8-12 UNF-2B, 3-Way
- 1-1/8-12 UNF-2B, 4-Way
- 1-5/16-12 UNF-2B, 3-Way
- 1-5/16-12 UN-2B, 4-Way
- 1-5/16-12 UN-2B, 4-Way
- M20x1.5, 3-Way
- M22x1.5, 2-Way
- M22x1.5, 3-Way
- M27x1.5, 3-Way
- M27x2, 2-Way
- M27x2, 2-Way
- M27x2, 3-Way
- M27x2, 3-Way
- M38x2, 3-Way
- SLIP-IN, 3-Way

- A2
- A3
- A4
- B2
- B3
- B4
- U3
- U4
- S3
- V4
- D4
- Q3
- QG2
- QF3
- R3
- QK2
- K2
- K3
- QL3
- T3
- W3, X3, Y3

*For more details on cavities and suitable valve types please see the SMT catalogue 0019.

Body configuration

- Single body 01
- Dual body 02
- Triple body 03

Connecting port

- G1/4 01
- SAE6, (9/6-18 UNF-2B) 02
- G3/8 03
- SAE8, (3/4-16 UNF-2B) 04
- G1/2 05
- SAE10, (7/8-14 UNF-2B) 06
- G3/4 07
- SAE12, (1-1/16-12 UN-2B) 08
- G1 09
- SAE16 (1-5/16-12 UN-2B) 10

Surface treatment
No designation without treatment*
P phosphated**
A 240 h salt spray test (ISO 9227)***

*only for aluminium bodies
**only for cast iron bodies
***only for steel bodies

Seals
No designation without seal rings
N NBR
V FPM (Viton)

Body material
AL aluminium
ST steel
G cast iron

Gauge port
No designation without gauge port
M gauge port

Control port
No designation without control port
XY drain for valve type VPN2-10 version SX and SY

Number of „P“-ports*
No designation single port „P1“
P *dual port „P1“ and „P2“

*only for cavity QG2, QK2, QL3

Not all combination of features are available as actual products. The standard versions are listed on pages 2 and 3. For the identification and feasibility of other body versions consult our technical department.

List of Bodies According to Cavity Types

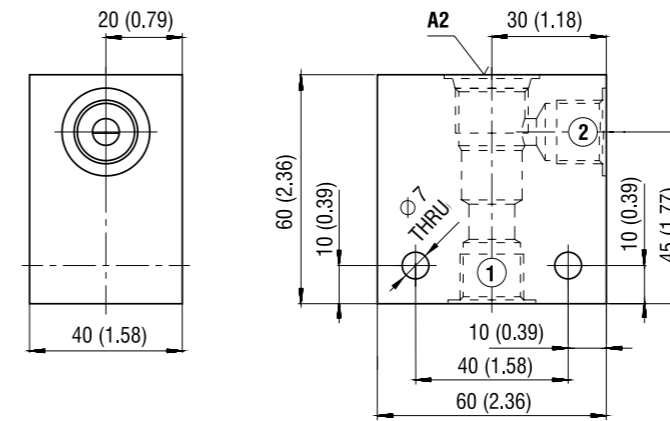
Cavity	Connecting thread	Material	Ordering code	Pressure bar (PSI)	Mass kg (lbs)	Dimensions	Ordering No.
A2 3/4-16 UNF-2B 2-Way	G1/4	Aluminium	SB-A2-0101AL	250 (3626)	0.56 (1.23)	Page 4	28129501
		Steel	SB-A2-0101ST-A	420 (6091)	1.27 (3.46)		27308300
	SAE6, 9/6-18	Aluminium	SB-A2-0102AL	250 (3626)	0.56 (1.23)		24365800
		Steel	SB-A2-0102ST-A	420 (6091)	1.27 (3.46)		24365700
	G3/8	Aluminium	SB-A2-0103AL	250 (3626)	0.56 (1.23)		15662201
		Steel	SB-A2-0103ST-A	420 (6091)	1.27 (3.46)		15662001
	SAE8, 3/4-16	Aluminium	SB-A2-0104AL	250 (3626)	0.56 (1.23)		33969000
		Steel	SB-A2-0104ST-A	420 (6091)	1.27 (3.46)		19569000
G1/2	Aluminium	SB-A2-0105AL	250 (3626)	0.56 (1.23)	19569100		
	Steel	SB-A2-0105ST-A	420 (6091)	1.27 (3.46)			
A3 3/4-16 UNF-2B 3-Way	G1/4	Aluminium	SB-A3-0101AL	250 (3626)	0.63 (1.39)	Page 4	24365901
		Steel	SB-A3-0101ST-A	420 (6091)	0.63 (1.39)		28649300
	SAE6, 9/6-18	Aluminium	SB-A3-0102AL	250 (3626)	0.63 (1.39)		15662300
		Steel	SB-A3-0102ST-A	420 (6091)	0.63 (1.39)		29888000
	G3/8	Aluminium	SB-A3-0103AL	250 (3626)	0.63 (1.39)		15662501
		Steel	SB-A3-0103ST-A	420 (6091)	0.63 (1.39)		17031300
SAE8, 3/4-16	Aluminium	SB-A3-0104AL	250 (3626)	0.63 (1.39)	33979700		
A4 3/4-16 UNF-2B 4-Way	G1/4	Aluminium	SB-A4-0101AL	250 (3626)	0.76 (1.68)	Page 4	20786001
		Steel	SB-A4-0102ST-A	420 (6091)	2.14 (4.72)		34277800
	G3/8	Aluminium	SB-A4-0103AL	250 (3626)	0.76 (1.68)		15662700
B2 7/8-14 UNF-2B 2-Way	G3/8	Aluminium	SB-B2-0103AL	250 (3626)	0.54 (1.19)	Page 5	19430701
		Steel	SB-B2-0103ST-A	420 (6091)	1.50 (3.31)		19937600
	SAE8, 3/4-16	Aluminium	SB-B2-0104AL	250 (3626)	0.54 (1.19)		27744700
		Steel	SB-B2-0104ST-A	420 (6091)	1.50 (3.31)		19569201
	G1/2	Aluminium	SB-B2-0105AL	250 (3626)	0.54 (1.19)		19696400
SAE10, 7/8-14	Steel	SB-B2-0106ST-A	420 (6091)	1.50 (3.31)	34293000		
B3 7/8-14 UNF-2B 3-Way	G3/8	Aluminium	SB-B3-0103AL	250 (3626)	0.60 (1.32)	Page 5	19965001
		Steel	SB-B3-0103ST-A	420 (6091)	1.68 (3.70)		19964800
	SAE8, 3/4-16	Aluminium	SB-B3-0104AL	250 (3626)	0.60 (1.32)		34048700
		Steel	SB-B3-0104ST-A	420 (6091)	1.68 (3.70)		31033500
B4 7/8-14 UNF-2B 4-Way	G1/2	Aluminium	SB-B3-0105AL	250 (3626)	0.60 (1.32)	Page 5	27673100
		Steel	SB-B3-0105ST-A	420 (6091)	1.68 (3.70)		28199100
	SAE10, 7/8-14	Aluminium	SB-B3-0106AL	250 (3626)	0.71 (1.57)		27461000
		Steel	SB-B3-0106ST-A	420 (6091)	1.99 (4.39)		27567600
U3 1-1/8-12 UNF-2B 3-Way	G1/2	Aluminium	SB-B4-0103AL	250 (3626)	0.71 (1.57)	Page 5	34277600
		Steel	SB-B4-0103ST-A	420 (6091)	1.99 (4.39)		33054100
	SAE10, 7/8-14	Aluminium	SB-B4-0104AL	250 (3626)	0.71 (1.57)		19965400
Steel		SB-B4-0104ST-A	420 (6091)	1.99 (4.39)	19965200		
U4 1-1/8-12 UNF-2B 4-Way	G1/2	Aluminium	SB-U3-0105AL	250 (3626)	0.81 (1.79)	Page 7	24296700
		Steel	SB-U3-0105ST-A	420 (6091)	2.07 (4.56)		24296800
	SAE10, 7/8-14	Aluminium	SB-U3-0106AL	250 (3626)	0.78 (1.72)		On request
Steel		SB-U3-0106ST-A	420 (6091)	2.26 (4.98)	On request		
S3 1-5/16-12 UNF-2B 3-Way	G1/2	Aluminium	SB-U4-0105AL	250 (3626)	0.80 (1.76)	Page 7	19296500
		Steel	SB-U4-0105ST-A	420 (6091)	2.05 (4.52)		18839000
	SAE10, 7/8-14	Aluminium	SB-U4-0106AL	250 (3626)	0.77 (1.70)		On request
Steel		SB-U4-0106ST-A	420 (6091)	2.23 (4.92)	On request		
V4 1-5/16-12 UN-2B 4-Way	G3/4	Aluminium	SB-S3-0107AL	250 (3626)	0.95 (2.09)	Page 6	24296100
		Steel	SB-S3-0107ST-A	420 (6091)	1.30 (2.87)		28018500
	SAE12, 1 1/16	Aluminium	SB-S3-0108AL	250 (3626)	0.93 (2.05)		On request
		Steel	SB-S3-0108ST-A	420 (6091)	1.25 (2.76)		On request
G3/4	Aluminium	SB-S3-0207AL	250 (3626)	1.91 (4.21)	24296200		
	Steel	SB-S3-0207ST-A	420 (6091)	3.00 (6.61)	28769200		
D4 1-5/16-12 UN-2B 4-Way	G1/2	Aluminium	SB-V4-0109ST-A	420 (6091)	4.30 (9.48)	On request	27418100
		Steel					
D4 1-5/16-12 UN-2B 4-Way	G1/2	Aluminium	SB-D4-0105AL	250 (3626)	1.50 (3.31)	Page 6	27955800
		Steel	SB-D4-0105ST-A	420 (6091)	4.35 (9.59)		31976800
	SAE10, 7/8-14	Aluminium	SB-D4-0106AL	250 (3626)	1.40 (3.09)		On request
Steel		SB-D4-0106ST-A	420 (6091)	4.06 (8.95)	On request		

Cavity	Connecting thread	Material	Ordering code	Pressure bar (PSI)	Mass kg (lbs)	Dimensions	Ordering No.				
Q3 M20x1.5 3-Way	G3/8	Aluminium	SB-Q3-0103AL	250 (3626)	0.27 (0.60)	Page 7, 8	15628000				
		Steel	SB-Q3-0103ST-A	420 (6091)	0.75 (1.65)		24295600				
	SAE8, 3/4-16	Aluminium	SB-Q3-0104AL	250 (3626)	0.25 (0.55)		On request				
		Steel	SB-Q3-0104ST-A	420 (6091)	0.73 (1.61)		On request				
	G3/8	Aluminium	SB-Q3-0203AL	250 (3626)	0.46 (1.01)		17236700				
		Steel	SB-Q3-0203ST-A	420 (6091)	1.28 (2.82)		24295700				
		Aluminium	SB-Q3-0303AL	250 (3626)	0.47 (1.04)		15628100				
QG2 M22x1.5 2-Way	G3/8	Cast iron	SB-QG2-0103MG-P	350 (5080)	1.17 (2.58)	Page 9	15989600				
			SB-QG2-0103PMG-P	350 (5080)	1.17 (2.58)		15989400				
			SB-QG2-0103PMGV-P	350 (5080)	1.17 (2.58)		22950200				
			SB-QG2-0103MGV-P	350 (5080)	1.17 (2.58)		22950400				
			SB-QG2-0103G-P	350 (5080)	1.05 (2.31)		15653400				
			SB-QG2-0104MG-P	350 (5080)	1.17 (2.58)		15990000				
	SAE8, 3/4-16	Cast iron	SB-QG2-0104MGV-P	350 (5080)	1.17 (2.58)		22939400				
			SB-QG2-0104PMG-A	350 (5080)	1.17 (2.58)		18748500				
			SB-QG2-0104PMG-P	350 (5080)	1.17 (2.58)		15989800				
			SB-QG2-0104PMGV-P	350 (5080)	1.17 (2.58)		22939200				
			SB-QG2-0104G-P	350 (5080)	1.00 (2.20)		15653600				
			SB-QG2-0105MG-P	350 (5080)	1.17 (2.58)		15989700				
	G1/2	Cast iron	SB-QG2-0105PMG-P	350 (5080)	1.17 (2.58)		15989500				
			SB-QG2-0105PMGV-P	350 (5080)	1.17 (2.58)		22950300				
			SB-QG2-0105MGV-P	350 (5080)	1.17 (2.58)		22950500				
			SB-QG2-0105G-P	350 (5080)	1.00 (2.20)		15653500				
			SB-QG2-0106MG-P	350 (5080)	1.17 (2.58)		15990100				
			SB-QG2-0106MGV-P	350 (5080)	1.17 (2.58)		22939500				
	SAE10, 7/8-14	Cast iron	SB-QG2-0106PMG-P	350 (5080)	1.17 (2.58)		22939300				
			SB-QG2-0106PMGV-P	350 (5080)	1.17 (2.58)		15989900				
			SB-QG2-0106G-P	350 (5080)	0.95 (2.09)		15653700				
			SB-QF3-0103G-P	350 (5080)	1.10 (2.43)		Page 7	16002700			
			R3 M27x1.5 3-Way	G1/2	Aluminium		SB-R3-0105AL	250 (3626)	0.44 (0.97)	Page 8	16947300
					Steel		SB-R3-0105ST-A	420 (6091)	1.20 (2.65)		24295800
G1/2	Aluminium	SB-R3-0205AL		250 (3626)	0.78 (1.72)	24295900					
	Steel	SB-R3-0205ST-A		420 (6091)	2.15 (4.74)	24296000					
SAE10, 7/8-14	Aluminium	SB-R3-0106AL		250 (3626)	0.41 (0.90)	On request					
	Steel	SB-R3-0106ST-A		420 (6091)	1.19 (2.62)	On request					
QK2 M27x2 2-Way	G3/4	Cast iron	SB-QK2-0107MG-P	350 (5080)	2.70 (5.95)	Page 10	15996300				
			SB-QK2-0107MG-A	350 (5080)	2.70 (5.95)		24510200				
			SB-QK2-0107MGV-P	350 (5081)	2.70 (5.95)		22976300				
			SB-QK2-0107PMG-P	350 (5080)	2.70 (5.95)		15996500				
			SB-QK2-0107PMGV-A	350 (5080)	2.70 (5.95)		19002800				
			SB-QK2-0107PMGV-P	350 (5080)	2.70 (5.95)		22976600				
	SAE12, 1 1/16	Cast iron	SB-QK2-0108PMG-P	350 (5080)	2.70 (5.95)		15996600				
			SB-QK2-0108PMGV-P	350 (5080)	2.70 (5.95)		22980100				
			SB-K2-0105AL	250 (3626)	0.40 (0.88)		Page 10	16991600			
			Steel	SB-K2-0105ST-A	420 (6091)		1.50 (3.31)	18953400			
K2 M27x2 2-Way	G1/2	Aluminium	SB-K2-0105AL	250 (3626)	0.40 (0.88)	Page 10	On request				
		Steel	SB-K2-0105ST-A	420 (6091)	1.50 (3.31)		On request				
	SAE10, 7/8-14	Aluminium	SB-K2-0106AL	250 (3626)	0.50 (1.10)		On request				
		Steel	SB-K2-0106ST-A	420 (6091)	1.49 (1.08)		On request				
K3 M27x2 2-Way	G1/2	Aluminium	SB-K3-0105AL	250 (3626)	0.65 (1.43)	Page 10	27135800				
		Steel	SB-K3-0105ST-A	420 (6091)	1.59 (3.51)		24296400				
	SAE10, 7/8-14	Aluminium	SB-K3-0106AL	250 (3626)	0.57 (1.26)		24296300				
		Steel	SB-K3-0106ST-A	420 (6091)	1.65 (3.64)		On request				
QL3 M27x2, 2-Way	G3/4	Cast iron	SB-QL3-0107XYMG-P	350 (5080)	2.70 (5.95)	Page 10	15996400				
			SB-QL3-0107XYMGV-P	350 (5080)	2.70 (5.95)		22976400				
T3 M38x2 3-Way	G1	Aluminium	SB-T3-0109AL	250 (3626)	1.47 (3.24)	On request	27871900				
		Steel	SB-T3-0109ST-A	420 (6091)	4.00 (8.82)		27135700				
		SB-T3-0209ST-A	420 (6091)	6.20 (13.7)	30547100						
W3, X3 M27x2, 3-Way	G3/8	Aluminium	SB-W3-0103AL	250 (3626)	0.56 (1.23)	Page 9	18737300				
	SAE8, 3/4-16		SB-W3-0104AL	250 (3626)	0.56 (1.23)		30945900				
Y3 M27x2, 3-Way	G3/8	Aluminium	SB-Y3-0103AL	250 (3626)	0.55 (1.21)	Page 9	18737200				

A2, A3, A4 - 3/4-16 UNF-2B

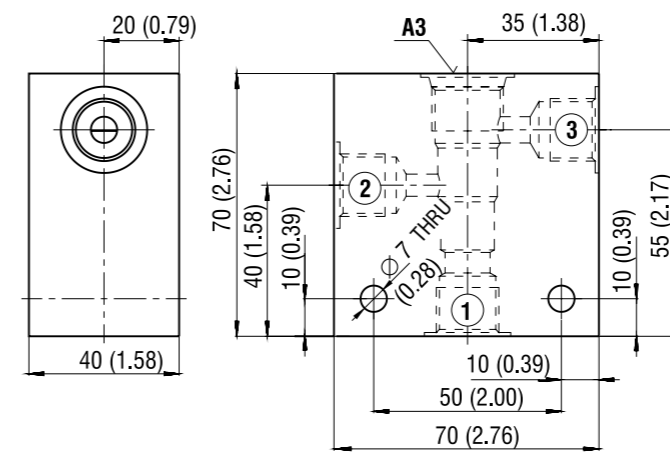
Dimensions in millimeters (inches)

Body for 2-Way SIC Valve



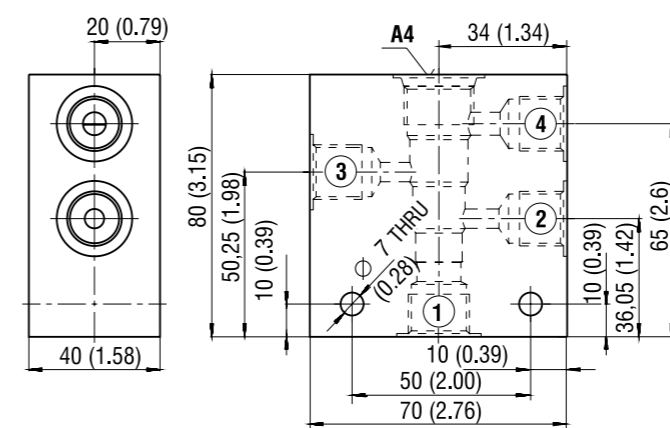
Model A2	Connecting port
SB-A2-0101*	G1/4
SB-A2-0102*	SAE6, 9/16-18
SB-A2-0103*	G3/8
SB-A2-0104*	SAE8, 3/4-16

Body for 3-Way SIC Valve



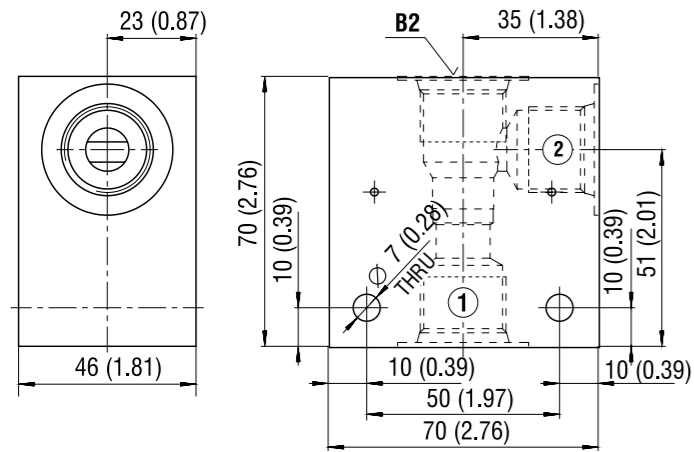
Model A3	Connecting port
SB-A3-0101*	G1/4
SB-A3-0102*	SAE6, 9/16-18
SB-A3-0103*	G3/8
SB-A3-0104*	SAE8, 3/4-16

Body for 4-Way SIC Valve



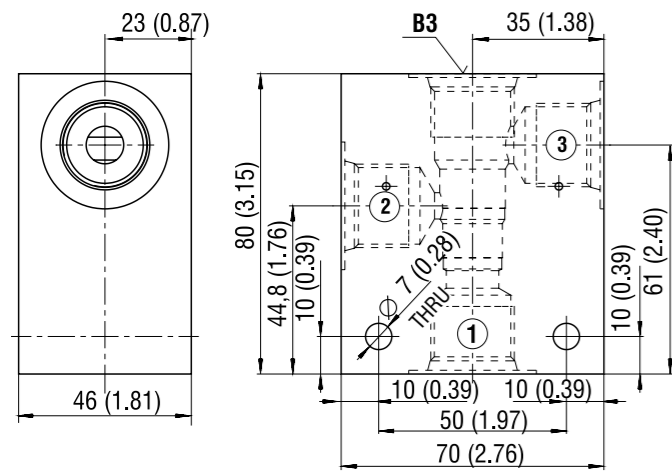
Model A4	Connecting port
SB-A4-0101*	G1/4
SB-A4-0102*	SAE6, 9/16-18
SB-A4-0103*	G3/8
SB-A4-0104*	SAE8, 3/4-16

Body for 2-Way SIC Valve



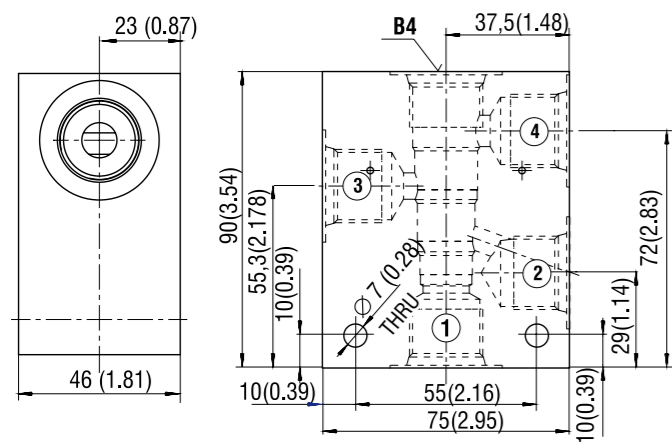
Model B2	Connecting port
SB-B2-0103*	G3/8
SB-B2-0104*	SAE8, 3/4-16
SB-B2-0105*	G1/2
SB-B2-0106*	SAE10, 7/8-14

Body for 3-Way SIC Valve



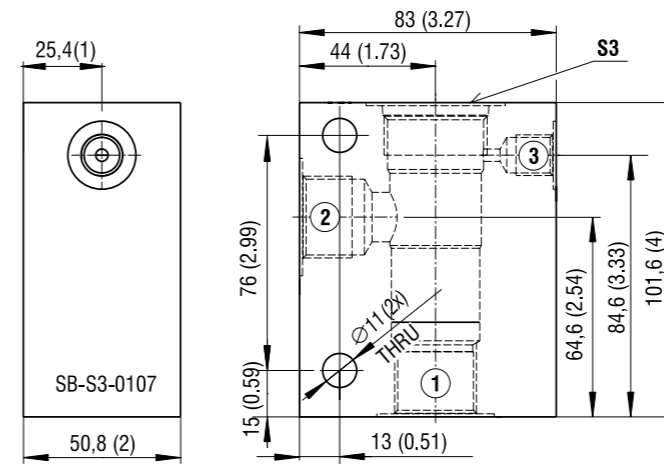
Model B3	Connecting port
SB-B3-0103*	G3/8
SB-B3-0104*	SAE8, 3/4-16
SB-B3-0105*	G1/2
SB-B3-0106*	SAE10, 7/8-14

Body for 4-Way SIC Valve



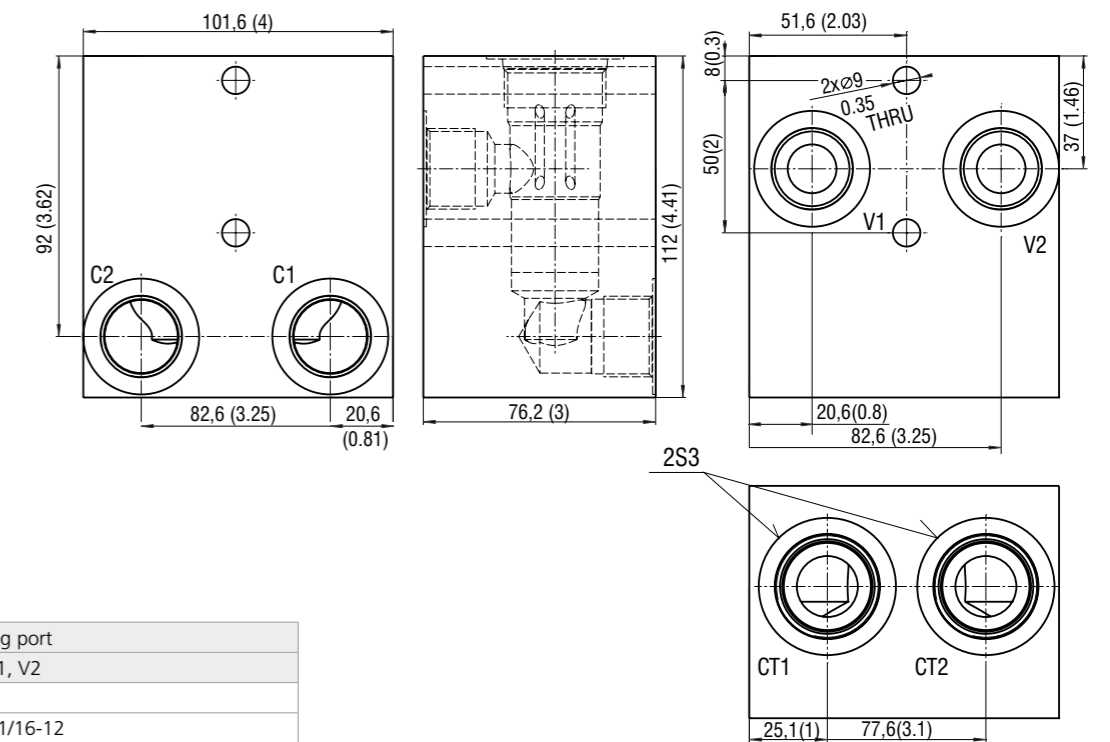
Model B4	Connecting port
SB-B4-0103*	G3/8
SB-B4-0104*	SAE8, 3/4-16
SB-B4-0105*	G1/2
SB-B4-0106*	SAE10, 7/8-14

Body for 3-Way SIC Valve - Body configuration 01



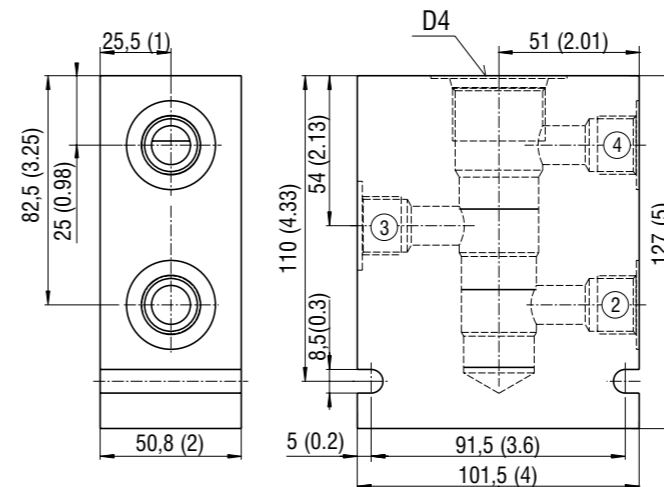
Model S3	Connecting port	
SB-S3-0107*	G3/4	G1/4
SB-S3-0108*	SAE12, 1-1/16-12	SAE6, 9/16-18

Body for 3-Way SIC Valve - Body configuration 02



Model S3	Connecting port
SB-S3-0207*	G3/4
SB-S3-0208*	SAE12, 1-1/16-12

Body for 4-Way SIC Valve

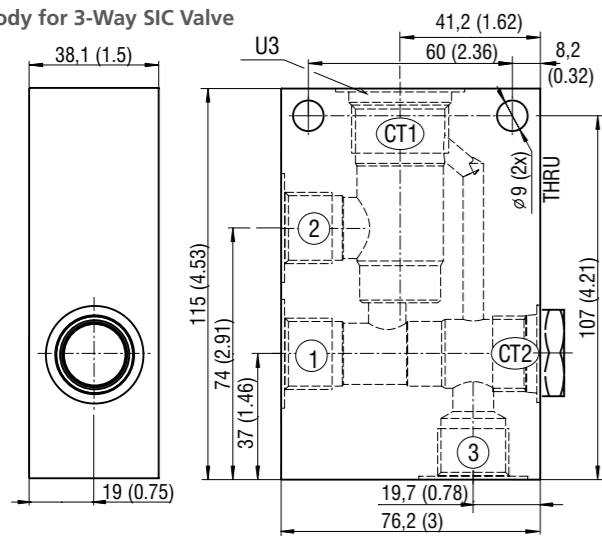


Model D4	Connecting port
SB-D4-0105*	G1/2
SB-D4-0106*	SAE10, 7/8-14

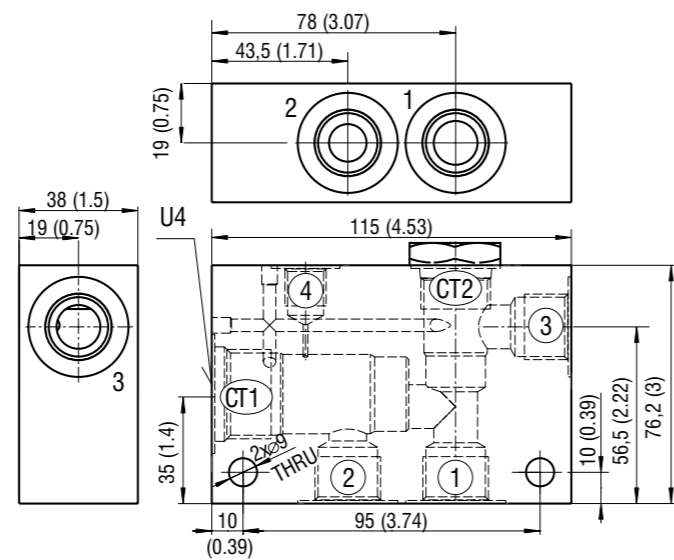
U3,U4 - 1-1/8-12 UNF-2B

Dimensions in millimeters (inches)

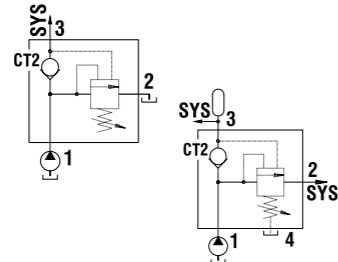
Body for 3-Way SIC Valve



Body for 4-Way SIC Valve



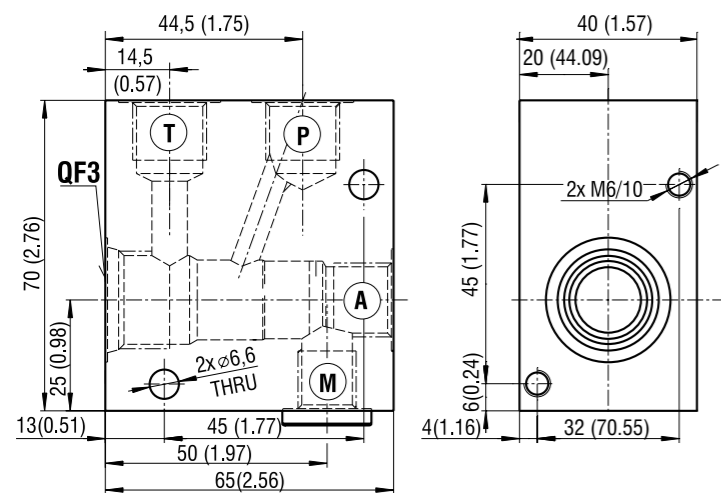
Model U3, U4	Connecting port	
	1, 2, 3	4
SB-U3-0105	G1/2	-
SB-U3-0106	SAE10, 7/8-14	-
SB-U4-0105	G1/2	G1/4
SB-U4-0106	SAE10, 7/8-14	SAE6, 9/16-18



QF3 - M22x1.5

Dimensions in millimeters (inches)

Body for 3-Way SIC Valve



i The steel end plugs are screwed into port M. The sealing material on these end plugs is either NBR or Viton, see the ordering code.

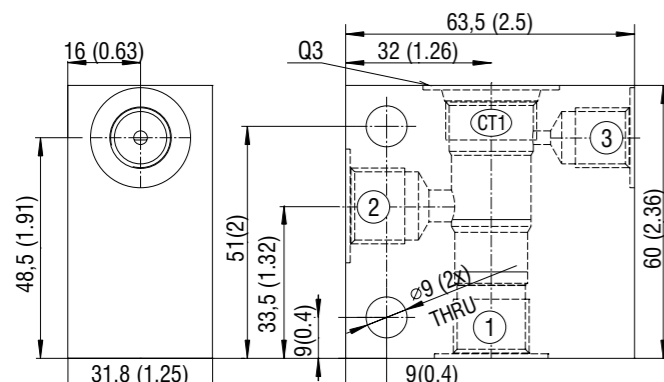
Model QF3	Former name
SB-QF3-0103G*	RRA1-06

Model QF3	Connecting port	
	P, T, A	M
SB-QF3-0103G*	G3/8	G1/4

Q3 - M20x1.5

Dimensions in millimeters (inches)

Body for 3-Way SIC Valve - Body configuration 01

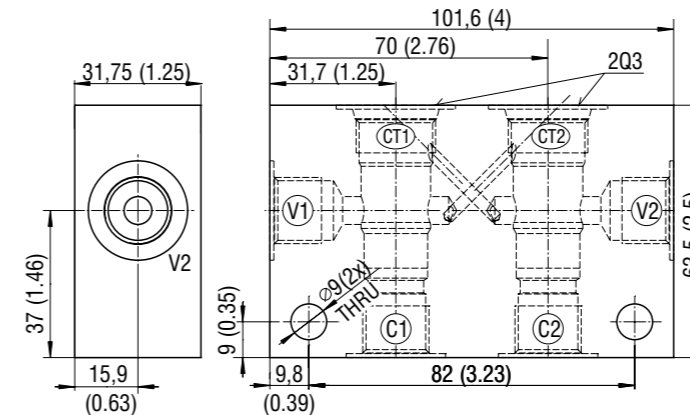


Model Q3	Connecting port	
	1, 2	3
SB-Q3-0103*	G3/8	G1/4
SB-Q3-0104*	SAE8, 3/4-16	SAE6, 9/16-18

Q3 - M20x1.5

Dimensions in millimeters (inches)

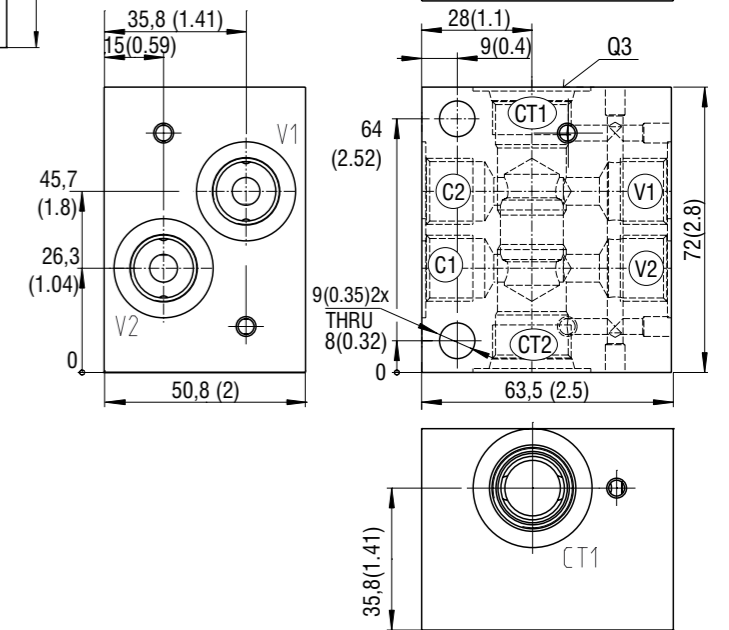
Body for 3-Way SIC Valve - Body configuration 02



Model Q3	Connecting port	
	C1, C2, V1, V2	
SB-Q3-0203*	G3/8	
SB-Q3-0204*	SAE8, 3/4-16	

Body for 3-Way SIC Valve - Body configuration 03

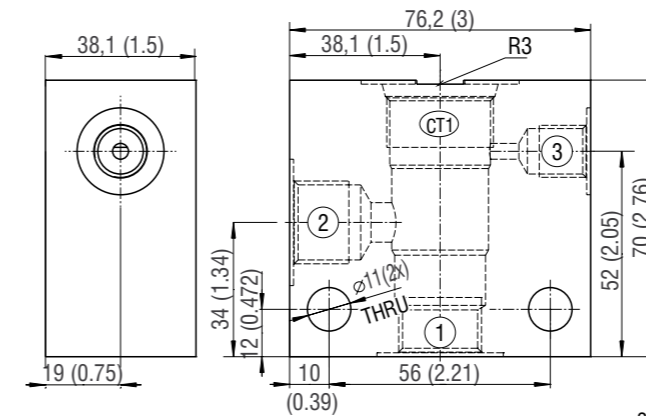
Model Q3	Connecting port	
	C1, C2, V1, V2	
SB-Q3-0303*	G3/8	



R3 - M27x1.5

Dimensions in millimeters (inches)

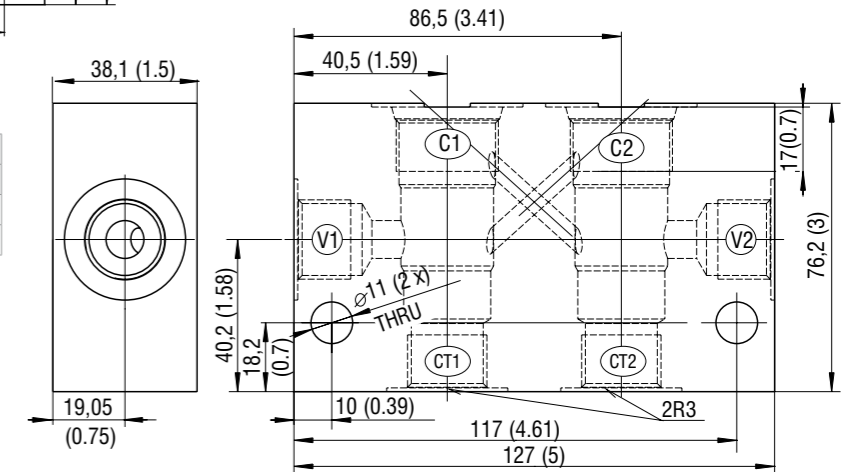
Body for 3-Way SIC Valve - Body configuration 01



Model R3	Connecting port	
	1, 2	3
SB-R3-0105*	G1/2	G1/4
SB-R3-0106*	SAE10, 7/8-14	SAE6, 9/16-18

Body for 3-Way SIC Valve - Body configuration 02

Model R3	Connecting port	
	C1, C2, V1, V2	
SB-R3-0205*	G1/2	
SB-R3-0206*	SAE10, 7/8-14	

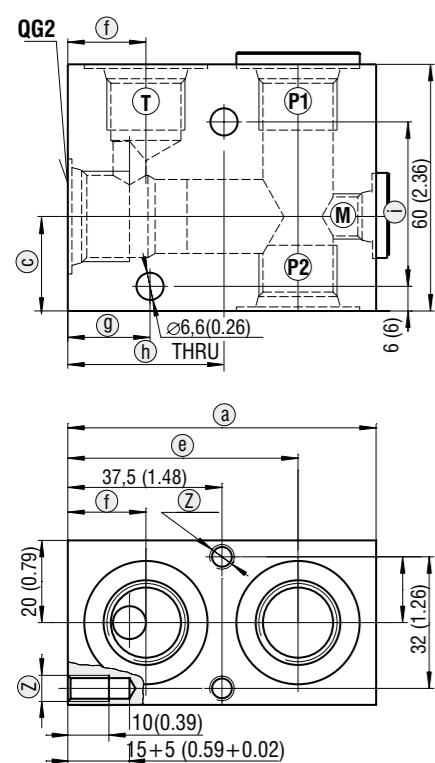


QG2 - M22x1,5

Dimensions in millimeters (inches)

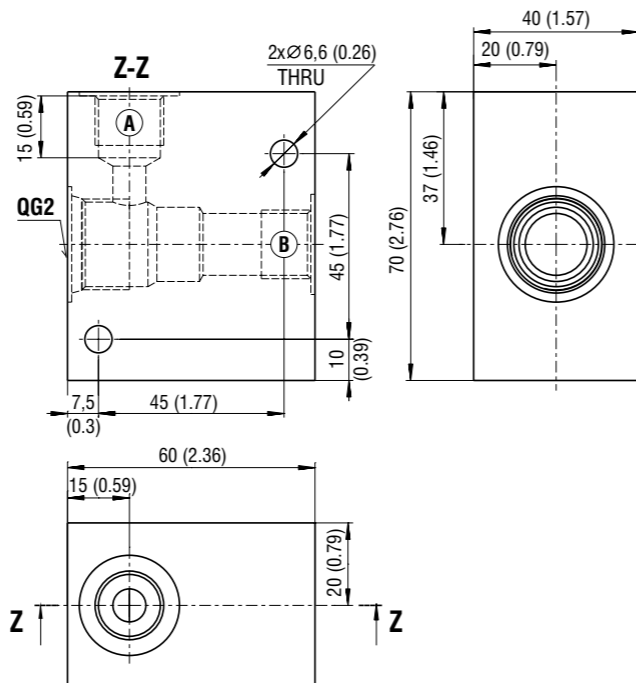
Body for 2-Way SIC Valve

Body with gauge port M



i The steel end plugs are screwed into ports M and P1. The sealing material on these end plugs is either NBR or Viton, see the ordering code.

Body without gauge port M



Body with gauge port M

Model QG2	Former name	Connecting thread	Model QG2	Former name	Connecting thread
SB-QG2-0103PMG*	RA1-06	G3/8	SB-QG2-0105PMG*	RA2-06	G1/2
SB-QG2-0103MG*	RB1-06		SB-QG2-0105MG*	RB2-06	
SB-QG2-0104PMG*	RA3-06	SAE8, 3/4-16	SB-QG2-0106PMG*	RA4-06	SAE10, 7/8-14
SB-QG2-0104MG*	RB3-06		SB-QG2-0106MG*	RB4-06	

Body without gauge port M

Model QG2	Former name	Connecting thread
SB-QG2-0103G*	R1-ROE3	G3/8
SB-QG2-0104G*	R3-ROE3	SAE8, 3/4-16
SB-QG2-0105G*	R2-ROE3	G1/2
SB-QG2-0106G*	R4-ROE3	SAE10, 7/8-14

Body with gauge port M

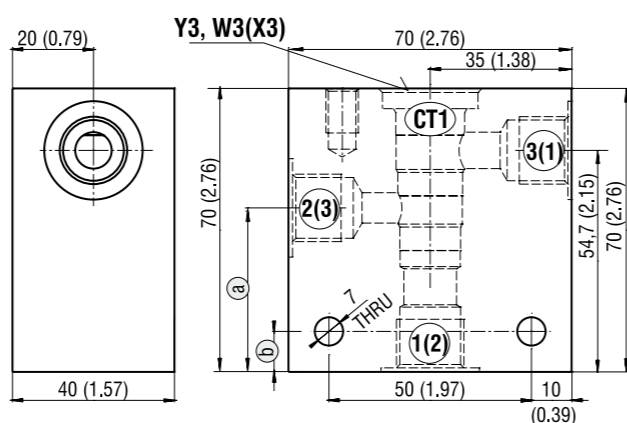
Model QG2	Connecting port					Dimensions in mm (in)								
	P1	P2	T	M	Z	a	b	c	d	e	f	g	h	i
SB-QG2-0103PMG*	G3/8	G3/8	G3/8	G1/4	M6-6H	60 (2.36)	70 (2.76)	33 (1.30)	45 (1.77)	39 (1.54)	12.5 (0.49)	7.5 (0.30)	52.5 (2.07)	45 (1.77)
SB-QG2-0103MG*	G3/8	-	G3/8	G1/4	M6-6H	60 (2.36)	70 (2.76)	33 (1.30)	60 (2.36)	38 (1.50)	15 (0.59)	7.5 (0.30)	38 (1.50)	45 (1.77)
SB-QG2-0104PMG*	SAE8	SAE8	SAE8	SAE4	1/4-20UNC-2B	75 (2.95)	60 (2.36)	33 (1.30)	32 (1.26)	56 (2.20)	19 (0.75)	20 (0.78)	38 (1.50)	40 (1.57)
SB-QG2-0104MG*	SAE8	-	SAE8	SAE4	1/4-20UNC-2B	60 (2.36)	60 (2.36)	23 (0.91)	32 (1.26)	40 (1.57)	19 (0.75)	20 (0.78)	38 (1.50)	40 (1.57)
SB-QG2-0105PMG*	G1/2	G1/2	G1/2	G1/4	M6-6H	70 (2.76)	70 (2.76)	33 (1.30)	45 (1.77)	46 (1.81)	14 (0.55)	18 (0.70)	63 (2.48)	45 (1.77)
SB-QG2-0105MG*	G1/2	-	G1/2	G1/4	M6-6H	60 (2.36)	70 (2.76)	33 (1.30)	45 (1.77)	38 (1.50)	16 (0.63)	7.5 (0.30)	38 (1.50)	45 (1.77)
SB-QG2-0106PMG*	SAE10	SAE10	SAE10	SAE4	1/4-20UNC-2B	75 (2.95)	60 (2.36)	23 (0.91)	32 (1.26)	56 (2.20)	19 (0.75)	20 (0.79)	38 (1.50)	40 (1.57)
SB-QG2-0106MG*	SAE10	-	SAE10	SAE4	1/4-20UNC-2B	60 (2.36)	60 (2.36)	23 (0.91)	32 (1.26)	40 (1.57)	19 (0.75)	20 (0.79)	38 (1.50)	40 (1.57)

Y3, W3 (X3) - M27x2

Dimensions in millimeters (inches)

Body for 3-Way SIC Valve

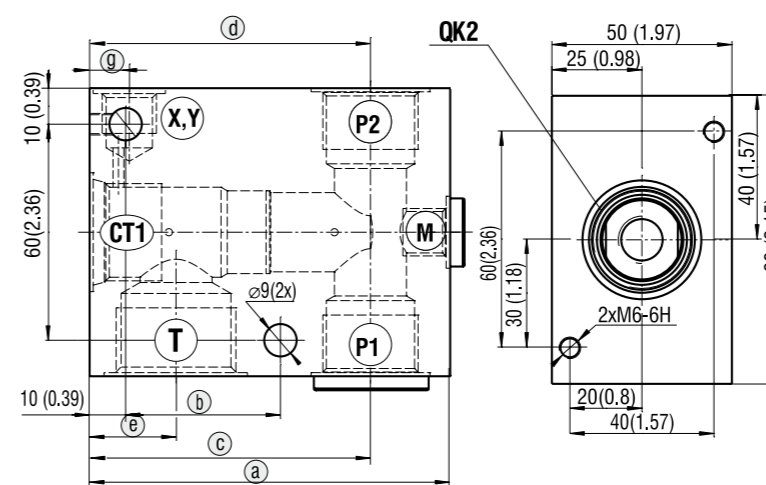
Model	Connecting port	Dimensions in mm (in)	
		a	b
SB-Y3-0103*	G3/8	29.5 (1.16)	10 (0.39)
SB-W3-0103*	G3/8	37.7 (1.48)	10 (0.39)
SB-W3-0104*	SAE8, 3/4-16	37.7 (1.48)	20 (0.79)
SB-X3-0103*	G3/8	37.7 (1.48)	10 (0.39)
SB-X3-0104*	SAE8, 3/4-16	37.7 (1.48)	20 (0.79)



QK2, QL3 - M22x1.5

Dimensions in millimeters (inches)

Body for 2(3)-Way SIC Valve



i The steel end plugs are screwed into ports M and P1. The sealing material on these end plugs is either NBR or Viton, see the ordering code.

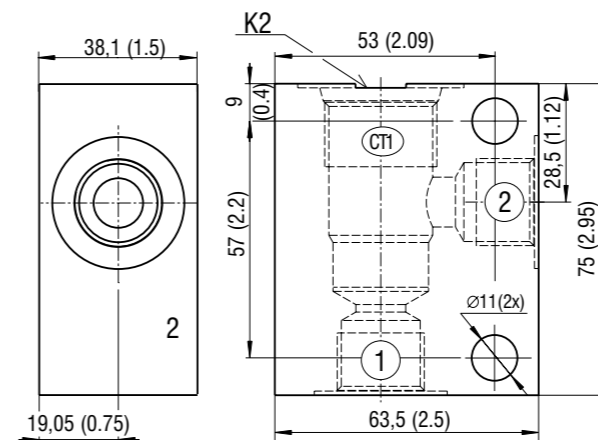
Model	Former name	Connecting thread
SB-QK2-0107PMG*	RA2-10	G3/4
SB-QK2-0107MG*	RB2-10	G3/4
SB-QK2-0108PMG*	RA3-10	SAE12, 1-1/16
SB-QL3-0107XYMG*	RC2-10	G1/2

Model	Connecting port					Dimensions in mm (in)					
	P1	P2	T	M	X, Y	a	b	c	d	e	g
SB-QK2-0107PMG*	G3/4	G3/4	G1	G1/4	-	100 (3.94)	43 (1.69)	78 (3.07)	78 (3.07)	24 (0.94)	-
SB-QK2-0108PMG*	SAE12	SAE12	SAE16	SAE4	-	100 (3.94)	43 (1.69)	78 (3.07)	78 (3.07)	24 (0.94)	-
SB-QK2-0107MG*	G3/4	-	G1	G1/4	-	90 (3.54)	70 (2.76)	68 (2.68)	-	24 (0.94)	-
SB-QL3-0107XYMG*	G3/4	-	G1/2	G1/4	X-G1/4	100 (3.94)	70 (2.76)	68 (2.68)	-	35 (1.38)	11 (0.43)

K2 - M27x2

Dimensions in millimeters (inches)

Body for 3-Way SIC Valve

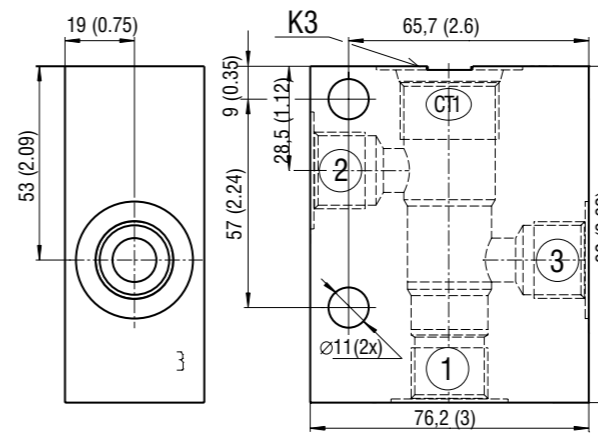


Model K2	Connecting port
SB-K2-0105*	G1/2
SB-K2-0106*	SAE10, 7/8-14

K3 - M27x2

Dimensions in millimeters (inches)

Body for 3-Way SIC Valve



Model K3	Connecting port
SB-K3-0105*	G1/2
SB-K3-0106*	SAE10, 7/8-14

Content

Type Code	Motor Output (kW)	Flow l/min (GPM)	Pressure bar (PSI)	Page	Data Sheet
Hydraulic Power Packs with Under Oil Motor					
SPA 01	3	10 (3)	250 (3600)	584	HA 7111
Hydraulic Power Packs - Mini					
SMA 05	3	17 (5)	250 (3600)	588	HA 7212
Hydraulic Power Packs					
SA 4	7.5	50 (13)	250 (3600)	606	HA 7100

Notes

Hydraulic Power Pack with Under Oil Motor

SPA 01

Q_{max} 10 l/min • p_{max} 250 bar • P_{max} 3 kW

Example: plastic tank version



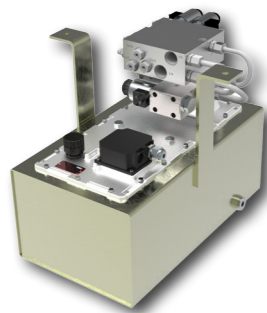
Technical Features

- › AC electro-hydraulic compact unit with under oil motor
- › Compact design with reduced overall dimensions for production cost saving
- › Main applications are lifting platforms
- › 3 central block basic circuits option
- › Possibility of building up an additional circuit in the form of vertical or horizontal stacking assembly
- › One- and three-phase motors with power ratings of up to 3 kW
- › Tank capacities from 7 to 30 l with optional plastic tanks for cost saving
- › In the standard version, the aluminium basic block is without surface protection and steel plate are zinc coated for 240 h protection acc. to ISO 9227

Functional Description

The under oil power packs are designed for applications which require low noise levels as well as small envelope dimensions. They are designed to be operated only occasionally, thus being suitable mainly for the use in lifting platforms, elevating tables and handling devices. Each power pack consists of an electric motor, a pump, a manifold and a tank. The aluminum body forms the base of the power pack, on which all the main components, including the hydraulic elements, are mounted. The function of the power packs is apparent from the respective hydraulic circuit diagrams. The desired combination of particular components and hydraulic elements can be defined by reference to the ordering code and the respective tables. The additional hydraulic circuits can be built up valve sizes 03 (RPEK), 04 (CETOP 02) and 06 (CETOP 03). The size 03 (RPEK) is in the form of a sectional directional valve. The mounting position of the power pack is horizontal - see Power Pack Dimensions. The basic combinations of electric motors and pumps, as well as their code designations, are shown in table 1.

Example: steel tank version additional valves in stacking assembly



Technical Data

Flow rate	l/min	see table 1
Working pressure	bar	see table 1
Max. operating pressure	bar	see table 1
Tank capacity	l	7, 10, 20, 30
Type of hydraulic pump		Gear pump, CLOCKWISE
Electrical Motor power ratings	kW	0.55 - 3
Type of electric motor		one- and three-phase
Voltage of electric motor	V	230 400
Duty cycle S3 of electric motor	%	20
Frequency	Hz	50
Protection degree of power unit		IP 55
Viscosity range	mm ² /s	20 ... 100
Fluid temperature range	°C	-20 ... +80
Ambient temperature max.	°C	+50
Thread of functional ports P, T, M		G1/4
	Data Sheet	Type
General information	GI_0060	Products and operating conditions

Ordering Code

SPA 01 - [] / [] - [] - [] - [] - [] / []

Under oil power pack

Pump displacement in cm ³			
0.8	08	3.6	36
1.2	12	4.4	44
1.6	16	4.8	48
2.1	21	5.8	58
2.5	25	6.2	62
3.3	33	7.9	79

Code of the electric motor - see table 1

Start-up module
without start-up module: 0
with start-up module: M

Type of the block - see page 3

Code of the tank

7 l	7
10 l	10
20 l	20
30 l	30

Solenoid voltage

01200	12 V DC	06000	60 V DC
01400	14 V DC	10200	102 V DC
02100	21 V DC	20500	205 V DC
02400	24 V DC	02450	24 V / 50 (60) HZ
04200	42 V DC	11550	115 V / 50 (60) HZ
04800	48 V DC	23050	230 V / 50 (60) HZ

Nominal size of stacking assembly elements

0	without stacking assembly
3	size 03
4	size 04
6	size 06

Number of add-on units

0	without stacking assembly
1	1 section
2	2 sections
3	3 sections
4	4 sections
5	5 sections

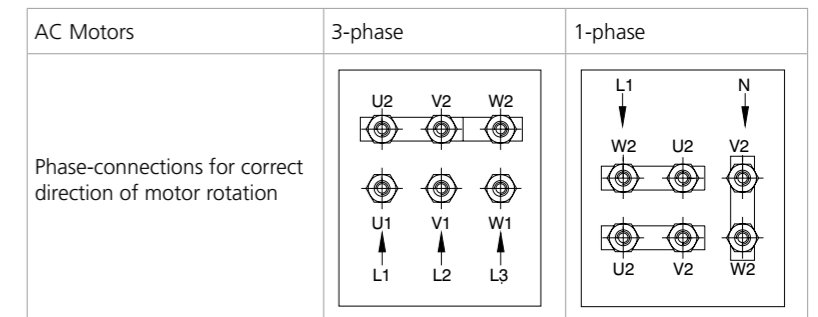
Tab. 1a

Code of the electric motor			Code of the pump					
			08 GP1..	12 GP1..	16 GP1..	21 GP1..	25 GP1..	33 GP1..
p_{max}^{**} [bar]			250					
rpm [1/min]	400 V	kW	Q/p _n * [l/min]/[bar]					
1500	13	0.55		1.5/175	2.0/130	2.6/100	3.1/85	4.2/65
	14	0.75			1.9/190	2.5/145	3.0/120	3.9/90
	15	1.10			2.1/200	2.8/190	3.3/160	4.4/120
	16	1.50					3.2/200	4.2/170
	17	2.20						
	18	3.0						
3000***	30	0.55	2.2/120	3.2/80	4.3/60	5.6/45	6.7/40	8.9/30
	31	0.75	2.2/160	3.2/110	4.3/80	5.6/65	6.7/55	8.9/40
	32	1.10	2.2/200	3.2/165	4.3/120	5.6/95	6.7/80	8.9/60
	33	1.50		3.2/200	4.3/165	5.6/130	6.7/110	8.9/80
	34	2.20			4.2/200	5.5/190	6.6/160	8.7/120
	35	3.00					6.4/200	8.5/170
rpm [1/min]	230 V	kW	Q/p _n * [l/min]/[bar]					
1500	5	0.55		1.6/165	2.1/125	2.7/100	3.2/80	4.3/60
	6	0.75		1.6/200	2.1/170	2.8/130	3.3/110	4.4/80
	7	1.10				2.8/190	3.3/160	4.4/120
	8	1.50					3.3/200	4.4/165
	9***	2.2						4.4/240

Tab. 1b

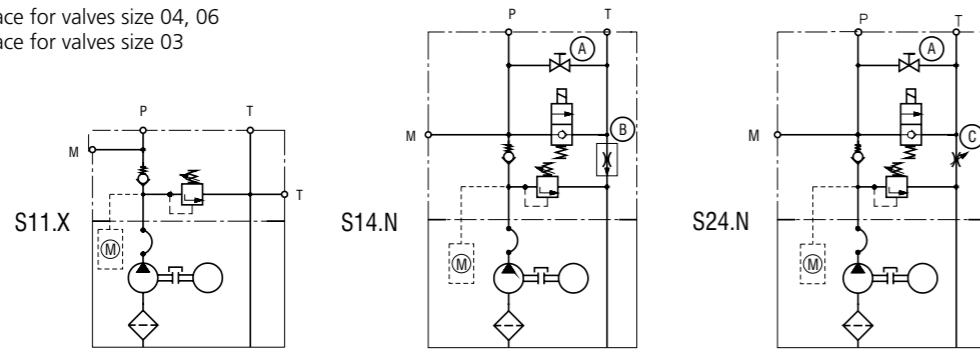
Code of the electric motor			Code of the pump					
			36 GP1..	44 GP1..	48 GP1..	58 GP1..	62 GP1..	79 GP1..
p_{max}^{**} [bar]			200					
rpm [1/min]	400 V	kW	Q/p _n * [l/min]/[bar]					
1500	13	0.55	4.5/60	5.5/50	6.0/45	7.3/35	7.8/35	9.9/25
	14	0.75	4.3/85	5.2/70	5.7/65	6.9/50	7.4/50	9.4/40
	15	1.10	4.8/110	5.8/90	6.3/85	7.7/70	8.2/65	10.4/50
	16	1.50	4.6/155	5.6/130	6.2/115	7.4/100	8.0/90	10.1/70
	17	2.20		5.0/200	5.5/190	6.6/160	7.1/150	9.0/120
	18	3.00			5.9/200	7.1/200	7.6/180	9.7/150
3000***	30	0.55						
	31	0.75	9.7/35					
	32	1.10	9.7/55	11.8/45	12.9/40	15.6/35		
	33	1.50	9.7/75	11.8/60	12.9/55	15.6/45	16.7/40	
	34	2.20	9.5/110	11.6/90	12.7/85	15.3/70	16.4/65	20.9/50
	35	3.00	9.3/155	11.3/125	12.4/115	15.0/95	16.0/90	20.4/70
rpm [1/min]	230 V	kW	Q/p _n * [l/min]/[bar]					
1500	5	0.55	4.7/55	5.7/45	6.2/40	7.5/35	8.0/30	10.2/25
	6	0.75	4.8/75	5.9/60	6.4/55	7.7/45	8.3/45	10.5/35
	7	1.10	4.8/110	5.9/90	6.4/80	7.7/70	8.5/65	10.5/50
	8	1.50	4.8/150	5.9/120	6.4/110	7.7/95	8.5/85	10.5/70
	9***	2.2	4.8/220	5.9/180	6.4/160	7.7/140	8.5/120	10.5/100

* p_n - nominal pressure = the highest working pressure allowed without time restriction
 ** p_{max} - maximum pressure = maximum pressure allowed for a short time - max. 20 s
 ***Before motor selection contact the producer.



Type of the Block

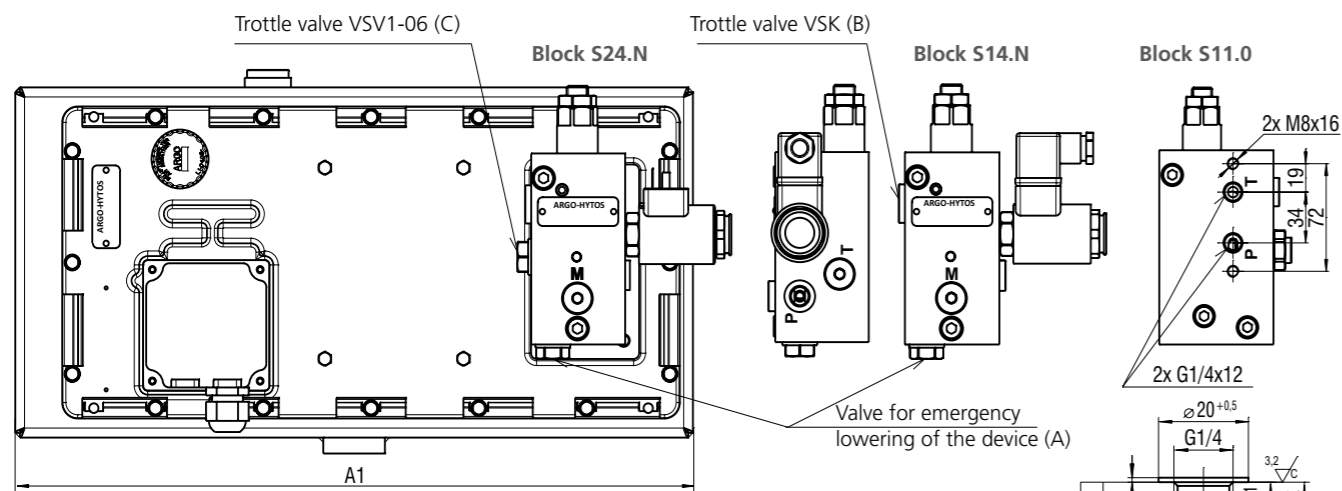
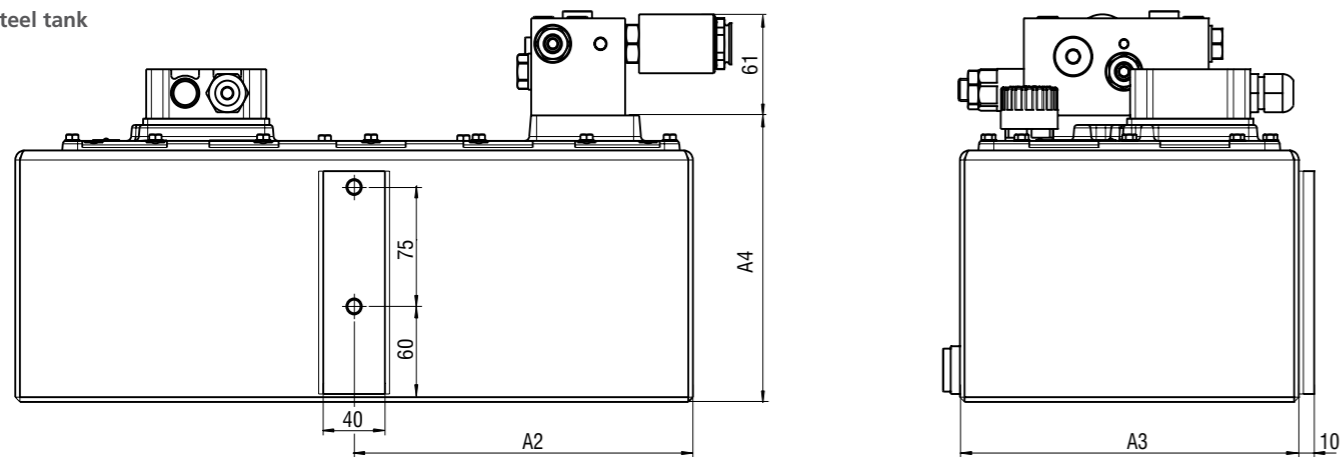
- S11.0 Connecting face for valves size 04, 06
- S11.1 Connecting face for valves size 03



The hydraulic circuit S11.X enables the power pack to be used as a simple pressure supply for general applications with the possibility to build up additional hydraulic circuits in the form of horizontal stacking assemblies of the size 04 or 06 (S11.0) or size 03 (S11.1).
 The hydraulic circuits S14.N and S24.N enable the power pack to be used as pressure supply for lifting platforms and other devices, in which the mass of the system provides returning into the basic position. The shuf-off valve (A) enables emergency lowering of the device, should a disconnection of the supply voltage occur.
 The hydraulic circuit S14.N comprises a flow control valve VSK (B) which is adjustable only in a certain range (see catalogue VSK - HA 5121). This valve is accessible from outside of the block. If not otherwise required, a valve VSK is mounted into the block. The stabilized flow rate of this valve corresponds with the respective flow rate of the power pack (see Tab. 1).
 The hydraulic circuit S24.N comprises a throttle valve VSV1-06 (C) without pressure compensation. This valve is accessible from outside of the block.
M - start-up module is suitable for one-phase E-motors (codes 5-9).
 Use it if there is no possibility to unload the pressure in the circuit.

Dimensions in millimeters (inches)

Steel tank

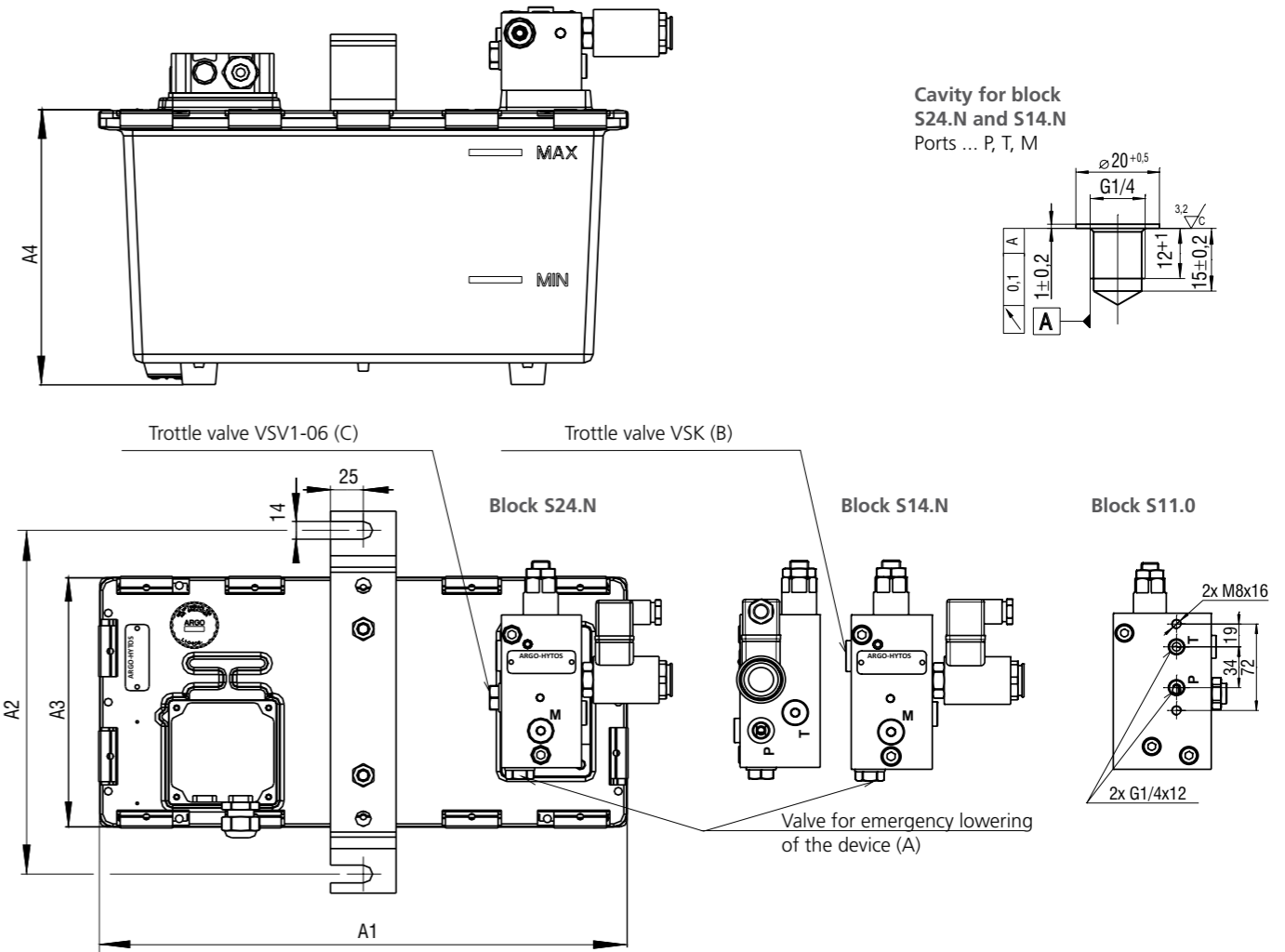


Code of the tank	Tank Capacity [l]	Working volume [l]	A1 [mm]	A2 [mm]	A3 [mm]	A4 [mm]
10 (steel)	10	6	440	220	220	180
20 (steel)	20	10	500	220	260	222
30 (steel)	30	20	500	220	260	302

Dimensions in millimeters (inches)

Plastic tank

Plastic tanks are not UV stable. Place the unit in the shade for outdoor application.



Code of the tank	Tank Capacity [l]	Working volume [l]	A1 [mm]	A2 [mm]	A3 [mm]	A4 [mm]
7 (plastic)	7	4	401	270	196	215

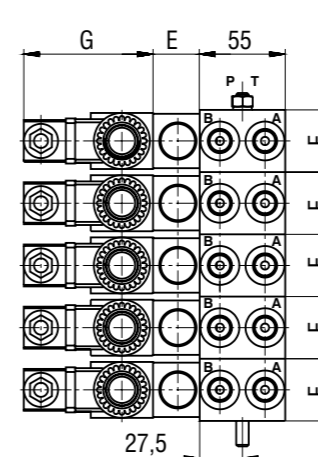
Example of horizontal stacking assembly

- possible only with hydraulic circuit S11.0

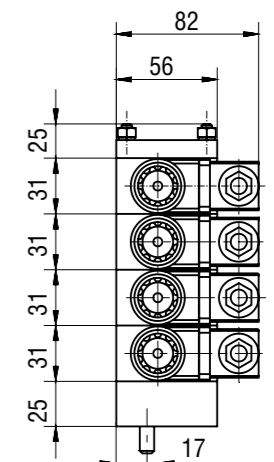
E - according to the elements used, see datasheet of modular elements HA 5021, HA 5023, HA 5051, HA 5093

F - Size 04=40 mm
Size 06=50 mm

G - Size 04=79 mm
Size 06=92 mm



- possible only with hydraulic circuit S11.1

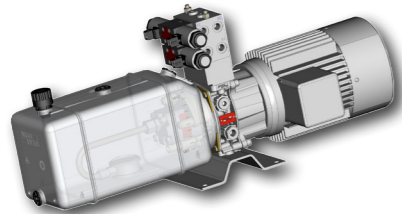


Hydraulic Mini Power Pack

SMA 05

Q_{max} 17 l/min • p_{max} 250 bar • P_{max} 3 kW

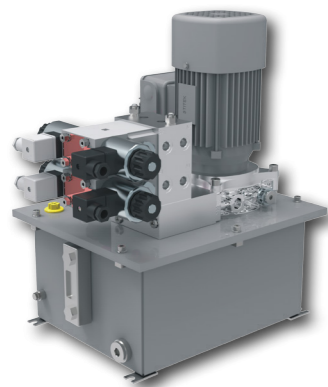
Example: plastic tank version



Technical Features

- › AC and DC electro-hydraulic unit, easy-to-assemble, compact
- › Modularity offers many combinations of hydraulic circuits to suit various requirements
- › Main applications are fork lifts, lifting platforms, automotive lifts, cranes for small trucks, snow plows, machine tools, food and textile industry
- › 7 central block basic circuits options
- › Possibility of building up an additional circuit in the form of vertical or horizontal stacking assembly
- › Rated power up to 3 kW with DC and AC
- › Single and triple-phase motors with power ratings of up to 3 kW
- › Tank capacities from 1.5 to 40 l with optional plastic tanks for cost saving
- › In the standard version, the aluminium basic block is without surface protection and steel plate are zinc coated for 240 h protection acc. to ISO 9227

Example: steel tank version



Functional Description

Compact mini hydraulic power packs are designed to fit small design envelopes and can be used in lifting platforms, elevating tables, manipulators, small presses, machine tools and mobile applications. Each power pack consists of an electric motor, a pump, a manifold and a tank. The aluminum body forms the base of the power pack, on which all the main components, including the hydraulic elements, are mounted. The function of the power packs is apparent from the respective hydraulic circuit diagrams. The desired combination of particular components and hydraulic elements can be defined by reference to the ordering code and the respective tables. The additional hydraulic circuits can be built up in valve sizes 03 (RPEK), 04 (CETOP 02) and 06 (CETOP 03). The size 03 (RPEK) is in a form of sectional directional valves. The mounting position of the power pack is horizontal or vertical - see Power Pack Dimensions on pages 12 to 19. All ports have G1/4 internal threads (thread G3/8 to be agreed with the manufacturer). With the standard model, the connecting ports A, B of the components of the vertical stacking assembly are oriented to one side. Orientation of ports A, B to different sides is to be discussed with the manufacturer. The basic combinations of electric motors and pumps as well as their code designations are shown in tables 1 - 5.

Technical Data

Flow rate	l/min	see table 1, 2, 3, 4 and 5
Working pressure	bar	see table 1, 2, 3, 4 and 5
Max. operating pressure	bar	see table 1, 2, 3 and 4
Tank capacity	l	1.5 - 40
Type of hydraulic pump		gear pump, COUNTER-CLOCKWISE
Electrical Motor power ratings	kW	0.12 - 3
Type of electric motor		one-, three-phase and DC
Voltage of electric motor	V	230 AC 230 / 400 AC 12 / 24 DC
Duty cycle S3 of electric motor	%	AC 100, DC see table
Frequency	Hz	AC 50
Protection degree of electric motor - insulation class		AC IP 55-F, DC - see table (page 7)
Viscosity range	mm ² /s	20 ... 100
Fluid temperature range	°C	0 ... +70
Fluid temperature range, short-time	°C	-20 ... +80
Ambient temperature max.	°C	+50
Thread of functional ports P, T, M, A, B		G1/4 (G3/8 A, B on request)

	Data Sheet	Type
General information	GI_0060	Products and operating conditions

Standard Surface Treatment

Model	Material used	Surface treatment
Cylindrical steel tank	sheet steel	Komaxit RAL 7030
Square steel tank / cover	sheet steel	Komaxit RAL 7030
Cylindrical plastic tank	BOREALIS ME 8131 (transparent)	without surface treatment
Square plastic tank	MOSTEN (transparent)	without surface treatment
DC electric motor		zinc-coated
AC electric motor		RAL 7030
Other components acc. to manufacturer standard		

For other surface treatment consult factory.

Ordering Code Single Pump

SMA 05- [] / [] - [] - [] - [] - [] - [] - [] - [] / []

Compact power pack

Pump displacement in cm³

Series GP0	
0.32	03
0.40	04
0.50	05
0.63	06

Series GP1

0.8	08
1.2	12
1.6	16
2.1	21
2.5	25
3.3	33
3.6	36
4.4	44
4.8	48
5.8	58
6.2	62
7.9	79

Code of the electric motor
(see tables 1-5)

DC electric motor with switch	R
one-phase electric motor without starting module	0
with starting module	M
three-phase electric motor	0

Type of hydraulic circuit
(see table on pages 8)

Code of the tank
see pages 12, 14-18

Solenoid voltage

01200	12 V DC
02400	24 V DC
20500	205 V DC
23050	230 V AC 50 (60) Hz

Nominal size of stacking assembly elements
without stacking assembly

0	size 03
3	size 04
4	size 06
6	(see page 12)

Parallel plate
without stacking assembly

0	1 section
1	2 sections
2	3 sections
3	4 sections
4	5 sections
5	(see page 12)

Base platte
without stacking assembly

0	configuration A
A	configuration B
B	configuration C
C	configuration D
D	configuration E
E	configuration F
F	(see page 12)

Foot bracket
without foot bracket

0	low foot bracket
F	high foot bracket (only for tank codes 40-45)
K	

Type of filter used
without filter

0	suction filter
S	return line filter without indication
R*	return line filter with el. indication
E*	return line filter with manometer
M*	

*only for tank codes 56-60 and 30-32

Ordering Code Double Pump

SMA05- / . 0 - G -

Compact power pack

Pump displacement in cm³

Series GP1	
4.8 + 1.2 cm ³	4812
4.8 + 1.6 cm ³	4816
4.8 + 2.1 cm ³	4821
5.8 + 1.2 cm ³	5812
5.8 + 1.6 cm ³	5816
5.8 + 2.1 cm ³	5821
6.2 + 1.2 cm ³	6212
6.2 + 1.6 cm ³	6216
6.2 + 2.1 cm ³	6221
7.9 + 1.2 cm ³	7912
7.9 + 1.6 cm ³	7916
7.9 + 2.1 cm ³	7921

Code of the e-motor
1, 2, 3, 4, 5, 6, 7, 8
9, 10, 11, 12, 13, 14, 15, 16, 17, 18
(see tables 3, 4)

Code of the tank
24, 31, 32, 44, 45, 55, 58, 59, 60, 69, 70

Type of filter used
without filter
suction filter
return line filter without indication
return line filter with el. indication
return line filter with manometer

O
S
R*
E*
M*

*only for tank codes 58-60 and 31-32

Solenoid voltage
01200 12 V DC
02400 24 V DC
20500 205 V DC
23050 230 V AC 50 (60) Hz

Nominal size of stacking assembly elements
without stacking assembly
size 03
size 04
size 06
(see page 12)

0
3
4
6

Parallel plate
without stacking assembly
1 section
2 sections
3 sections
4 sections
5 sections
(see page 12)

0
1
2
3
4
5

Base platte
without stacking assembly
configuration A
configuration B
configuration C
configuration D
configuration E
configuration F
(see page 12)

0
A
B
C
D
E
F

Foot bracket
without foot bracket
low foot bracket
high foot bracket (only for tank codes 40-45)

0
F
K

Tab. 1a Single Pumps AC Electric Motors - three-phase

Code of the three-phase motor	Code of the pump																		
	03 GP0-...		04 GP0-...		05 GP0-...		06 GP0-...		08 GP1-...		12 GP1-...		16 GP1-...		21 GP1-...				
p _{max} ** [bar]	240										250								
400V	n[1/min]	P[kW]	Q/p _n * [l/min] / [bar]																
9	1320	0.12	0.3	160	0.4	130	0.6	100	0.7	80	0.9	65	1.4	40	1.8	30			
10	1320	0.18	0.3	220	0.4	190	0.6	150	0.7	120	0.9	95	1.4	60	1.8	45	2.5	35	
11	1395	0.25			0.5	220	0.6	200	0.8	160	0.9	125	1.4	80	1.9	60	2.6	45	
12	1400	0.37							0.8	200	0.9	180	1.4	120	1.9	90	2.6	70	
13	1390	0.55									0.9	200	1.4	180	1.9	135	2.6	105	
14	1400	0.75											1.4	200	1.9	180	2.6	140	
15	1410	1.10													2.0	200	2.6	200	
16	1410	1.50																	
17	1425	2.20																	
18	1425	3.00																	
27	2745	0.18	0.7	115	0.9	90	1.2	75	1.5	60	1.9	45	2.8	30					
28	2740	0.25	0.7	160	0.9	130	1.2	100	1.5	80	1.9	65	2.8	40	3.8	30			
29	2790	0.37	0.7	200	0.9	185	1.2	150	1.5	115	1.9	90	2.9	60	3.9	45	5.2	35	
30	2820	0.55					1.2	200	1.5	175	1.9	135	2.9	90	3.9	65	5.3	50	
31	2850	0.75							1.5	200	1.9	180	2.9	120	4.0	90	5.3	70	
32	2850	1.10									1.9	200	2.9	175	4.0	130	5.3	100	
33	2855	1.50											2.9	200	4.0	175	5.3	135	
34	2855	2.20													4.0	200	5.3	200	
35	2860	3.00																	

Tab. 1a Single Pumps AC Electric Motors - three-phase

Code of the three-phase motor	Code of the pump																		
	25 GP1-...		33 GP1-...		36 GP1-...		44 GP1-...		48 GP1-...		58 GP1-...		62 GP1-...		79 GP1-...				
p _{max} ** [bar]	250										200				160				
400V	n[1/min]	P[kW]	Q/p _n * [l/min] / [bar]																
9	1320	0.12																	
10	1320	0.18	3.0	30															
11	1395	0.25	3.2	40	4.2	30	4.6	25											
12	1400	0.37	3.2	55	4.2	45	4.6	40	5.6	35	6.1	30	7.4	25					
13	1390	0.55	3.2	85	4.2	65	4.6	60	5.6	50	6.1	45	7.4	35	7.9	35	10.1	25	
14	1400	0.75	3.2	115	4.3	90	4.6	80	5.7	65	6.2	60	7.5	50	8.0	45	10.2	35	
15	1410	1.10	3.2	165	4.3	130	4.7	115	5.7	95	6.2	90	7.5	75	8.0	70	10.2	55	
16	1410	1.50	3.2	200	4.3	175	4.7	160	5.7	130	6.2	120	7.5	100	8.0	95	10.2	75	
17	1425	2.20			4.3	200	4.7	200	5.8	190	6.3	175	7.6	145	8.1	135	10.4	105	
18	1425	3.00									6.3	200	7.6	195	8.1	180	10.4	145	
27	2745	0.18																	
28	2740	0.25																	
29	2790	0.37	6.3	30															
30	2820	0.55	6.4	40	8.6	30	9.3	30	11.4	25									
31	2850	0.75	6.5	55	8.7	45	9.4	40	11.5	30	12.6	30	15.2	25					
32	2850	1.10	6.5	80	8.7	65	9.4	60	11.5	45	12.6	45	15.2	35	16.3	35			
33	2855	1.50	6.5	110	8.7	85	9.5	80	11.6	65	12.6	60	15.2	50	16.3	45			
34	2855	2.20	6.5	165	8.7	125	9.5	115	11.6	95	12.6	85	15.2	70	16.3	65			
35	2860	3.00	6.5	200	8.7	170	9.5	160	11.6	130	12.6	120	15.3	100	16.3	90			

*p_n - nominal pressure = the highest working pressure allowed without time restriction
** p_{max} - maximum allowable pressure of the pump for max. 20 sec. Motor overload max. 30 % for max. 20 sec.

In the case of rotation speed control keep the speed limits of the gear pump - see Gear Pumps catalog.

Tab. 2a Single Pumps AC Electric Motors - single-phase

Code of the single-phase motor			Code of the pump															
			03 GP0-...	04 GP0-...	05 GP0-...	06 GP0-...	08 GP1-...	12 GP1-...	16 GP1-...	21 GP1-...								
p _{max} ** [bar]			240				250											
230V	n[1/min]	P[kW]	Q/p _n * [l/min] / [bar]															
1	1300	0.12	0.3	160	0.4	125	0.6	100	0.7	80	0.9	65	1.3	40	1.8	30		
2	1350	0.18	0.4	220	0.4	185	0.6	150	0.7	115	0.9	90	1.4	60	1.9	45	2.5	35
3	1390	0.25			0.5	220	0.6	200	0.8	160	0.9	125	1.4	80	1.9	60	2.6	45
4	1410	0.37							0.8	200	0.9	180	1.4	120	1.9	90	2.6	70
5	1370	0.55									0.9	200	1.4	180	1.9	135	2.6	105
6	1410	0.75											1.5	200	2.0	180	2.6	140
7	1410	1.10															2.6	200
8	1410	1.50																
19	2840	0.18	0.7	110	0.9	90	1.2	70	1.5	55	1.9	45	2.9	30				
20	2840	0.25	0.7	155	0.9	125	1.2	100	1.5	80	1.9	60	2.9	40	3.9	30		
21	2780	0.37	0.7	200	0.9	185	1.2	150	1.5	120	1.9	90	2.9	60	3.9	45	5.2	35
22	2820	0.55					1.2	200	1.5	175	1.9	135	2.9	90	3.9	65	5.3	50
23	2820	0.75							1.5	200	1.9	185	2.9	120	3.9	90	5.3	70
24	2845	1.10									1.9	200	2.9	175	4.0	130	5.3	100
25	2855	1.50											2.9	200	4.0	175	5.3	135
26	2810	2.20															5.3	200

Tab. 2b Single Pumps AC Electric Motors - single-phase

Code of the single-phase motor			Code of the pump															
			25 GP1-...	33 GP1-...	36 GP1-...	44 GP1-...	48 GP1-...	58 GP1-...	62 GP1-...	79 GP1-...								
p _{max} ** [bar]			250				200		160									
230V	n[1/min]	P[kW]	Q/p _n * [l/min] / [bar]															
1	1300	0.12																
2	1350	0.18	3.1	30														
3	1390	0.25	3.1	40	4.2	30	4.6	30										
4	1410	0.37	3.1	55	4.2	45	4.6	40	5.6	30	6.1	30	7.4	25				
5	1370	0.55	3.1	85	4.2	65	4.6	60	5.6	50	6.1	45	7.4	35	7.8	35	10.0	30
6	1410	0.75	3.2	115	4.3	85	4.7	80	5.7	65	6.2	60	7.5	50	8.0	45	10.2	35
7	1410	1.10	3.2	165	4.3	130	4.7	115	5.7	95	6.2	90	7.5	75	8.0	70	10.2	55
8	1410	1.50	3.2	200	4.3	175	4.7	160	5.7	130	6.2	120	7.5	100	8.0	95	10.2	75
19	2840	0.18																
20	2840	0.25																
21	2780	0.37	6.3	30														
22	2820	0.55	6.4	40	8.6	30	9.3	30										
23	2820	0.75	6.4	55	8.6	45	9.3	40	11.4	35	12.5	30	15.0	25				
24	2845	1.10	6.5	85	8.6	65	9.4	60	11.5	50	12.5	45	15.1	35	16.2	35		
25	2855	1.50	6.5	110	8.6	85	9.4	80	11.5	65	12.5	60	15.1	50	16.2	45		
26	2810	2.20	6.5	165	8.6	130	9.4	120	11.5	95	12.5	90	15.1	75	16.1	70		

Attention! Pay special attention to the start-up torque of single-phase motors. Use the start-up module during start-up under pressure.

*p_n - nominal pressure = the highest working pressure allowed without time restriction

** p_{max} - maximum allowable pressure of the pump for max. 20 sec. Motor overload max. 30 % for max. 20 sec.

In the case of rotation speed control keep the speed limits of the gear pump - see Gear Pumps catalog.

Tab. 3a Double Pumps AC Electric Motors 400 V - three-phase

Pump code P1+P2		4812	4816	4821	5812	5816	5821
P2 p _{max} [bar]		250 for a short period only - max. 20 s					
P1 p _{max} [bar]		184	173	160	166	157	147
3 phase E-motor		Q1	p1 _n	Q1, Q2 [l/min] p1 _r , p2 _n [bar] P1 p _{max} is limited due to torque of the pump shaft			
code	P[kW]	Q2	p2 _n				
12	0.37	6.1	25	6.1	20		
		1.4	120	1.9	90		
13	0.55	6.1	35	6.1	35	6.1	30
		1.4	180	1.9	135	2.6	105
14	0.75	6.1	50	6.1	45	6.1	45
		1.4	200	1.9	180	2.6	140
15	1.1	6.1	75	6.1	70	6.1	65
		1.4	200	1.9	200	2.6	200
16	1.5	6.1	100	6.1	95	6.1	85
		1.4	200	1.9	200	2.6	200
17	2.2	6.1	150	6.1	140	6.1	130
		1.4	200	1.9	200	2.6	200
18	3	6.1	184	6.1	173	6.1	160
		1.4	200	1.9	200	2.6	200

Tab. 3b Double Pumps AC Electric Motors 400 V - three-phase

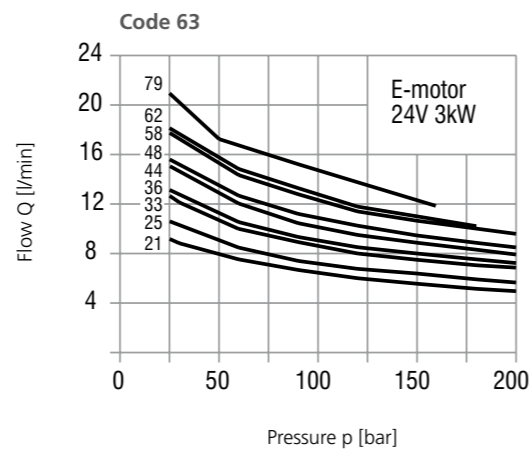
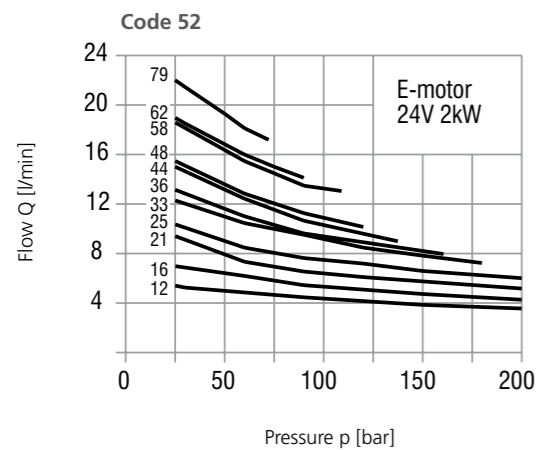
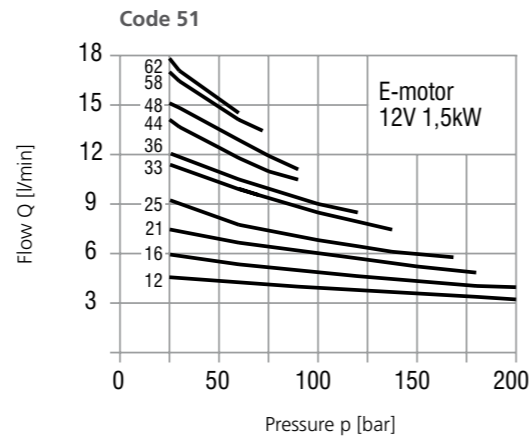
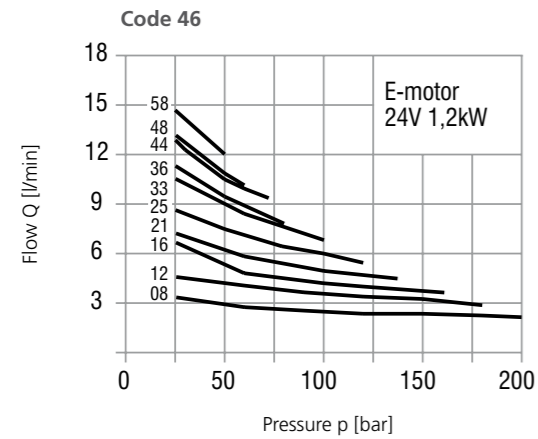
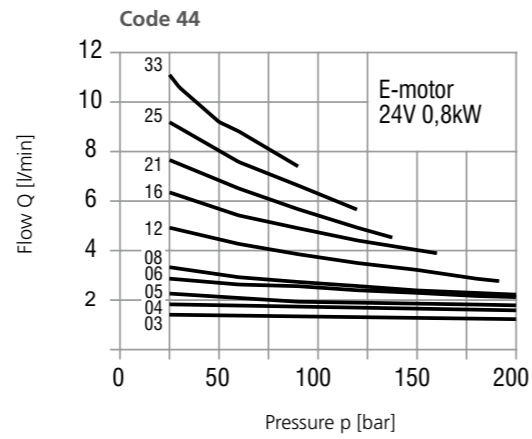
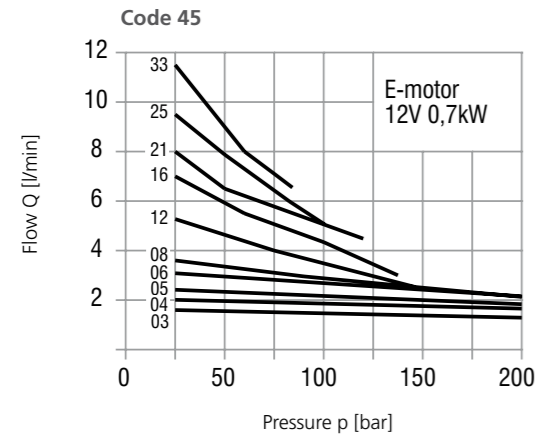
Pump code P1+P2		6212	6216	6221	7912	7916	7921
P2 p _{max} [bar]		250 for a short period only - max. 20 s					
P1 p _{max} [bar]		151	143	134	139	133	127
3 phase E-motor		Q1	p1 _n	Q1, Q2 [l/min] p1 _r , p2 _n [bar] P1 p _{max} is limited due to torque of the pump shaft			
code	P[kW]	Q2	p2 _n				
13	0.55	8	30	8	25		
		1.4	180	1.9	135		
14	0.75	8	40	8	35	10.2	30
		1.4	200	1.9	180	2.6	140
15	1.1	8	60	8	55	8	50
		1.4	200	1.9	200	2.6	200
16	1.5	8	80	8	75	8	70
		1.4	200	1.9	200	2.6	200
17	2.2	8	120	8	115	8	105
		1.4	200	1.9	200	2.6	200
18	3	8	151	8	143	8	134
		1.4	200	1.9	200	2.6	200

Tab. 4a Double Pumps AC Electric Motors 230 V - one-phase

Pump code P1+P2		4812	4816	4821	5812	5816	5821
P2 p _{max} [bar]		250 for a short period only - max. 20 s					
P1 p _{max} [bar]		184	173	160	166	157	147
1 phase E-motor		Q1	p1 _n	Q1, Q2 [l/min] p1 _r , p2 _n [bar] P1 p _{max} is limited due to torque of the pump shaft			
code	P[kW]	Q2	p2 _n				
4	0.37	6.1	25	6.1	20		
		1.4	120	1.9	90		
5	0.55	6.1	35	6.1	35	6.1	30
		1.4	180	1.9	135	2.6	105
6	0.75	6.1	50	6.1	45	6.1	45
		1.4	200	1.9	180	2.6	140
7	1.1	6.1	75	6.1	70	6.1	65
		1.4	200	1.9	200	2.6	200
8	1.5	6.1	100	6.1	95	6.1	85
		1.4	200	1.9	200	2.6	200

Tab. 4b Double Pumps AC Electric Motors 230 V - one-phase

Pump code P1+P2		4812	4816	4821	5812	5816	5821
P2 p _{max} [bar]		250 for a short period only - max. 20 s					
P1 p _{max} [bar]		184	173	160	166	157	147
1 phase E-motor		Q1	p1 _n	Q1, Q2 [l/min] p1 _r , p2 _n [bar] P1 p _{max} is limited due to torque of the pump shaft			
code	P[kW]	Q2	p2 _n				
5	0.55	6.1	25	6.1	20		
		1.4	120	1.9	90		
6	0.75	6.1	35	6.1	35	6.1	30
		1.4	180	1.9	135	2.6	105
7	1.1	6.1	50	6.1	45	6.1	45
		1.4	200	1.9	180	2.6	140
8	1.5	6.1	75	6.1	70	6.1	65
		1.4	200	1.9	200	2.6	200

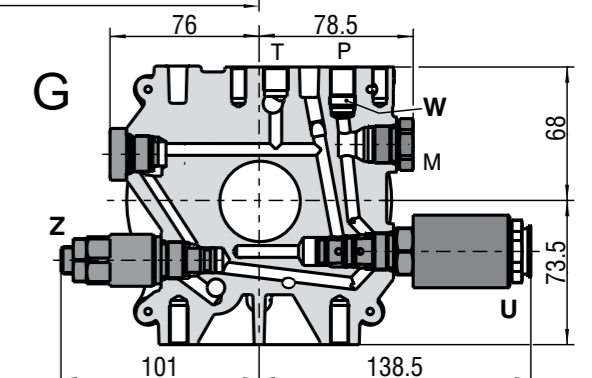
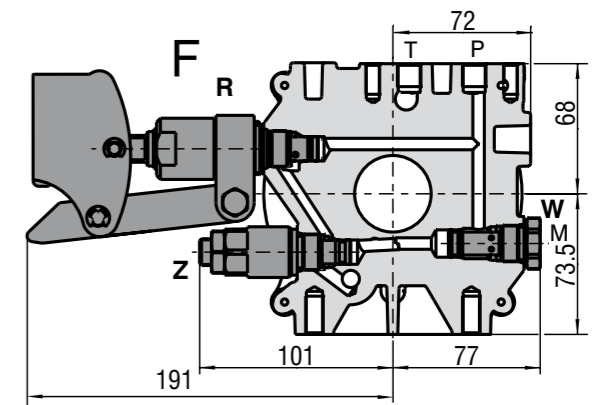
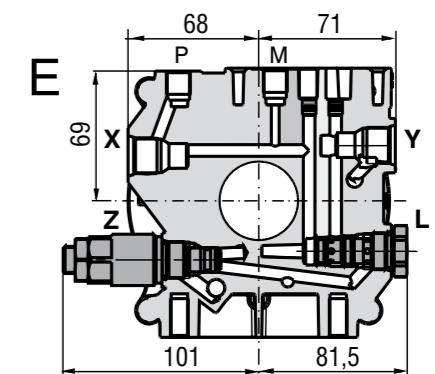
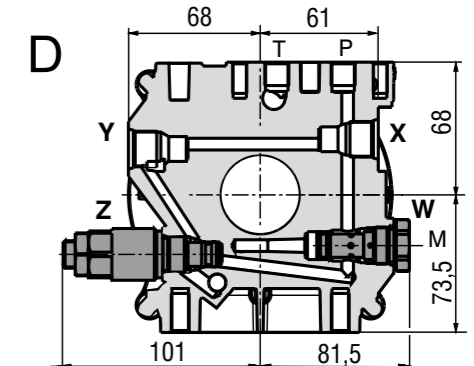
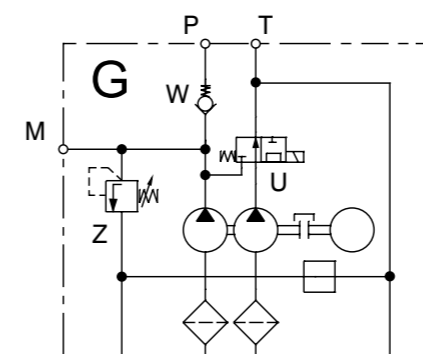
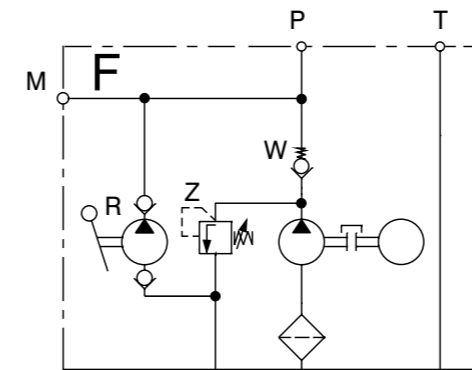
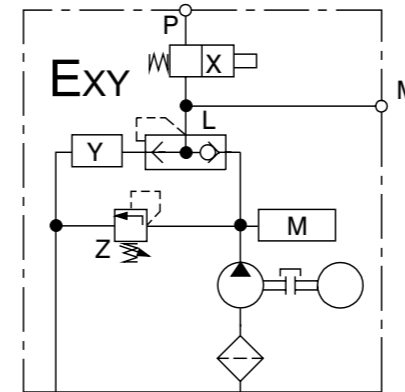
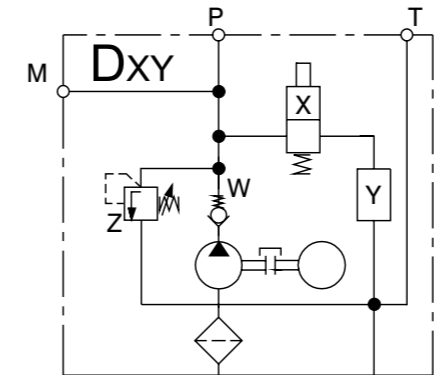
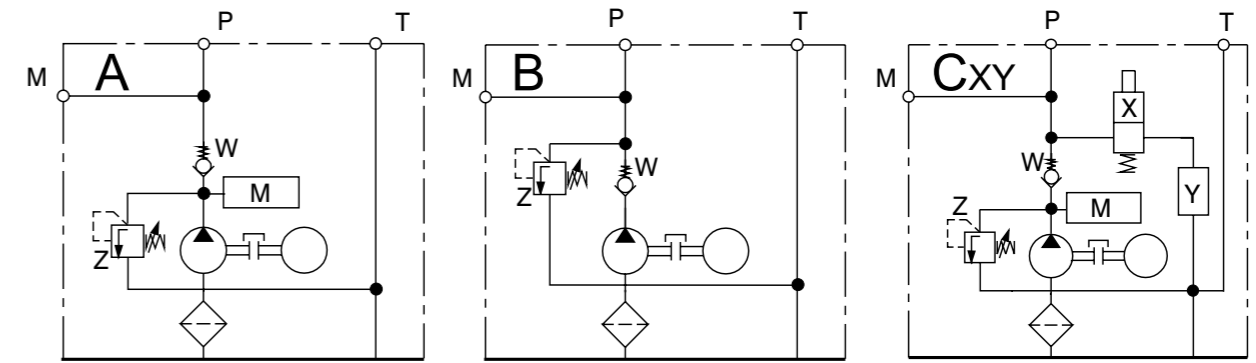


Tab. 5 DC Electric Motors

12 V	24 V	kW	Protection degree - insulation class
Code of the electric motor			
45	/	0.7	IP 44
/	44	0.8	IP 54
/	46	1.2	IP 44
51	/	1.5	IP 54
/	52	2.0	IP 54
/	63	3.0	IP 20

Attention! The DC motors must be loaded, so as to reduce the revolutions! Do not run the motors without pressure loading!

In the case of rotation speed control keep the speed limits of the gear pump - see Gear Pumps catalog.



Valves for Central Manifolds

Table of Dimensions Dimensions of Electric Motors in millimeters

X	Type of the seat valve	Functional symbol
5	SD1M-A2/SL3 + lever with micro switch	
4	SD1M-A2/SL2 + lever without micro switch	
3	SD1M-A2/SL1	
2	SD3E-A2/H2O2	
1	SD3E-A2/H2L2	
0*	17250900	

Y	Type of the throttle valve	Functional symbol
2	SF22A-A2/H**	
**The size of the throttle valve corresponds regularly with the flow rate Q of the pump used. Other throttle valve size on request of the customer.		
1	ST21A-A2/L20S	
0	15960800 for X=0	
0	17250900 for X≠0	

M	Type	Symbols
M*	Starting module	
0*	Plug VSTI G1/4	

*Exact position of the starting module or plug ... ref. page 18

Z	W	L	R	U
Pressure relief valve directly operated	Check valve	Load shuttle	Hand pump	Unloading valve
SR1A-A2/S (HA 5063)	SC1F-A3 (HA 5016)	VJ01-06/SG-01 (HA 5004)	SH1F-A3 (HA 5029)	RC 3/4-16UNF (HA 2020)
	A, B, C, D, F	G	F (HA 2020)	G

Code of EM	Power [kW]	Voltage [V]	Current [A]**	Speed [1/min]**	B max. [mm]	C max. [mm]	∅ D [mm]
1	0.12	230	1.30	1300	248	139	120
2	0.18	230	1.70	1350	248	139	120
3	0.25	230	2.13	1390	261	151	141
4	0.37	230	2.82	1410	261	151	141
5	0.55	230	5.00	1370	305	157	159
6	0.75	230	6.00	1410	305	157	159
7	1.10	230	8.20	1410	314	165	174
8	1.50	230	10.00	1410	339	165	174
9	0.12	400	0.65	1320	248	101	120
10	0.18	400	0.78	1320	248	101	120
11	0.25	400	0.83	1395	261	105	140
12	0.37	400	1.14	1400	261	105	140
13	0.55	400	1.51	1390	305	127	159
14	0.75	400	1.98	1400	305	127	159
15	1.10	400	2.78	1410	314	139	174
16	1.50	400	3.61	1410	339	139	174
17	2.20	400	5.07	1425	390	148	196
18	3.00	400	6.66	1425	390	148	196
19	0.18	230	1.52	2840	248	139	120
20	0.25	230	1.90	2840	248	139	120
21	0.37	230	2.90	2780	261	151	141
22	0.55	230	4.10	2820	261	151	141
23	0.75	230	5.45	2820	305	157	159
24	1.10	230	8.00	2845	305	157	159
25	1.50	230	11.50	2855	314	165	174
26	2.20	230	14.80	2810	339	165	174
27	0.18	400	0.56	2745	248	101	120
28	0.25	400	0.73	2740	248	105	120
29	0.37	400	1.00	2790	261	105	140
30	0.55	400	1.40	2820	261	105	140
31	0.75	400	1.80	2850	305	127	159
32	1.10	400	2.54	2850	305	127	159
33	1.50	400	3.50	2855	314	139	174
34	2.20	400	4.95	2855	339	139	174
35	3.00	400	6.35	2860	390	148	196

Code of EM	Power [kW]	Voltage [V]	Current [A]**	Speed [1/min]**	Load factor **	B [mm]*	C [mm]*	D [mm]*	A [mm]
44	0.8	24	40	3300	S2 - 2.5 min S3 - 7 % ED	143	96	76	62
45	0.7	12	135	3300	S2 - 2.5 min S3 - 4 % ED	165	95	80	105
46	1.2	24	90	3000	S2 - 1.2 min S3 - 4 % ED	165	95	80	120
51	1.5	12	220	2600	S2 - 2 min S3 - 7.5 % ED	179	100	117	250
52	2.0	24	140	2600	S2 - 1.2 min S3 - 4.5 % ED	179	100	117	150
63	3.0	24	200	1700	S2 - 16 min S3 - 10 % ED	336	121	162	180

*Dimension B, C, D may differ, subject to supplier's changes. ** Valid for rated power values

Load factor

Duty S1 (min) – Intended for use under continuous duty cycle conditions (load factor S1) for various press-related applications and those which involve dynamic strokes, with recommendation to consult the conditions of use with manufacturer.

Duty S2 (min) - short-time operation

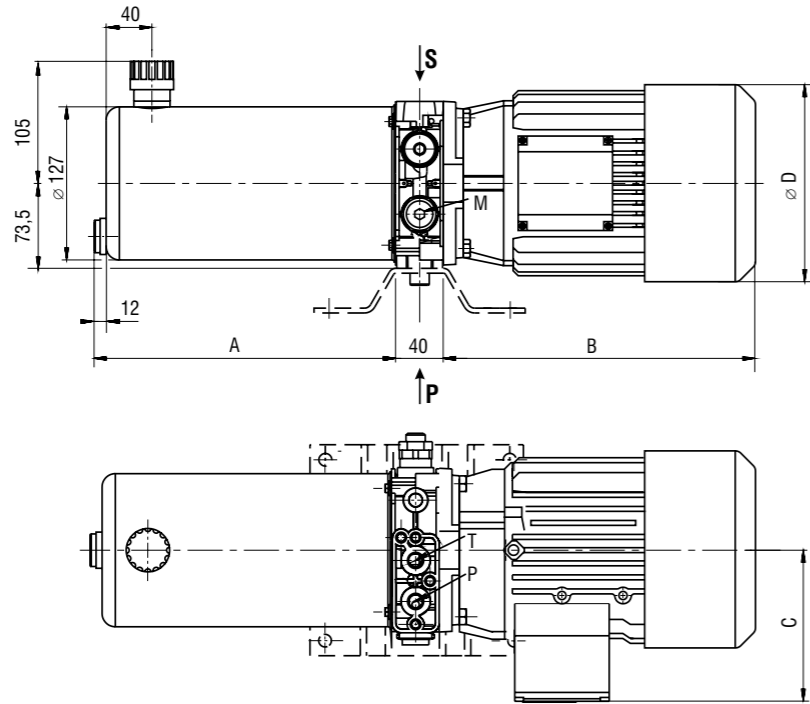
The motor operates with constant load for a definite time until the motor reaches the maximum permissible temperature T max. It is followed by an idle period long enough to reach equality between motor temperature and ambient temperature.

Duty S3 (% ED) - periodic operation

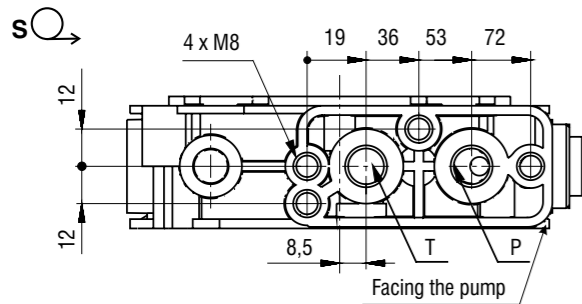
The operation of the motor is a continuous sequence of identical cycles, each compound from a load period and an idle period. During the load period the motor can reach the maximum permissible temperature. S3 value shows, in percentage, the length of the load period with respect to the total cycle-load period more idle period. The S3 curve quoted in the performance specifications is referred to a lengths cycle of 10 minutes.

Tank Dimensions Dimensions in millimeters

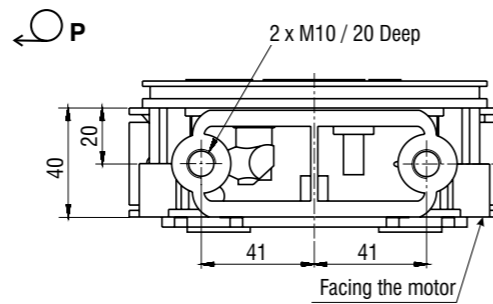
Power pack with cylindrical steel tank, one-phase and three-phase motors
- mounting position horizontal



Connecting Block

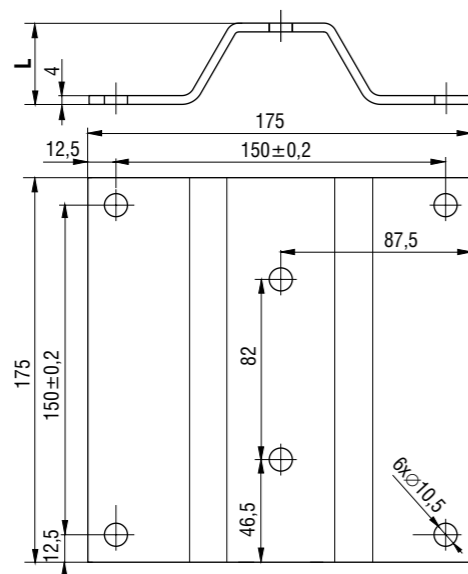


Connecting Holder

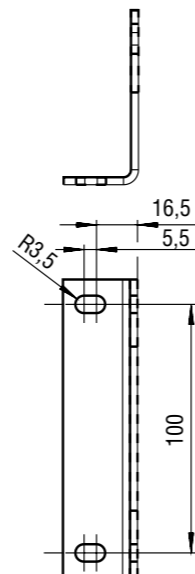


Code of the tank	Tank capacity [l]	Working volume [l]	A [mm]
10 (steel)	1.5	0.8	152
11 (steel)	2	1.1	252
12 (steel)	3	1.6	332
13 (steel)	4	2	412

Dimensions B, C, Ø D see Table of Dimensions - page 10



Tank Support
code 64-70 with holder
of power pack
configuration F

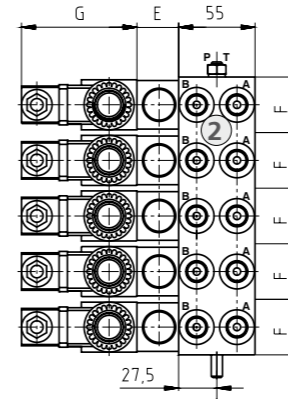


Power pack foot bracket	
Typ	Dimensions L [mm]
F	37
K	62

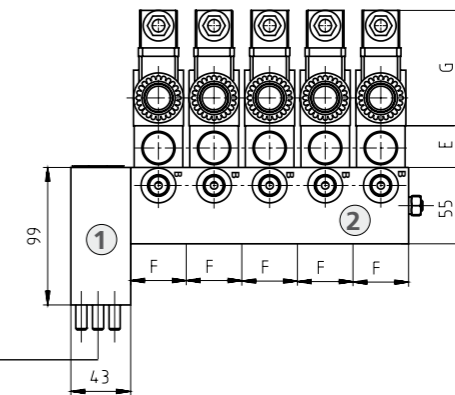
Valve Dimensions Dimensions in millimeters

Base Plates and Parallel Plates

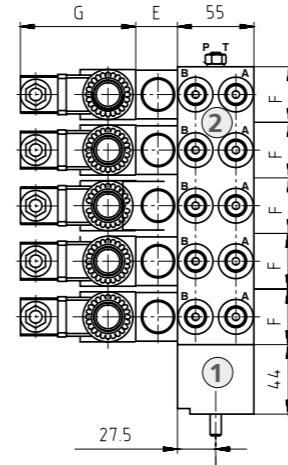
Configuration A
Size 04, 06



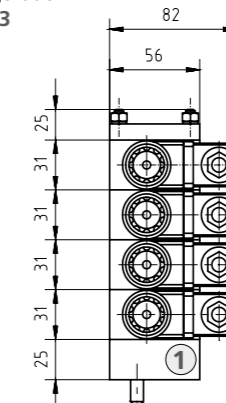
Configuration B
Size 04, 06



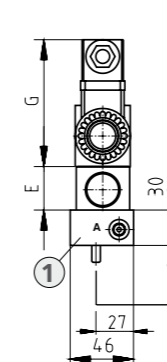
Configuration C
Size 04, 06



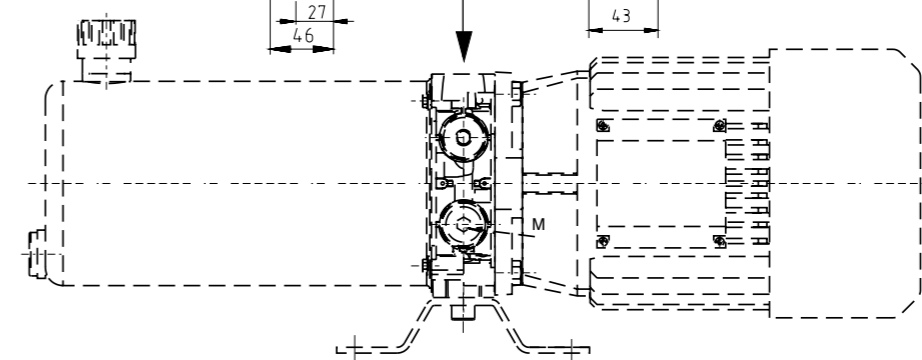
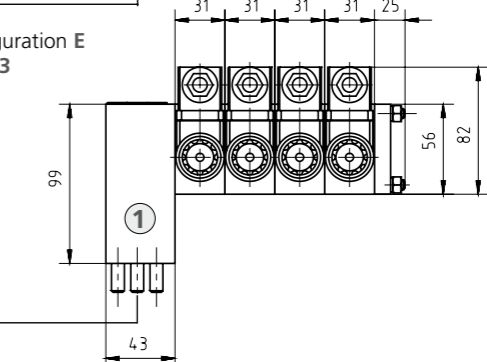
Configuration D
Size 03



Configuration F
Size 04, 06



Configuration E
Size 03



Thread of the connecting ports A, B, P, T, M - G1/4 standard (A, B - G3/8 option)

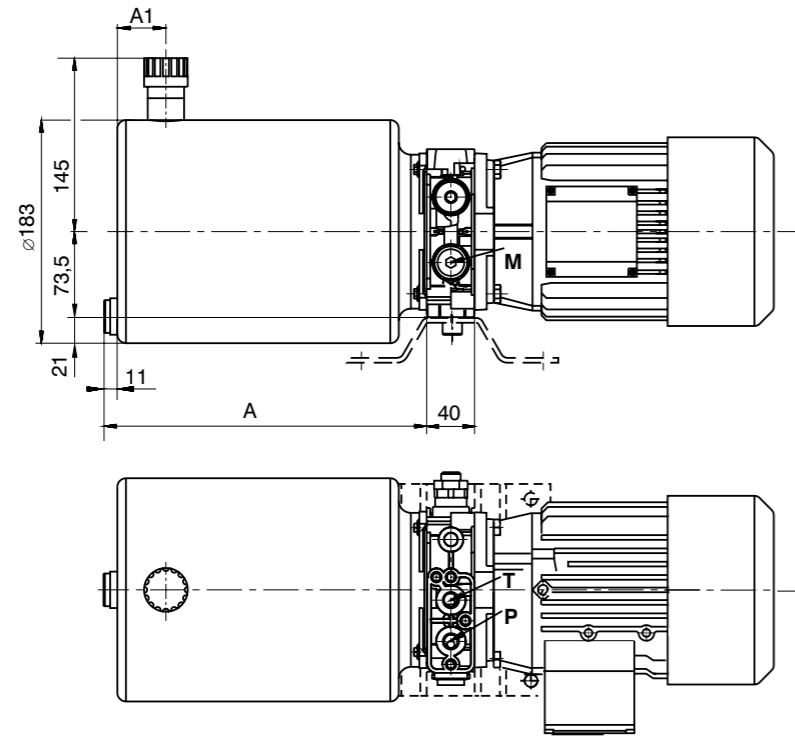
Dimension	E [mm]						F [mm]	G [mm]
	Pressure switch	Reducing valves	Pressure relief valves	Pilot operated check valves cartridge	Check valves	Flow valves		
Size 04	35	30	35	30	30	30	40	79
Size 06	43	45	40	40	31.4	40	50	92

1 Base Plate
2 Parallel Plate

1 Base Plate
2 Parallel Plate

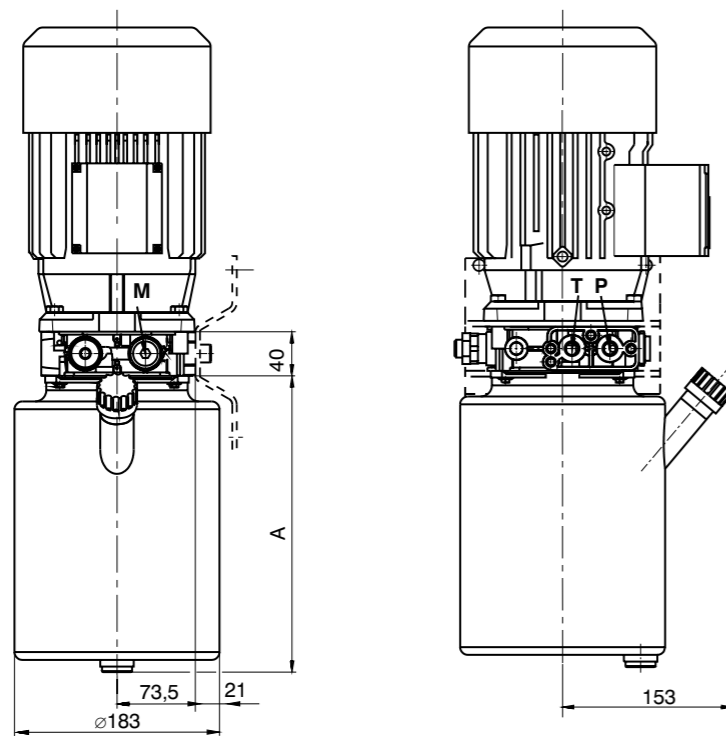
1 Base Plate

Power pack with cylindrical steel tank - mounting position horizontal



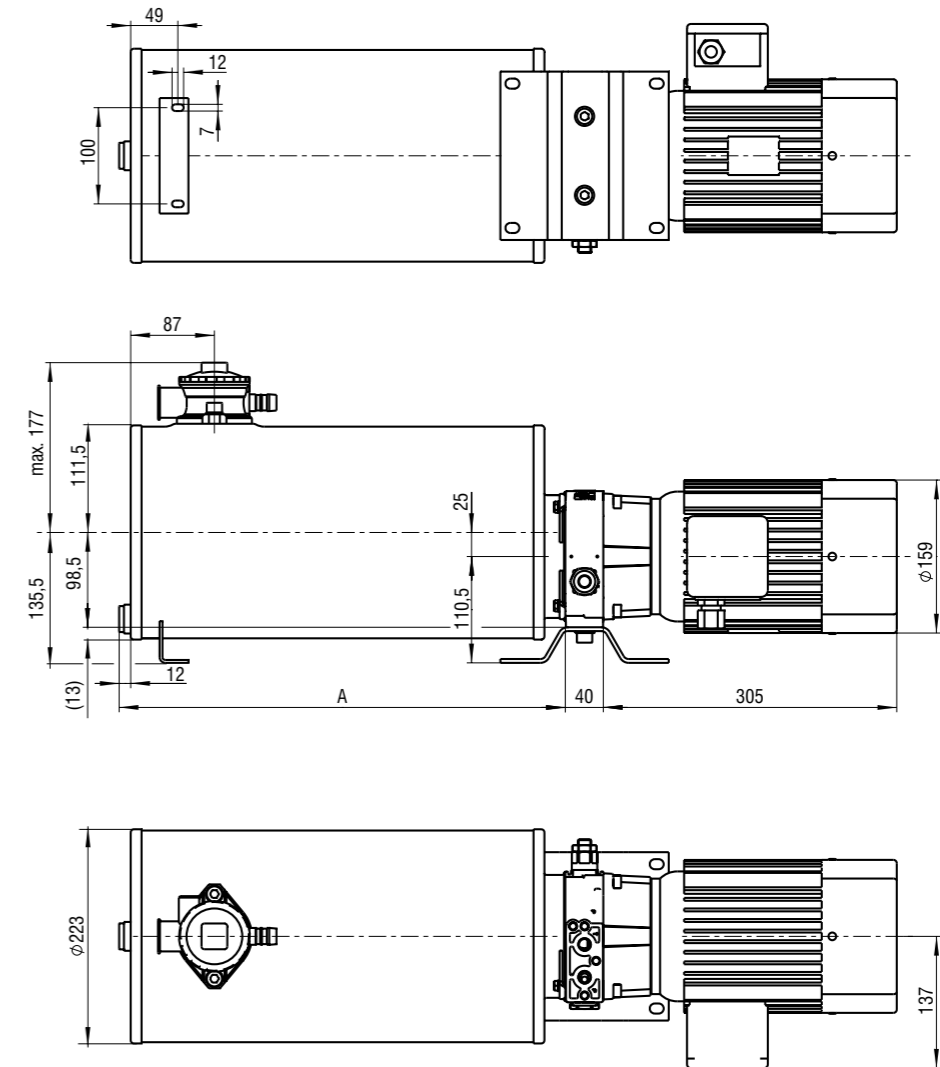
Code of the tank	Tank capacity [l]	Working volume [l]	A [mm]	A1 [mm]
20 (steel)	6	3.7	269	40
22 (steel)	8	4.9	349	155
24 (steel)	10	6.1	429	195

Power pack with cylindrical steel tank - mounting position vertical



Code of the tank	Tank capacity [l]	Working volume [l]	A [mm]
51 (steel)	6	3.4	269
53 (steel)	8	5.4	349
55 (steel)	10	7.4	429

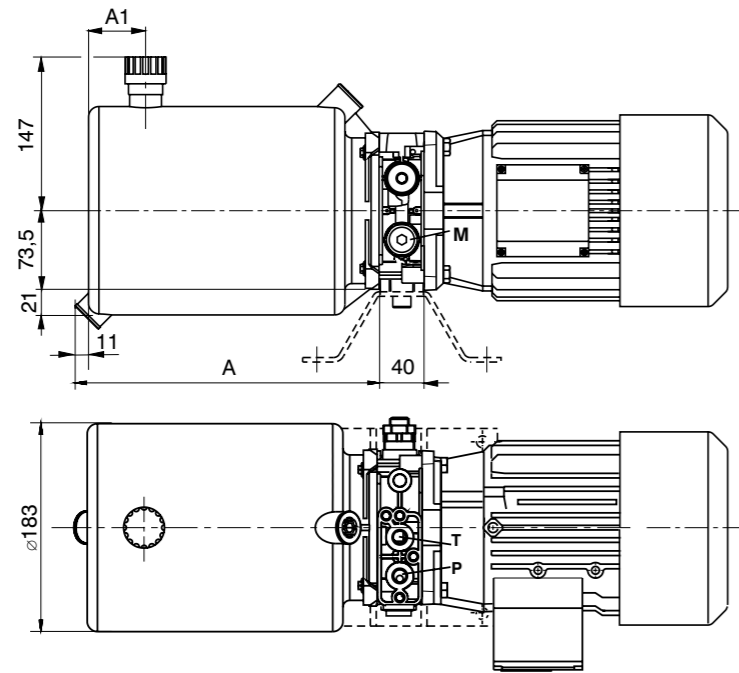
Power pack with cylindrical steel tank - mounting position horizontal



Code of the tank	Tank capacity [l]	Working volume [l]	A [mm]	B [mm]
30 (steel)	9	7.5	304	188
31 (steel)	15	12	464	348
32 (steel)	25	20	724	608

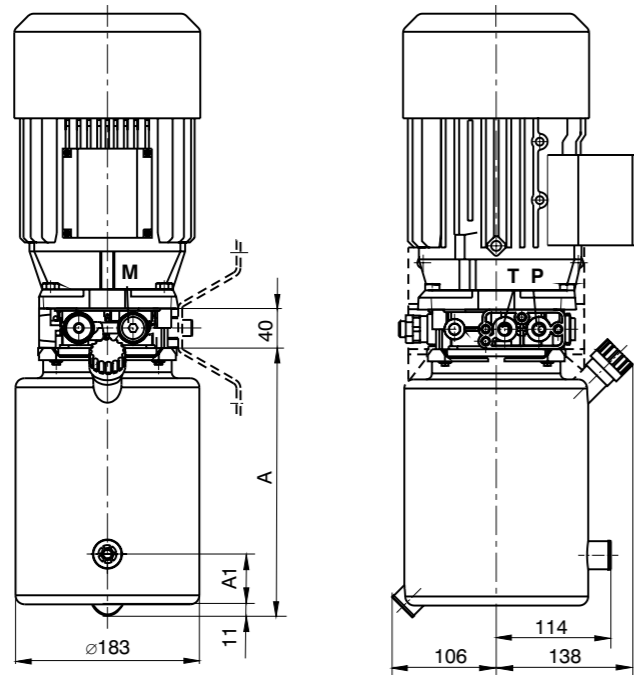
Tank Dimensions Dimensions in millimeters

Power pack with cylindrical plastic tank - mounting position horizontal
Plastic tanks are not UV stable. Place the unit in the shade for outdoor application.



Code of the tank	Tank capacity [l]	Working volume [l]	A [mm]	A1 [mm]
40 (plastic)	6	3.7	280	61
42 (plastic)	8	4.9	360	121
44 (plastic)	10	6.1	440	201

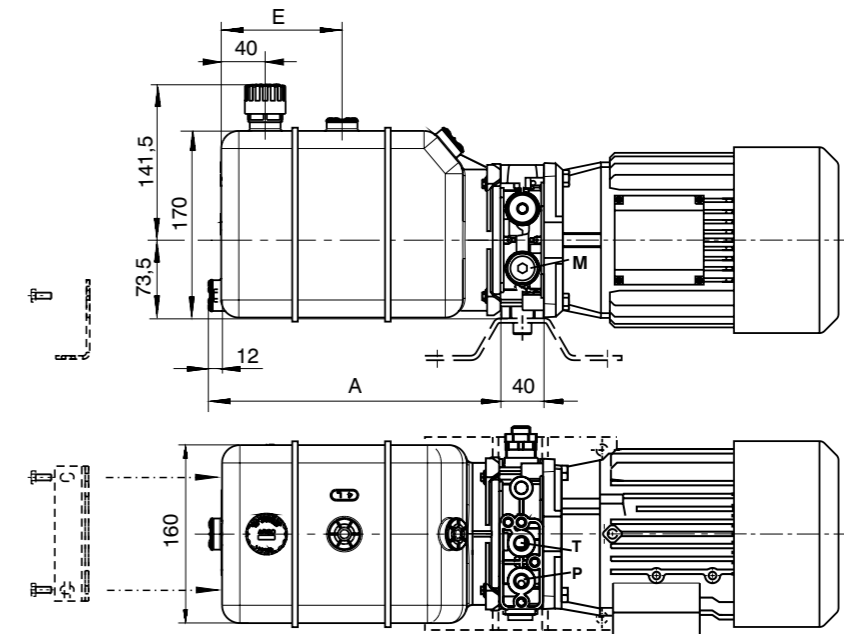
Power pack with cylindrical plastic tank - mounting position vertical
Plastic tanks are not UV stable. Place the unit in the shade for outdoor application.



Code of the tank	Tank capacity [l]	Working volume [l]	A [mm]	A1 [mm]
41 (plastic)	6	3.7	280	61
43 (plastic)	8	4.9	360	121
45 (plastic)	10	6.1	440	201

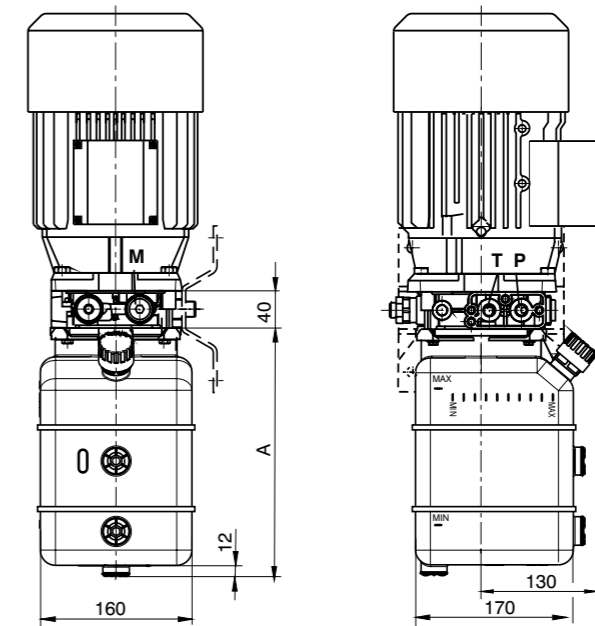
Tank Dimensions Dimensions in millimeters

Power pack with square plastic tank - mounting position horizontal
Plastic tanks are not UV stable. Place the unit in the shade for outdoor application.



Code of the tank	Tank capacity [l]	Working volume [l]	A [mm]	E [mm]
62 (plastic)	2	1.7	178	-
64 (plastic)	4	3.0	270	120
66 (plastic)	6	4.5	359	165
68 (plastic)	8	6.0	449	208
70 (plastic)	10	7.5	543	208

Power pack with square plastic tank - mounting position vertical
Plastic tanks are not UV stable. Place the unit in the shade for outdoor application.



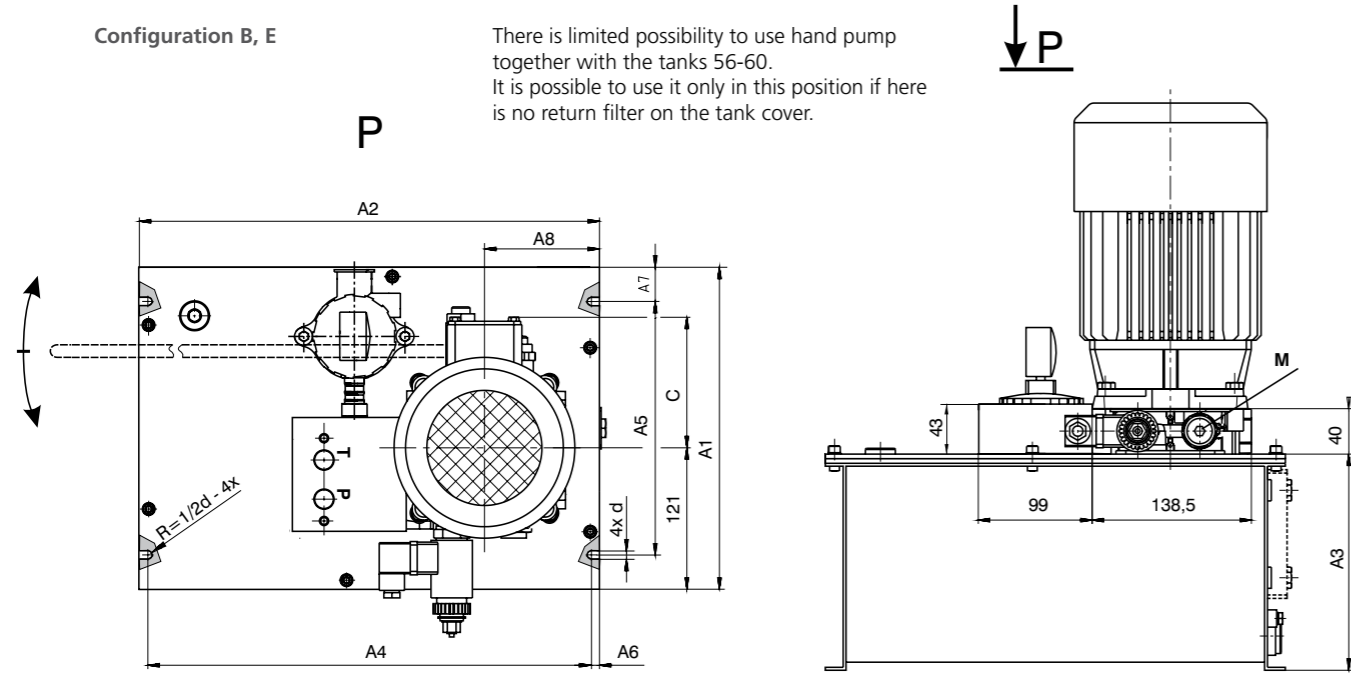
Code of the tank	Tank capacity [l]	Working volume [l]	A [mm]
61 (plastic)	2	1.3	178
63 (plastic)	4	3.5	270
65 (plastic)	6	5.5	359
67 (plastic)	8	7.5	449
69 (plastic)	10	9.5	543

Tank Dimensions Dimensions in millimeters

Power pack with square steel tank - one-phase and three-phase motors with return line filter

Configuration B, E

There is limited possibility to use hand pump together with the tanks 56-60. It is possible to use it only in this position if there is no return filter on the tank cover.

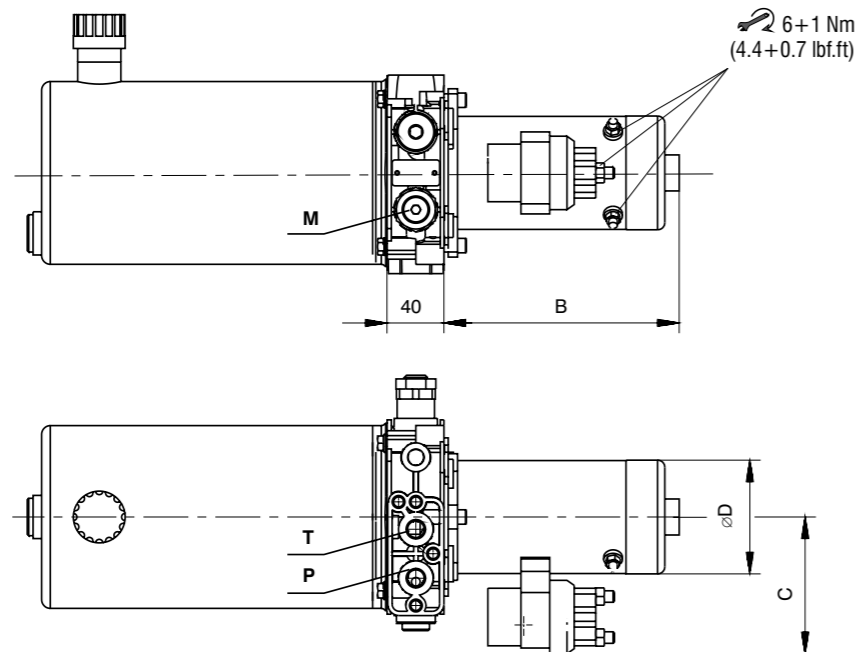


Code of the tank	Tank capacity [l]	Working volume [l]	A1	A2	A3	A4	A5	A6	A7	A8	d
56 (steel)	8	4.5	280	340	165	319	220	10.5	30	100	9
57 (steel)	10	8	280	400	188	388	220	6	30	100	9
58 (steel)	20	16	280	400	276	388	220	6	30	100	9
59 (steel)	30	24	320	500	287	479	260	9.5	30	132	11
60 (steel)	40	34	320	500	366	479	260	9.5	30	132	11

Dimensions C see Table of Dimensions - page 10

Power Pack Dimensions Dimensions in millimeters

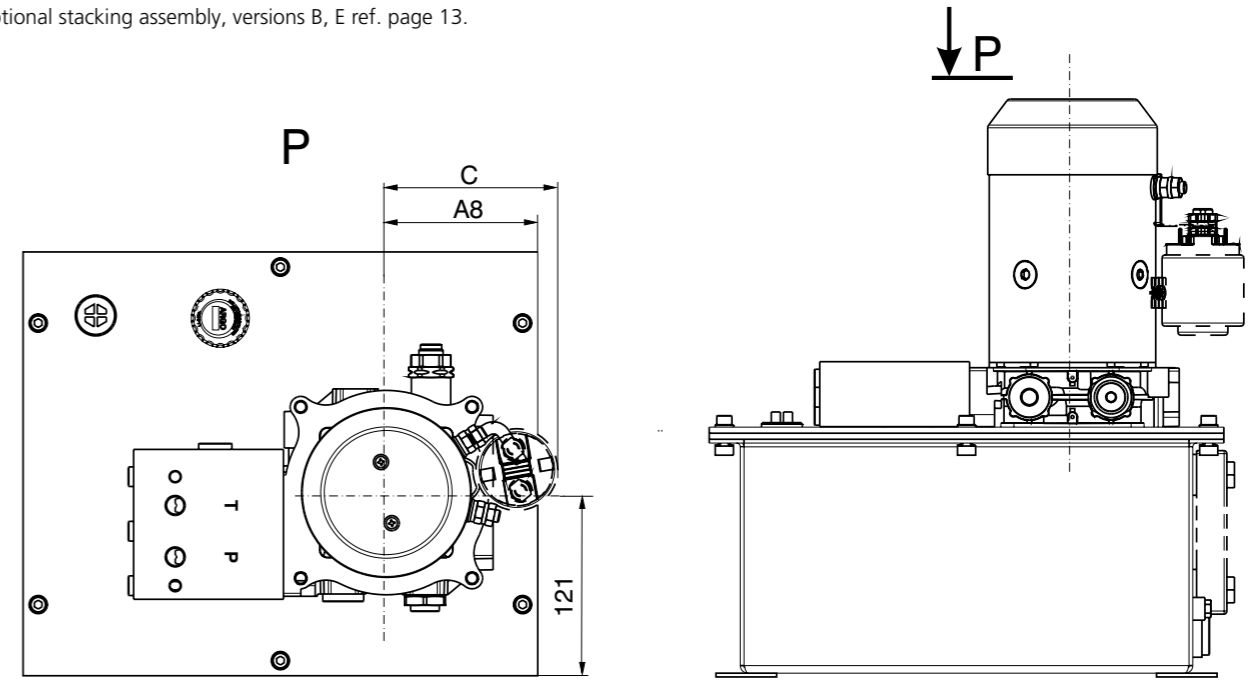
Power pack with cylindrical steel tank - with DC electric motor without return line filter



Power Pack Dimensions Dimensions in millimeters

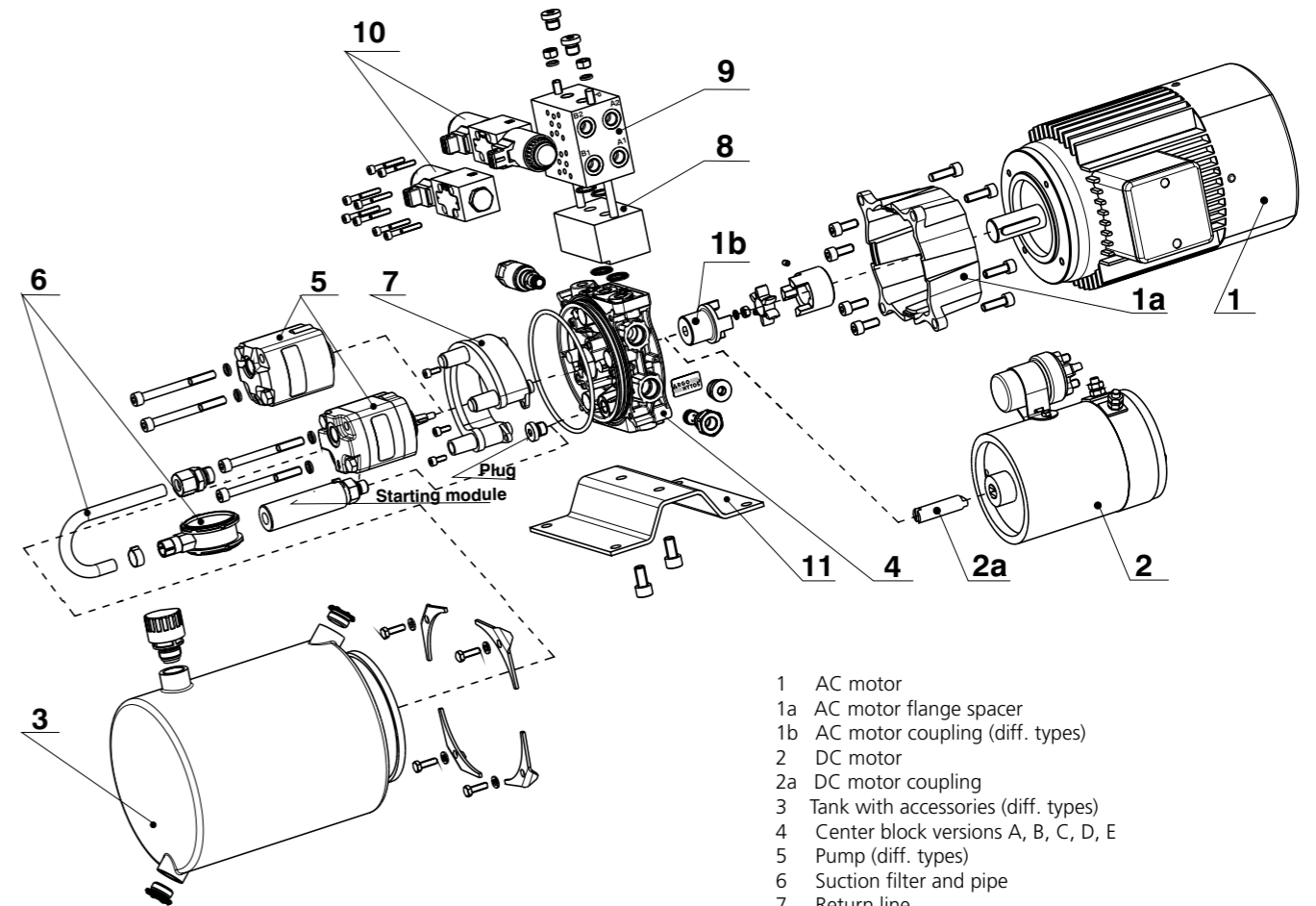
Power pack with square steel tank - with DC electric motor without return line filter

Optional stacking assembly, versions B, E ref. page 13.

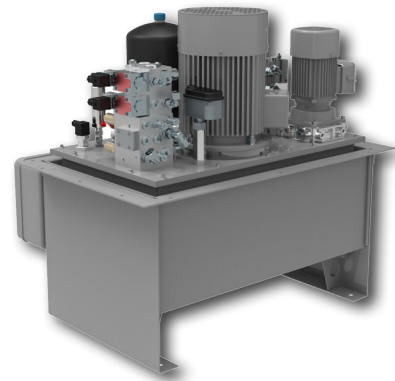


Dimensions B, C, Ø D see Table of Dimensions - page 10
Dimensions A8 see Table of Dimensions - page 17

SMA05 - Illustration Figure



- 1 AC motor
- 1a AC motor flange spacer
- 1b AC motor coupling (diff. types)
- 2 DC motor
- 2a DC motor coupling
- 3 Tank with accessories (diff. types)
- 4 Center block versions A, B, C, D, E
- 5 Pump (diff. types)
- 6 Suction filter and pipe
- 7 Return line
- 8 Base-plate for different types of stacking assembly
- 9 Cover plate for horizontal stacking
- 10 Stacking assembly valves
- 11 Foot bracket

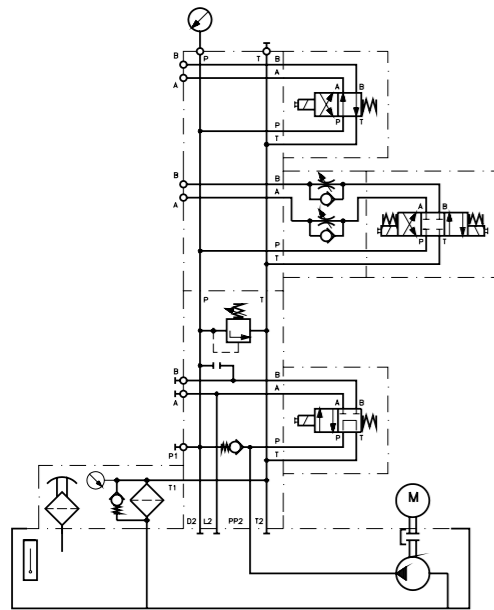


Technical Features

- › AC electro-hydraulic unit, easy-to-assemble, compact
- › Modularity offers many combinations of hydraulic circuits to suit various requirements
- › Main applications are in industrial automation such as machine tools, the food or textile industry or power engineering
- › 8 optional central block basic circuits see ZB06 (HA0010) data sheet
- › Possibility of building up an additional circuit in the form of vertical or horizontal stacking assembly
- › Three-phase motors with power ratings of up to 7.5 kW
- › Tank capacities from 10 to 250 l
- › Regulated and constant gear pump options
- › In the standard version, the steel basic block is phosphated, oil tank and cover are painted and steel plates are zinc-coated for 240 h protection acc. to ISO 9227

Functional Description

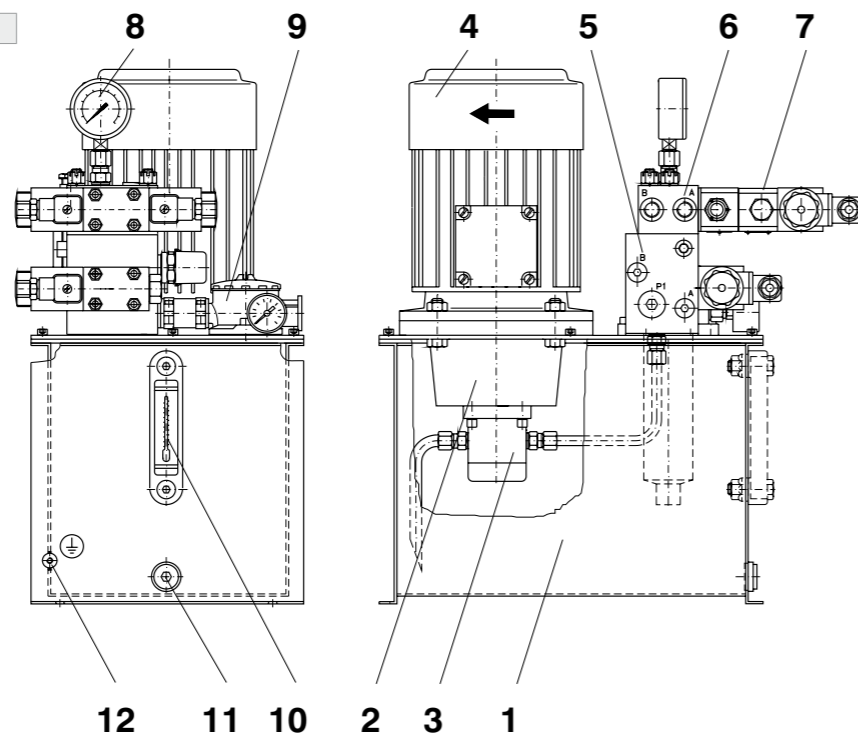
This technical information serves as a basic summary for configuring and building hydraulic power packs designed from standardized sub-assemblies. Table 1 supports the selection of the required combination (tank capacity, pump type, flow rate, pressure, size of the electric motor, type of pressure control etc.). If you cannot find the required solution using the components shown below, please consult with us. We can offer standard and special oil tanks, remote control of components, drives with double pumps, special component connections etc. On request, also the separate components can be delivered. A questionnaire, which is enclosed with this information, also should help you specify your requirements. Please enclose also the respective circuit diagram, the required installation dimensions, as well as the size and orientation of the connecting ports. That we can offer you a power pack, which will comply completely with your requirements, we need exact information about your system.



SA4

Fig. 1

- 1 Tank
- 2 Drive / bell housing
- 3 Pump
- 4 Electric motor
- 5 Base block (safety block of the accumulator)
- 6 Horizontal stacking assembly
- 7 Vertical stacking assembly
- 8 Pressure gauge
- 9 Return filter with by-pass, integrated air breather / filler and clogging indicator
- 10 Continuous level gauge
- 11 Magnetic drain plug
- 12 Grounding point



Tab. 1

Type of the power pack	Tank capacity [l]	Type of the pump	Flow rate [l/min]	Working pressure [bar]	Size of the electric motor	Q/p Table No.	Type of the control
SA4-10C	10	gear pump	0.5 - 10.5	250	80, 90	3	14
SA4-20C	20	gear pump	0.5 - 21.8	250	80, 90, 100, 112	3	14, 16
SA4-30C	30	gear pump	1.9 - 23.6	250	80, 90, 100, 112	2 - 3	14, 15, 16
SA4-40C	40	gear pump	1.9 - 23.6	250	80, 90, 100, 112	2 - 3	14, 15, 16
SA4-45U	45	gear pump	1.9 - 23.6	250	80, 90, 100, 112	2 - 3	14, 15, 16
SA4-60H	60	gear pump	6 - 36	250	80, 90, 100, 112, 132	2 - 4	14, 15, 16, 18
		variable piston pump	up to 29			5	17
SA4-60U	60	gear pump	6 - 36	250	80, 90, 100, 112, 132	2 - 4	14, 15, 16, 18
		variable piston pump	up to 29			5	17
SA4-100H	100	gear pump	6 - 42	250	90, 100, 112, 132	2 - 4	14, 15, 16, 18
		variable piston pump	up to 29			5	17
SA4-250H	250	gear pump	up to 50	250	80, 90, 100, 112, 132	2 - 4	14, 15, 16, 18
		variable piston pump	up to 50			5	17

Design of the Power Pack from Standardized Sub-Assemblies

- 1 Location**
Clear description of the working environment of the power pack.
- 2 Working conditions**
Example of the power pack working cycle (service character).
- 3 Working pressure p [bar]**
Working cycle description - time / pressure diagram.
- 4 Flow rate Q [l/min]**
Flow rate, which is necessary to ensure the required velocities and revolutions.
- 5 Type of the pump**
To be determined after evaluation of the points above.
The following pumps are available: - gear pumps
- variable piston pumps

6 Pump displacement

See point 7.

7 Electric motor

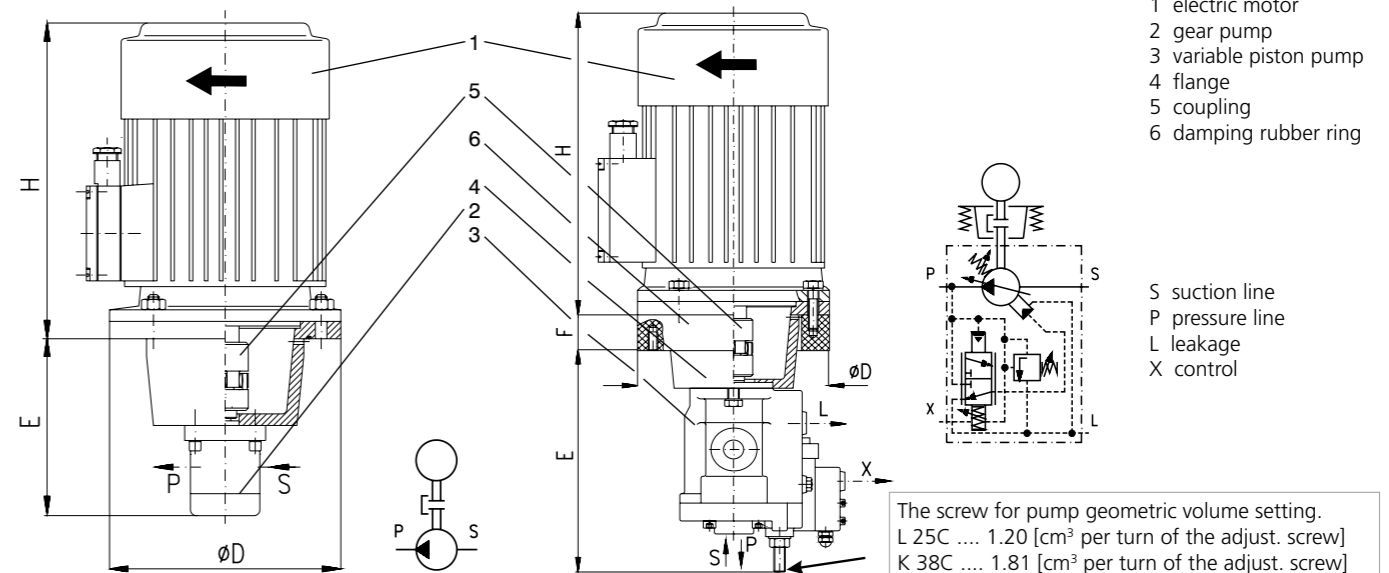
Using Tables 1 through 5 and the required flow rate and pressure, the respective displacement of the pump, as well as the power and revolutions of the electric motor are to be determined. These data are to be put down into the questionnaire, together with the information regarding the network voltage and frequency, type of enclosure, climatic endurance etc. The tables also include the basic drive dimensions - diameter of the flange and the total height of the electric motor including the flange thickness or the thickness of the damping ring (Fig. 2 and 3). The damping rubber ring is normally delivered with the drives with the variable piston pump. On request, it can also be delivered with the gear pumps.

8 Lay out of the drive

Vertical - with all types of gear pumps and with axial piston pumps with pressure control (Fig. 2 and 3).
Horizontal - only for special applications and after consultation with us.

Fig. 2

Fig. 3



- 1 electric motor
- 2 gear pump
- 3 variable piston pump
- 4 flange
- 5 coupling
- 6 damping rubber ring

- S suction line
- P pressure line
- L leakage
- X control

The screw for pump geometric volume setting.
L 25C 1.20 [cm³ per turn of the adjust. screw]
K 38C 1.81 [cm³ per turn of the adjust. screw]

Tab. 2a Gear Pumps Size 1 - Series GP1

Data of the electric motor			Displacement of the pump [cm ³]											Dimension of the drive			
Size	rpm [1/min]	P [kW]	Q/p _n [l/min] / [bar]											Ø D [mm]	H [mm]	E max. [mm]	
			0.8	1.2	1.6	2.1	2.5	3.3	4.4	6.0	8.0	11.0	15.0				20.0
80	1395	0.55	1.1	200	1.6	170	2.1	125	2.8	95	3.3	80	4.4	60	200	270	174
80	1395	0.75			1.6	200	2.1	170	2.8	130	3.3	110	4.4	80	200	270	174
90	1410	1.10					2.1	200	2.8	190	3.3	160	4.4	120	200	310	174
90	1410	1.50							2.8	200	3.3	200	4.4	165	200	310	174
100	1420	2.20											4.4	200	250	360	192
100	1420	3.00															
71	2790	0.55	2.1	125	3.1	85	4.2	60	5.6	45	6.6	40	8.7	30	160	225	157
80	2850	0.75	2.2	165	3.2	110	4.3	85	5.7	65	6.8	55	8.9	40	200	270	174
80	2835	1.10	2.2	200	3.2	160	4.3	125	5.7	95	6.7	80	8.9	60	200	270	174
90	2860	1.50			3.2	200	4.3	165	5.7	125	6.8	105	9.0	80	200	310	174
90	2850	2.20					4.3	200	5.7	185	6.8	155	8.9	120	200	310	174
100	2895	3.00											9.1	160	250	360	192

Tab. 2b Gear Pumps Size 1 - Series GP1

Data of the electric motor			Displacement of the pump [cm ³]											Dimension of the drive			
Size	rpm [1/min]	P [kW]	Q/p _n [l/min] / [bar]											Ø D [mm]	H [mm]	E max. [mm]	
			3.6	4.4	4.8	5.8	6.2	7.9	10.5	13.5	18.0	25.0	35.0				50.0
80	1395	0.55	4.8	55	5.8	45	6.4	40	7.7	35	8.2	30	10.5	25	200	270	174
80	1395	0.75	4.8	75	5.8	60	6.4	55	7.7	45	8.2	45	10.5	35	200	270	174
90	1410	1.10	4.8	110	5.9	90	6.4	80	7.8	70	8.3	65	10.6	50	200	310	174
90	1410	1.50	4.8	150	5.9	120	6.4	110	7.8	95	8.3	85	10.6	70	200	310	174
100	1420	2.20	4.8	200	5.9	180	6.5	165	7.8	135	8.4	125	10.7	100	250	360	192
100	1420	3.00			5.9	200	6.5	200	7.8	160	8.4	160	10.7	135	250	360	192
71	2790	0.55	9.5	30	11.7	25	12.7	20	15.4	20	16.4	15	20.9	15	160	225	157
80	2850	0.75	9.7	35	11.9	30	13.0	30	15.7	25	16.8	20	21.4	15	200	270	174
80	2835	1.10	9.7	55	11.9	45	12.9	40	15.6	35	16.7	30	21.3	25	200	270	174
90	2860	1.50	9.7	75	11.9	60	13.0	55	15.8	45	16.8	45	21.5	35	200	310	174
90	2850	2.20	9.7	110	11.9	90	13.0	80	15.7	65	16.8	65	21.4	50	200	310	174
100	2895	3.00	9.9	145	12.0	120	13.2	110	16.0	90	17.1	85	21.7	65	250	360	192

Tab. 3a Gear Pumps Size 2 - Series GP2

Data of the electric motor			Displacement of the pump [cm ³]										Dimension of the drive		
Size	rpm [1/min]	P [kW]	Q/p _n [l/min] / [bar]										Ø D [mm]	H [mm]	E max. [mm]
			4	5	6.3	8	10	13.5	18.0	25.0	35.0	50.0			
90	1410	1.1	5.4	100	6.7	80	8.5	65	10.8	50	13.5	40	200	310	222
90	1410	1.5	5.4	135	6.7	110	8.5	85	10.8	65	13.5	55	200	310	222
100	1420	2.2	5.4	195	6.7	155	8.5	125	10.8	100	13.5	80	250	360	228
100	1420	3.0	5.4	270	6.7	215	8.5	170	10.8	135	13.5	105	250	360	228
112	1440	4.0			6.8	270	8.6	225	11.0	175	13.8	140	250	348	228
132	1455	5.5							11.0	240	13.8	190	300	470	248
132	1455	7.5									13.8	250	300	470	248

Tab. 3b Gear Pumps Size 2 - Series GP2

Data of the electric motor			Displacement of the pump [cm ³]								Dimension of the drive		
Size	rpm [1/min]	P [kW]	Q/p _n [l/min] / [bar]								Ø D [mm]	H [mm]	E max. [mm]
			12.5	16	20	25	33.7	45	60	80			
90	1410	1.1	16.9	30	21.6	25	27.0	20	33.7	15	200	310	222
90	1410	1.5	16.9	45	21.6	35	27.0	25	33.7	20	200	310	222
100	1420	2.2	16.9	65	21.6	50	27.0	40	33.7	30	250	360	228
100	1420	3.0	16.9	85	21.6	65	27.5	55	33.7	45	250	360	228
112	1440	4.0	17.3	110	22.1	90	27.5	70	34.6	55	250	348	228
132	1455	5.5	17.3	155	22.1	120	27.5	95	34.6	75	300	470	248
132	1455	7.5	17.3	210	22.1	165	27.5	130	34.6	105	300	470	248

Tab. 4 Gear Pumps Size 3 - Series GP3

Data of the electric motor			Displacement of the pump [cm ³]								Dimension of the drive [mm]		
Size	rpm [1/min]	P [kW]	Q/p _n [l/min] / [bar]								Ø D	H	E max.
			10	17	27	34	45	60	80	105			
100	1420	3.0	13.5	105	22.9	65	36.9	40	45.9	30	250	360	255
112	1440	4.0	13.8	140	23.3	85	36.9	50	46.5	40	250	348	255
132	1455	5.5	13.8	190	23.5	110	37.3	70	47.0	55	300	470	275
132	1455	7.5			23.5	155	37.3	95	47.0	75	300	470	275

Tab. 5 Variable Pistons Pumps

Data of the electric motor			Maximum geometric volume of the pump [cm ³]				Dimension of the drive [mm]			L25C	K38C
Size	rpm [1/min]	P [kW]	L25C		K38C		Ø D	H	F	E max. [mm]	E max. [mm]
			25*	38*	max. Q/p [l/min] / [bar]	max. Q/p [l/min] / [bar]					
100	1420	2.2	33.7	35			250	360	45	296	
100	1420	3.0	33.7	50			250	360	45	296	
112	1440	4.0	34.1	65			250	348	45	296	
132	1455	5.5	34.4	90	52.5	55	300	470	50	296	313
132	1455	7.5	34.4	120	52.5	75	300	470	50	296	313

*Maximum geometric volume of pump is adjusted with setting screw (see Fig. 3)
L 25C 1.20 [cm³ per turn of the adjustment screw], K 38C 1.81 [cm³ per turn of the adjustment screw]

9 Tank capacity

The following are our recommendations for a suitable tank capacity:
– hydraulic circuits with fixed pumps - from 3 up to 6 multiple of the pump flow rate [l/min].
– hydraulic circuits with variable pumps - from 2 up to 4 multiple of the pump flow rate [l/min]
Tanks normally delivered:

Fig. 4
Tank models 10C, 20C, 30C, 40C

Fig. 5
Tank models 45U, 60U

Fig. 6
Tank models 60H, 100H, 250H

Fig. 7

Parts delivered with a tank (Fig.4, 5, 6):
a) Drain plug on the front side of the tank - with capacities 10H, 20H, 30H, 40H, 45U, 60U
b) Drain plug on the bottom of the tank - with capacities 60H, 100H, 250H
c) Leakage drain plug on the through collector at the upper side of the tank - with capacities 60H, 100H, 250H
d) Cleaning cover on the side of the tank - with capacities 60H, 100H, 250H
e) Bolt mounted cover sealad against dust penetration
f) Grounding bolt
g) Continuous level gauge

Tank designation	Tank capacity [l]	Tank dimension Length x width x height [mm]	Dimension of fix slots [mm] (Fig. 7)				
			A	B	C	D	Ø E
10C	10	400 x 280 x 186	30	220	6	388	9 (slot)
20C	20	400 x 280 x 274	30	220	6	388	9 (slot)
30C	30	500 x 320 x 285	30	260	10.5	479	11 (slot)
40C	40	500 x 320 x 364	30	260	10.5	479	11 (slot)
45U	45	700 x 370 x 329	35	300	25	650	11
60U	60	700 x 370 x 394	35	300	25	650	11
60H	60	600 x 470 x 485	35	400	30	540	14
100H	100	700 x 550 x 565	25	500	30	640	14
250H	250	1006 x 610 x 680	20	570	47	912	14

10 Painting

The following are the standard paintings of the outside surface of the tank:
 – top coat - RAL 7030 KOMAXIT (stone gray)
 – aluminum parts - without surface treatment
 – hydraulic components - manufacturer's standard painting
 Other paints or special surface treatment on request.

Component assembly on the tank cover

In addition to drive unit, also the base block and filtering unit are usually situated on the tank cover. The base block is connected to the pump output. It comprises a check valve and pressure valve (or some other components) according to the pressure control system used (see the circuit diagrams in Fig. 14 to 18). It also enables other components of the hydraulic circuit to be connected, e.g.:

- oil filter
- subplates or connecting plates with the respective components
- accumulator

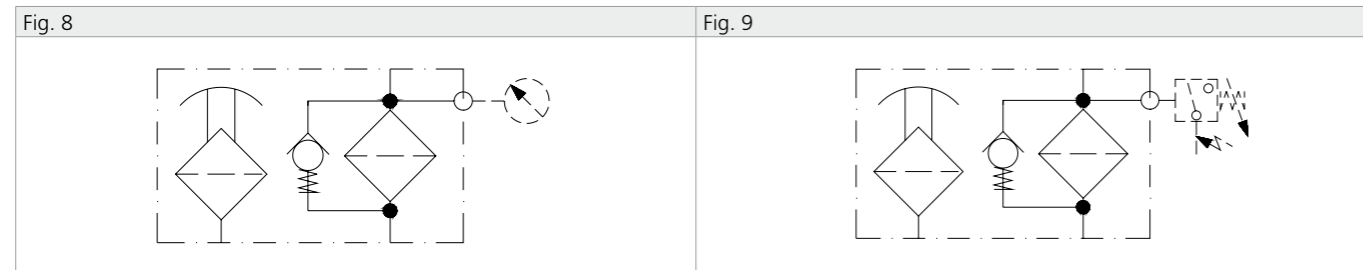
11 Pressure control

- Pressure relief valve VT (Fig. 14) - used with all types of gear pumps.
- Unloading valve VO (Fig. 15) - used in combination with a gear pump, an accumulator and a check valve. When the pressure set at the unloading valve is reached, the valve loads the pump. The accumulator provides for holding the pressure in the circuit behind the check valve. The pressure valve VP works as the safety valve of the accumulator.
- Switching (Fig. 16) - used in combination with a gear pump, an accumulator, a check valve and a pressure switch TS. When the pressure in the system reaches the pressure set at the pressure switch, the respective circuit switches off the electric motor. The accumulator holds the pressure in the circuit behind the check valve. The pressure valve VP works as the safety valve of the accumulator.
- Remote control with the pressure relief valve VT (Fig. 17) - used only with piston pumps with pressure control. The pressure valve VP protects the circuits against pressure peaks.
- Pressure valve on the pump - used with piston pumps with pressure control. The pressure is adjusted by the screw which is fixed to the pump. The pressure valve VP protects the circuit against pressure peaks.

12 Oil filtration

Preferably the return line filters with visual (Fig. 8) or electric (Fig. 9) clogging indication are used. These filters can also be used (after removing the cover) as the filling filters. They usually also comprise an integrated air breather.

Type of the filter	Type of the insert	Flow rate [l/min]	By-pass Δp [bar]	Absolute filtration [μm]
FR 043 - 166	V3 . 0510 - 56	25	2.5	10
FR 072 - 166	V3 . 0520 - 56	50	2.5	10
E 103 - 676	V3 . 0620 - 56	80	2.5	10



13 Size of the components

The hydraulic components are assembled into a hydraulic circuit by means of connecting or modular plates PD06 (catalogue HA 0006). These plates support the build-up of hydraulic systems as horizontal or vertical stacking assemblies resulting in a compact system without connecting pipes or hoses. Up to 8 section can be connected in a horizontal stacking assembly. The installation dimension of the components size 06 correspond with ISO 4401- Ab-03-4 and DIN 24340-A6. The working ports are provided with pipe threads as follows:

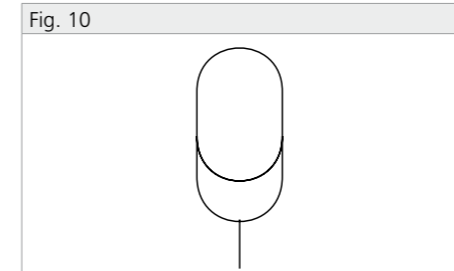
- a) base block type ZB 06 x - xx
 A, B - G3/8"
 P, P1, T - G1/2"
- b) in-line modular plates PD 06 xx - AL
 A, B, P - G3/8"
 T - G1/2"

14 Control voltage

The control voltage of the electro-hydraulic components must be determined with regard to the safety and health protection. On request, the components with the following DC control voltages can be delivered: 12, 14, 21, 24, 42, 48, 60, 102 and 205 V. The available AC voltages are 24, 115 and 230 V / 50 (60) Hz.

15 Accumulators

The gas bladder or membrane accumulators are being used (Fig. 10). The required capacity in liters is to be determined. Preferably the accumulators from suppliers who can ensure the international certification (at least the certification from the German Testing Laboratory TÜV) are used. When filling in the form, please indicate the country in which your machine with our power pack is going to be used. The accumulator is a pressure tank which must comply with work safety regulations. These regulations differ from country to country. The accumulator must be provided with the certificate of the respective country it is going to be used in! Smaller accumulators (up to 4 l) are mounted directly onto the cover of the tank or onto a short block (max. with 2 section of control components above the base block). Larger accumulators are mounted only onto the tank cover. Together with an accumulator also the filling and checking equipment can be delivered (including the pressure gauge for filling the accumulator with nitrogen). We recommend the use of an accumulator to be discussed with our technicians.

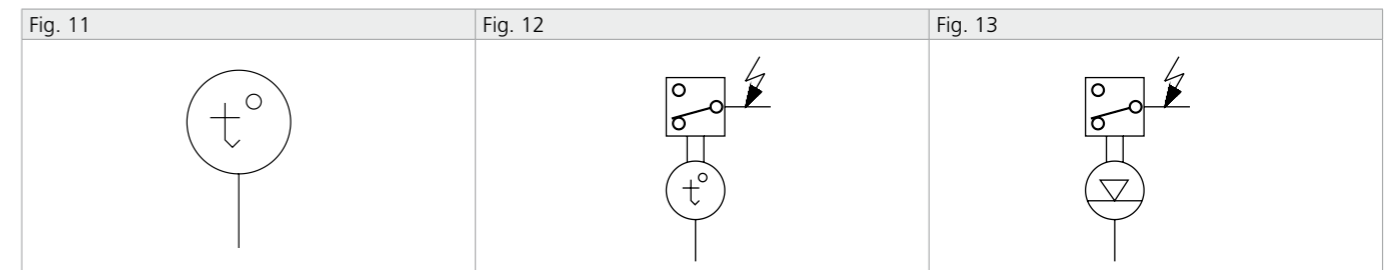


16 Accumulator block

The function of the safety block is provided by the base block (see Fig. 15 and 16). The use of another block is to be discussed with us.

17, 18 Thermometer, thermostat, oil level transducer

These instruments can be mounted onto the tank cover. The thermometer (Fig. 11) and the thermostat (Fig. 12) check the oil temperature. The oil level transducer (Fig. 13) indicates the oil level in the tank.



19 Electric equipment

Power packs delivered without electric equipment are standard. The electric circuit diagram of the electric motor is on the lower side of the cover of the motor terminal box. On request, the electric boxes (including terminals, circuits breakers etc.) can be delivered.

20 Hydraulic fluid

The hydraulic power packs are designed to operate with mineral oils of the power classes HM and HV according to the European specification CETOP-RP 91 H and with the bio-degradable hydraulic fluids of the groups HTG and HE according to DIN-proposal.

21 Special equipment

Special requirements regarding the power pack equipment, such as oil cooling and heating, power pack covering etc., are to be consulted with our technicians.

Design of the Power Pack from the Standardized Sub-assemblies

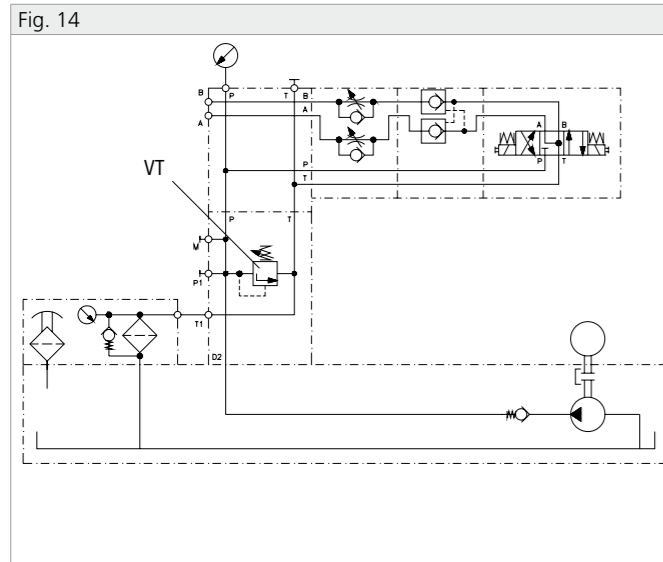


Fig. 14 Power pack with gear pump - pressure in hydraulic system is controlled by pressure relief valve VT. (usable with tank capacities)

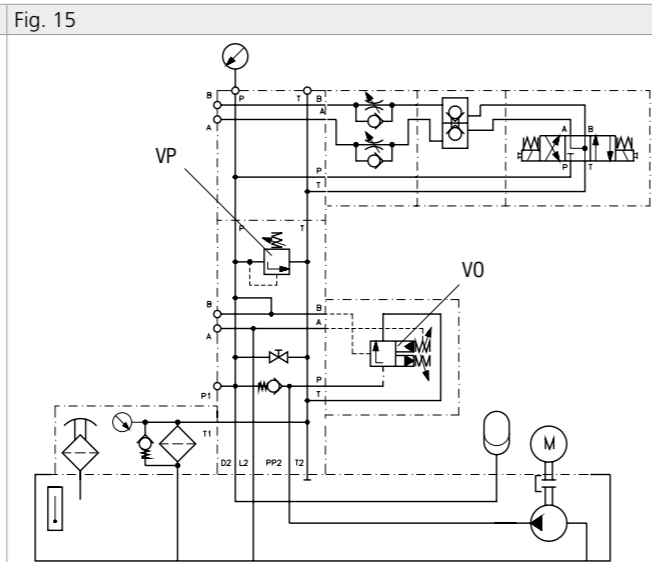


Fig. 15 Power pack with gear pump - pressure in the system held by accumulator and check valve, pump pressure unloaded through unloading valve VO. Pressure relief valve VP works as the safety valve of the accumulator (for tank capacities from 40 up to 250 l and accumulators capacities from 2.5 up to 10 l).

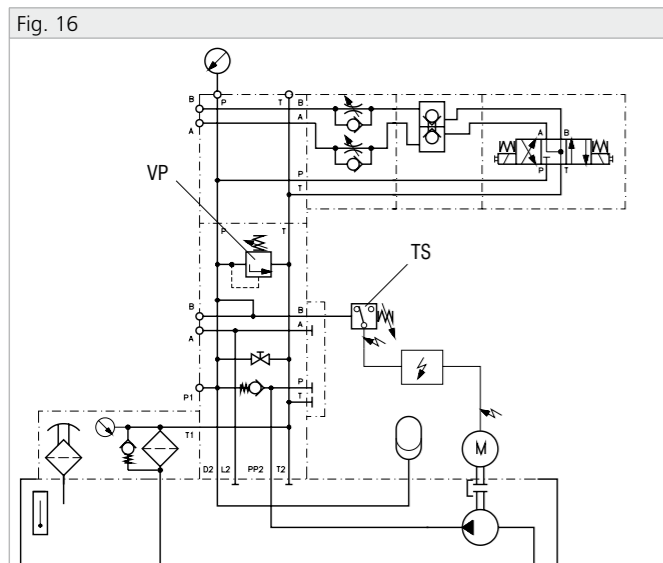


Fig. 16 Power pack with gear pump and pressure switch TS controlling the switching-off of the electric motor. Pressure relief valve VP works as the safety valve of the accumulator (for tank capacities from 20 up to 60 l and accumulators capacities from 2.5 up to 10 l).

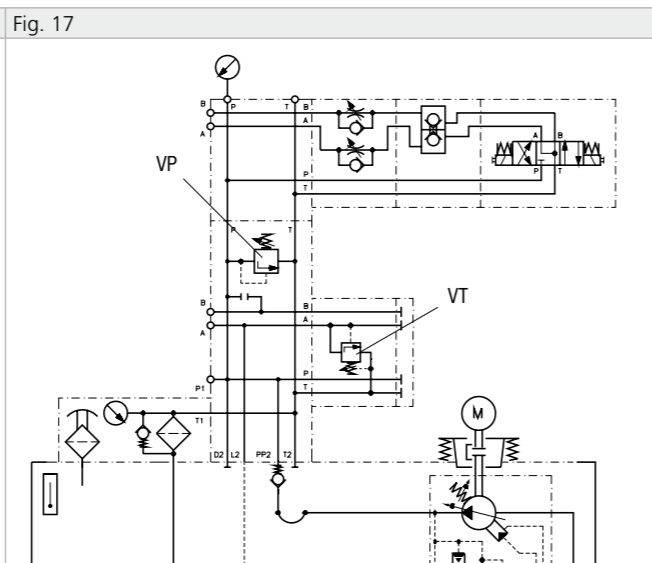


Fig. 17 Power pack with piston pump with pressure control - remote pressure control through pressure relief valve VT. Pressure relief valve VP protects the system against pressure peaks (for tank capacities from 60 up to 250 l).

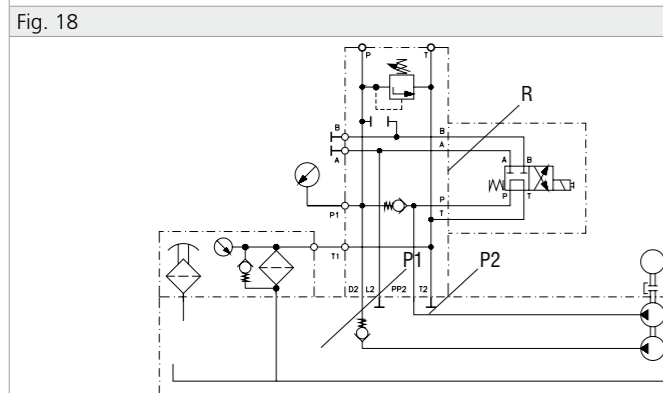


Fig. 18 Double gear pump hydraulic power unit with two pressure ports P1 and P2. P2 pressure port is unloaded by 4/2 solenoid operated directional valve R. (for tank capacities from 40 up to 250 l).

Questionnaire - Hydraulic power pack modular system

1 Location	Productional hall	Protected against weather	Outside	Explosive							
2 Working condition	Uninterrupted	With pauses in min.	Occasionally	Other:							
3 Working pressure / peak pressure [bar]	/										
4 Flow [l/min]	Constant:	Variable min.:	max.:								
5 Type of the pompe	Gear										
6 Displacement of the pump [cm ³]	0.8	1.2	1.6	2.1	2.5	3.3	3.6	4.4	4.8	25	
	5.8	6.2	7.9	4.0	5.0	6.3	8.0	10.0	12.5	38	
	16	17	20	25	27	34				Other:	
7 Electric motor	[kW]:	[V]:	[Hz]:	[rev/min]:	Other information:						
8 Lay out of the drive	Vertical on the tank										
9 Tank capacity [l]	2.6	5.3	7.9	10.6	11.9	15.9	26.5	66	Other:		
10 Painting	Top coat - standard RAL 7030 KOMAXIT (stone gray)										
11 Pressure control	Other top coat:										
12 Filtration	In return line	In pressure line	In suction line	[µm]:							
13 Size of the components	06	04 (after consultation)				Other:		Number of section:			
14 Control voltage	12 V DC	14 V DC	21 V DC	24 V DC	42 V DC	48 V DC					
	60 V DC	102 V DC	205 V DC								
15 Accumulator [l]	24 V AC / 50 (60) Hz				115 V AC / 50 (60) Hz			230V AC / 50 (60) Hz			
	No	Membrane accumulator				0.32	0.75	1.00	1.40		
16 Accumulator block	No	ZB06				Other:					
17 Thermometer, thermostat	No	Contact thermometer				TH143					
18 Oil level transducer	No	One - point		Two - point		Continuous					
19 Electric equipment											
20 Hydraulic fluid	Mineral oil					Ecological fluid - type					
21 Special equipment											
The required specifications should be marked with a cross (X) or described with text!											

Content

Type Code		Page	Data Sheet
Modular Hydro-Pneumatic Suspension Systems			
MHPS	Improving suspension performance with a proper setup	616	HA 4081
Modular Load Sensing Systems			
MLS3-06	Modular load sensing system for valves, size 06 (D03)	632	HA 0025
MLS3-10	Modular load sensing system for valves, size 10 (D05)	642	HA 0055

Notes

MHPS

Modular Hydro-Pneumatic Suspension System

Improving Suspension Performance with a Proper Setup: Quicker and Better Adaptation to Applications



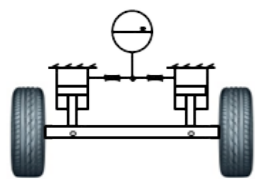
Technical Features

- > p_{max} up to 250 bar (3600 PSI)
- > Reduces vibrations in axle, wheel, cabin and payload suspension systems
- > Basic and advanced suspension solutions with additional options
- > Automatic control of cylinder position and suspension comfort parameters
- > Serves all loads and cylinder sizes
- > Modular system design with standard modules easily adaptable for specific applications
- > Hydraulic modules
- > Electronic control unit (ECU), touch display (TD) and accumulators
- > Position and pressure sensors
- > Variable settings for different operating and loading conditions
- > Flexible configurations of ECU and TD

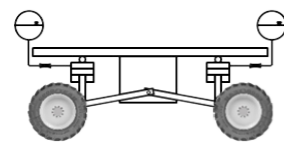
Suspension Systems in mobile machines

Hydro-pneumatic suspension systems improve comfort and productivity of vehicles by isolating the vehicle's chassis and cab - and thus the driver and the payload/implements - from the undesired vibrations from the ground. This is done by hydraulic means - a cylinder and an accumulator act as a combination of spring and damper. With the regulation of oil flow and preload pressure an optimal suspension performance can be achieved. The health and safety directive 2002/44/EG implements high standards for the daily permissible vibration exposure to the driver. Particularly during off-road work, the usage of our hydro-pneumatic suspension extends the possible working time. It increases comfort and driving safety. The driver is more relaxed and therefore he can complete work processes faster and with more precision.

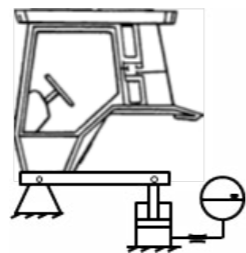
Possible fields of applications



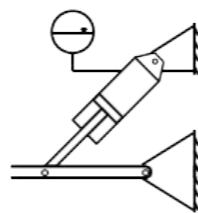
Axle suspensions



All wheel suspensions



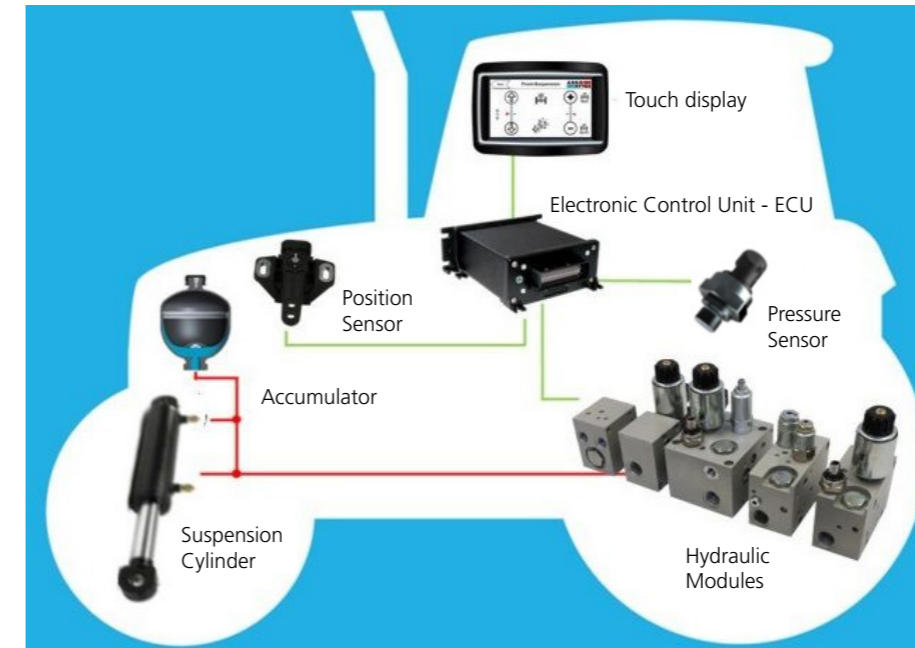
Cab suspensions



Drawbar and payload suspensions

System Integration

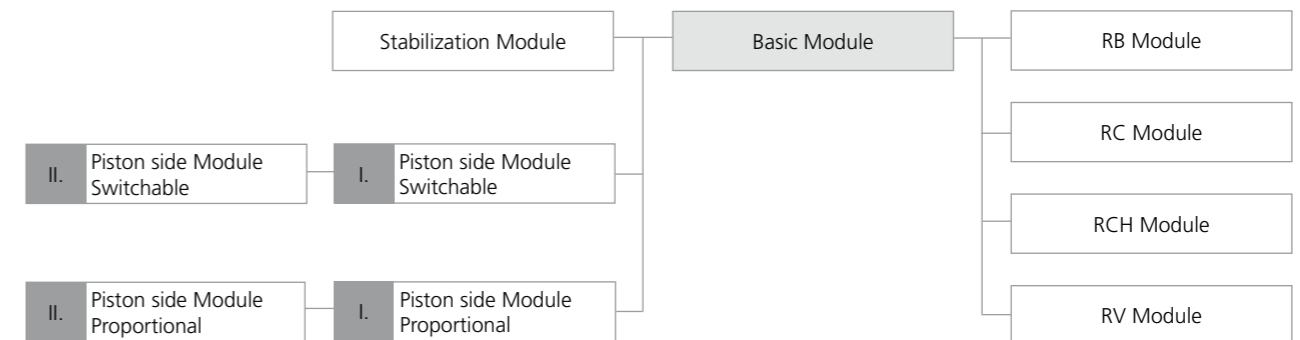
The modular control system consists of a hydraulic manifold, which is connected to an ECU. The ECU is the command and control center, it coordinates and regulates all the functions of the hydraulic manifold. The necessary input for the commands is provided by data from the TD, various sensors and the vehicle's bus system. In the basic suspension configuration the hydraulic manifold is connected to the suspension cylinder so it can control the position of the cylinder. For a high variance between maximum and minimum load, the advanced suspension is able to control the pressure in the cylinder's rod side chamber. Shut-off and damping-control can be achieved using optional Modules.



— green — electronic connection
— red — hydraulic connection

Modularity

The fast available, adaptable modular assembly kit allows to easily achieve customer tailored solutions. By selecting standard modules, various settings can be tested easily to determine the best configuration.



Proportional Level Control

Unique proportional control allows adaption to various driving conditions faster and more sensitively than traditional hydraulic suspension control systems.

Intelligent automatic and easy manual adjustment

Simple pre-selection of desired suspension behavior in manual and automatic mode. The automatic intelligent mode monitors vehicle behavior and adapts the suspension setting to achieve best comfort.

Full application support

For a proper suspension set-up ARGO-HYTOS offers full support in machine integration including advice concerning of geometry and mechanical parts.

Cost-effective solutions

Thanks to the modular design MHPS allows cost effective solutions even for small volumes. If there is no need for a modular design ARGO-HYTOS is able to adapt the results from functional testing into a customized hydraulic manifold.

HS1-B*/*-RC Advanced Suspension - Preload Control. Rod Side Module Constant



Description

Application

The advanced suspension with the ROD SIDE MODULE CONSTANT (RC) is used for suspension applications with medium and high load ratio between minimum and maximum load.

It is typically used for:

- › Heavy duty axle suspensions
- › Trailer drawbar suspensions
- › All wheel suspensions with a high load ratio

Technical Features

- › The same features as the Basic module
- › Controls the preload pressure in the suspension cylinder's rod side (up to 200 bar; 2900 PSI)
- › Pressure relief valve setting dependent on application
- › Overpressure relief and service function through Basic module
- › Optional accumulators

Functional Description

The advanced suspension with the rod side module constant (RC) sets a constant pressure in the rod side chamber of the suspension cylinder. This pressure creates a preload which allows a higher ratio between minimum and maximum

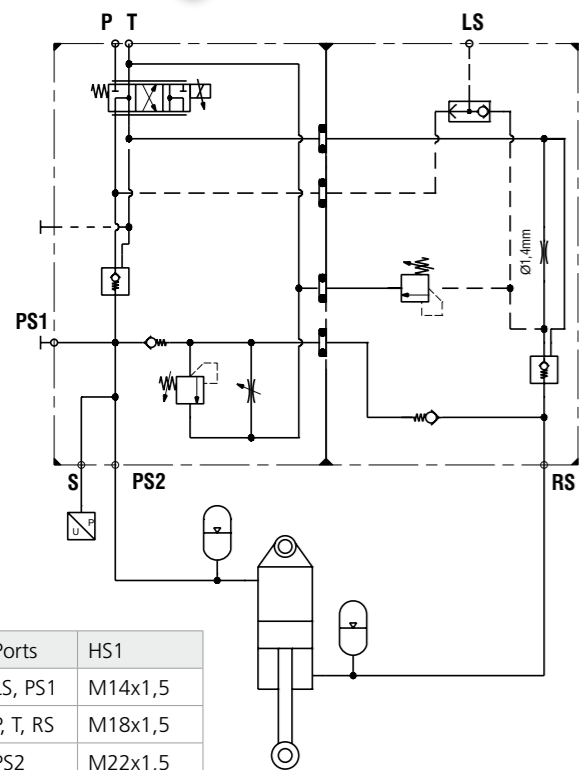
suspension load. This is particularly important when using diaphragm accumulators.

Technical Data

Max. operating pressure at ports P	bar (PSI)	250 (3600)
Max. operating pressure at ports T	bar (PSI)	100 (1450)
Max. Limit pressure at Rod Side	bar (PSI)	200 (2900)
Max. flow	l/min (GPM)	45 (11.9)
Weight	kg (lbs)	6,12 (13.4)

Solenoid Technical Data

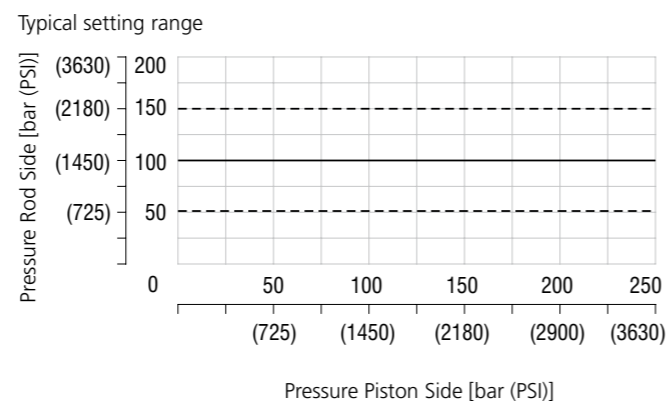
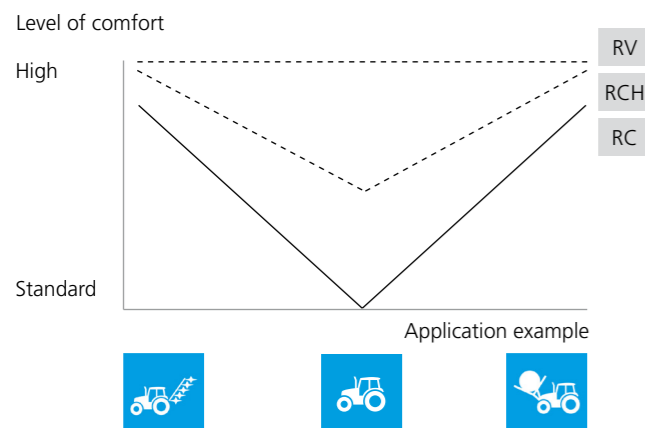
Type of coil	V DC	12 / 24
Limit current	A	2,5 / 1,5
Resistance nominal at 20 °C (68 °F)	Ω	2,3 / 13,4
PWM Frequency	Hz	200
Max. allowable voltage variation	%	±10 %



Ports	HS1
LS, PS1	M14x1,5
P, T, RS	M18x1,5
PS2	M22x1,5
S	G 1/4

System code example:
HS1-B*/*-RC*-*

Characteristics measured at $v = 32 \text{ mm}^2/\text{s}$ (156 SUS)



Min. and max. pressure settings depend on the application. Typically for a system with 200 bar maximum pump pressure the p_{min} and p_{max} is about 30 to 150 bar also depending on the accumulator precharge pressure.

HS1-B*/*-RCH* Advanced Suspension - Preload Control. Rod Side Module Characteristic



Description

Application

The advanced suspension with the ROD SIDE MODULE CHARACTERISTIC (RCH) is made for the same applications as the RC but with an extended working range (e.g. for front loader work) and achieving good comfort particular in medium and high load conditions.

RCH is typically used for tractor front-axle suspensions and rear-axes on combines and self-propelled forage harvesters.

Technical Features

- › The same features as the Basic module
- › Higher suspended load compared to RC
- › Higher comfort compared to RC
- › Pressure valve settings depend on the application
- › Overpressure relief and service function through Basic module
- › Optional accumulators

Functional Description

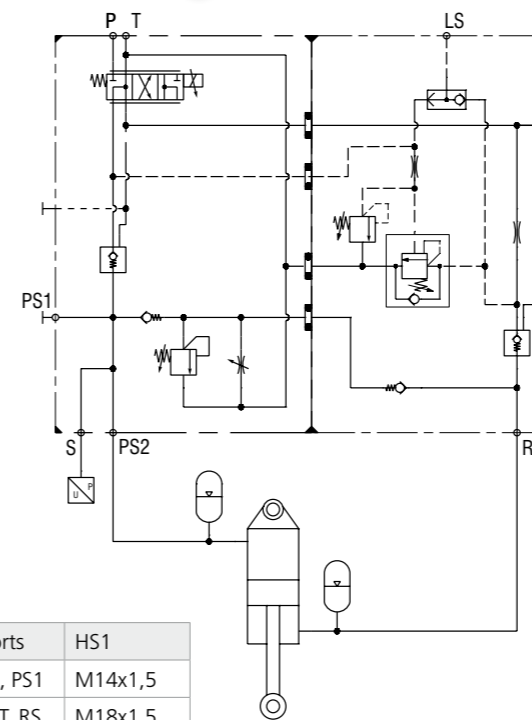
By hydraulically sensing the pressure on the piston side, the rod side pressure is adjusted to the load conditions. At very low suspended loads (e.g. mounted plow unloading axle) the rod side pressure is increased automatically, which creates an additional hydraulic preload in the suspension, thus improving the ride behavior.

Technical Data

Max. operating pressure at ports P	bar (PSI)	250 (3600)
Max. operating pressure at ports T	bar (PSI)	100 (1450)
Max. Limit pressure at Rod Side	bar (PSI)	200 (2900)
Overcentre Valve Pilot Ration Options		3:1 / 5:1
Max. flow	l/min (GPM)	45 (11.9)
Weight	kg (lbs)	5 (11)

Solenoid Technical Data

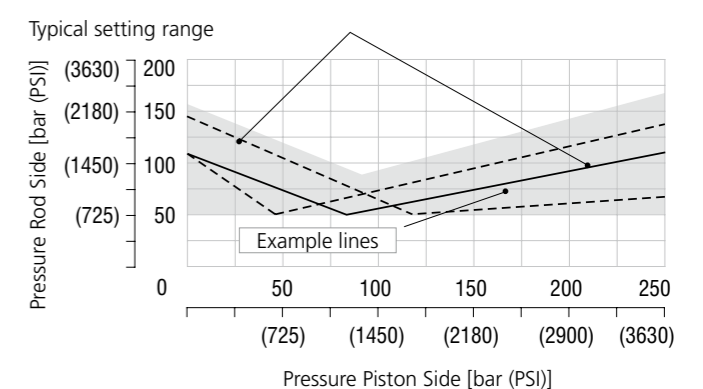
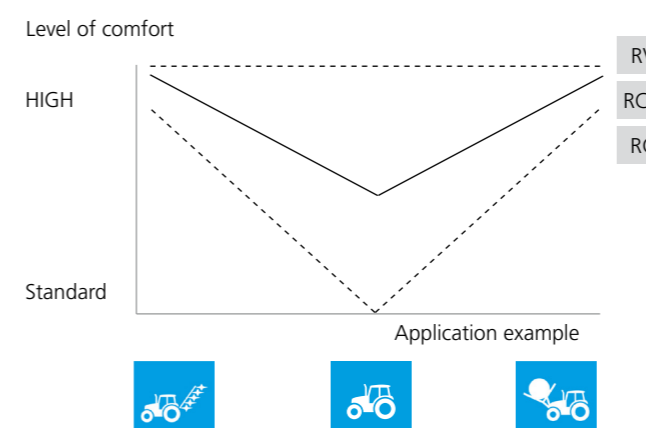
Type of coil	V DC	12 / 24
Limit current	A	2,5 / 1,5
Resistance nominal at 20 °C (68 °F)	Ω	2,3 / 13,4
PWM Frequency	Hz	200
Max. allowable voltage variation	%	±10 %



Ports	HS1
LS, PS1	M14x1,5
P, T, RS	M18x1,5
PS2	M22x1,5
S	G 1/4

System code example:
HS1-B*/25-RCH*-*

Characteristics measured at $v = 32 \text{ mm}^2/\text{s}$ (156 SUS)



Min. and max. pressure settings depend on the application. Typically for a system with 200 bar maximum pump pressure the p_{min} and p_{max} is about 30 to 150 bar, also depending on the accumulator precharge pressure.

HS1-B*/*-RV* Advanced Suspension - Preload Control. Rod Side Module Variable



Description

Application

Variable, adjustable preload of the suspension cylinder's rod side is achieved by using advanced suspension ROD SIDE MODULE VARIABLE (RV). RV is preferably used in high-end applications, in which suspension parameters need to be adjusted freely.

Technical Features

- > Fine and fast proportional adjustment of rod side preload
- > Pressure sensor included
- > Accumulators optional
- > Overpressure relief and service function through Basic Module

Functional Description

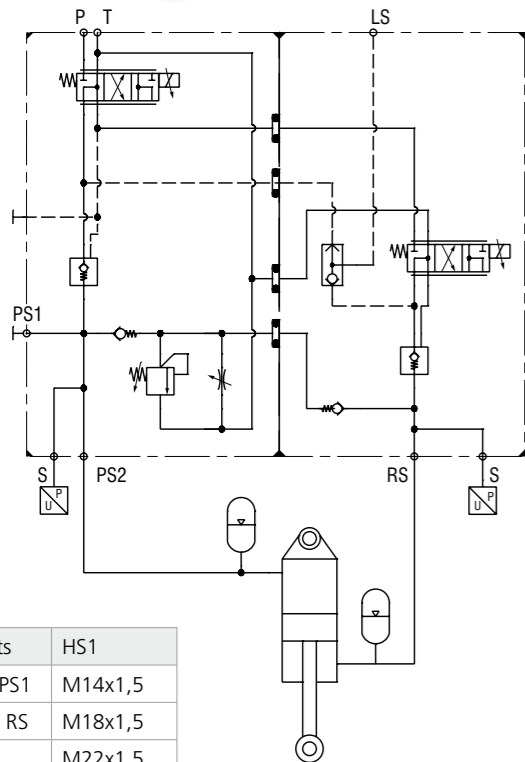
The Rod side Module Variable (RV) provides pressure control of rod side of the suspension cylinder. It proportionally feeds or drains the suspension cylinder's rodside chamber. When the valve is not energized, the oil in the rod side chamber of the suspension circuit is disconnected by a pilot-operated check valve.

Technical Data

Max. operating pressure at ports P	bar (PSI)	250 (3600)
Max. operating pressure at ports T	bar (PSI)	100 (1450)
Max. flow	l/min (GPM)	45 (11.9)
Weight	kg (lbs)	5,35 (11.8)

Solenoid Technical Data

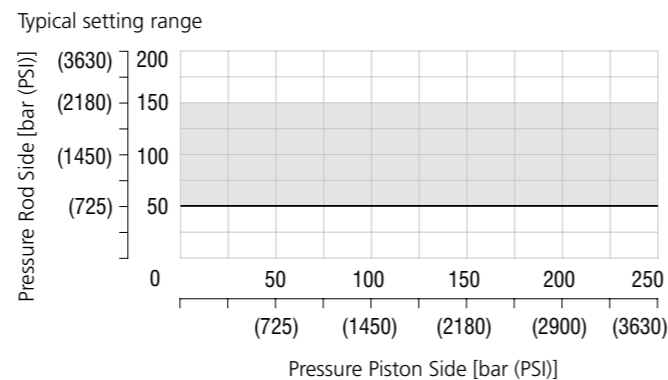
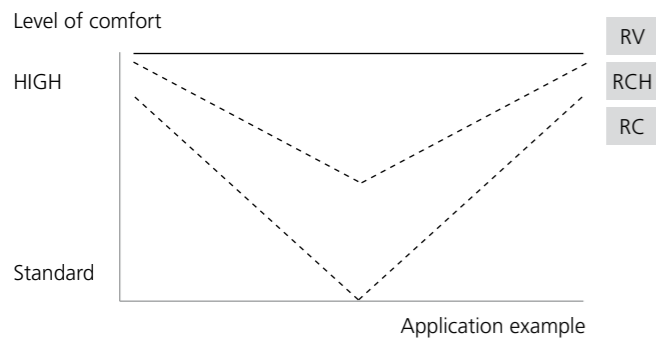
Type of coil	V DC	12 / 24
Limit current	A	2,5 / 1,5
Resistance nominal at 20 °C (68 °F)	Ω	2,3 / 13,4
PWM Frequency	Hz	200
Max. allowable voltage variation	%	±10 %



Ports	HS1
LS, PS1	M14x1,5
P, T, RS	M18x1,5
PS2	M22x1,5
S	G 1/4

System code example:
HS1-B*/25-RV*-*

Characteristics measured at $v = 32 \text{ mm}^2/\text{s}$ (156 SUS)



Min. and max. pressure settings depend on the application. Typically for a system with 200 bar maximum pump pressure the p_{min} and p_{max} is about 30 to 150 bar also depending on the accumulator precharge pressure.



HS1-B*/*-RB* Advanced Suspension - Preload Control. Rod Side Module - Boost Plate



Description

Application

As a cost-effective alternative for RC, the RODSIDE MODULE BOOST PLATE (RB) is made to pressurize the rodside of the suspension cylinder with full pump pressure. Accordingly, the LS Signal can be boosted. Possible applications are:

- > Trailer drawbar suspension or simple axle suspensions

Technical Features

- > Controls the preload pressure in the suspension cylinder's rod side
- > Overpressure relief and service function through Basic module
- > Optional pressure sensors and accumulator

Functional Description

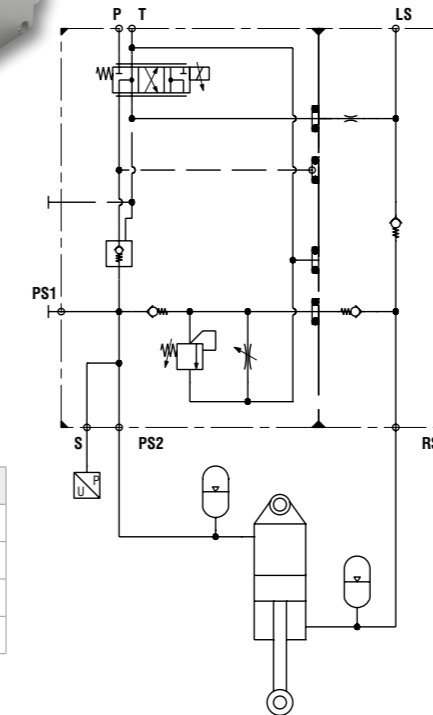
This Module establishes a direct connection from the pump pressure to the rodside of the suspension cylinder.

Technical Data

Max. operating pressure at ports P	bar (PSI)	250 (3600)
Max. operating pressure at ports T	bar (PSI)	100 (1450)
Max. Limit pressure at Rod Side	bar (PSI)	250 (3600)
Max. flow	l/min (GPM)	45 (11.9)
Weight	kg (lbs)	5,22 (11.5)

Solenoid Technical Data

Type of coil	V DC	12 / 24
Limit current	A	2,5 / 1,5
Resistance nominal at 20 °C (68 °F)	Ω	2,3 / 13,4
PWM Frequency	Hz	200
Max. allowable voltage variation	%	±10 %



Ports	HS1
LS, PS1	M14x1,5
P, T, RS	M18x1,5
PS2	M22x1,5
S	G 1/4

System code example:
HS1-B*/25-RB*-*

Ordering Code

Example of the ordering code

HS1- BS 2 / 25/25 RCH 5 / 37 / 6 - 12 E12A - B V - A

Modular hydro pneumatic suspension system		
Level control - basic modules		
Basic module	B	
Basic module with Stabilization	BS	
Pressure sensor at basic module		
without pressure sensor	0	
pressure sensor at basic module	2	
Basic module - pressure relief valve setting		
in range up to 250 bar (3600 PSI)	25	
Flow rate of basic module		
5 l/min (1.32 GPM)	5	
25 l/min (6.60 GPM)	25	
Rod side module - preload control		
rodside module - boost plate	RB	
rodside module - constant	RC	
rodside module - characteristic	RCH	
rodside module - variable	RV	
RCH module - overcentre valve pilot ratio		
3:1	3	
5:1	5	
RV option - pressure sensor		
without pressure sensor	0	
pressure sensor at RV module	2	
		12
		24
		6
		37
		25

Surface treatment steel parts

- A 240 h salt spray (ISO 9227)
- B 520 h salt spray (ISO 9227)

Seals

- No designation NBR
- V FPM (Viton)

Block material and surface treatment

- B Steel - 520 h salt spray (ISO 9227)

Connector type of solenoid

- E3A axial AMP junior timer (2 pins; male)
- E12A deutsch DT 04-2P (2 pins; male)

Rated supply voltage of solenoid

- 12 12 V DC
- 24 24 V DC

RC and RCH modules -pressure relief valve setting

- in range up to 200 bar (2900 PSI)
- 60 bar (870 PSI)

RCH module - overcentre valve pressure setting

- in range up to 400 bar (5800 PSI)
- 370 bar (5400 PSI)

RV module - flow rate of proportional valve

- 5 l/min (1.32 GPM)
- 25 l/min (6.60 GPM)

HS1-B*/*P* Optional Suspension - Damping Control. Piston side Module Switchable / Proportional



Description

Application

The PISTON SIDE MODULE SWITCHABLE (PS) is used in applications, in which the suspension needs to be shut off in certain working conditions (e.g. for high working precision during tractor front loader work). The PROPORTIONAL (PP) version offers the same features as the switchable version but is freely adjustable. A shut off is also possible in the proportional version of this module but additionally, it is preferred in applications with high comfort requirements and strongly varying loading and application conditions.

Technical Features

- > Fine and fast prop. adjustment of the suspension's damping
- > Flow rates up to 80 lpm (21.1 GPM) in PP and 40 lpm (10.6 GPM) in PS-version (each at 10 bar Δp). Manual override PP flow 15 lpm for 10 bar.
- > Accumulators optional

Functional Description

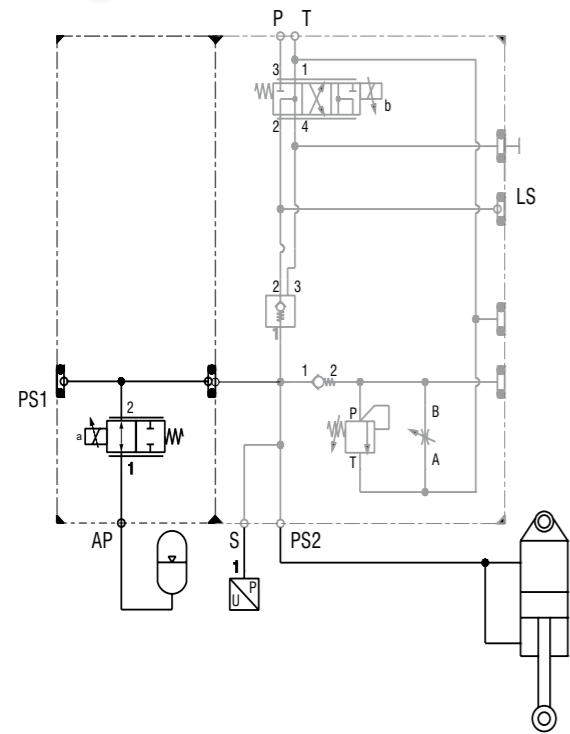
The piston side module influences the oil flow between accumulator and piston side of the cylinder. The piston side module switchable PS is a directional control valve, opens or closes the connection between accumulator and cylinder. When the connection is open, the suspension is switched on; when it is closed the suspension is shut off. Depending on the application or safety restrictions the neutral spool position can be normally open or normally closed. The piston side module proportional PP is equipped with a proportional valve that offers the ability to control flow between the piston side of the cylinder and the accumulator proportional to the current applied to the valve's solenoid. The PP can be used in applications, in which the damping of the suspension has to be adjustable.

Technical Data

Max. operating pressure at ports P	bar (PSI)	250 (3600)
Max. operating pressure at ports T	bar (PSI)	100 (1450)
Max. flow	l/min (GPM)	45 (11.9)
Flow rates at Δp=10 bar	PS	40 (10.6)
	PP	80 (21.1)
Weight	kg (lbs)	6.72 (11.8)

Solenoid Technical Data

Type of coil	V DC	12 / 24
Limit current	A	2,5 / 1,5
Resistance nominal at 20 °C (68 °F)	Ω	2,3 / 13,4
PWM Frequency	Hz	200
Max. allowable voltage variation	%	±10 %

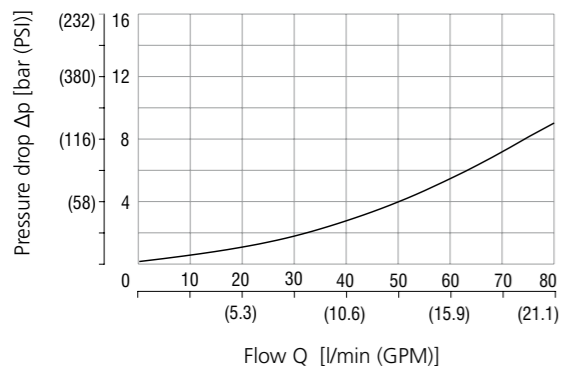


Ports	HS1
LS, PS1	M14x1,5
P, T	M18x1,5
PS2, AP	M22x1,5
S	G 1/4

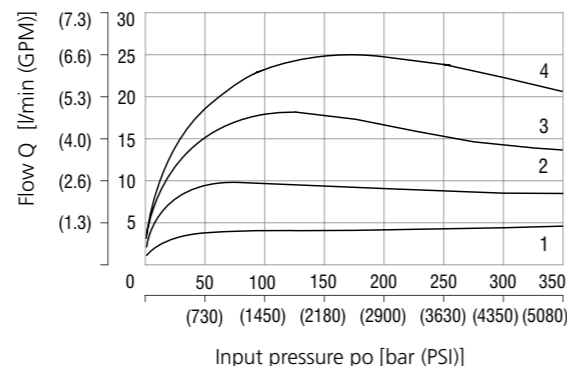
System code example:
HS1-B*/25-PP

Characteristics measured at v = 32 mm²/s (156 SUS)

Pressure drop of PS Module P *- AP



Regulation diagram



The coil current which initializes the flow through the proportional directional valve can differ due to the production tolerances about in a range of ±6% of the limit current.

General Technical Data

Max. pressure in the LS - port	bar (PSI)	210 (3050)
Hydraulic fluid		Hydraulic oils of power classes (HL, HLP) to DIN 51524
Fluid temperature range (NBR)	°C (°F)	-30 ...80 (-22 ...176)
Fluid temperature range (FPM)	°C (°F)	-20 ...80 (-4 ...176)
Ambient temperature range	°C (°F)	-20 ...50 (-4 ...122)
Viscosity range	mm ² /s (SUS)	10 ...500 (49 ...2450)
Duty cycle	%	100
Enclosure type to EN 60529		IP67 (for connector type E3A), IP69K (for connector type E12A)
Maximum degree of fluid contamination		Class 21/18/15 according to ISO 4406
Mounting position		unrestricted
Manual override		All electric-operated valves can have manual override closed with retaining nut against undesired usage
Vibration Endurance		

Ordering Code

Example of the Ordering Code

HS1 - B 2 / 25 / 25 RCH 5 / 37 / 6 PP 1 / O 4 - 12 E12A - B V - A

Modular hydro pneumatic suspension system

- Level control - basic modules**
 - Basic module: B
 - Basic module with stabilization: BS
- Pressure sensor at basic module**
 - Without pressure sensor: 0
 - Pressure sensor at basic module: 2
- Basic module - pressure relief valve setting**
 - Example in range up to 250 bar (3600 PSI): 25
- Flow rate of basic module**
 - 5 l/min (1.32 GPM): 5
 - 25 l/min (6.60 GPM): 25
- Rod side module - preload control**
 - Rodside module - boost plate: RB
 - Rodside module - constant: RC
 - Rodside module - characteristic: RCH
 - Rodside module - variabel: RV
- RCH module - overcentre valve pilot ratio**
 - 3:1: 3
 - 5:1: 5
- RV option - pressure sensor**
 - without pressure sensor: 0
 - pressure sensor at RV module: 2
- RCH module - overcentre valve pressure setting**
 - example in range up to 400 bar (5800 PSI): 37
- RV module - flow rate of proportional valve**
 - 5 l/min (1.32 GPM): 5
 - 25 l/min (6.60 GPM): 25

Surface treatment steel parts

- A: 240 h salt spray (ISO 9227)
- B: 520 h salt spray (ISO 9227)

Seals

- No designation: NBR
- V: FPM (Viton)

Block material and surface treatment

- B: steel - 520 h salt spray (ISO 9227)

Connector type of solenoid

- E3A: axial AMP junior timer (2 pins; male)
- E12A: deutsch DT04-2P (2 pins; male)

Rated supply voltage of solenoid

- 12: 12 V DC
- 24: 24 V DC

Flow rate of piston side module

- PS module - 40 l/min @ Δp = 10 bar
- PP module - 80 l/min @ Δp = 10 bar

PS module - spool type of the valve

- O: normally open
- N: normally closed

Number of piston side modules

- 1: 2 modules maximum

Piston side module - damping control

- without piston side control
- piston side modul switchable
- piston side module proportional

RC and RCH modules - pressure relief valve setting

- example in range up to 200 bar (2900 PSI): 60 bar (870 PSI)

Application Examples

Preselected Module Combinations

Front Axle Suspension Tractors

Basic Module + Rod Side Module Characteristic
Product Code: HS1-B2/25/25RCH5/37/60-12E12A-B-A

Basic Module [B] for suspension-cylinder leveling
Rod Side Module Characteristic [RCH] for load dependent spring rate control



Ports	Size
LS, PS1	M14x1,5
P, T, RS	M18x1,5
PS2	M22x1,5
S	G 1/4

Front Axle Suspension „High-End“ Tractors

Basic Module + Piston Side Module Proportional + Rod Side Module Variable
Product Code: HS1-B2/25/25RV2/25/PP1/4-12E12A-B-A

Basic Module [B] for suspension-cylinder leveling
Piston Side Module Proportional [PP] for damping control
Rod Side Module Variable [RV] for fully variable spring rate control



Ports	Size
LS, PS1	M14x1,5
P, T, RS	M18x1,5
PS2, AP	M22x1,5
S	G 1/4

Application Examples

Preselected Module Combinations

Trailer - Drawbar Suspension

Basic Module + Rod Side Module Boost Plate
Product Code: HS1-B0/25/25RB/0-12E12A-B-A

Basic Module [B] for suspension-cylinder leveling
Rod Side Module Boost Plate [RB]



Ports	Size
LS, PS1	M14x1,5
P, T, RS	M18x1,5
PS2	M22x1,5
S	G 1/4

Vineyard Tractor Front Axle Suspension

Basic Module Stabilized+ Rod Side Module Characteristic
Product Code: HS1-BS2/25/25RCH5/37/60-24E3A-BV-B

Basic Module Stabilized [BS] for stabilized suspension-cylinder leveling;
no flow between suspension cylinders
Rod Side Module Characteristic [RCH] for load dependent spring rate control



Ports	Size
LS	M14x1,5
CP1, CP2	M16x1,5
P, T, RS	M18x1,5
PS2	M22x1,5
S	G 1/4

Application Examples

Preselected Module Combinations

Sprayer All Wheel Suspension

Front Axle:
Basic Module + Rod Side Module Variable
Product Code: HS1-B0/25/25RV0/25/0-24E12A-BV-A

Basic Module [B] for left suspension-cylinder leveling
Rod Side Module Variable [RV] for right suspension-cylinder leveling

Ports	Size
LS, PS1	M14x1,5
P, T, RS	M18x1,5
PS2	M22x1,5
S	G 1/4

Rear Axle:
Basic Module Stabilized
Product Code: HS1-BS2/25/25/0-24E12A-BV-A
Basic Module Stabilized [BS] for stabilized rear suspension cylinders

Ports	Size	Ports	Size
LS	M14x1,5	CP1	M16x1,5
P, T	M18x1,5	CP2	M16x1,5
PS1, PS2	M22x1,5	S	G 1/4

Application Examples

Preselected Module Combinations

Trailer - Axle Suspension

Basic Module + Rod Side Module Constant
Product Code: HS1-B0/25/25RC/60-12E12A-B-A

Basic Module [B] for suspension-cylinder leveling
Rod Side Module Constant [RC] for fixed spring rate

Ports	Size
LS, PS1	M14x1,5
P, T, RS	M18x1,5
PS2	M22x1,5
S	G 1/4

Cab Suspension

Basic Module
Product Code: HS1-B2/25/25/0-24E3A-BV-B
Basic Module [B] for level control and suspension

Ports	Size
LS, PS1	M14x1,5
P, T	M18x1,5
PS2	M22x1,5

EC Electronic Control Unit - ECU



Technical Features

- > Pre-programmed based on module configuration
- > 4 current controlled PWM outputs
- > 6 analog voltage inputs

Functional Description

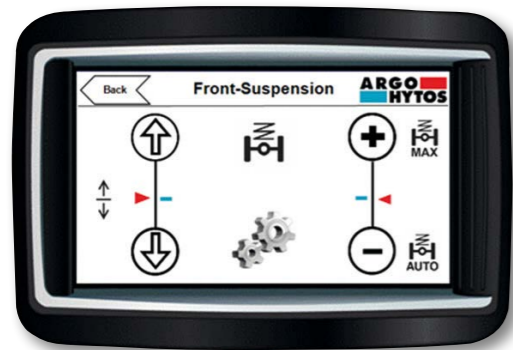
THE ELECTRONIC CONTROL UNIT (ECU) is a controller for mobile hydraulics programmed with special ARGO-HYTOS application software to control all modules of the MHPS. For this purpose, the ECU has four current controlled PWM-outputs, as well as six analog inputs (0 ... 10V), digital in+out+CAN (I/O+CAN).

Technical Data

Total dimensions	mm (in)	152x150x56 (5.98x5.90x2.20)
Plug connections		AMP 1 0967280 1, 42 PINS
Interfaces		RS 232, CAN (5080)
Supply	V	8 ... 32
Current consumption at 24 V	mA	60
Temperature range	°C (°F)	-40 ... 85 (-40 ... 185)
Weight	kg (lbs)	0,65 (1.43)
EMV		Guideline 2004/108 EG, EN 61000-6-4
		EN 61000-6-2, ISO 7637-2, EN 13309
		EN ISO 14 982, Guideline 2006/42/EG

Inputs	10	Digital switch inputs
	6	Analog inputs
Outputs	1	Power supply output, 5 V or 8 V
	1	Power supply solenoid output
	4	Proportional solenoid output
	2	Switch outputs

TD Touch Display



Technical Features

- > Pre-programmed based on module configuration
- > Easy-to-use control of the ECU
- > Usable for service purposes

Functional Description

The display unit is an optional attachment to the ECU and for general as well as for service purposes. The 4.3" TFT color graphic LCD with LED backlight has a resolution of 480x272 pixels and is connected to the ECU via CAN-bus. It is used for adjustment of the set points of level, spring rate and damping, as well as for service functions.

Technical Data

Total dimensions	mm (in)	142x98x53 (5.59x3.86x2.09)
Main connector		Tyco-AMP 1437288-6
Interfaces		RS 232, 2xCAN (5080)
Max. viewing angles	°	H ±60, V ±55
Supply	V	9 ... 36
Current consumption at 24 V	mA	max. 240
Temperature range	°C (°F)	-40 ... 85 (-40 ... 185)
EMV		Guideline 2004/108 EG, EN 61000-6-4
		EN 61000-6-2, ISO 7637-2, EN 13309
		EN ISO 14 982, Guideline 2006/42/EG

Inputs	4	configurable analog / digital inputs
Outputs	3	digital outputs

EC Angle Sensor



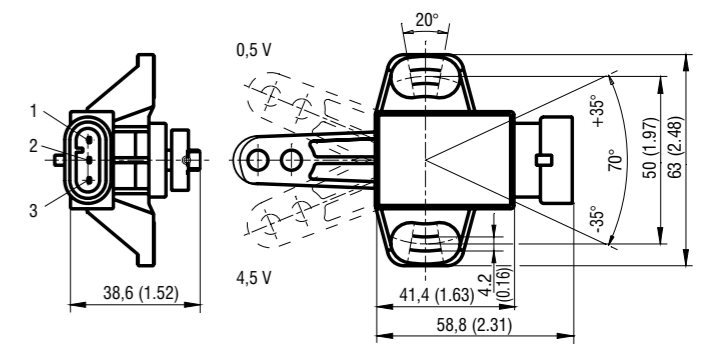
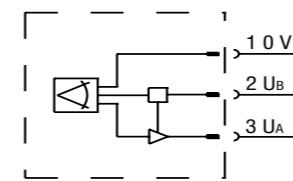
Technical Features

- > 70° angular measuring range
- > Supply 10 to 30 V DC
- > 3-PIN AMP Superseal 1.5 plug

Functional Description

A position sensor is always required for position control of the BM in combination with the ECU. The sensor has an angular measuring range of 70° based on a non-contacting measuring principle and an output signal of 0,5 to 4,5 V. Connection is done via a 3-PIN AMP Superseal 1.5 plug.

Dimensions in millimeters (inches)



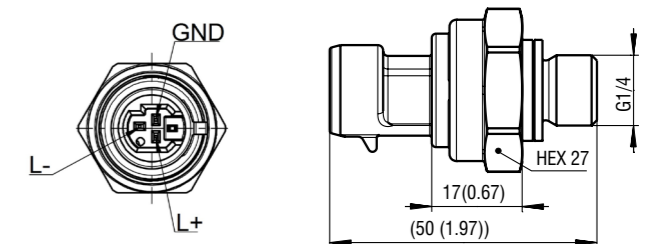
Pressure Sensor



Functional Description

The pressure sensor can be used with the BM and / or the RMV and is required for the spring rate control of the RMV in combination with the ECU. There are several types of operating pressure ranges available and it is issued as an analog voltage signal (0 to 10 V). The pressure sensors are available as well as Metri-Pack 150 version.

Dimensions in millimeters (inches)



Ordering Code

Electronic Control Unit	EC-**-EA-T0-*	as per installation
Electronic Touch Display	EC-**-E0-TA-*	as per installation
Universal Mounting Kit for Touch Display	EC-000-E0-TA-M1	32584500
Dashboard mounting Kit	EC-000-E0-TA-M2	32584700
Pressure Sensor (Metri Pack 150)	PSC 250-1844	32549300
Angle Sensor	424A17A070B	32585300

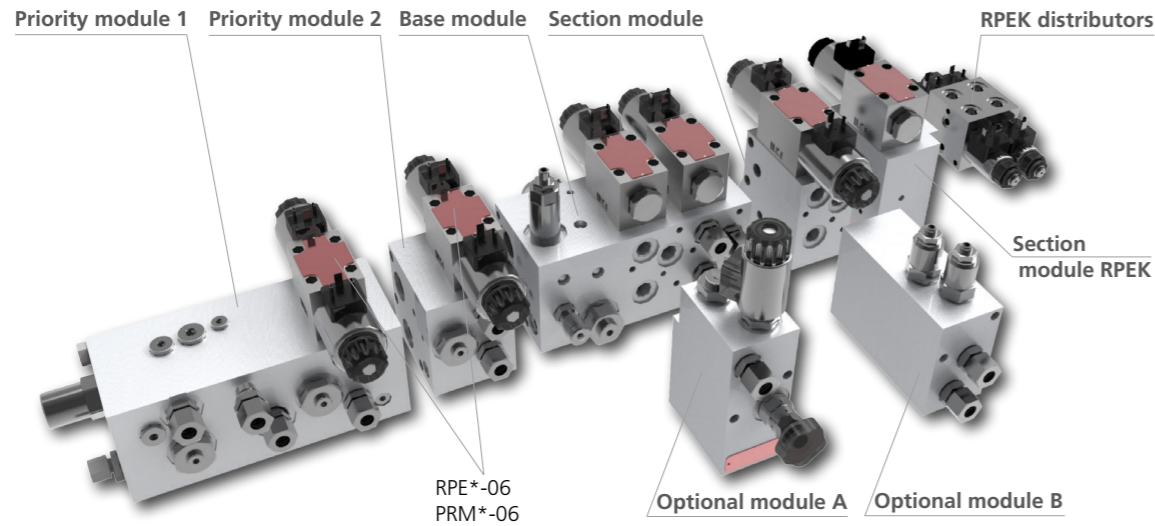
*For types and sizes of accumulators please consult with the factory.

Modular Load Sensing System

MLS3-06

Size 06 (D03) • Q_{max} 100 l/min (26.4 GPM) • p_{max} 250 bar (4600 PSI)

Possible Applications



Technical Features

- › Modular manifold system for the work hydraulics in mobile machines
- › Designed to the complex and variable demands of mobile hydraulics needs
- › Modular concept based on existing modular and screw-in valve technology by ARGO-HYTOS
- › Standard modules easily adaptable for specific applications
- › Various modules allow the integration of various options into the standard modules
- › Modules on manufacturer's stock shorten machine development time at the producers
- › Modularity offers short delivery time and flexibility in the field during validation stage
- › Load sensing control of pressure source from each working section
- › Each working section is pressure compensated for constant performance
- › Flexible modules including inlet block, section blocks, priority function (e.g. steering) or other optional blocks
- › Inlet section suitable for both LS pumps and fixed displacement pumps
- › Basic modular valves interface with sub plate mounting pattern acc. to ISO 4401, DIN 24340 (CETOP 03)

Functional Description

The MLS kit is intended for hydraulic circuits with several hydraulic actuators being used at the same time with different loads. These kit systems provide two basic functions. First, they provide a constant pressure drop on operating valves of each section. A pressure compensator in each section ensures that the flow is independent of the load on the section. The second function is energy saving. The logic valves in the MLS choose the highest pressure needed in the system for a given section. This pressure signal is connected into the LS channel, which is used to control the pressure source. The pressure source can either be a regulated pump with LS control or a fixed displacement pump. If a fixed displacement pump is used, the LS signal controls the pressure compensator (pos 6). The LS signal drives the pressure source to the required value in real-time. Therefore, no energy is wasted on the relief valve, which must be set to the highest expected pressure.

MLS modular kits consist of the following modules

Priority module P1

The module with a priority valve, pressure compensator and one integrated main consumer establishes a supply to consumers in the first priority.

Priority module P2

The module for the second priority consumer function is attached to the „Priority module 1“.

Base module B

The inlet module with pressure compensator realizes a LS pressure depending on the need of the consumers and has 2 consumer sections. The consumer ports are flangeable to optional modules A and B. The LS signal of the base module can be electrically unloaded.

Section module S

The section module is used in cases where additional consumer functions are needed. It is flangeable to the base module as well, the consumer port side is flangeable to optional modules A and B.

Section module SRPEK

The SRPEK module is designed to connect two or more RPEK1-03 valves via two pressure compensators.

Optional modules A and B

These modules enable additional functions at the consumer side, such as load holding, electrical cylinder unload etc.

Design Recommendations

Relief and unloading of the LS line:

In the MLS system only one relief valve on the main P line is implemented, therefore the used LS pump must have its own relief of the LS line. The LS line pressure in the Base module of the system can be released to the tank by an electrical unloading valve.

Technical specifications of the module:

The specified values for operating pressure, flow rate and temperatures in the technical documentation are consistent with the values for the recommended valves in the ARGO-HYTOS program.

Operation at low temperatures:

Minimum storage temperature: -30 °C (-22 °F)
Minimum operating temperature: -20 °C (-4 °F)

Attention should be paid to the viscosity at cold start, as highly viscous media may cause cavitation. The listed viscosity limits have to be observed. Refer to the datasheet „General Information“ GI_0060 (Products and operating conditions) for basic recommendations.

- › New components have to be filled at higher temperatures to ensure sufficient lubrication
- › Low temperature measures for pumps, filters, cylinders, gears, etc. have to be coordinated with the manufacturers

Warm-up instructions:

- › Warm up the system to a least -30 °C (-22 °F), start engine
- › Set pumps to neutral position without flow
- › Use pumps for at least 10 min at idle speed
- › Afterward swivel pumps slowly or use them in pressure-reduced mode (max. 50 bar and 50 % flow)
- › Activate all system functions for some time without load
- › Continuously circulate flow through all components to avoid temperature shocks
 - › Temperature difference between media and component should not exceed 20 °C (68 °F)
- › On hydraulic motors ensure passage between flush and leakage port (permitted housing pressure)
- › System is ready for use at temperatures over -20 °C (-4 °F)

Inlet modules (Priority 1 and Base module):

Influence of the inlet pressure compensator and the individual pressure compensator on the flow:

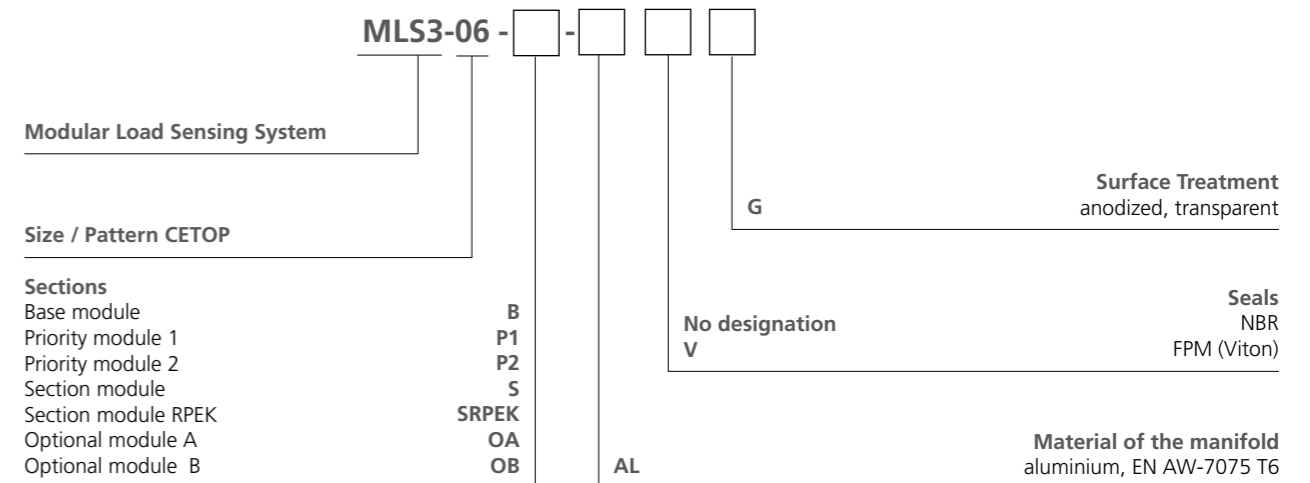
The size of the spring used in the inlet pressure compensator determines the flow in the complete system. The spring must always be bigger than the ones in the following individual pressure compensators of the consumer sections. We recommend that the inlet spring shall be set to 10 bar above the maximum required value so that the demanded flow at the biggest consumer is only overridden a little. The spring rate of the individual pressure compensator is selected according to the inlet pressure compensator. The spring pressure should be around 2-3 bar lower than the inlet.

If the chosen individual pressure compensator begins throttling the oil flow too early – the installed spring is too weak.

Position of the modules in the complete system:

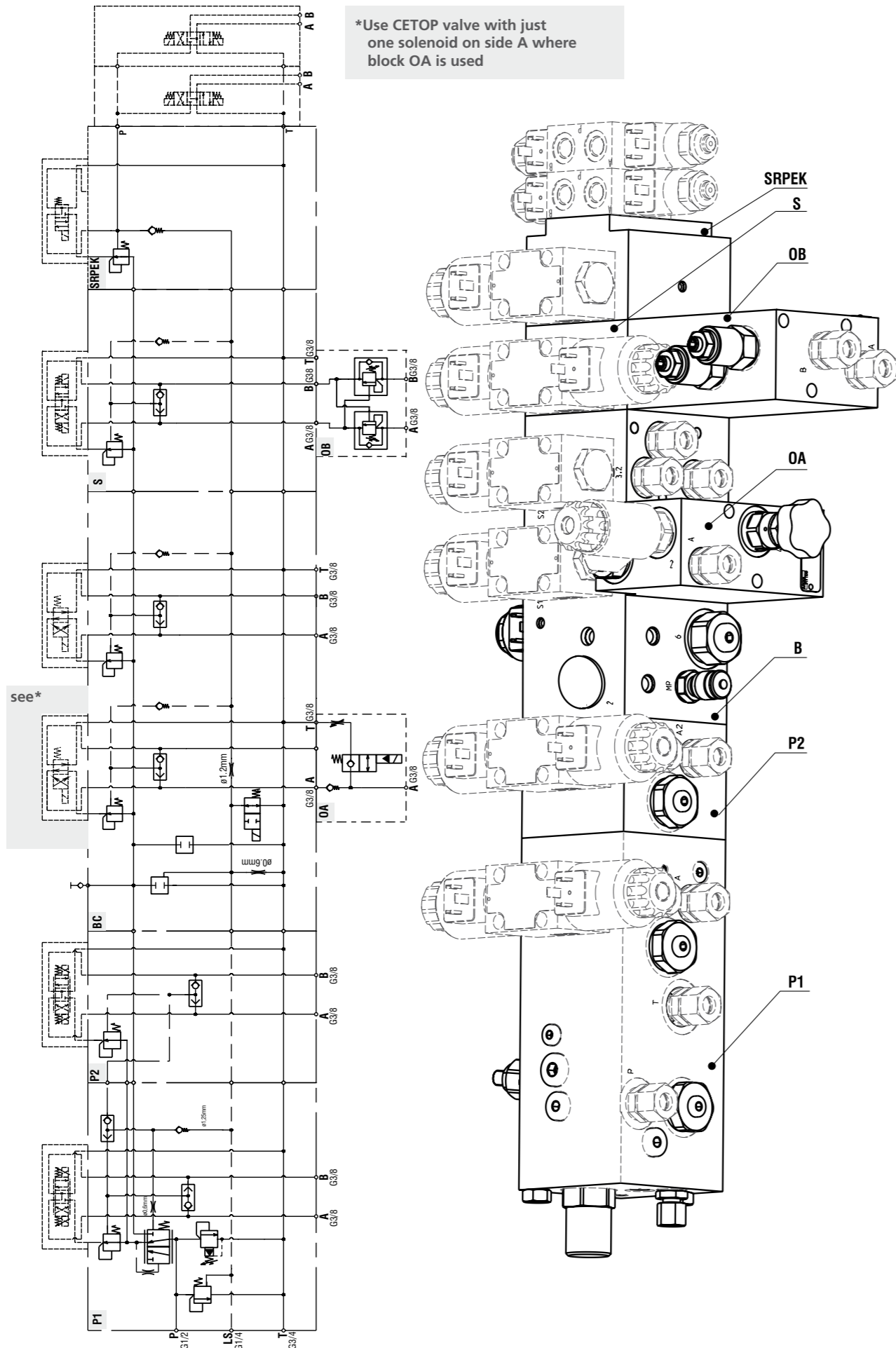
The module (function module) with the highest flow has to be directly installed at the inlet module. Smaller consumers follow. The smallest consumers (e.g. cylinder functions) have to be mounted at the end as RPEK distributors.

Ordering Code



The modules have to be ordered separately. All modules are supplied only with the valves necessary for the functions. The valves depending on the circuit variations need to be ordered separately. Completely assembled MLS modules in one solution are possible. Contact our technical support for their specification, identification and feasibility.

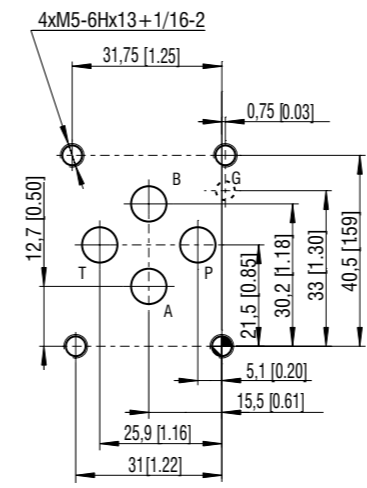
Illustrative Picture



*Use CETOP valve with just one solenoid on side A where block OA is used

Technical Data

ISO 4401-03-02-0-05



Ports P, A, B, T max. \varnothing 7.5 mm (0.29 in)

Modular valves mounting surface		06 (D03)
Max. operating pressure (Al)	bar (PSI)	250 (3626)
Max. flow	l/min (GPM)	100 (26.4)
Port dimensions	T ...	G3/4
	P ...	G1/2
	A, B, P ...	G3/8
	LS ...	G1/4
Mass (Al)	B	5.3 (11.68)
	P1	6.0 (13.23)
	P2	2.0 (4.41)
	S	1.55 (3.42)
	SRPEK	1.68 (3.70)
	OA	2.2 (4.85)
	OB	2.4 (5.29)

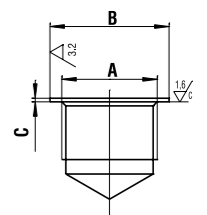
Studrods

Modular combination	Studrod (Al)	Ordering number	Optional module	Bolts DIN 912-10.9
OA (M8)	M8x127	20204400	OA	M8x110 + washer + spring washer
OB (M8)	M8x171	20205000	OB	M8x160 + washer + spring washer
B+P1	M10x270	24607700	B+S (or B+SRPEK)	M10x80 + washer + spring washer
B+P1+P2	M10x350	23701400	Bolts, nuts and washers are not delivered.	
B+2S	M10x160	23704300		
B+3S	M10x220	on request		
B+4S	M10x280	23710100		
B+5S	M10x340	on request		



Threaded Chambers for the MLS3-06

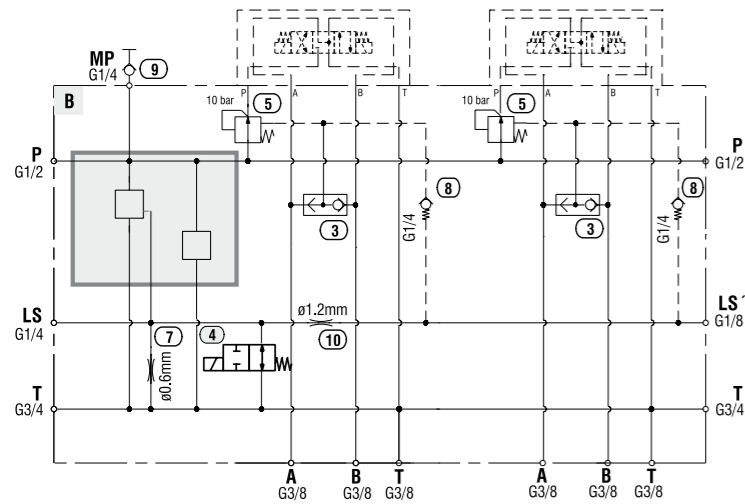
	Dimensions in millimeters (inches)									
	G1/8		G1/4		G3/8		G1/2		G3/4	
A										
B	15.45	(0.608)	20.7	(0.815)	27.1	(1.067)	34.5	(1.358)	39	(1.535)
C	1.3	(0.051)	2	(0.079)	2	(0.079)	2	(0.079)	2	(0.079)
O-rings (NBR)	12.42x1.78		15.54x2.62		22.22x2.62		29.82x2.62		34.59x2.62	
Ordering number	20130000		20150600		20146300		19906700		20149200	





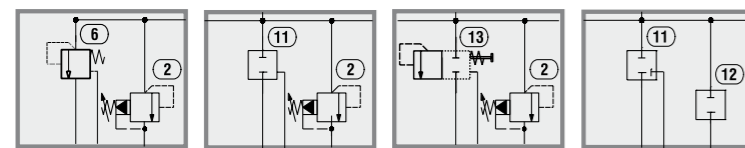
Description

The inlet base module with pressure compensator realizes a LS pressure depending on the consumer demand. This ensures that always the highest pressure required will be provided by the LS pump. If there are no consumers active, there will be an unpressurized flow corresponding to the pressure compensator. It is possible to flange-on priority modules on one side and sectional modules from the other side.
The inlet base module MLS3-06-B* includes two consumer sections for the installation of control valves with subplate mounting interface acc. to ISO 4401, DIN 24340 (CETOP 03).



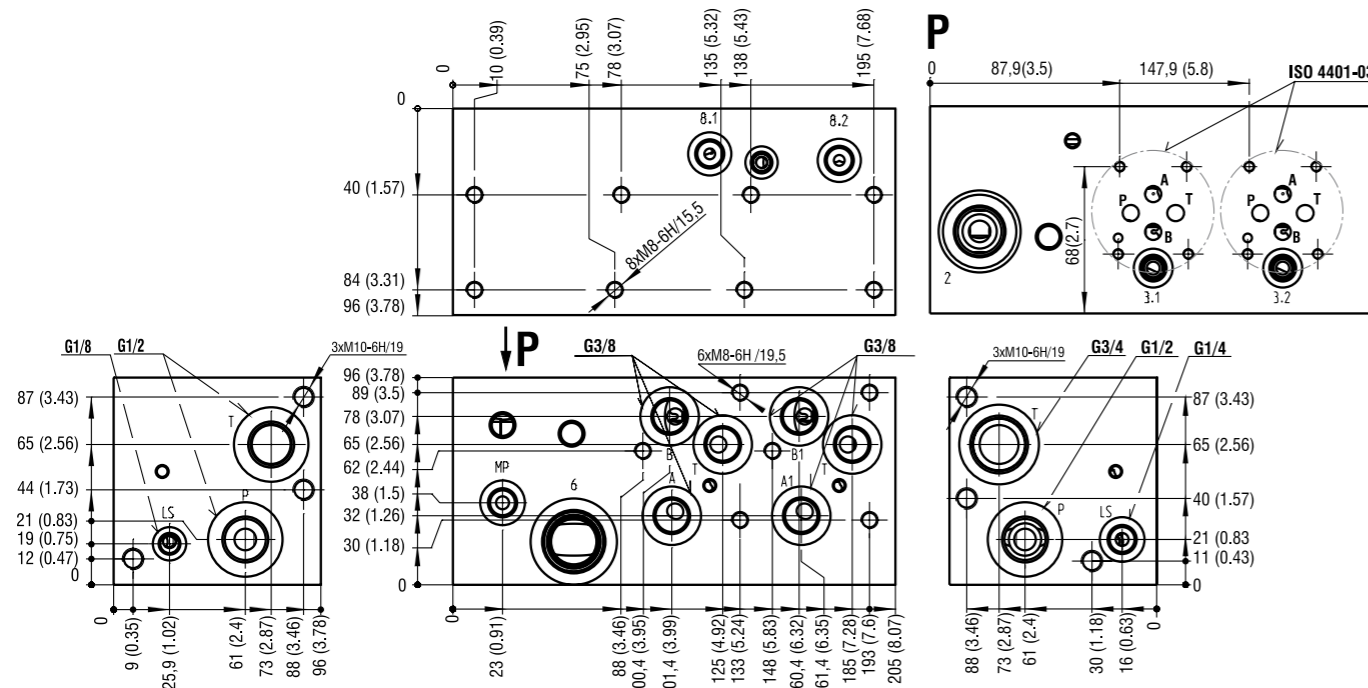
MLS3-06-B includes:		Ordering number => 33985000		
Pos.	Description	Type	Pcs	Ordering number
1	Manifold block		1	32035101
3	Shuttle valve	LV2-043	2	28944700
5	Pressure compensator	TV2-102/S1C-A	2	15959501
7	Orifice	M6-060	1	27380600
8	Check valve	VJ01-06/SG002-1	2	15949400
9	Minimess	2103-01-18.00 G1/4	1	20424800
10	Orifice	M6-120	1	18181600

i The grey marked valves are not included when MLS3-06-B modules are ordered. The combination of valves is application specific.



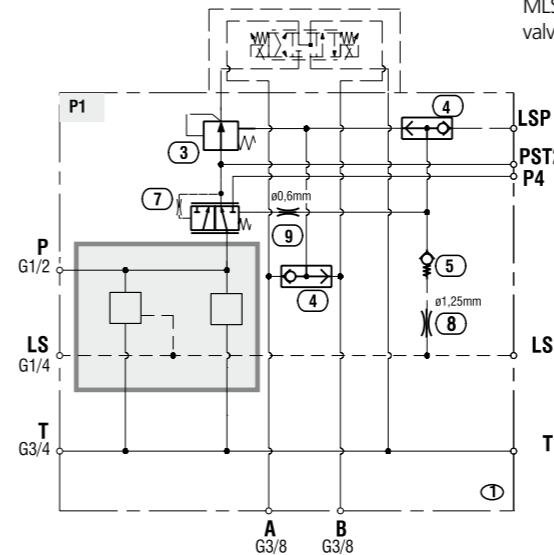
Fixed displacement pump Load sensing pump Switchable fixed displacement and load sensing pump MLS3-06-B combination with MLS3-06-P1 (P2)

Order separately other recommended items:		Data sheet/ Ord. No.	
2	Pressure relief valve	SR4A-B2/H35S-A	1 HA 5065
4	2/2 Direct. control valve	SD2E-A2/H2111-A	1 HA 4040
	Coil	C 19B*	1 HA 8007
6	Pressure compensator	TV2-103/S2C-A	1 22747901
11	Cavity plug	SCP-QM3/XXX-A	1 24493100
12	Cavity plug	SCP-B2/XX-A	1 19356300
13	Pressure compensator	TV2-103/S14F	1 34637900



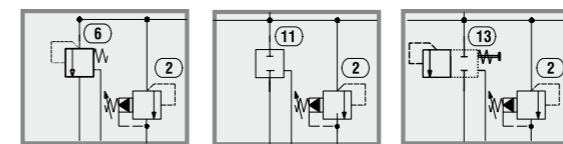
Description

The inlet module with a priority valve and one integrated main consumer implements the supply flow to consumers in the first priority and in second priority, and from there to the other sections. Typical priority 1 functions are steering (open- or closed-center), priority 2 functions include work hydraulics. The flow in priority consumers is supplied by a pressure compensator valve. In the third priority it is possible to use the integrated consumer in proportional mode. Supply and overpressure protection is achieved by a pressure compensator with integrated relief function of the main P line. If there are no consumers active there will be an unpressurized flow corresponding to the pressure compensator. It is possible to flange-on modules on one side. The inlet priority module MLS3-06-P1* includes one consumer section with priority flow for the installation of a control valve with subplate mounting interface acc. to ISO 4401, DIN 24340.



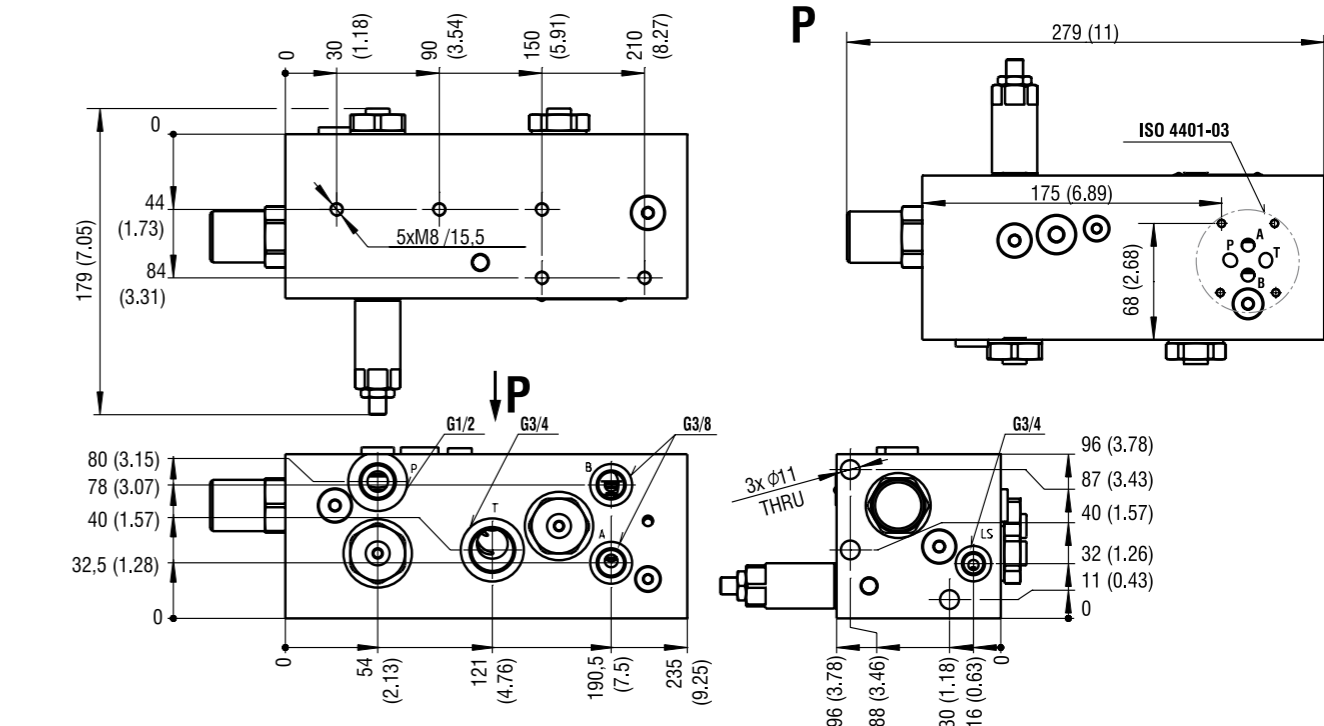
MLS3-06-P1 includes:		Ordering number => 33984800		
Pos.	Description	Type	Pcs	Ordering number
1	Manifold block		1	34344400
4	Shuttle valve	LV2-043	2	28944700
5	Check valve	VJ01-06/SG002-1	1	15949400
3	Pressure compensator	TV2-102/S1C-A	1	15959501
7	Priority valve	EC 12-42-0-N-160	1	30936800
8	Orifice	M6-125	1	30666200
9	Orifice	M6-060	1	27380600
	O-rings	12.42x1.78	1	20130000
		15.54x2.62	2	20150600
		29.82x2.62	1	19906700
		34.59x2.62	1	20149200

i The grey marked valves are not included when MLS3-06-P1 modules are ordered. The combination of valves is application specific.



Fixed displacement pump Load sensing pump Switchable fixed displacement and load sensing pump

Order separately other recommended items:		Data sheet/ Ord. No.	
2	Pressure relief valve	SR4A-B2/H35S-A	1 HA 5065
6	Pressure compensator	TV2-103/S2C-A	1 22747901
11	Cavity plug	SCP-QM3/XXX-A	1 24493100
12	Cavity pug	SCP-B2/XX-A	1 19356300
13	Pressure compensator	TV2-103/S14F	1 34637900



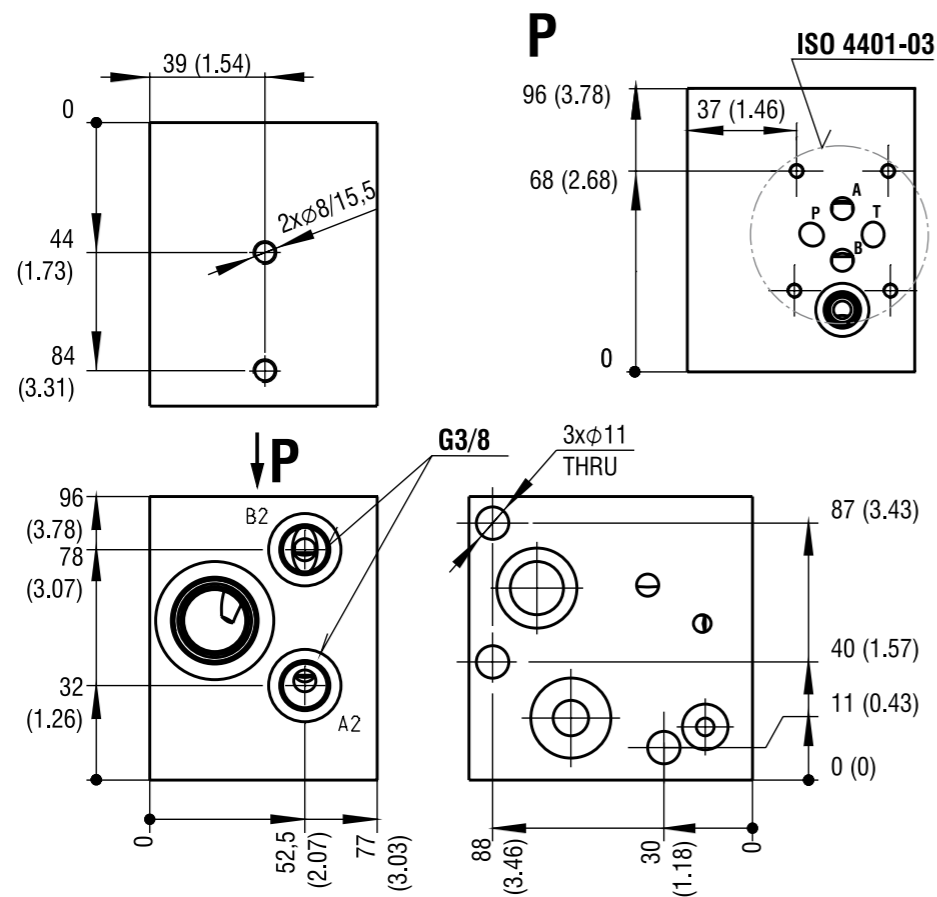
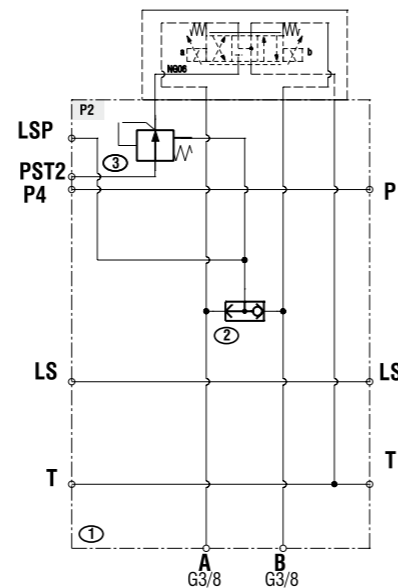


Description

The Priority module 2 and Section block „S“ implement an on/off or proportional consumer supply depending on the valve installation. The Priority module 2 extends the Priority module 1 while the Section block „S“ extends the Base module. They are used in situations when additional consumers need to be operated. Sections are always compensated with 2-way pressure compensators. The LS signal is reported via check valves.

Note: The modules are not interchangeable.

MLS3-06-P2 includes:		Ordering number => 33984900	
Pos.	Description	Type	Ordering number
1	Manifold block		34338400
2	Shuttle valve	LV2-043	28944700
3	Pressure compensator	TV2-102/S1C-A	15959501
	O-rings	12.42x1.78	20130000
		22.22x2.62	20146300

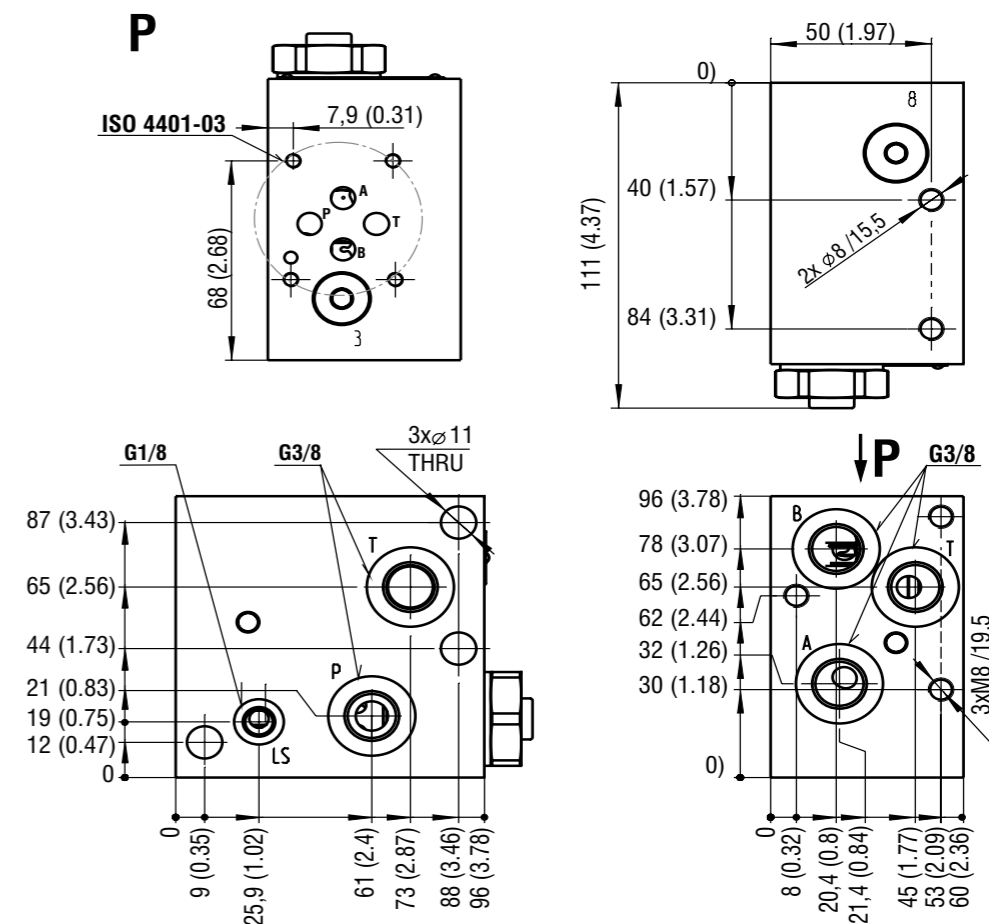
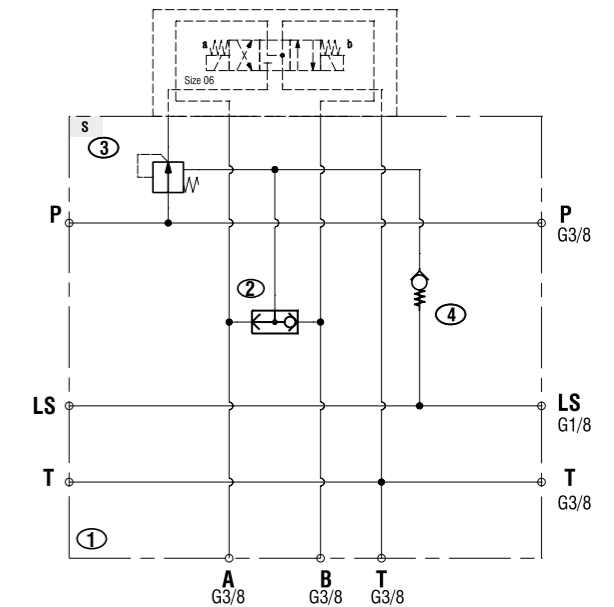


Description

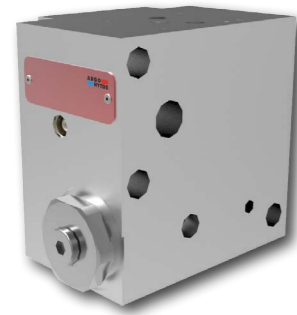
The Priority module 2 and Section block „S“ implement an on/off or proportional consumer supply depending on the valve installation. The Priority module 2 extends the Priority module 1 while the Section block „S“ extends the Base module. They are used in situations when additional consumers need to be operated. Sections are always compensated with 2-way pressure compensators. The LS signal is reported via check valves.

Note: The modules are not interchangeable.

MLS3-06-S includes:		Ordering number => 31788001	
Pos.	Description	Type	Ordering number
1	Manifold block		32032101
2	Shuttle valve	LV2-043	28944700
3	Pressure compensator	TV2-102/S1C-A	15959501
4	Check valve	VJ01-06/SG002-1	15949400
	O-rings	12.42x1.78	20130000
		22.22x2.62	20146300
		29.82x2.62	19906700



MLS3-06-SRPEK*/* Modular Load Sensing System - Section Module SRPEK

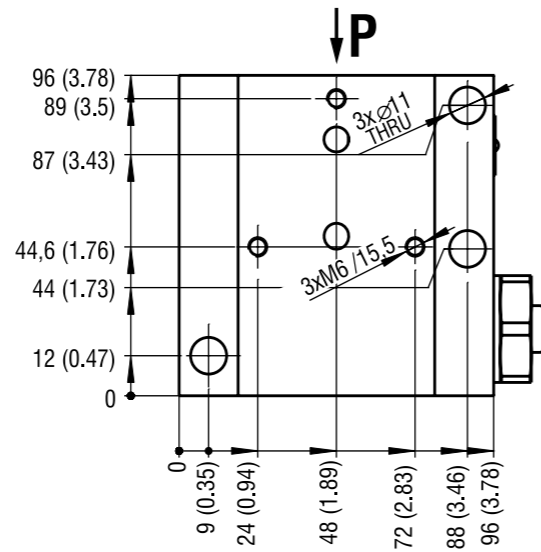
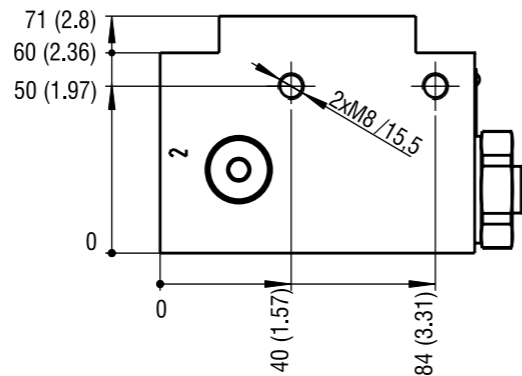
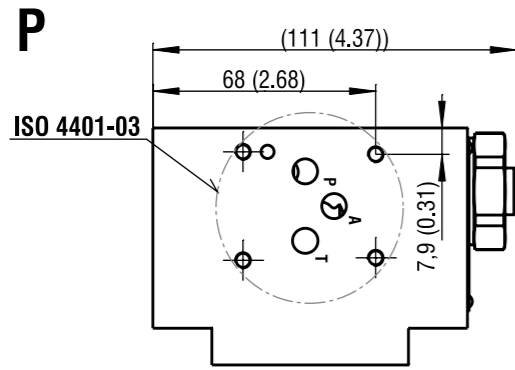
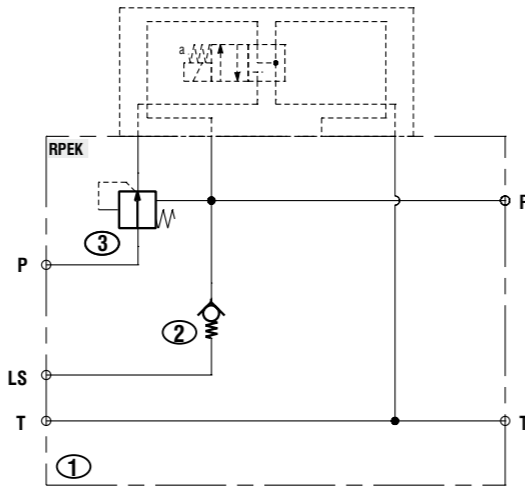


Description

Section module SRPEK
The SRPEK module is designed to connect two or more RPEK1-03 valves via two pressure compensators.

MLS3-06-SRPEK includes: Ordering number ⇒ **31788101**

Pos.	Description	Type	Pcs	Ordering number
1	Manifold block		1	32027801
2	Check valve	VJO1-06/SG002-1	1	15949400
3	Pressure compensator	TV2-102/S1C-A	1	15959501
	O-rings	12.42x1.78	1	20130000
		22.22x2.62	3	20146300
		29.82x2.62	2	19906700



MLS3-06-OA(OB)*/* Modular Load Sensing System - Optional Block

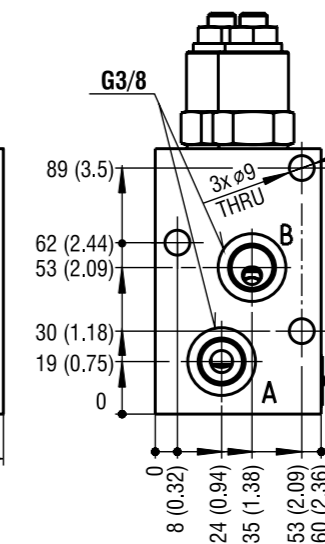
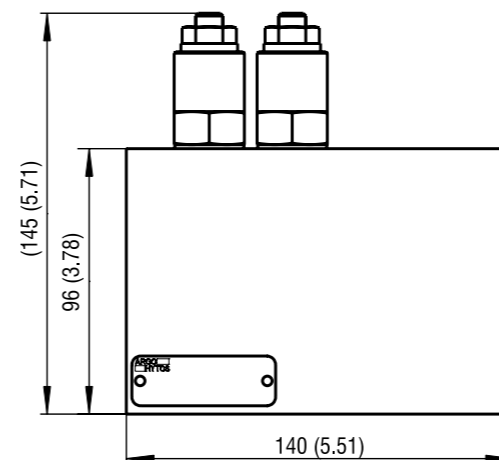
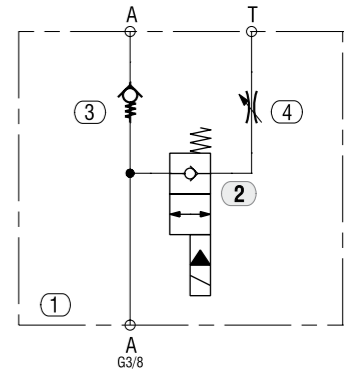
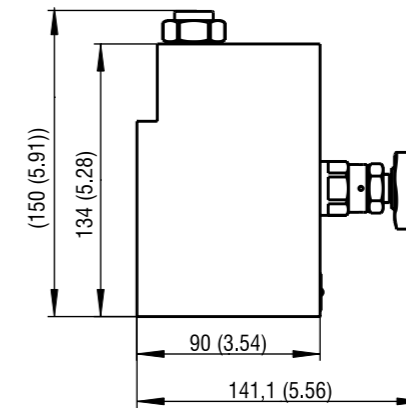
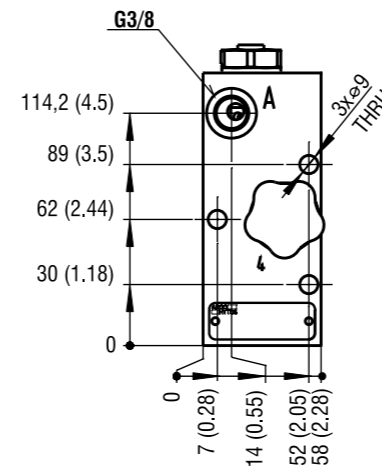


Description

OA (OB) is an optional block that may be connected to output ports of the sections. Use a CETOP valve with just one solenoid on side A where block OA is used - see page 3.

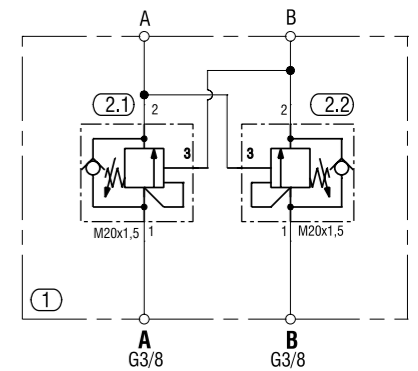
MLS3-06-OA includes: Ordering number ⇒ **31787700**

Pos.	Description	Type	Pcs.	Data sheet/ Ord. No.
1	Manifold block		1	32032900
3	Check valve	SC1F-B2/H005	1	27835000
4	Needle-restrictor valve 7/8" UNF	SF21M-B2/H4	1	27853600
	O-rings	22.22x2.62	3	20146300
Order separately the other recommended items:				
2	2/2 Directional control valve	SD3E-B2/H2L2M9	1	HA 4063
	Coil	C22B*	1	HA 8007



MLS3-06-OB includes: Ordering number ⇒ **33985100**

Pos.	Description	Type	Pcs.	Ordering number
1	Manifold block		1	34336100
2	Over center valve	SO5A-Q3/I5	2	15628200
	O-rings	22.22x2.62	3	20146300

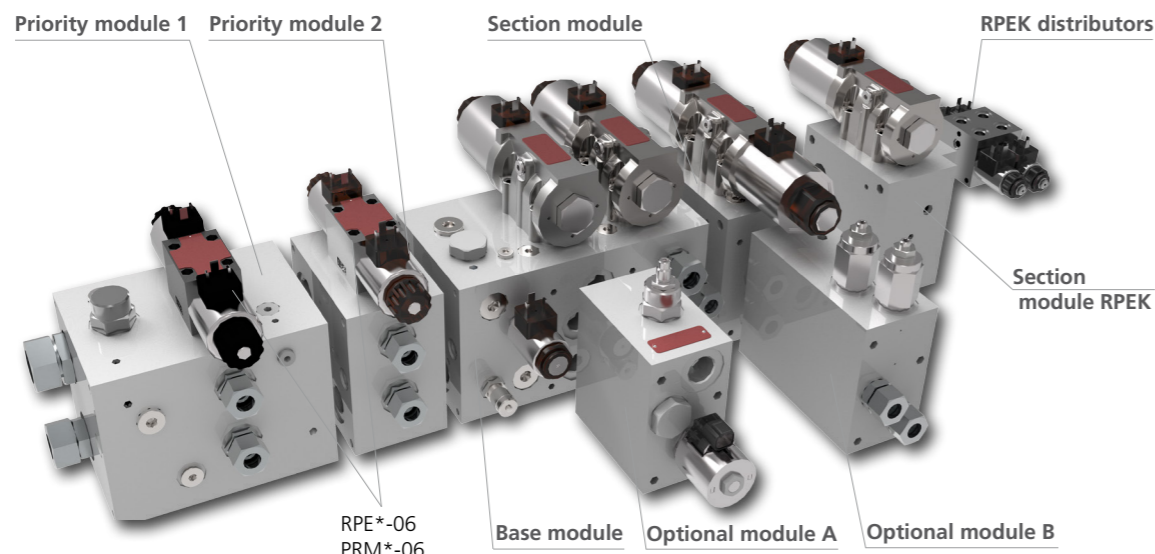


Modular Load Sensing System

MLS3-10

Size 10 (D05) • Q_{max} 150 l/min (39.6 GPM) • p_{max} 250 bar (4600 PSI)

Possible Applications



Technical Features

- › Modular manifold system for the work hydraulics in mobile machines
- › Designed to the complex and variable demands of mobile hydraulics needs
- › Modular concept based on existing modular and screw-in valve technology by ARGO-HYTOS
- › Standard modules easily adaptable for specific applications
- › Various modules allow the integration of various options into the standard modules
- › Modules on manufacturer's stock shorten machine development time at the producers
- › Modularity offers short delivery time and flexibility in the field during validation stage
- › Load sensing control of pressure source from each working section
- › Each working section is pressure compensated for constant performance
- › Flexible modules including inlet block, section blocks, priority function (e.g. steering) or other optional blocks
- › Inlet section suitable for both LS pumps and fixed displacement pumps
- › Basic modular valves interface with sub plate mounting pattern acc. to ISO 4401, DIN 24340 (CETOP 05)

Functional Description

The MLS kit is intended for hydraulic circuits with several hydraulic actuators being used at the same time with different loads. These kit systems provide two basic functions. First, they provide a constant pressure drop on operating valves of each section. A pressure compensator in each section ensures that the flow is independent of the load on the section. The second function is energy saving. The logic valves in the MLS choose the highest pressure needed in the system for a given section. This pressure signal is connected into the LS channel, which is used to control the pressure source. The pressure source can either be a regulated pump with LS control or a fixed displacement pump. If a fixed displacement pump is used, the LS signal controls the pressure compensator (pos 6). The LS signal drives the pressure source to the required value in real-time. Therefore, no energy is wasted on the relief valve, which must be set to the highest expected pressure.

MLS modular kits consist of the following modules

Priority module P1

The module with a priority valve, pressure compensator and one integrated main consumer establishes a supply to consumers in the first priority.

Priority module P2

The module for the second priority consumer function is attached to the „Priority module 1“.

Base module B

The inlet module with pressure compensator realizes a LS pressure depending on the need of the consumers and has 2 consumer sections. The consumer ports are flangeable to optional modules A and B. The LS signal of the base module can be electrically unloaded.

Section module S

The section module is used in cases where additional consumer functions are needed. It is flangeable to the base module as well, the consumer port side is flangeable to optional modules A and B.

Section module SRPEK

The SRPEK module is designed to connect two or more RPEK1-03 valves via two pressure compensators.

Optional modules A and B

These modules enable additional functions at the consumer side, such as load holding, electrical cylinder unload etc.

Projecting recommendations

Relief and unloading of the LS line:

In the MLS system only one relief valve on the main P line is implemented, therefore the used LS pump must have its own relief of the LS line. The LS line pressure in the Base module of the system can be released to the tank by an electrical unloading valve.

Technical specifications of the module:

The specified values for operating pressure, flow rate and temperatures in the technical documentation are consistent with the values for the recommended valves in the ARGO-HYTOS program.

Operation at low temperatures:

Minimum storage temperature: -30 °C (-22 °F)

Minimum operating temperature: -20 °C (-4 °F)

Attention should be paid to the viscosity at cold start, as highly viscous media may cause cavitation. The listed viscosity limits have to be observed. Refer to the datasheet „General Information“ GI_0060 (Products and operating conditions) for basic recommendations.

- › New components have to be filled at higher temperatures to ensure sufficient lubrication
- › Low temperature measures for pumps, filters, cylinders, gears, etc. have to be coordinated with the manufacturers

Warm-up instructions:

- › Warm up the system to a least -30 °C (-22 °F), start engine
- › Set pumps to neutral position without flow
- › Use pumps for at least 10 min at idle speed
- › Afterward swivel pumps slowly or use them in pressure-reduced mode (max. 50 bar and 50 % flow)
- › Activate all system functions for some time without load
- › Continuously circulate flow through all components to avoid temperature shocks
- › Temperature difference between media and component should not exceed 20 °C (68 °F)
- › On hydraulic motors ensure passage between flush and leakage port (permitted housing pressure)
- › System is ready for use at temperatures over -20 °C (-4 °F)

Inlet modules (Priority 1 and Base module):

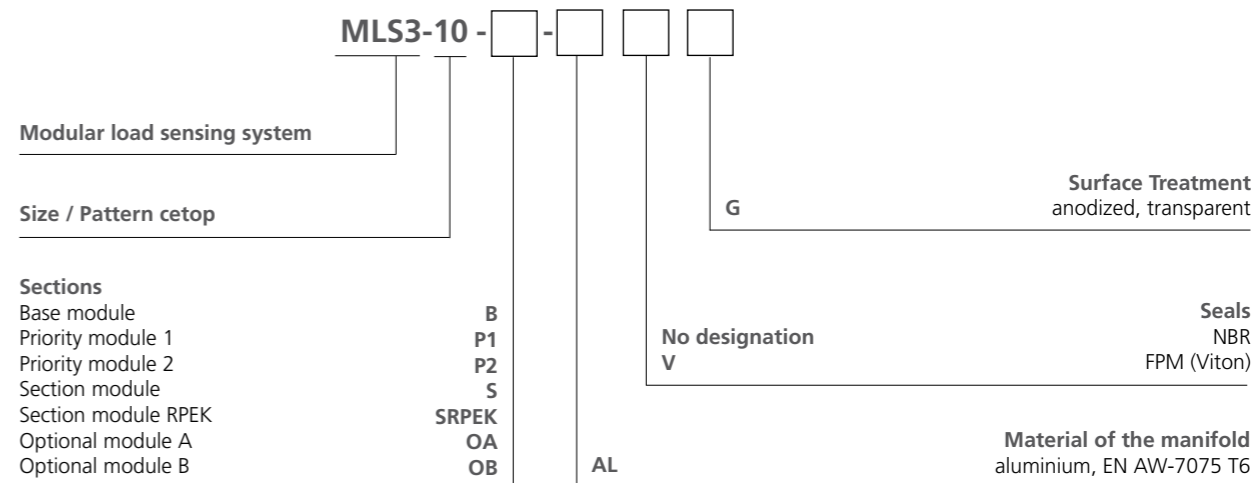
Influence of the inlet pressure compensator and the individual pressure compensator on the flow:

The size of the spring used in the inlet pressure compensator determines the flow in the complete system. The spring must always be bigger than the ones in the following individual pressure compensators of the consumer sections. We recommend that the inlet spring shall be set to 10 bar above the maximum required value so that the demanded flow at the biggest consumer is only overridden a little. The spring rate of the individual pressure compensator is selected according to the inlet pressure compensator. The spring pressure should be around 2-3 bar lower than the inlet. If the chosen individual pressure compensator begins throttling the oil flow too early – the installed spring is too weak.

Position of the modules in the complete system:

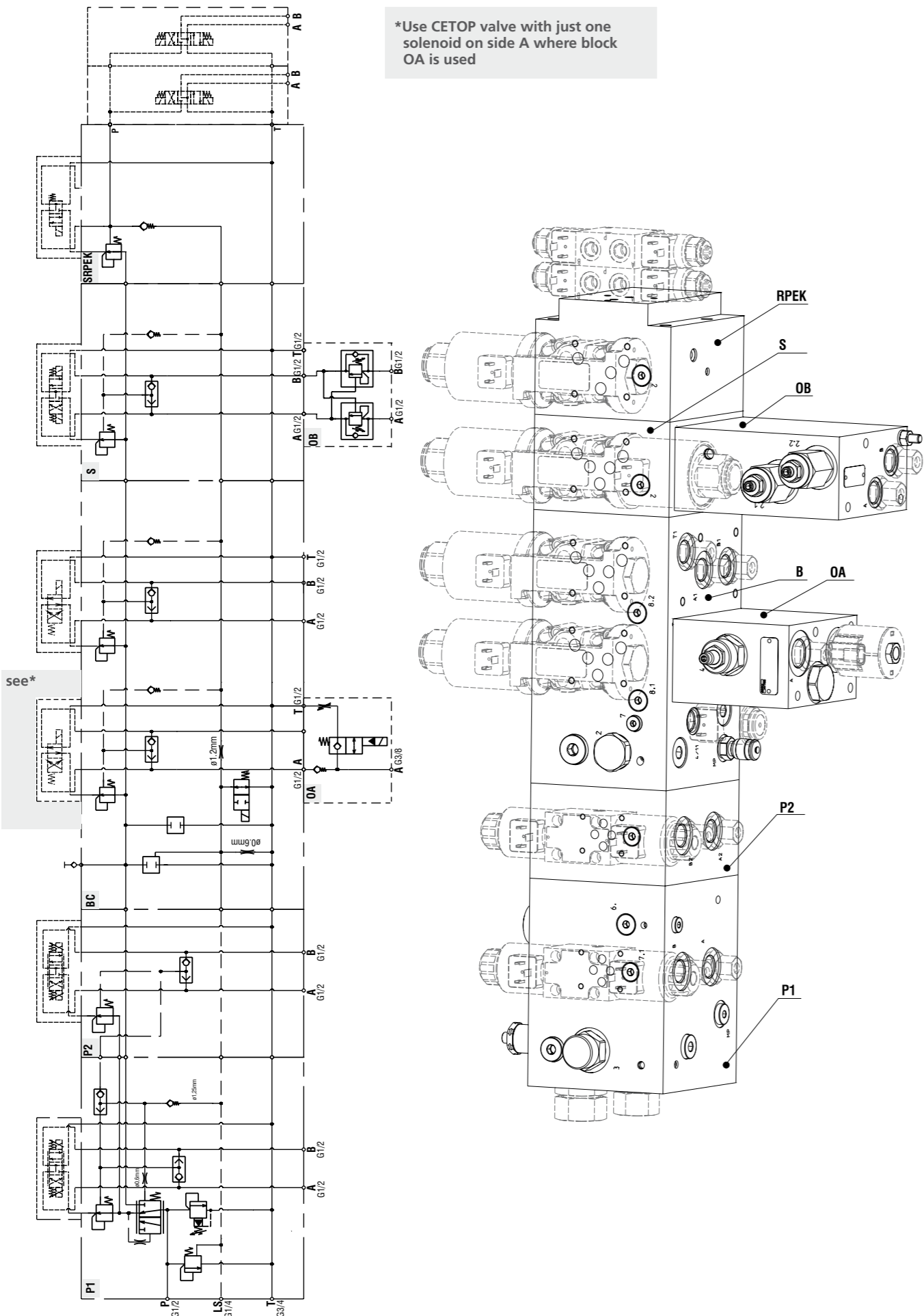
The module (function module) with the highest flow has to be directly installed at the inlet module. Smaller consumers follow. The smallest consumers (e.g. cylinder functions) have to be mounted at the end as RPEK distributors.

Ordering Code



The modules have to be ordered separately. All modules are supplied only with the valves necessary for the functions. The valves depending on the circuit variations need to be ordered separately. Completely assembled MLS modules in one solution are possible. Contact our technical support for their specification, identification and feasibility.

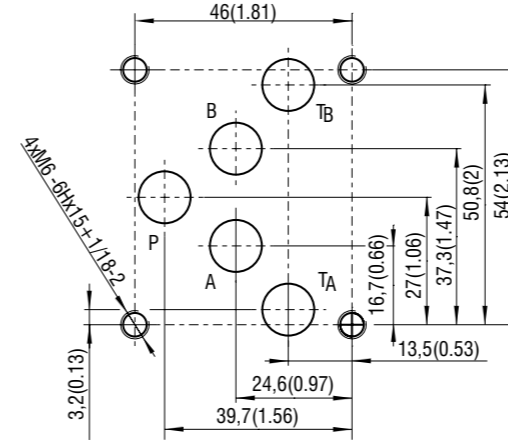
Illustrative Picture



*Use CETOP valve with just one solenoid on side A where block OA is used

Technical Data

ISO 4401-05-04-0-05



Ports P, A, B, T - max. Ø11.2 mm (0.44 in)

Modular valves mounting surface		10 (D05)
Max. operating pressure (Al)	bar (PSI)	250 (3626)
Max. flow	l/min (GPM)	150 (39.6)
Port dimensions	T ...	G1
	P ...	G3/4
	A, B, P ...	G1/2
	LS ...	G1/4
Mass (Al)	B	13.7 (0.54)
	P1	10.4 (0.57)
	P2	4.8 (0.19)
	S	4.8 (0.19)
	SRPEK	5.5 (0.22)
	OA	3.4 (0.13)
	OB	4.7 (0.19)

Studrod

Studrods / Bolts MLS3-10

Modular combination	Studrod (Al)	Ordering number
OA	M8x153	20204700
OB	M8x197	20205400
B+P1	M8x227	20205700
B+P1+P2	M8x304	23378800
B+S (or B+SRPEK)	M10x125	on request
B+2S	M10x215	23707100
B+3S	M10x300	on request
B+4S	M10x390	33788400
B+5S	M10x470	on request

Optional module	Bolts DIN 912-10.9
OA	M8x140 + wascher + spring wascher
OB	M8x190 + wascher + spring wascher

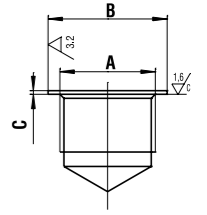
Bolts, nuts and washers are not delivered.



Studrods are not part of delivery but can be ordered.

Threaded Chambers for the MLS3-10

Ports	Dimensions in millimeters (inches)									
	G1/8		G1/4		G1/2		G3/4		G1	
A	15.45	(0.608)	20.7	(0.815)	34.5	(1.358)	39	(1.453)	46	(1.811)
B	1.3	(0.051)	2	(0.079)	2	(0.079)	2	(0.079)	2	(0.079)
C	12.42x1.78		15.54x2.62		29.82x2.62		34.59x2.62		40.94x2.62	
O-rings (NBR)	12.42x1.78		15.54x2.62		29.82x2.62		34.59x2.62		40.94x2.62	
Ordering number	20130000		20150600		19906700		20149200		20149700	





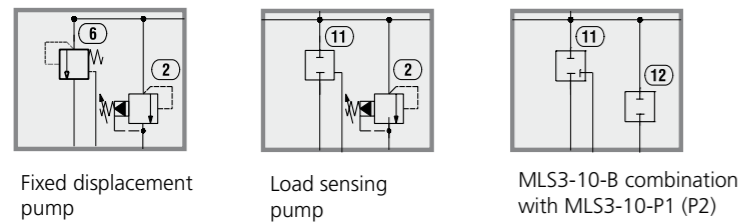
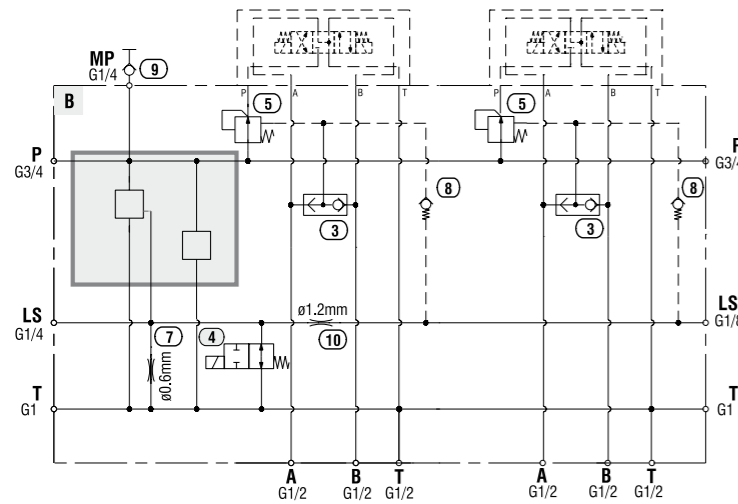
Description

The inlet base module with pressure compensator realizes a LS pressure depending on the consumer demand. This ensures that always the highest pressure required will be provided by the LS pump. If there are no consumers active, there will be an unpressurized flow corresponding to the pressure compensator. It is possible to flange-on priority modules on one side and sectional modules from the other side.
The inlet base module MLS3-10-B* includes two consumer sections for the installation of control valves with subplate mounting interface acc. to ISO 4401, DIN 24340 (CETOP 05).

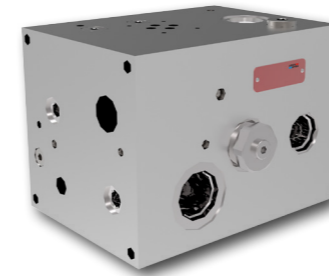
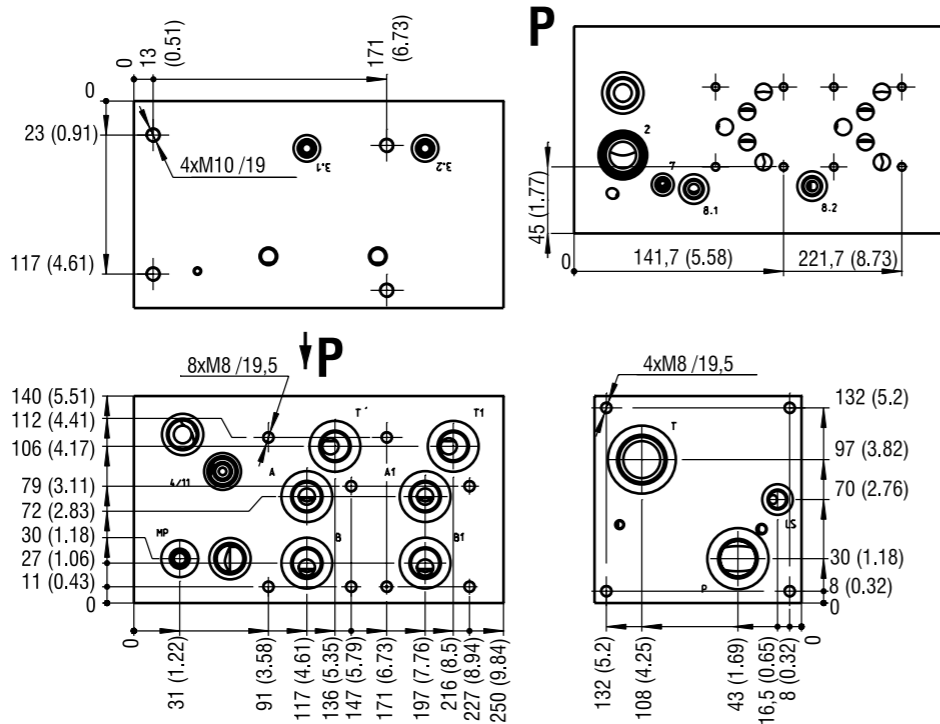
MLS3-10-B includes:		Ordering number => 33134300		
Pos.	Description	Type	Pcs	Ordering number
1	Manifold block		1	33351500
3	Shuttle valve	LV2-043	2	28944700
5	Pressure compensator	TV2-102/S1C-A	2	15959501
7	Orifice	M6-060	1	27380600
8	Check valve	VJO1-06/SG002-1	2	15949400
9	Minimess	2103-01-18.00 G1/4	1	20424800
10	Orifice	M6-120	1	18181600

i The grey marked valves are not included when MLS3-10-B modules are ordered. The combination of valves is application specific.

Order separately other recommended items:		Data sheet/ Ord. No.	
2	Pressure relief valve	VPN2-10/S-32SS	1 HA 5154
4	Direct. control valve	SD2E-A2/H2L11	1 HA 4040
	Coil	C19B*	1 HA 8007
6	Pressure compensator	EP12-S35T-0-P-240	1 29790600
11	Cavity plug	CP12-S30-N	1 32077700
12	Cavity plug	SCP-QK2/XX-A	1 19433600



Fixed displacement pump Load sensing pump MLS3-10-B combination with MLS3-10-P1 (P2)



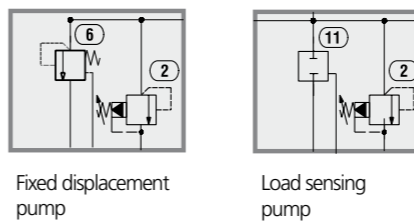
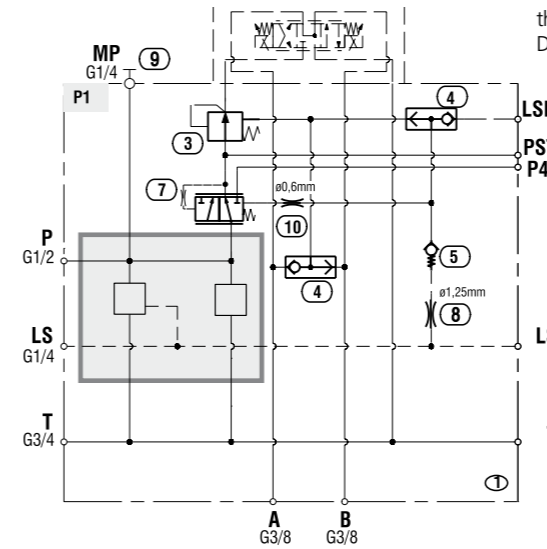
Description

The inlet module with a priority valve and one integrated main consumer implements a supply flow to consumers in the first priority and in the second priority, and from there to the other sections. Typical priority 1 functions are steering (open- or closed-center), priority 2 functions include the work hydraulics. The flow in priority consumers is supplied by a pressure compensator valve. In the third priority it is possible to use the integrated consumer in proportional mode. Supply and overpressure protection is achieved by a pressure compensator with integrated relief function of the main P line. If there are no consumers active there will be an unpressurized flow corresponding to the pressure compensator. It is possible to flange-on modules on one side.
The inlet priority module MLS3-10-P1* includes one consumer section with priority flow for the installation of a control valve with subplate mounting interface acc. to ISO 4401, DIN 24340.

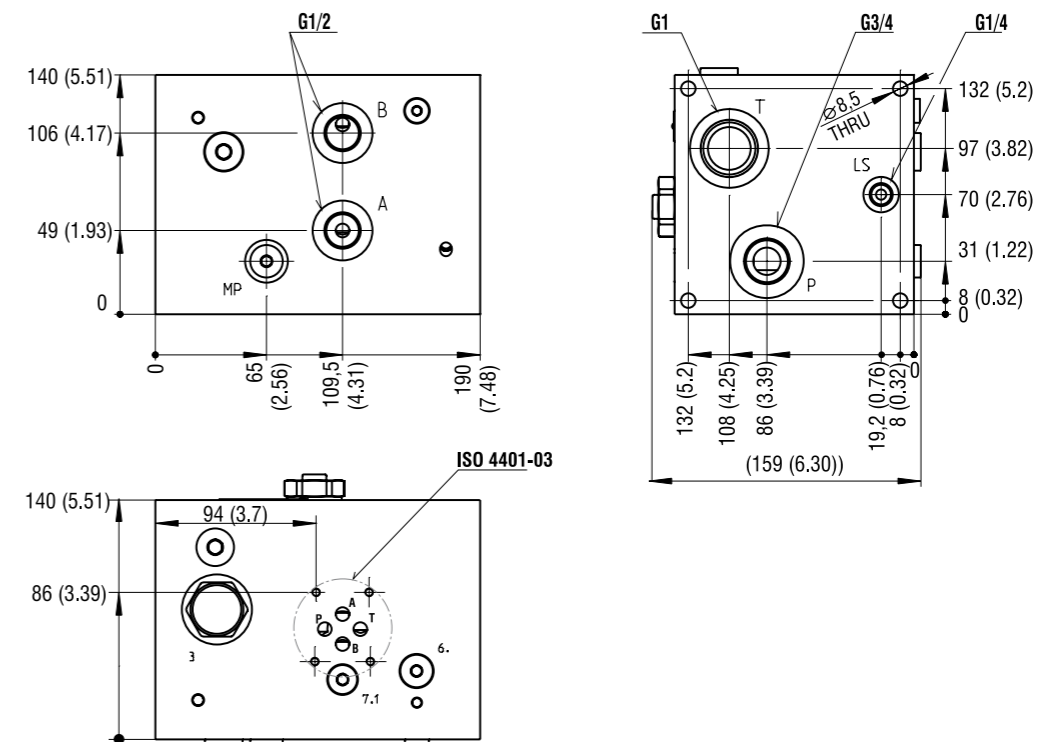
MLS3-10-P1 includes:		Ordering number => 33139200		
Pos.	Description	Type	Pcs	Ordering number
1	Manifold block		1	33300700
4	Shuttle valve	LV2-043	2	28944700
3	Pressure compensator	TV2-102/S1C-A	1	15959501
8	Orifice	M6-120	1	18181600
5	Check valve	VJO1-06/SG002-1	1	15949400
7	Priority valve	EC-16-42-0-N-150	1	32468600
9	Minimess	2103-01-18.00 G1/4	1	20424800
10	Orifice	M6-060	1	27380600
	O-rings	15.54x2.62	3	20150600
		34.59x2.62	1	20149200
		40.94x2.62	1	20149700

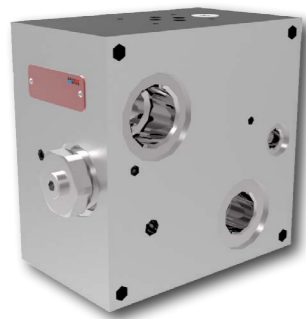
i The grey marked valves are not included when MLS3-10-P1 modules are ordered. The combination of valves is application specific.

Order separately other recommended items:		Data sheet/ Ord. No.	
2	Pressure relief valve	VPN2-10/S-32SS	1 HA 5154
6	Pressure compensator	EP12-S35T-0-P-240	1 29790600
11	Cavity plug	CP12-S30-N	1 32077700



Fixed displacement pump Load sensing pump



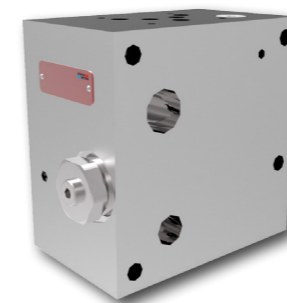
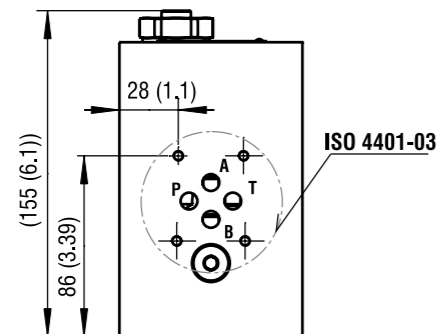
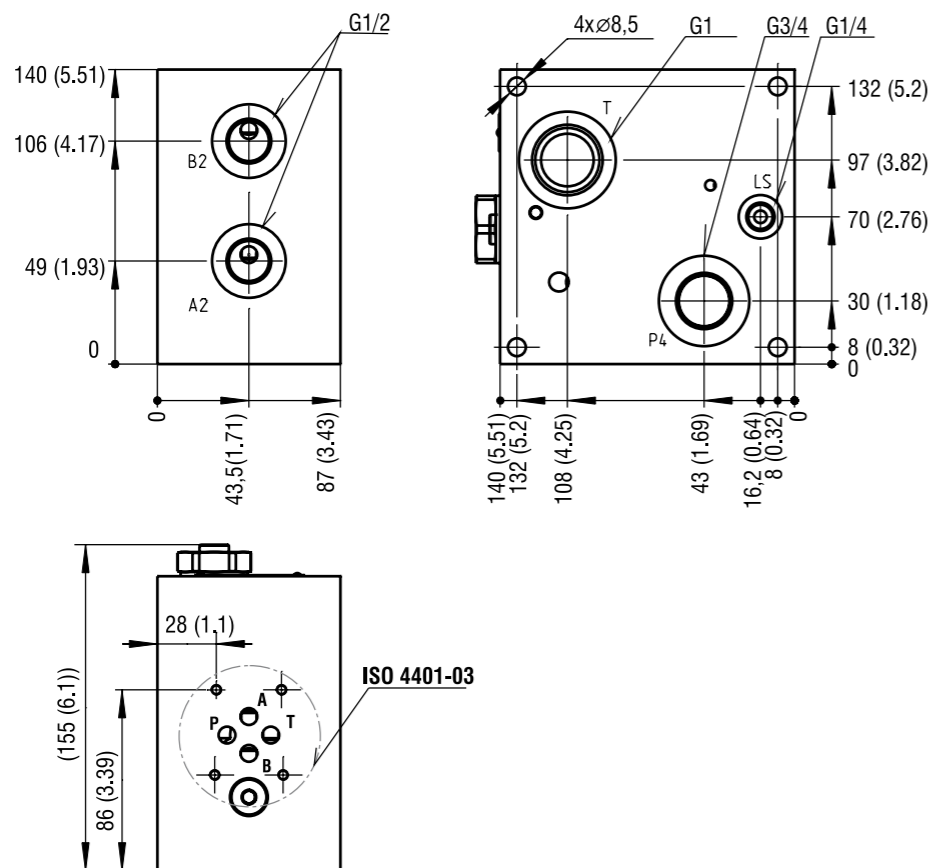
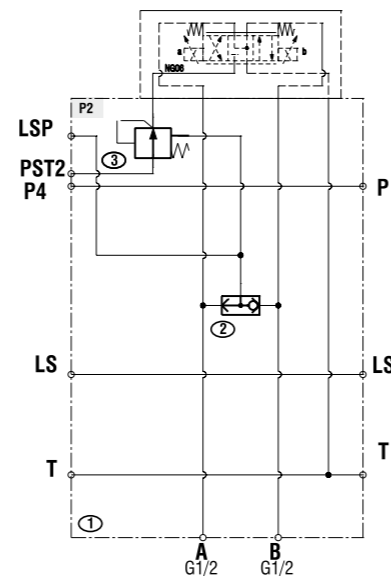


Description

The Priority module 2 and Section block „S“ implement an on/off or proportional consumer supply depending on the valve installation. The Priority module 2 extends the Priority module 1 while the Section block „S“ extends the Base module. They are used in situations when additional consumers need to be operated. Sections are always compensated with 2-way pressure compensators. The LS signal is reported via check valves.

Note: The modules are not interchangeable.

MLS3-10-P2 includes:		Ordering number ⇒ 33806300		
Pos.	Description	Type	Pcs	Ordering number
1	Manifold block		1	34277300
2	Shuttle valve	LV2-043	1	28944700
3	Pressure compensator	TV2-102/S1C-A	1	15959501
	O-rings	15.54x2.62	1	20150600
		34.59x2.62	1	20149200
		40.94x2.62	1	20149700

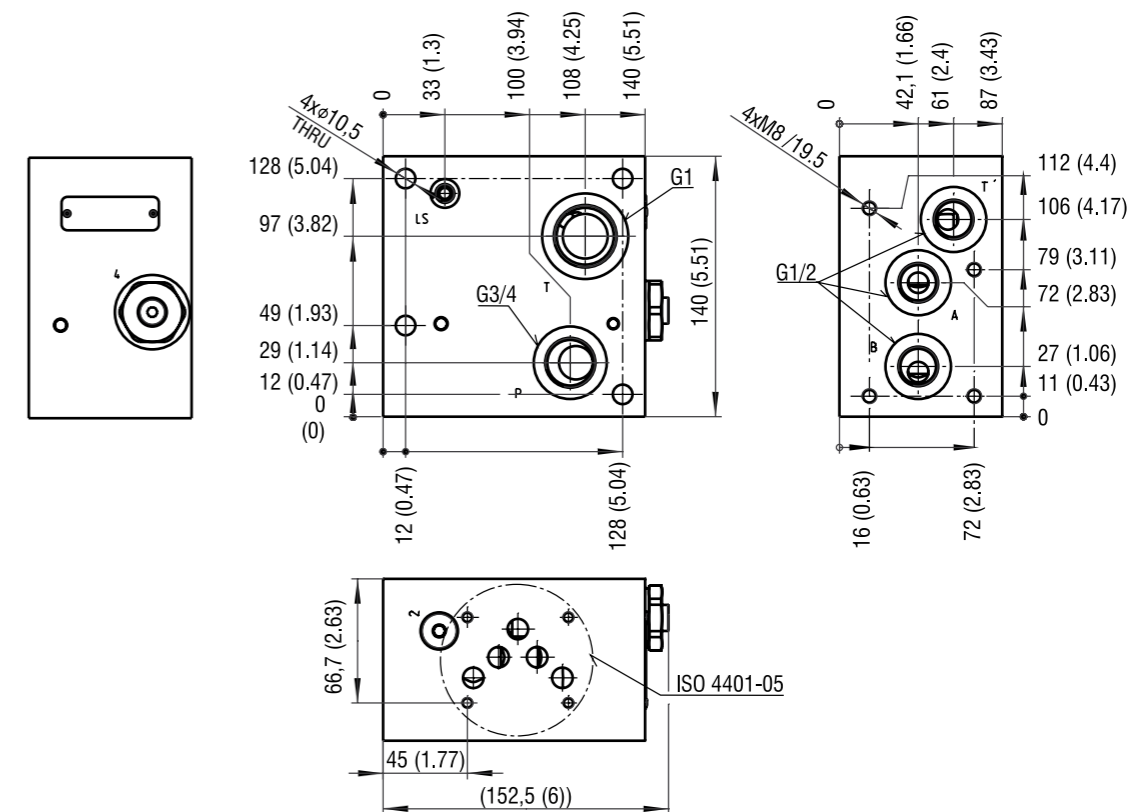
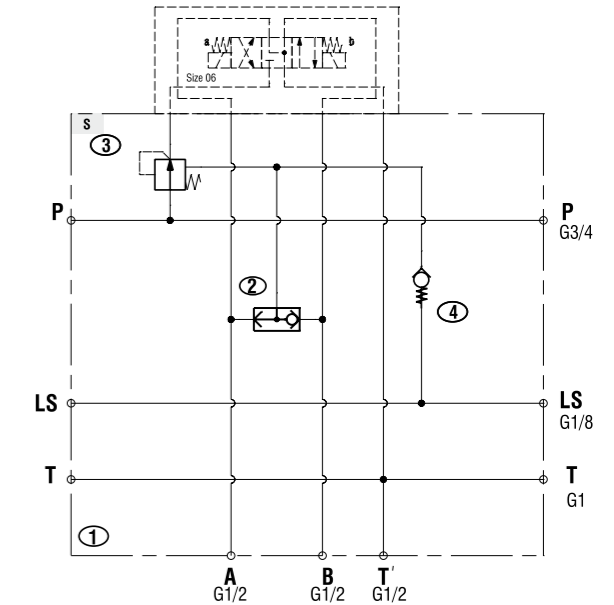


Description

The Priority module 2 and Section block „S“ implement an on/off or proportional consumer supply depending on the valve installation. The Priority module 2 extends the Priority module 1 while the Section block „S“ extends the Base module. They are used in situations when additional consumers need to be operated. Sections are always compensated with 2-way pressure compensators. The LS signal is reported via check valves.

Note: The modules are not interchangeable.

MLS3-10-S includes:		Ordering number ⇒ 33127800		
Pos.	Description	Type	Pcs	Ordering number
1	Manifold block		1	33284200
2	Shuttle valve	LV2-043	1	28944700
3	Pressure compensator	TV2-102/S1C-A	1	15959501
4	Check valve	VJO1-06/SG002-1	1	15949400
	O-rings	12.42x1.78	1	20130000
		34.59x2.62	1	20149200
		40.94x2.62	1	20149700

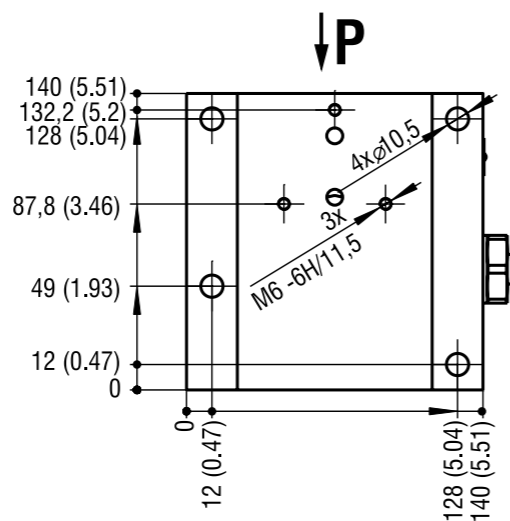
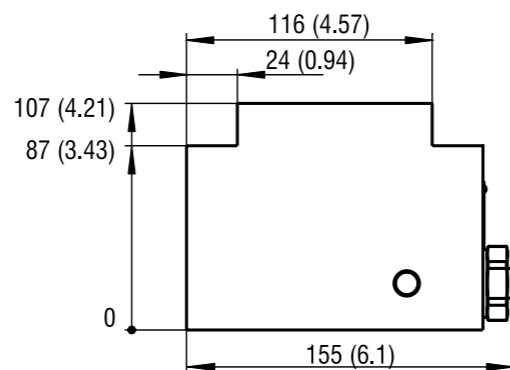
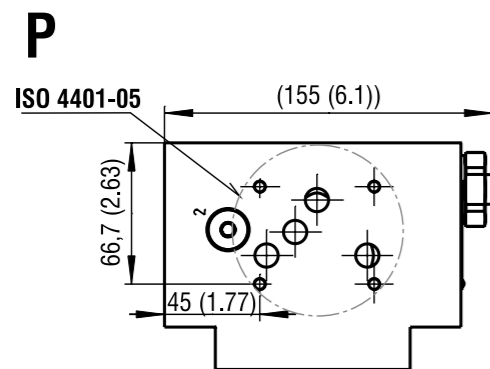
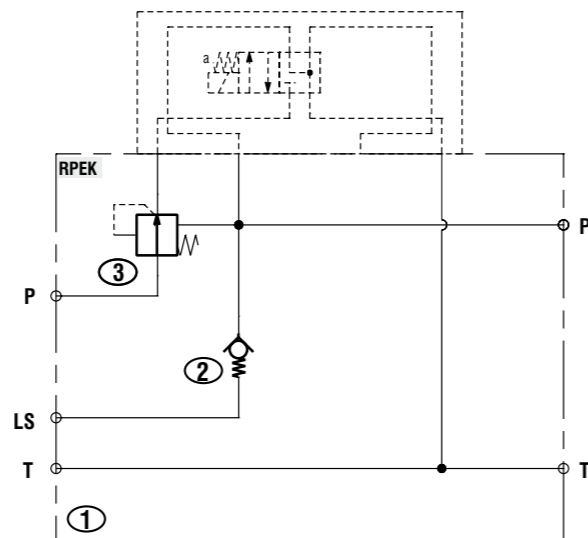




Description

Section module SRPEK
The SRPEK module is designed to connect two or more RPEK1-03 valves via two pressure compensators.

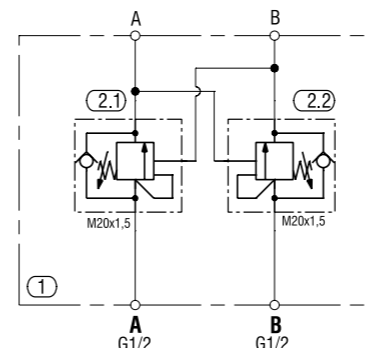
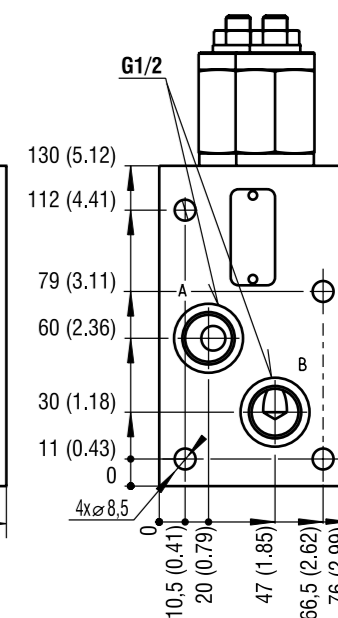
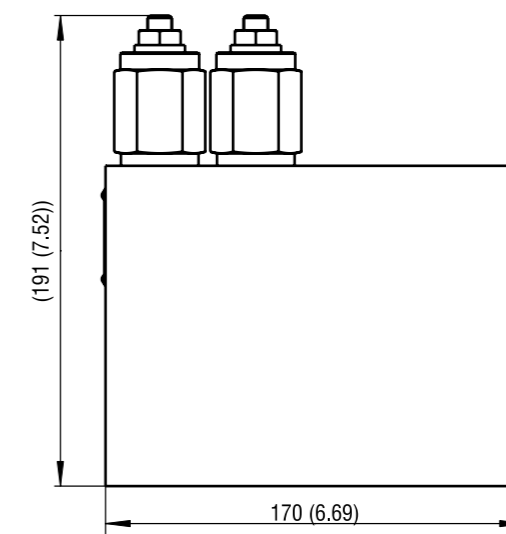
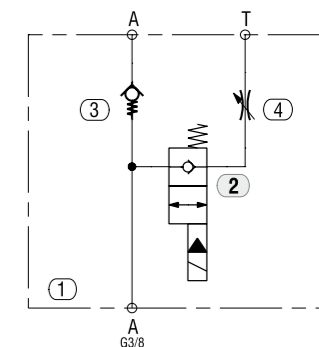
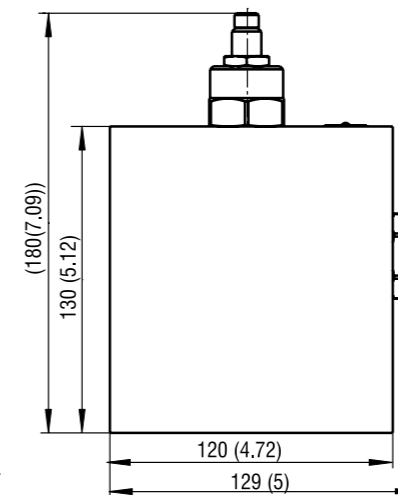
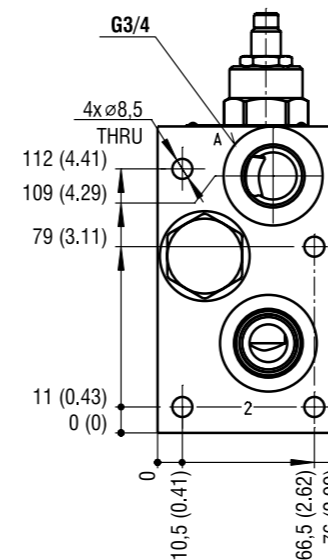
MLS3-10-SRPEK includes:		Ordering number ⇒ 33125200		
Pos.	Description	Type	Pcs	Ordering number
1	Manifold block		1	33274000
2	Check valve	VJO1-06/SG002-1	1	15949400
3	Pressure compensator	TV2-102/S1C-A	1	15959501
	O-rings	12.42x1.78	1	20130000
		34.59x2.62	1	20149200
		40.94x2.62	1	20149700



Description

OA (OB) is an optional block that may be connected to output ports of the sections. Use a CETOP valve with just one solenoid on side A where block OA is used - see page 3.

MLS3-10-OA includes:		Ordering number ⇒ 33137900		
Pos.	Description	Type	Pcs	Ordering number
1	Manifold block		1	33300900
3	Check valve	CV12-20-0-N-25	1	31944900
4	Needle valve	NV12-20-A-0-N	1	31945000
	O-rings	29.82x2.62	3	19906700
Order separately the other recommended items:				
2	Load control valve	HSV12-20-0-U-0	1	31944700
	Coil 12 VDC			34721000
	Coil 24 VDC			34721100



MLS3-10-OB includes:		Ordering number ⇒ 33803900		
Pos.	Description	Type	Pcs	Ordering number
1	Manifold block		1	34279800
2	Over center valve	SO5A-R3/4	2	20421500
	O-rings	29.82x2.62	3	19906700

Content

Type Code		Page	Data Sheet
Studs and Nuts for Vertical Stacking Assemblies			
D02, D03 and D05	Size 04 (D02), Size 06 (D03), Size 10 (D05)	654	HA 0020
Cavity Plugs - Standard			
SCP	Screw-in cartridge cavities blanking plugs	656	HA 0050
Cavity Form Tools			
SMT		658	HA 0019
Hand Pumps			
RCA	Push-type, 3/4-16 UNF, M22x1.5, p _{max} 250 bar (3600 PSI)	674	HA 2020
Spare Parts			
Spare Parts		676	HA 8010

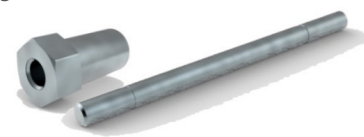
Notes

Studkits for ISO 02 (03, 05), (CETOP 02 (03, 05)) Sandwich Bodies

D02, D03 and D05

Size 04 (D02), Size 06 (D03), Size 10 (D05)

Studkit M5



Technical Features

- › Simplify the installation of ISO 4401, DIN 24340 (CETOP 02, 03 and 05) sandwiches
- › Optionally uncut (can be cut to length in the field) or precut studkits
- › Metric standard threaded rod versions with rolled threads
- › All studs are made of high tensile, class of strength 10.9. (Material ASTM-A-193 Grade B)
- › When installed in a subplate or manifold, they act as a guide during assembly of the sandwich body stack
- › The studnuts are hex socket nuts with an outside diameter equivalent to a standard socket head cap screw
- › In the standard version, the studs and nuts are zinc coated for 240 h protection acc. to ISO 9227

Studkit M6



Calculating of studrod length

Calculation formula: $L = LP + \sum HM + LB + LN$

L - total length of the studrod
LP - thread length projection into subplate / block
 $\sum HM$ - SUM of all heights of all installed sandwich valves
LB - length of directional valve projection
LN - length of thread in the nut

Size	Dn 04 (D02)	Dn 06 (D03)	Dn 10 (D05)
Studrod thread	M5	M5	M6
length of thread projection into subplate / block (LP)	10 mm (0.39 in)		
length of thread in the nut (LN _{min} - LN _{max})	6 mm (0.24 in) - 14 mm (0.55 in)		8 mm (0.31 in) - 14 mm (0.55 in)
length of directional valve projection (LB)	27 mm (1.06 in)	37.3 mm (1.47 in)	30 mm (1.18 in)

Example calculation Dn 06 (D03):

- directional valve RPE3-06, 1 pc 37.3 mm (1.47 in)
- pressure relief valve VPN1-06, 1 pc 40 mm (1.57 in)
- pilot operated check valve 2RJV1-06, 1 pc 40 mm (1.57 in)
Calculation of studrod length (mm) L min. = 10 + 40 + 40 + 37.3 + 6 = 133.3 mm, L max. 10 + 40 + 40 + 37.3 + 14 = 141.3 mm
The correct length of the studs must be between 133.3 mm and 141.3 mm. Available stud length is 136 mm. See table on page 2.

Example calculation Dn 10 (D05):

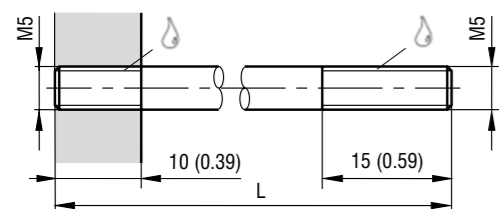
- directional valve RPE4-10, 30 mm (1.18 in)
- pilot operated check valve VJR2-10, 1 pc 50 mm (1.97 in)
Calculation of studrod length (mm) L min. = 12 + 50 + 30 + 8 = 100 mm, L max. = 12 + 50 + 30 + 14 = 106 mm
The correct length of the studs must be between 100 mm and 106 mm. Available stud length is 103 mm. See table on page 2.

Installation note:

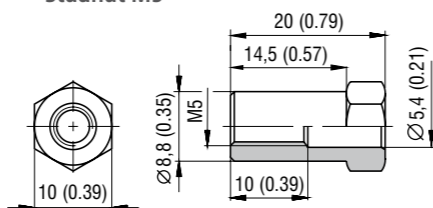
With increases studrod length the maximum operation pressure of complete stack assembly decreases. See table on page 2.
Lubricate threads before assembly! Use the upper limit of torque range.

Metric Threads dimensions in millimeters (in)

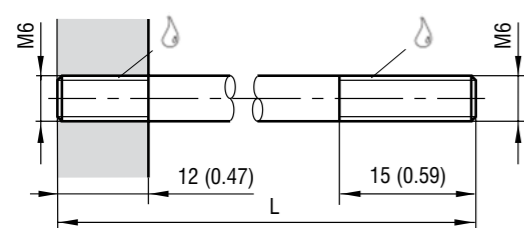
Studrod M5xL (length L see the table)
Streight class - GR.8 ISO 10.9



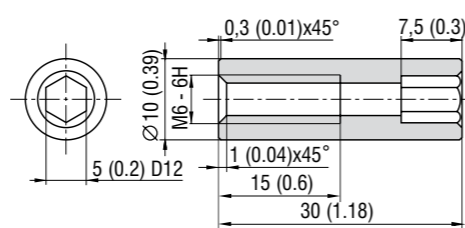
Studnut M5



Studrod M6xL (length L see the table)
Streight class - GR.8 ISO 10.9



Studnut M6



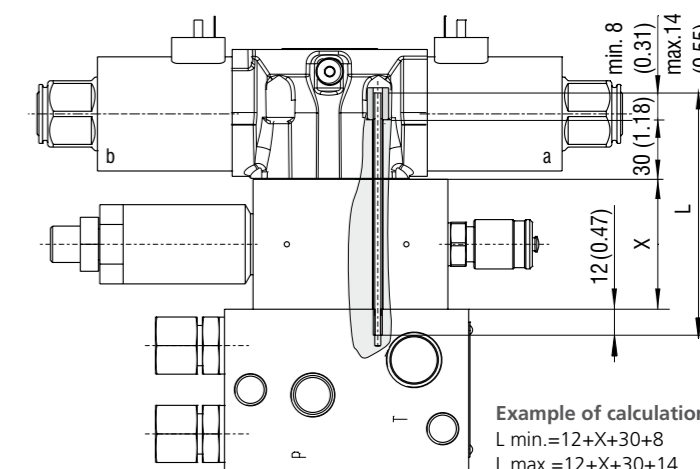
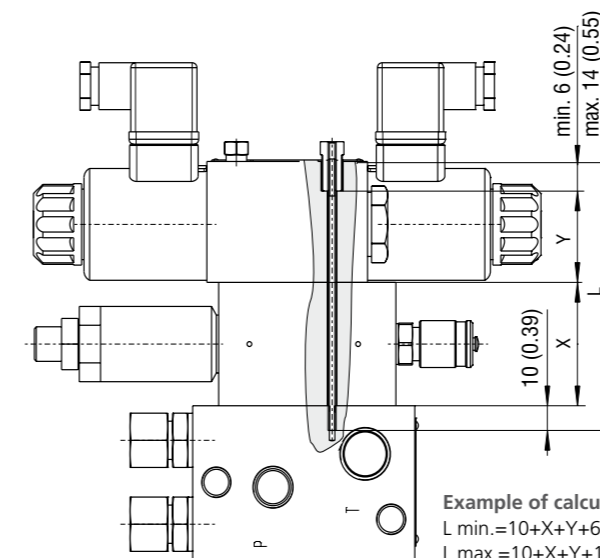
Studrods - order numbers of separate elements or kits

Item	Length L [mm]	Torque to 8.9 Nm (6.6 lbf.ft)			Max. pressure [bar]
		Weight kg / 100 pcs	Item number 1pc	Item number Kit*	
Studrod 70	70	1.0	20197400	16103500	350
Studrod 77	77	1.1	15609500	16105100	350
Studrod 82	82	1.2	20197600	16103600	350
Studrod 88	88	1.2	16679400	16105200	350
Studrod 93	93	1.3	24233200	33884500	350
Studrod 98	98	1.4	20197800	16103700	350
Studrod 102	102	1.4	20197900	16103800	350
Studrod 110	110	1.6	15609700	16103900	350
Studrod 115	115	1.6	20198100	16108200	350
Studrod 120	120	1.8	20198200	23678300	350
Studrod 125	125	1.8	24233300	33884800	350
Studrod 130	130	1.8	15609600	16104000	350
Studrod 136	136	1.9	15609800	16104100	350
Studrod 144	144	2.0	20198500	16104200	350
Studrod 150	150	2.1	20198600	33885000	350
Studrod 158	158	2.2	20198700	33885200	320
Studrod 166	166	2.3	20198800	23686800	320
Studrod 170	170	2.4	16679500	16104300	320
Studrod 177	177	2.5	20199000	16108300	320
Studrod 180	180	2.5	20199100	16104500	320
Studrod 185	185	2.6	20199200	16104600	320
Studrod 190	190	2.7	20199300	23679200	320
Studrod 202	202	3.0	20199400	16105300	320
Studrod 210	210	3.1	20199500	16104700	250
Studrod 215	215	3.2	20199600	16104800	250
Studrod 222	222	3.3	20199700	16104900	250
Studrod 230	230	3.4	20199800	33885600	250
Studrod 242	242	3.4	23698400	23685200	250
Studrod 250	250	3.5	20199900	16105500	200
Studrod 255	255	3.6	20200000	16105000	200
Studrod 262	262	3.7	20200100	16105400	200
Nut M5	M5	0.7	15630800		

Caution!

*Kits include 4 studrods + 4 nuts

Item	Length L [mm]	Torque to 14 Nm (10.3 lbf.ft)			Max. pressure [bar]
		Weight kg / 100 pcs	Item number 1pc	Item number Kit*	
Studrod 92	92	1.9	20200200	16106800	350
Studrod 100	100	2.0	15610000	33881400	350
Studrod 103	103	2.1	20200400	16106700	350
Studrod 109	109	2.2	20200500	33881500	350
Studrod 115	115	2.4	20200600	33881600	350
Studrod 125	125	2.6	20200700	27483500	350
Studrod 128	128	2.7	20200900	33881800	350
Studrod 133	133	2.8	20201000	33881900	350
Studrod 136	136	2.8	20201100	16107900	350
Studrod 139	139	2.9	20201200	33882000	350
Studrod 143	143	3.0	15609900	16106900	350
Studrod 147	147	3.1	20201400	16108000	350
Studrod 152	152	3.2	20201500	16107000	320
Studrod 157	157	3.3	20201600	33882100	320
Studrod 163	163	3.5	20201800	33882200	320
Studrod 167	167	3.6	28802300	33882300	320
Studrod 172	172	3.7	28802500	33882400	320
Studrod 179	179	3.8	20201900	33882500	320
Studrod 183	183	3.9	20202000	33882600	320
Studrod 187	187	4.0	20202100	16107100	320
Studrod 194	194	4.1	20202300	16107200	320
Studrod 199	199	4.2	20202400	16108100	320
Studrod 203	203	4.3	20202500	16107300	250
Studrod 209	209	4.5	20202600	33882700	250
Studrod 219	219	4.7	20202700	33882800	250
Studrod 224	224	4.8	20202900	27484200	250
Studrod 236	236	5.0	20203100	16107400	250
Studrod 245	245	5.2	20203200	16107500	250
Studrod 253	253	5.4	20203300	16107800	210
Studrod 256	256	5.5	20203400	33883000	210
Studrod 259	259	5.6	20203500	33883200	210
Studrod 265	265	5.7	28802600	33883300	210
Studrod 273	273	5.9	28802700	33883500	210
Studrod 279	279	6.0	20203600	33883600	210
Studrod 287	287	6.1	20203700	16107600	210
Studrod 295	295	6.4	20203800	16107700	210
Studrod 300	300	6.5	28802800	33883700	180
Studrod 309	309	6.7	24233700	33883800	180
Studrod 314	314	6.9	28802900	33883900	180
Studrod 320	320	7.2	28803000	33884000	180
Studrod 328	328	7.5	28803200	33884100	180
Studrod 367	367	7.8	31044000	33884200	180
Nut M6	M6	1.3	16115200		



Standard Cavity Plugs

SCP

3/4-16 UNF • 7/8-14 UNF • M20x1.5 • M22x1.5 • M27x2 • G1/8



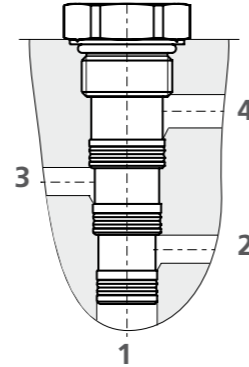
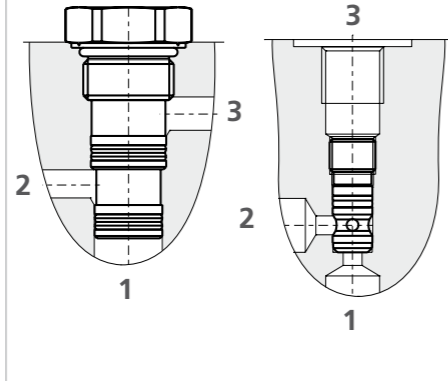
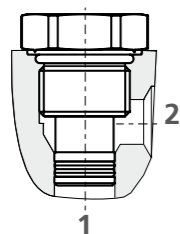
Technical Features

- › Seal all access to the cavities
- › Axial bore in all cavity plugs for optional radial ports connection
- › Identical sealings as valves
- › In the standard version, the plug is zinc-coated for 240 h protection acc. to ISO 9227

Technical Data

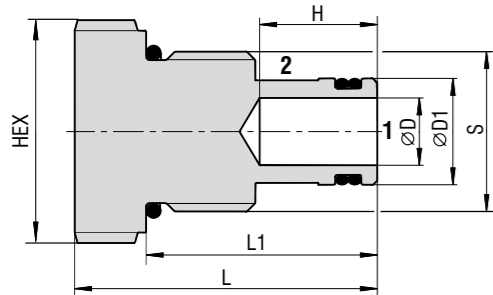
Fluid temperature range (NBR)	°C (°F)	-30...+100 (-22 ...+212)
Fluid temperature range (FPM)	°C (°F)	-20 ... +120 (-4 ... 248)

Model Code	2-Way Cavity		3-Way Cavity			4-Way Cavity		
	* /XX-*	* /OO-*	* /XXX-*	* /XOO-*	* /OOX-*	* /XXXX-*	* /XXOO-*	* /OOXX-*
Symbol								



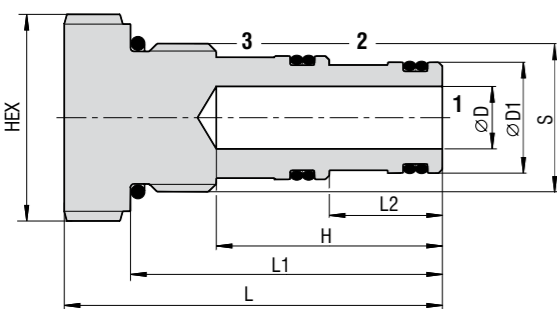
Dimensions in millimeters (inches)

2-Way Cavity



S	3/4-16 UNF	7/8-14 UNF	M22x1.5	M27x2
HEX	A2	B2	QG2	QK2
L	24 (0.95)	27 (1.06)	27 (1.06)	32 (1.26)
L1	36 (1.42)	43 (1.69)	38 (1.50)	58 (2.28)
Ø D	8 (0.32)	10 (0.39)	12 (0.47)	13.5 (0.53)
Ø D1	12.7 (0.50)	15.8 (0.62)	18 (0.71)	23 (0.91)
H	14 (0.55)	19 (0.75)	18 (0.71)	32 (1.26)

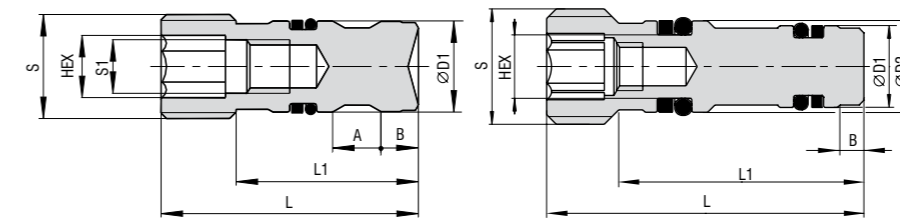
3-Way Cavity



S	3/4-16 UNF	7/8-14 UNF	M20x1.5	M22x1.5	M27x2	M27x2
HEX	A3	B3	QE3	QF3	QM3	K3
L	24 (0.95)	27 (1.06)	24 (0.95)	27 (1.06)	32 (1.26)	32 (1.26)
L1	48.5 (1.91)	57 (2.24)	55 (2.17)	51 (2.01)	63 (2.48)	82 (3.23)
L2	40 (1.58)	47 (1.85)	45 (1.77)	41 (1.62)	51 (2.01)	70 (2.76)
Ø D	8 (0.32)	10 (0.39)	10 (0.39)	10 (0.39)	12 (0.47)	12 (0.47)
Ø D1	14.2 (0.56)	15.8 (0.62)	15.4 (0.61)	17.5 (0.69)	21.0 (0.83)	21.0 (0.83)
Ø D2	15.8 (0.62)	17.4 (0.69)	16.9 (0.67)	18.0 (0.71)	23.0 (0.91)	23.0 (0.91)
H	29 (1.14)	33 (1.30)	32 (1.26)	31 (1.22)	36 (1.42)	55 (2.17)

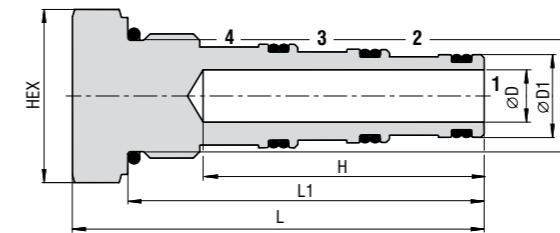
Dimensions in millimeters (inches)

3-Way Cavity



S	G1/8	M12x1,5
HEX	QY3	QD3
L	5 (0.20)	6 (0.24)
L1	24 (0.95)	33 (1.30)
S1	17 (0.67)	25.5 (1.00)
Ø D1	5 (0.20)	
Ø D2	8.5 (0.34)	8.5 (0.33)
A		9.5 (0.37)
B	4.5 (0.18)	2.5 (0.1)

4-Way Cavity



S	3/4-16 UNF	7/8-14 UNF
HEX	A4	B4
L	24 (0.95)	27 (1.06)
L1	63 (2.48)	70.5 (2.78)
L2	54.5 (2.15)	60.5 (2.38)
L3	28.5 (1.12)	31 (1.22)
Ø D	14.5 (0.57)	15 (0.59)
Ø D1	8 (0.32)	10 (0.39)
Ø D2	12.7 (0.50)	15.8 (0.62)
Ø D3	14.2 (0.56)	17.4 (0.69)
H	15.8 (0.62)	19 (0.75)
	43 (1.69)	46 (1.81)

Ordering Code

Standard cavity plugs

Cavity thread size and cavity type

Thread size	Valve version
Two-way cavities	
3/4-16 UNF-2A	SD*, SC*, SR*, SF*, ST*
7/8-14 UNF-2A	SD*, SC*, SR*, SF*, ST*
M12x1	VSV2, VSVJ2
M22x1.5	ROE3, ROR3, VPP2-04, VPN1-06, VSS3-06
M24x1.5	DBV2-
M27x2	VPN2-10/S
M27x2	SF2C2A-K2/I
M28x1.5	VPP1-06, VPP2-06
M35x1.5	VPP1-10

Three-way

3/4-16 UNF-2A	SD*, SC*, SP*
7/8-14 UNF-2A	SD*, SP*, SF*
M20x1.5	PVRM1-063, TV2-063
M20x1.5	SO5A, SCC5H, SC5H-Q3
M22x1.5	ROV1, VRN2-06, LV1-063
M22x1.5	VJL2-304
M24x1.5	PVRM3
M24x1.5	RJV1-05
M27x1.5	SO5A, SCD5H
M27x2	VPN2-10/SX;SY
M27x2	TV2-10X
M27x2	VRN2-10, SF32A-K3/I
M38x2	SO5A-T3/I
G1/8	LV1-043-1
M12x1,5	LV2-043
1 1/8-12; A3146	SU6A-U3
1-5/16-12UNF	SCC5H-S3/I, SC5H-S3/I, SOB5A-S3/I
Ø20, Ø19, Ø17	PD2E, PP2P
Ø20, Ø19, Ø17	PD2E
Ø17, Ø16, Ø15	PD2E

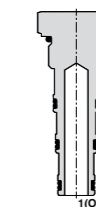
Four-way

3/4-16 UNF-2A	SD*
7/8-14 UNF-2A	SD*
M27x1.5	SOBD5A-R4/I
1 1/8-12; A12088	SU6A-U4
1-5/16-12UNF	SOBD5A-S4/I, SOZD5A-S4/I
1-5/16-12UNF	SUD6A-V4/I

SCP - [] / [] - []

Surface treatment
A zinc-coated (ZnCr-3), ISO 9227 (240 h)
B zinc-coated (ZnNi), ISO 9227 (520 h)

Seals
NBR
FPM (Viton)



Design type (X=blocked, O=open)
O port 1 (open)
X port 2 (closed)
X port 3 (closed)
X port 4 (closed)

Model code, symbol example

A2		* /XX-*		* /OO-*	
A3		* /XXX-*		* /XOO-*	* /OOX-*
A4		* /XXXX-*		* /XXOO-*	* /OOXX-*

Screw-In Cartridge Cavity Manufacturing Tools

SMT



Technical Features

- › Designed to achieve standardization based on each thread size
- › Reduce the amount of tooling required to cover the valve range
- › UNF based cartridges are made to fit the ISO recommendations for standard cavities
- › Drawings for standard tools are available upon request
- › Special tools can be supplied, consult factory for cost and leadtime

Functional Description

The tables below show the specific tools and the required tooling sequence to produce the respective cavity.
Note: A pilot hole may have to be drilled before using the form drill.
Great care must be taken to ensure that the tools are inserted along the same machining axis to maintain the required concentricity. The cavity should be machined in a single clamping.
Argo-Hytos normally stocks the standard tools in the sizes indicated.
Tool drawings are available upon request.

Ordering Code

SMT [] - [] - []

Tool material - technical characteristics
No designation High speed steel (HSS)
TK Tungsten Carbide Tipped (special finishers only)

Tool type
B Drill
Z Countersink conical
C Counterbore
D Forming drill
R Forming reamer
T Tap drill

Standard cavity tools (H5-Steel)

Cavity thread size

3/4-16UNF-2A	A2
3/4-16UNF-2A	A3
3/4-16UNF-2A	A4
7/8-14UNF-2B	B2
7/8-14UNF-2B	B3
7/8-14UNF-2B	B4
1-5/16-12UN-2B	D4
M27x2	K2
M27x2	K3
M27x2	QL3
M24x1.5	LA3
M27x2	QK2
M12x1	QC2
M20x1.5	Q3
M12x1.5	QD3
M20x1.5	QE3
M22x1.5	QF3
M22x1.5	QG2
M24x1.5	QJ2
M24x1.5	QJ3
M24x1.5	QH2
M27 x 2	QM3
M28x1.5	QP2
M35x1.5	QT2
G1/8	QY3
M27x1.5	R3
M27x1.5	R4
1-5/16-12UNF-2B	S3
M38x2	T3
1-1/8-12UNF-2B	U3, U4
1-5/16-12UN-2B	V4
SLIP-IN	W3, X3
SLIP-IN	Y3

B	Z	D	R	T
	C			

Tool Type

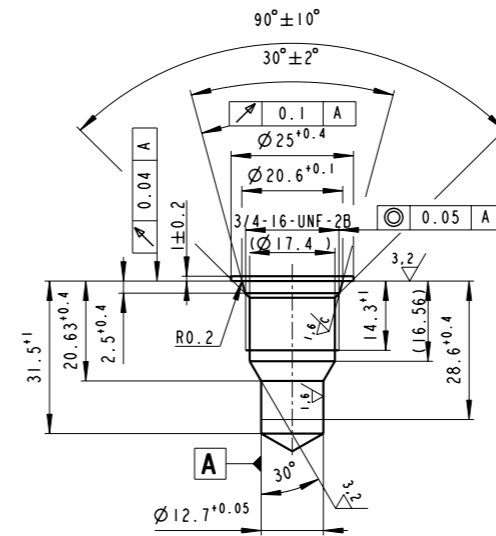
Product name	Cavity No.	Cavity	B Drill	Z Countersink conical	C Counter-bore	D Forming drill	R Forming reamer	T Tap drill
	Page	Thread size	SAP	SAP	SAP	SAP	SAP	SAP
SD2E-A2, SD1E-A2, SD3E-A2, SD1M-A2	279396	A2	SMT-A2-B	not used	not used	SMT-A2-D	SMT-A2-R	SMT-A2,A3,A4-T
SC1F-A2, SR1A-A2,ST21A-A2 SF22A-A2/H, SR1P2-A2	4	3/4-16UNF-2B	33532700	not used	not used	15604400	33595500	
SD2E-A3, SD1E-A3, SC1F-A3, SP2A-A3	279397	A3	SMT-A3-B	not used	not used	SMT-A3-D	SMT-A3-R	
SS4A-A3, SH1F-A3, SD1EX-A3	4	3/4-16UNF-2B	25974600	not used	not used	33567700	33595700	33696500
SD2E-A4	279398	A4	SMT-A4-B	not used	not used	SMT-A4-D	SMT-A4-R	
	4	3/4-16UNF-2B	25974700	not used	not used	33567800	33595800	
SD2E-B2, SD3E-B2, SR1A-B2, SR4A-B2, SR4E2-B2, SF22A-B2/H, SR4P2-B2, SD3EX-B2, SD2EX-B2, SR1A-B2/HxSx-CE1017	279399	B2	SMT-B2-B	SMT-B2, B3, B4-Z	SMT-B2, B3, B4-C	SMT-B2-D	SMT-B2-R	SMT-B2,B3,B4-T
	5	7/8-14UNF-2B	33533000			33567900	33595900	
SD2E-B3, SP2A-B3, SP4A-B3, SF32A-B3, SP4P2-B3, SD2EX-B3	279400	B3	SMT-B3-B			SMT-B3-D	SMT-B3-R	
	5	7/8-14UNF-2B	33536900	33613200	33693900	33568000	33598000	33696800
SD2E-B4, SP4P1-B4, SD2P-B4, SD2EX-B4, SFD2F-B4/I	279401	B4	SMT-B4-B			SMT-B4-D	SMT-B4-R	
	5	7/8-14UNF-2B	33537200			33568100	33598100	
VSV2;VSV2-J	284410	QC2	SMT-QC2-Bx	not used	SMT-QC2-C	SMT-QC2-D	SMT-QC2-R	SMT-QC2-T
	6	M12x1	B1 33538100 B2 33538200	not used	33694800	33592700	33607300	33697700
SC5H-Q3/I, SCC5H-Q3/I, SO5A-Q3/I, SOP5A-Q3/I, SOB5A-Q3/I	291248	Q3	SMT-Q3-B	SMT-Q3, QE3-Z	SMT-Q3-C	SMT-Q3-D	SMT-Q3-R	SMT-Q3, QE3-T
	6	M20x1.5	33538300		33694900	33592800	33607400	
PVRM1, TV2-063	279404	QE3	SMT-QE3-B	33615800	SMT-QE3-C	SMT-QE3-D	SMT-QE3-R	33697800
	6	M20x1.5	33538400		33695000	33593000	33607500	
ROV1, VRN2-06, LV1-063/5	279405	QF3	SMT-QF3-B	SMT-QF3, QG2-Z	SMT-QF3-C	SMT-QF3-D	SMT-QF3-R	SMT-QF3, QG2-T
	7	M22x1.5	33538500		33695300	33593100	33607600	
ROE3, ROR3-062, VPP2-04, VPN1-06, VSS3-062	279406	QG2	SMT-QG2-B	33616000	SMT-QG2-C	SMT-QG2D	SMT-QG2-R	33698000
	7	M22x1.5	33538700		33695400	33593200	33607700	
VJL2-304	303228	RD3	SMT-RD3-B	SMT-RD3-Z	SMT-RD3-C	SMT-RD3-D	SMT-RD3-R	SMT-RD3-T
	7	M22x1.5	on request	on request	on request	on request	on request	on request
RJV1-05	279412	QJ2	SMT-QJ2-B	not used	not used	SMT-QJ2-D	SMT-QJ2-R	not used
	8	M24x1.5	33538800	not used	not used	33593400	33607800	not used
PVRM3-10	281052	QJ3	SMT-QJ3-B	SMT-QJ3-Z	SMT-QJ3-C	SMT-QJ3-D	SMT-QJ3-Rx	SMT-LA3,QJ3,QH2-T
	8	M24x1.5	33543500	33616200	33695500	33593500	R1 33608100 R2 33608200	33698200
DBV3	279411	QH2	SMT-QH2-B	SMT-QH2-Z	SMT-QH2-C	SMT-QH2-D	SMT-QH2-R	
	8	M24x1.5	33543600	33629100	33695600	33593600	33608400	
SD2H-LA3	336467	LA3	SMT-LA3-B	not used	SMT-LA3-C	SMT-LA3-D	SMT-LA3-R	SMT-LA3,QJ3,QH2-T
	9	M24x1.5	33537900	not used	33694600	33592500	33607000	33698200
SC5H-R3/I, SCD5H-R3/I, SO5A-R3/I, SOP5A-R3/I, SOB5A-R3/I	303068	R3	SMT-R3-B	SMT-R3-Z	SMT-R3-C	SMT-R3-D	SMT-R3-Rx	SMT-R3,R4-T
	9	M27x1.5	33548200	33629300	on request	33594200	R1 33610400 R2 33734200	
SOBD5A-R4/I	303235	R4	SMT-R4-B	SMT-R4-Z	not used	SMT-R4-D	SMT-R4-Rx	33698700
	9	M27x1.5	33548300	33629400	not used	33594300	R1 33610600 R2 33734400	

Tool Type

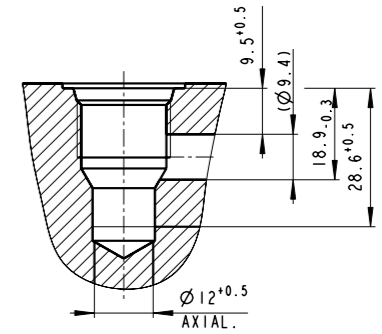
Product name	Cavity No.	Cavity	B Drill	Z Countersink conical	C Counterbore	D Forming drill	R Forming reamer	T Tap drill
	Page	Thread size	SAP	SAP	SAP	SAP	SAP	SAP
VPN2-10/S	279407	QK2	SMT-QK2-B	SMT-QK2-Z	SMT-QK2-C	SMT-QK2-D	SMT-QK2-R	SMT-QK2,QM3 K2,K3,QL3-T
	10	M27x2	33538000	33615700	33694700	33592600	33607200	
VPN2-10/SX;SY	279408	QL3	SMT-QL3-B	not used	not used	SMT-QL3-D	SMT-QL3-Rx	33697400
	10	M27x2	33537800	not used	not used	33592400	R1 33606700 R2 33606800	
TV2-10X	279409	QM3	SMT-QM3-B	SMT-QM3-Z	SMT-QM3-C	SMT-QM3-D	SMT-QM3-Rx	33697400
	10	M27x2	33543700	33629200	33695700	33593700	R1 33608500 R2 33608600	
SF2C2A-K2/I		K2	SMT-K2-B	SMT-K2-Z	SMT-K2-C	SMT-K2-D	SMT-K2-R	SMT-QK2,QM3 K2,K3,QL3-T
	11	M27x2	33537600	33613600	33694400	33568300	33599200	
VRN2-10, SP4A-K3, SF32A-K3/I	281054	K3	SMT-K3-B	SMT-K3-Z	SMT-K3-C	SMT-K3-D	SMT-K3-Rx	33697400
	11	M27x2	33537700	33615600	33694500	33592100	R1 33606300 R2 33606600	
VPP1-(06), VPP2-06	279413	QP2	SMT-QP2-B	not used	SMT-QP2-C	SMT-QP2-D	SMT-QP2-R	SMT-QP2-T
	11	M28x1.5	33547100	not used	33695800	33593900	33609200	
VPP1-(10)	279415	QT2	SMT-QT2-Bx	not used	SMT-QT2-C	SMT-QT2-D	SMT-QT2-R	not used
	12	M35x1.5	B1 33547200 B2 33698800		33695900	33594000	33609700	
SO5A-T3/I, SOP5A-T3/I	303237	T3	SMT-T3-B	SMT-T3-Z	SMT-T3-C	SMT-T3-D	SMT-T3-R	33697400
	12	M38x2	33548600	33629700	33696100	33594600	33610800	
LV1-043	303227	QY3	SMT-QY3-Bx	not used	SMT-QY3-D	SMT-QY3-R	SMT-QY3-T	33698600
	12	G1/8	B1 33547300 B2 33698300		not used	33594100	33610300	
LV2-043	279417	QD3	SMT-QD3-B	not used	SMT-QD3-C	SMT-QD3-D	SMT-QD3,QY3-Rx	SMT-QD3-T
	13	M12x1.5	34041500	not used	34042400	34041800	R1 33610300 R2 34042100	
SFD2F-D4/I	303234	D4	SMT-D4-B	SMT-D4-Z	SMT-D4-C	SMT-D4-D	SMT-D4-Rx	SMT-D4,V4-T
	13	1-5/16-12UN-2B	33537500	33613500	33694200	33568200	R1 33598200 R2 33598400 R3 33598500	
SC5H-S3/I, SCC5H-S3/I, SOB5A-S3/I	291482	S3	SMT-S3-B	SMT-S3-Z	SMT-S3-C	SMT-S3-D	SMT-S3-R	SMT-S3-T
	13	1-5/16-12UNF-2B	33548400	33629500	33696000	33594500	33610700	33699200
SUD6A-V4/I	291483	V4	SMT-V4-B	SMT-V4-Z	SMT-V4-C	SMT-V4-D	SMT-V4-R	SMT-D4,V4-T
	14	1-5/16-12UNF-2B	33549200	33693700	33696400	33594900	33611200	33697100
SU6A-U3/I	291480	U3	SMT-U3, U4-B	not used	SMT-U3, U4-C	SMT-U3, U4-D	SMT-U3, U4-Rx	SMT-U3,U4-T
	14	1-1/8-12UNF-2B	33548700	not used	33696200	33594700	R1 33611000 R2 33611100	33699000
SU6A-U4/I	291479	U4		not used				
	14	1-1/8-12UNF-2B	not used					
PP2P, PD2E-X, PD2E-W	279403	W3, X3	SMT-X3,W3-B	SMT-X3,W3-Z	not used	SMT-X3,W3-D	SMT-X3,W3-R	not used
	15	SLIP-IN	33549800	33693800	not used	33595000	33611400	
PD2E-Y	279402	Y3	SMT-Y3-B	not used	not used	SMT-Y3-D	SMT-Y3-R	not used
	15	SLIP-IN	33549900	not used	not used	33595100	33611800	

A2 - 279396

3/4-16UNF-2B

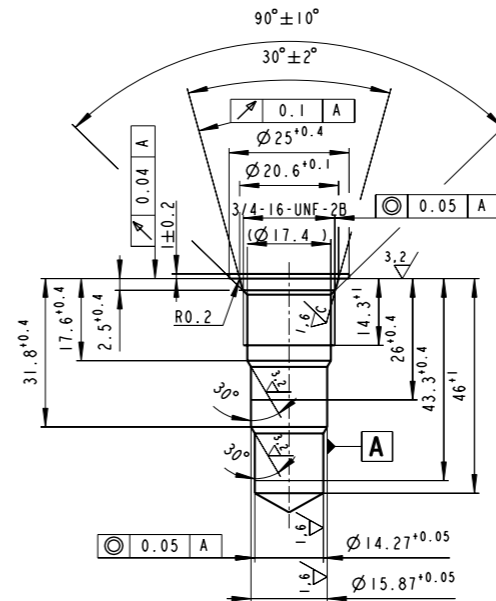


Tool type	Ordering code	SAP No.
Drill	SMT-A2-B	33532700
Forming drill	SMT-A2-D	15604400
Forming reamer	SMT-A2-R	33595500
Tap drill	SMT-A2,A3,A4-T	33696500

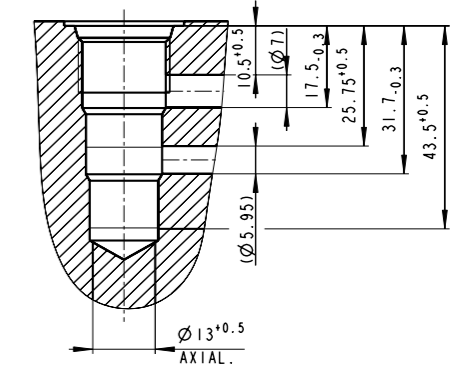


A3 - 279397

3/4-16UNF-2B

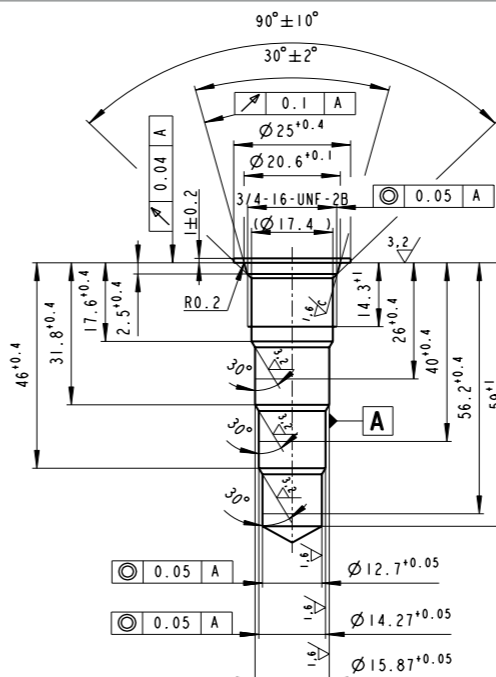


Tool type	Ordering code	SAP No.
Drill	SMT-A3-B	25974600
Forming drill	SMT-A3-D	33567700
Forming reamer	SMT-A3-R	33595700
Tap drill	SMT-A2,A3,A4-T	33696500

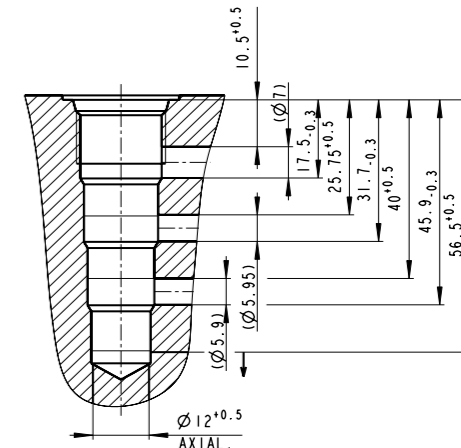


A4 - 279398

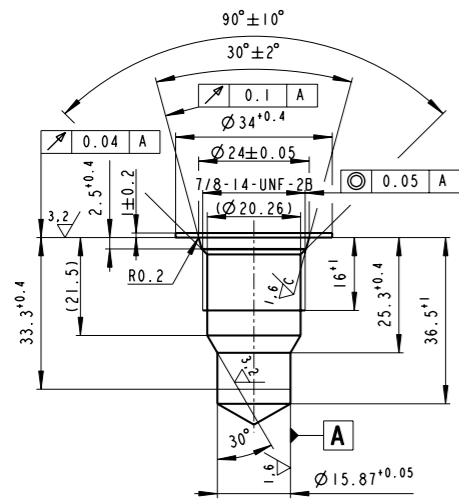
3/4-16UNF-2B



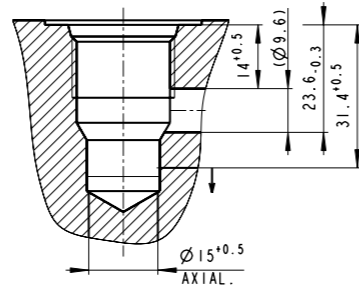
Tool type	Ordering code	SAP No.
Drill	SMT-A4-B	25974700
Forming drill	SMT-A4-D	33567800
Forming reamer	SMT-A4-R	33595800
Tap drill	SMT-A2,A3,A4-T	33696500



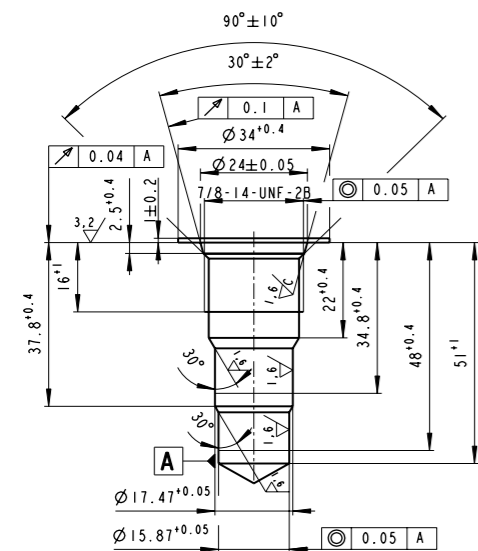
B2 - 279399 7/8-14UNF-2B



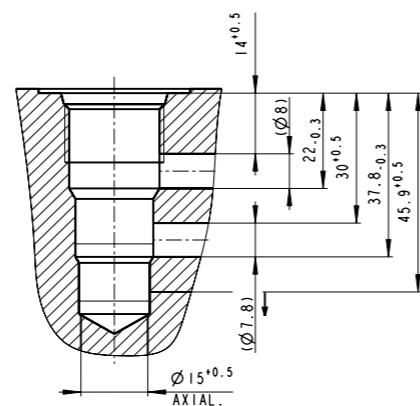
Tool type	Ordering code	SAP No.
Drill	SMT-B2-B	33533000
Countersink conical	SMT-B2, B3, B4-Z	33613200
Counterbore	SMT-B2, B3, B4-C	33693900
Forming drill	SMT-B2-D	33567900
Forming reamer	SMT-B2-R	33595900
Tap drill	SMT-B2,B3,B4-T	33696800



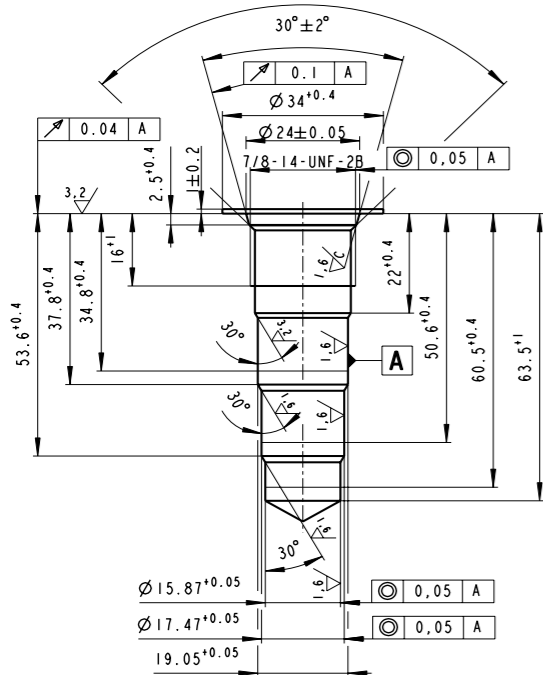
B3 - 279400 7/8-14UNF-2B



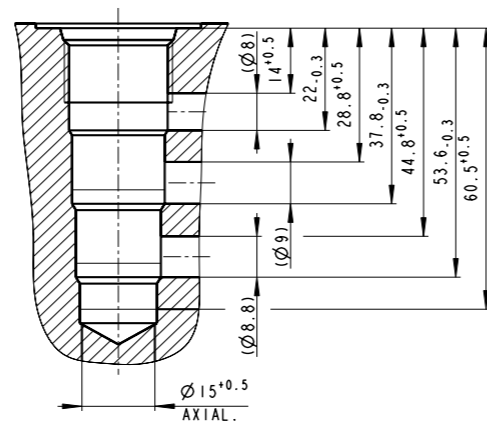
Tool type	Ordering code	SAP No.
Drill	SMT-B3-B	33536900
Countersink conical	SMT-B2, B3, B4-Z	33613200
Counterbore	SMT-B2, B3, B4-C	33693900
Forming drill	SMT-B3-D	33568000
Forming reamer	SMT-B3-R	33598000
Tap drill	SMT-B2,B3,B4-T	33696800



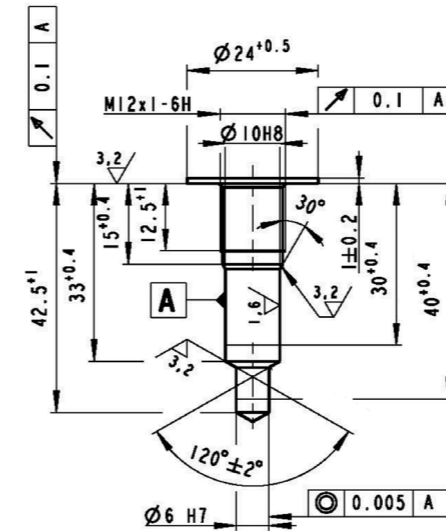
B4 - 279401 7/8-14UNF-2B



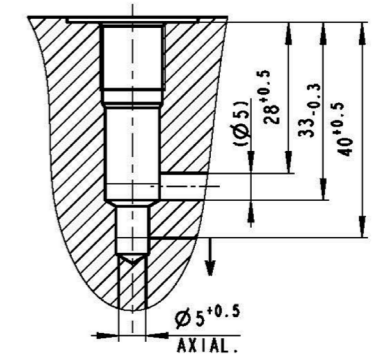
Tool type	Ordering code	SAP No.
Drill	SMT-B4-B	33537200
Countersink conical	SMT-B2, B3, B4-Z	33613200
Counterbore	SMT-B2, B3, B4-C	33693900
Forming drill	SMT-B4-D	33568100
Forming reamer	SMT-B4-R	33598100
Tap drill	SMT-B2,B3,B4-T	33696800



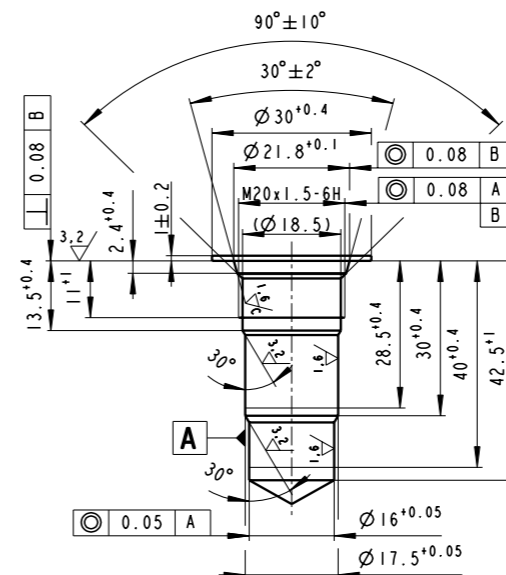
QC2 - 284410 M12x1



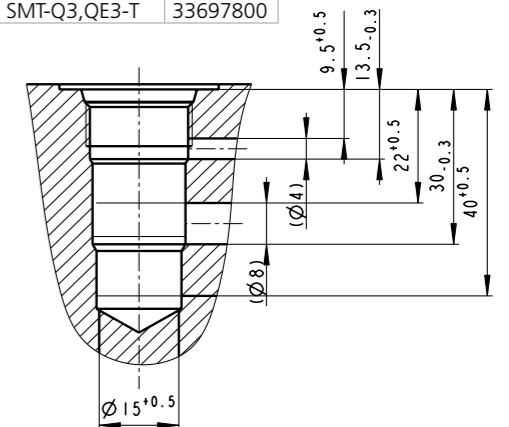
Tool type	Ordering code	SAP No.
Drill	SMT-QC2-B1	33538100
	SMT-QC2-B2	33538200
Counterbore	SMT-QC2-C	33694800
Forming drill	SMT-QC2-D	33592700
Forming reamer	SMT-QC2-R	33607300
Tap drill	SMT-QC2-T	33697700



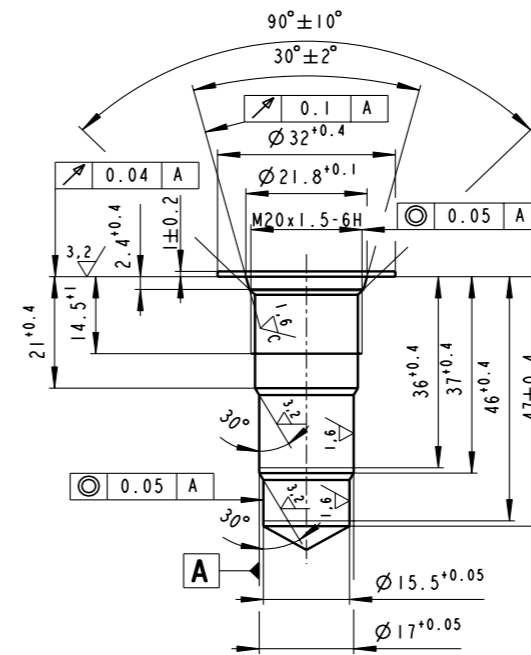
Q3 - 291248 M20x1.5



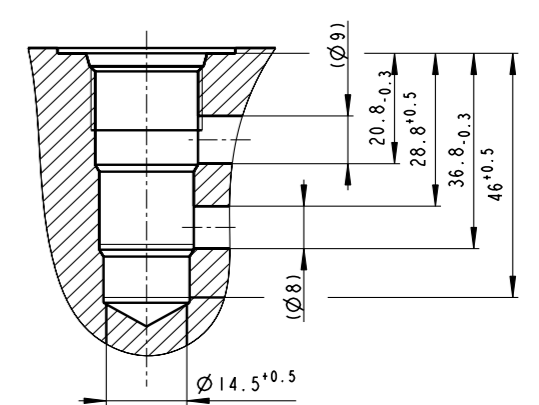
Tool type	Ordering code	SAP No.
Drill	SMT-Q3-B	33538300
Countersink conical	SMT-Q3, QE3-Z	33615800
Counterbore	SMT-Q3-C	33694900
Forming drill	SMT-Q3-D	33592800
Forming reamer	SMT-Q3-R	33607400
Tap drill	SMT-Q3,QE3-T	33697800



QE3 - 279404 M20x1.5

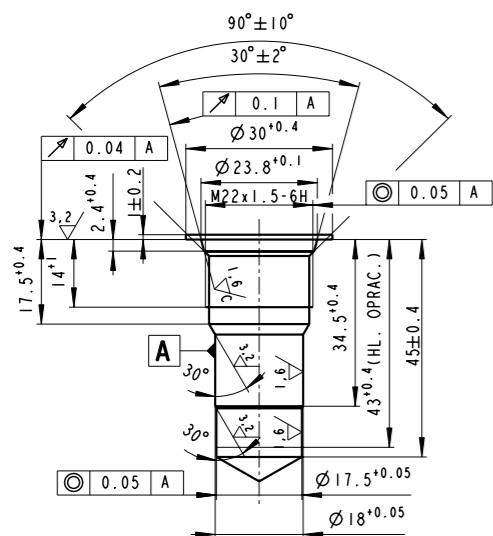


Tool type	Ordering code	SAP No.
Drill	SMT-QE3-B	33538400
Countersink conical	SMT-Q3, QE3-Z	33615800
Counterbore	SMT-QE3-C	33695000
Forming drill	SMT-QE3-D	33593000
Forming reamer	SMT-QE3-R	33607500
Tap drill	SMT-Q3,QE3-T	33697800

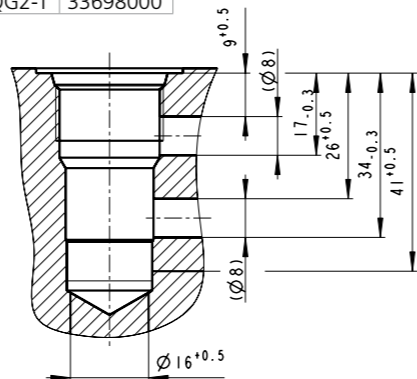


QF3 - 279405

M22x1.5

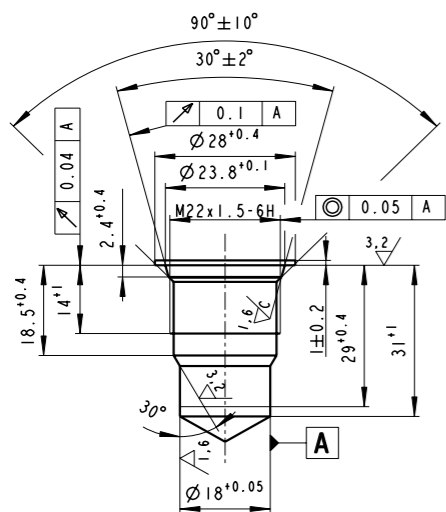


Tool type	Ordering code	SAP No.
Drill	SMT-QF3-B	33538500
Countersink conical	SMT-QF3, QG2-Z	33616000
Counterbore	SMT-QF3-C	33695300
Forming drill	SMT-QF3-D	33593100
Forming reamer	SMT-QF3-R	33607600
Tap drill	SMT-QF3, QG2-T	33698000

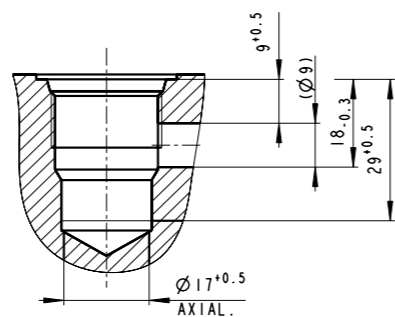


QG2 - 279406

M22x1.5

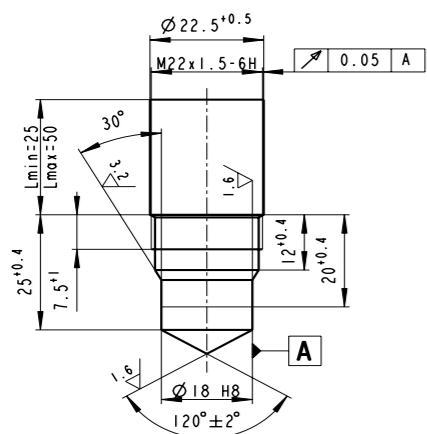


Tool type	Ordering code	SAP No.
Drill	SMT-QG2-B	33538700
Countersink conical	SMT-QF3, QG2-Z	33616000
Counterbore	SMT-QG2-C	33695400
Forming drill	SMT-QG2-D	33593200
Forming reamer	SMT-QG2-R	33607700
Tap drill	SMT-QF3, QG2-T	33698000

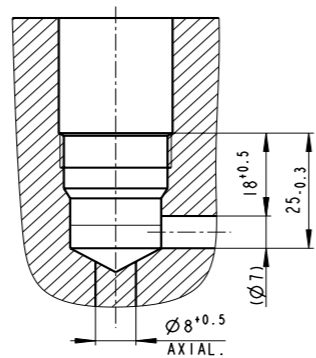


RD3 - 303228

M22x1.5

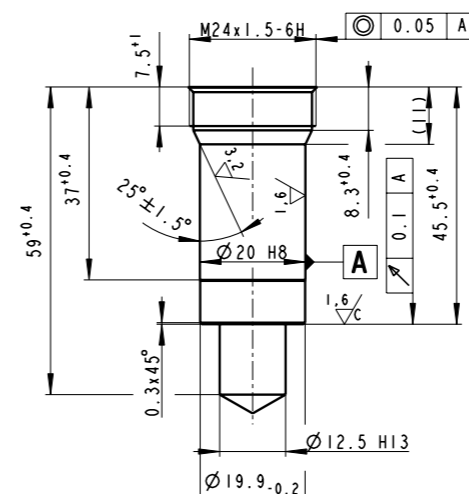


Tool type	Ordering code	SAP No.
On request		

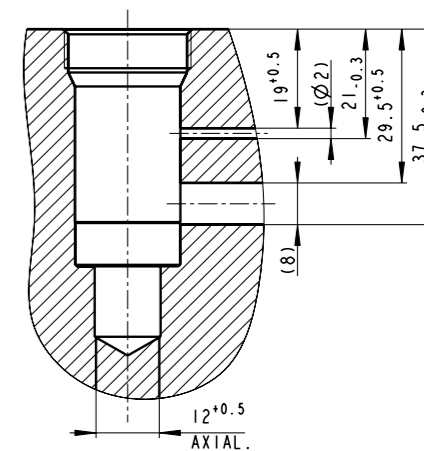


QJ2 - 279412

M24x1.5

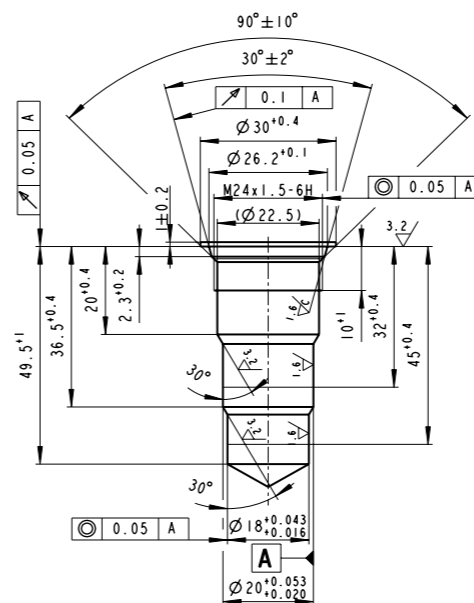


Tool type	Ordering code	SAP No.
Drill	SMT-QJ2-B	33538800
Forming drill	SMT-QJ2-D	33593400
Forming reamer	SMT-QJ2-R	33607800

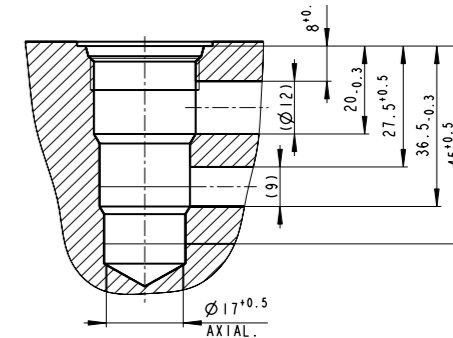


QJ3 - 281052

M24x1.5

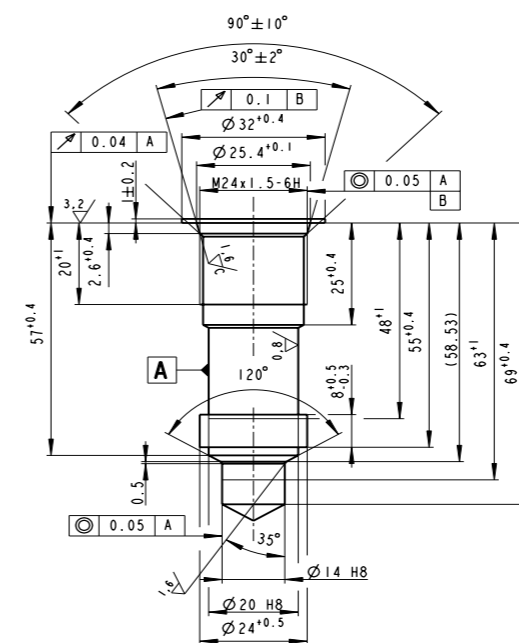


Tool type	Ordering code	SAP No.
Drill	SMT-QJ3-B	33543500
Countersink conical	SMT-QJ3-Z	33616200
Counterbore	SMT-QJ3-C	33695500
Forming drill	SMT-QJ3-D	33593500
Forming reamer	SMT-QJ3-R1	33608100
Tap drill	SMT-QJ3-R1	33608200
Tap drill	SMT-LA3, QJ3, GH2-T	33698200

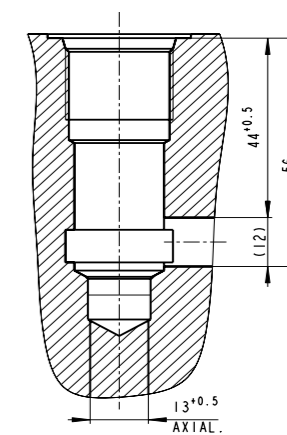


QH2 - 279411

M24x1.5

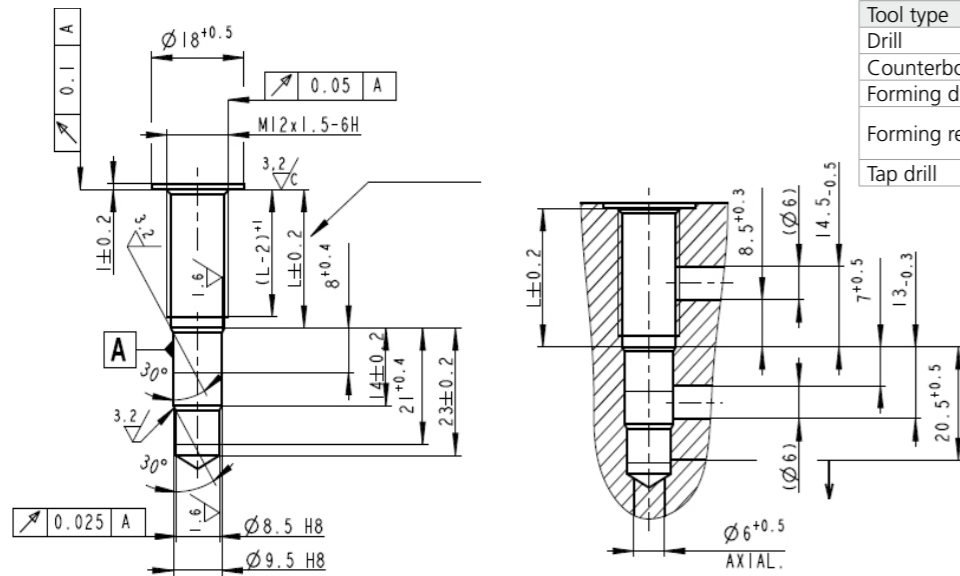


Tool type	Ordering code	SAP No.
Drill	SMT-QH2-B	33543600
Countersink conical	SMT-QH2-Z	33629100
Counterbore	SMT-QH2-C	33695600
Forming drill	SMT-QH2-D	33593600
Forming reamer	SMT-QH2-R	33608400
Tap drill	SMT-LA3, QJ3, GH2-T	33698200



QD3 - 279417

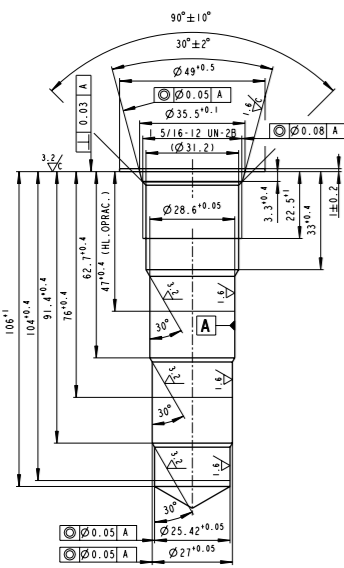
M12x1.5



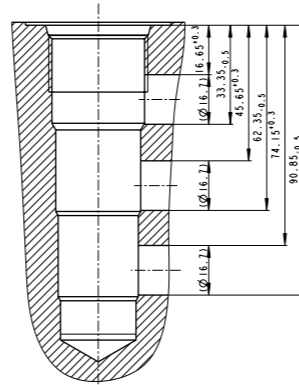
Tool type	Ordering code	SAP No.
Drill	SMT-QD3-B	34041500
Counterbore	SMT-QD3-C	34042400
Forming drill	SMT-QD3-D	34041800
Forming reamer	SMT-QD3-R1	33610300
	SMT-QD3-R2	34042100
Tap drill	SMT-QD3-T	34044700

D4 - 303234

1-5/16-12UN-2B

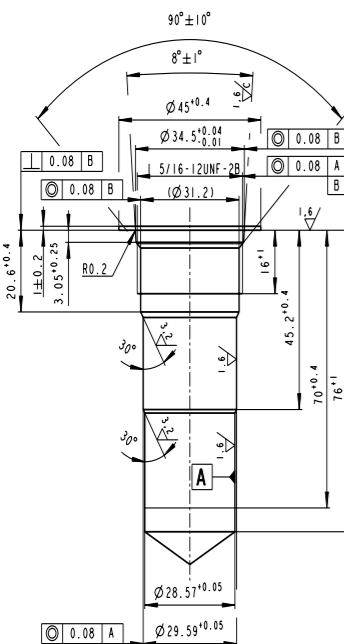


Tool type	Ordering code	SAP No.
Drill	SMT-D4-B	33537500
Countersink conical	SMT-D4-Z	33613500
Counterbore	SMT-D4-C	33694200
Forming drill	SMT-D4-D	33568200
	SMT-D4-R1	33598200
	SMT-D4-R2	33598400
	SMT-D4-R3	33598500
Tap drill	SMT-D4,V4-T	33697100

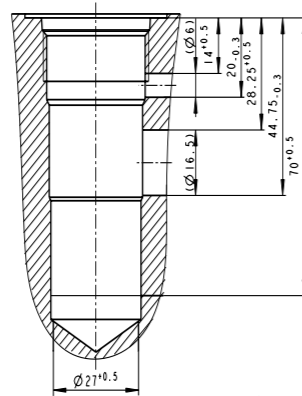


S3 - 291482

1-5/16-12UNF-2B

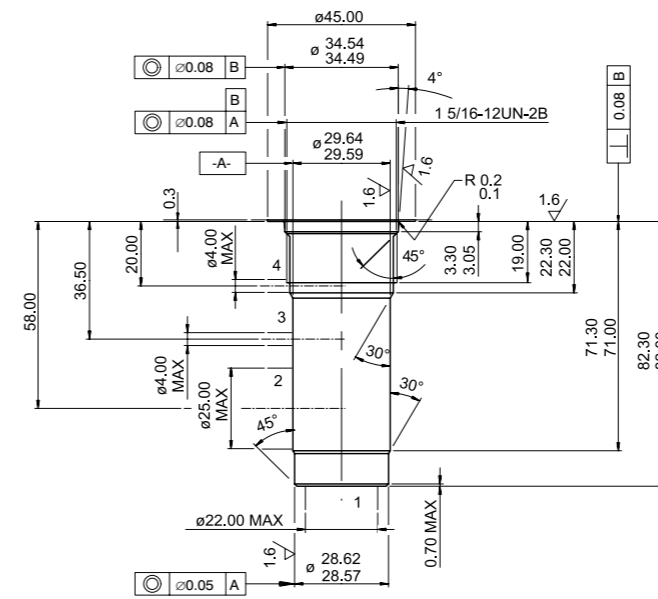


Tool type	Ordering code	SAP No.
Drill	SMT-S3-B	33548400
Countersink conical	SMT-S3-Z	33629500
Counterbore	SMT-S3-C	33696000
Forming drill	SMT-S3-D	33594500
Forming reamer	SMT-S3-R	33610700
Tap drill	SMT-S3-T	33699200



V4 - 291483

1-5/16-12UN

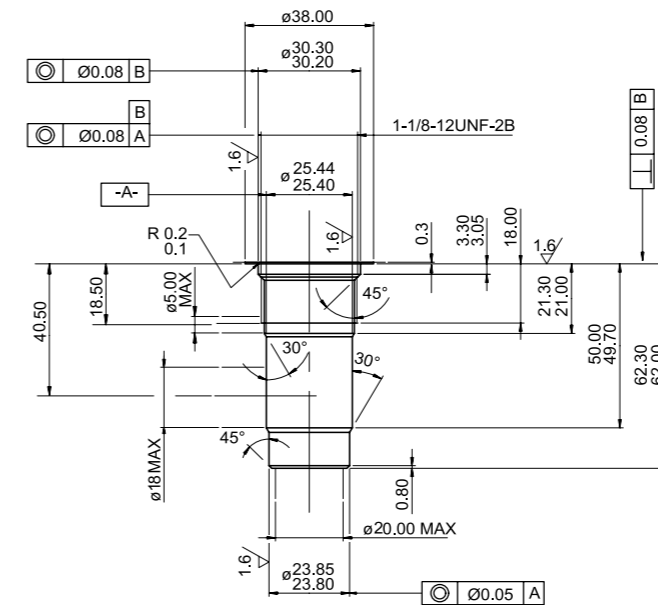


Tool type	Ordering code	SAP No.
Drill	SMT-V4-B	33549200
Countersink conical	SMT-V4-Z	33693700
Counterbore	SMT-V4-C	33696400
Forming drill	SMT-V4-D	33594900
Forming reamer	SMT-V4-R	33611200
Tap drill	SMT-D4,V4-T	33697100

U3, U4

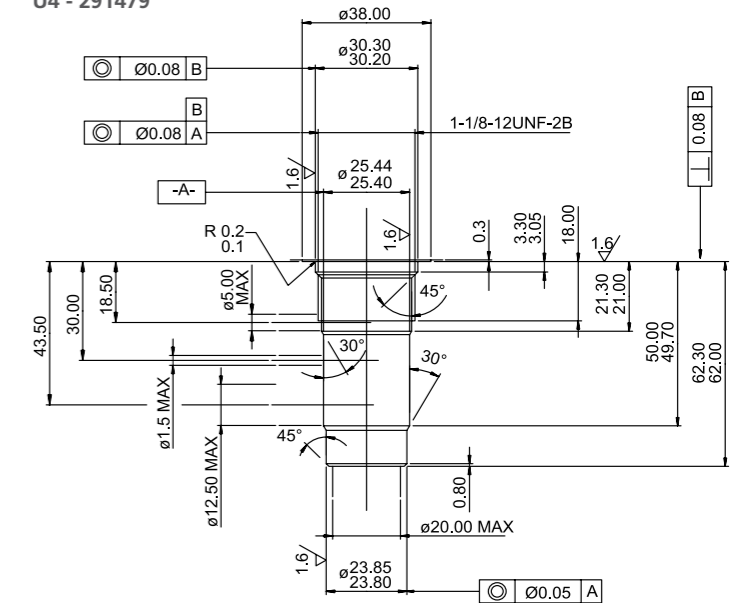
1-1/8-12 UNF

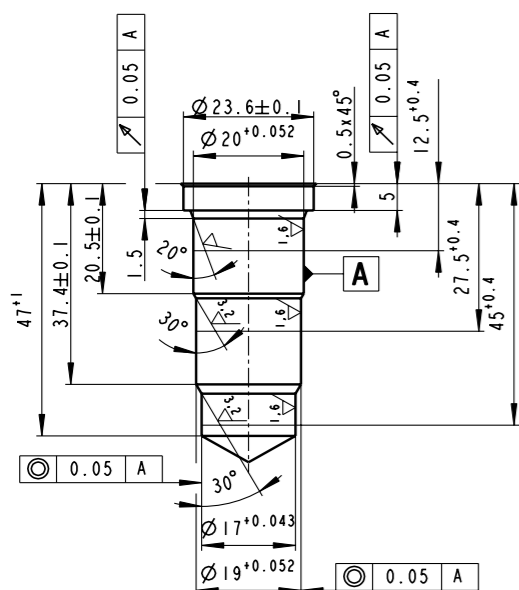
U3 - 291480



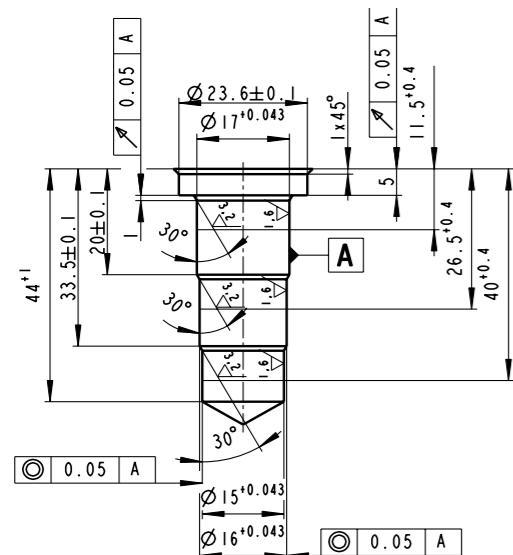
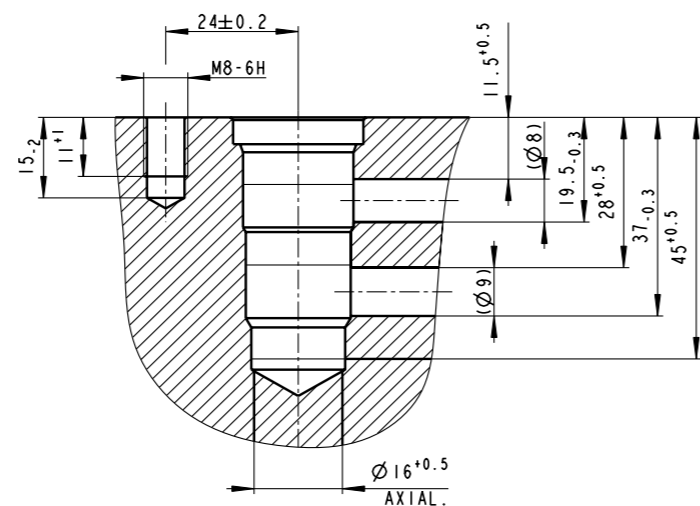
Tool type	Ordering code	SAP No.
Drill	SMT-U3, U4-B	33548700
Counterbore	SMT-U3, U4-C	33696200
Forming drill	SMT-U3, U4-D	33594700
Forming reamer	SMT-U3, U4-R1	33611000
	SMT-U3, U4-R2	33611100
Tap drill	SMT-U3, U4-T	33699000

U4 - 291479

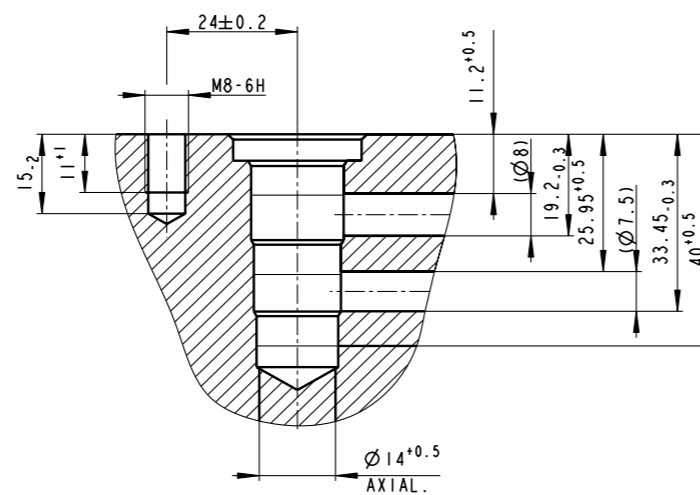




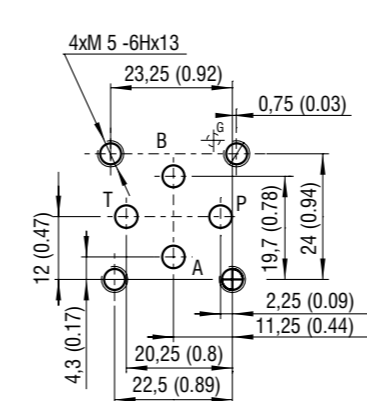
Tool type	Ordering code	SAP No.
Drill	SMT-W3,X3-B	33549800
Countersink conical	SMT-W3,X3-Z	33693800
Forming drill	SMT-W3,X3-D	33595000
Forming reamer	SMT-W3,X3-R	33611400



Tool type	Ordering code	SAP No.
Drill	SMT-Y3-B	33549900
Forming drill	SMT-Y3-D	33595100
Forming reamer	SMT-Y3-R	33611800

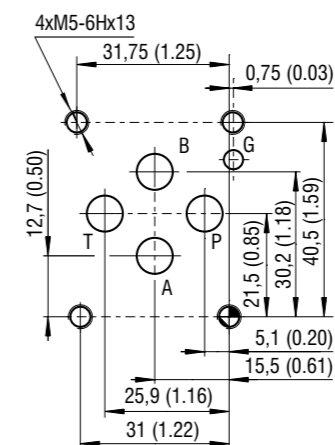


Size 04 - ISO 4401-02-01-0-05



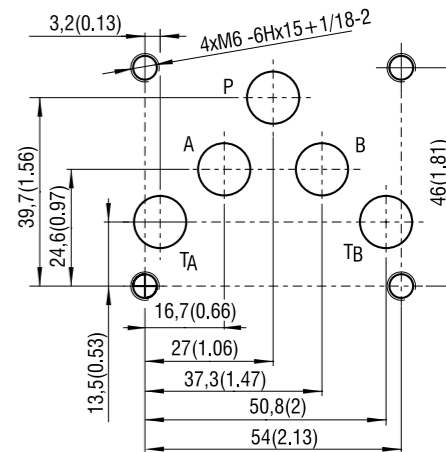
Ports P, A, B, T - max. Ø4.5 mm (0.18 in)

Size 06 - ISO 4401-03-02-0-05



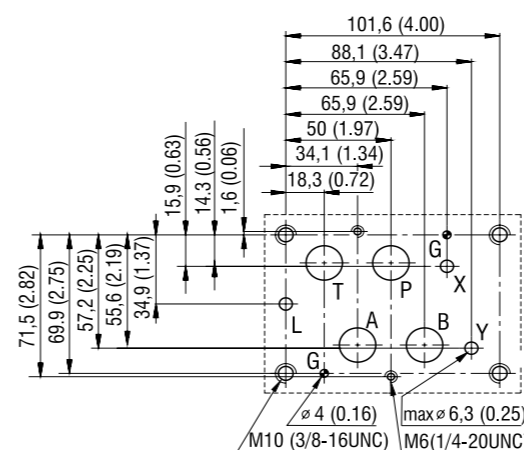
Ports P, A, B, T - max. Ø7.5 mm (0.29 in)

Size 10 - ISO 4401-05-04-0-05

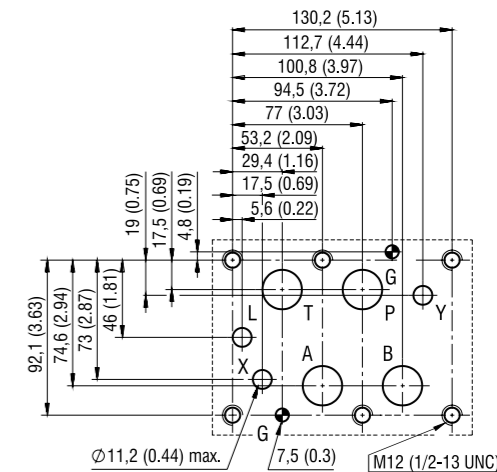


Ports P, A, B, T - max. Ø11.2 mm (0.44 in)
Ports X, Y - max. - Ø6.3 mm (0.25 in)

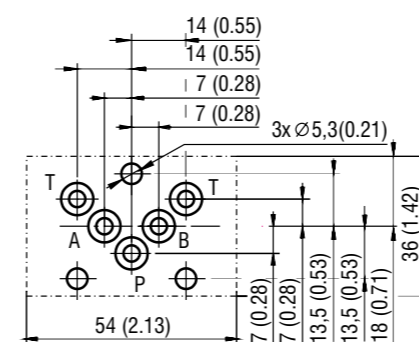
Size 16 - ISO 4401-07-07-0-05



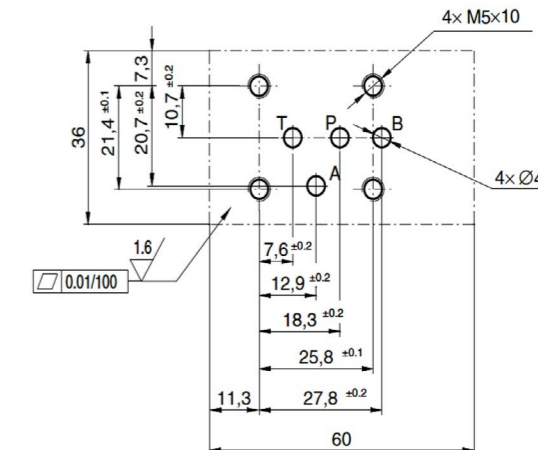
Size 25 - ISO 4401-08-08-0-05



Size 04 - CETOP-RP 121H)



Size 04 - ISO 4401-AA-02-4-A
(DIN 24 340-A4)



Hand Pump, Push-Type

RCA

3/4-16 UNF, M22x1.5 • p_{max} 250 bar (3600 PSI)

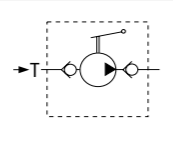


Technical Features

- › Push to pressurize
- › Simple and reliable design
- › High flow capacity and leak-free closing
- › Built-in pressure and suction check valves
- › Handle beam can be rotated by 360°, to suit the available space
- › Optional dust cuff for piston protection
- › In the standard version, the pump is zinc-coated for 240 h protection acc. to ISO 9227

Functional Description

Symbol



RCA-A2, Push to pressurize

This version provides flow of up to 7 cm³ (0.43 in³) per stroke at a pressure of 160 bar (2320 PSI). Built-in pressure and suction check valves provide a reliable device which delivers the right operational system flows.

RCA-RA2, Push to pressurize

This version provides flow of up to 5 cm³ (0.31 in³) per stroke at a pressure of 160 bar (2320 PSI). Built-in pressure check valve and radial suction sealing element provide a reliable device which delivers the right operational system flows.

Note: During operation the shaft will become lightly coated with an oil film from the internal high pressure circuit. The piston rod protruding from the hand pump may appear damp with oil after use. This is desirable as it lubricates the shaft seal, reducing friction and assuring optimal shaft seal life.

Technical Data

Hand pump size / cartridge cavity		3/4-16 UNF / A2	M22x1.5 / RA2
Max. operating pressure	bar (PSI)	160 (2320)	
Max. circuit pressure	bar (PSI)	250 (3630)	
Max. operating force L=500 mm (19.68 in)	N (lbf)	340 (77.2)	
Displacement per stroke	cm ³ (in ³)	7±1 (0.43±0.06)	5±1 (0.31±0.06)
Fluid temperature range (NBR)	°C (°F)	-30 ... +100 (-22 ... +212)	
Fluid temperature range (FPM)	°C (°F)	-20 ... +120 (-4 ... +248)	
Service life	cycles	500 000	
Mass of valve	kg (lbs)	0.72 (1.59)	0.70 (1.54)
Mass of lever		0.42 (0.91)	

	Data Sheet	
General information	GI_0060	Products and operating condition
Cavity details	SMT_0019	
Spare parts	SP_8010	

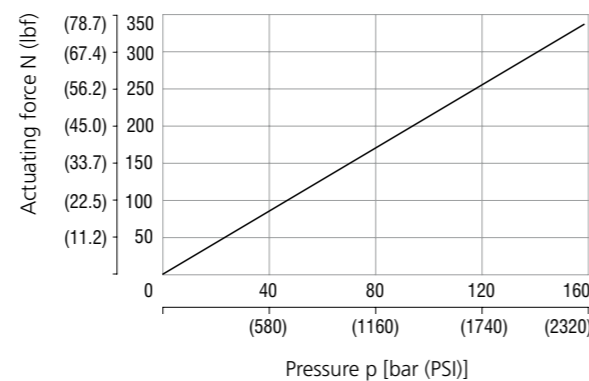
Characteristics measured at v = 32 mm³/s (156 SUS)

Operating limits

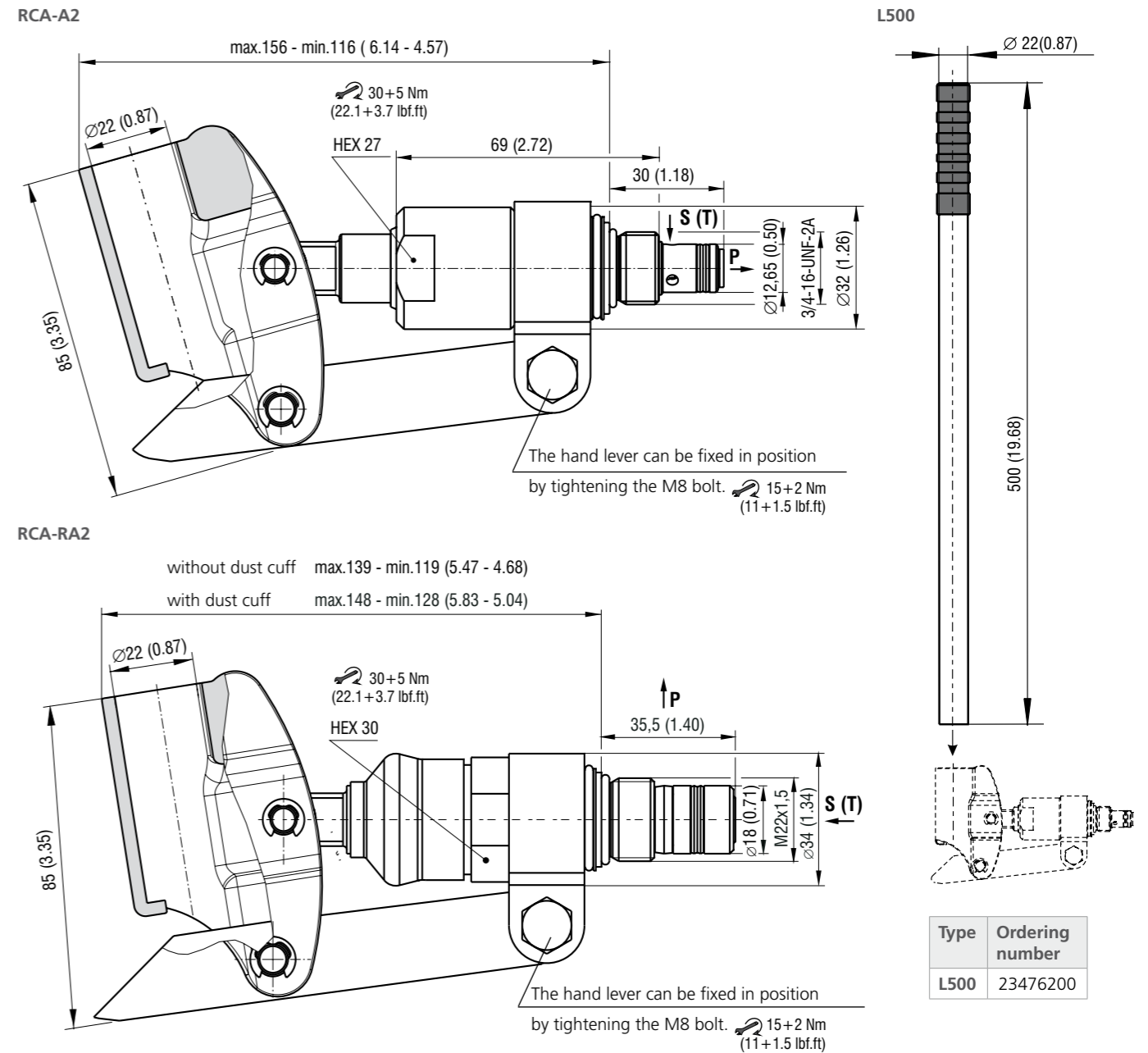
Manual force on the lever at max. pressure 160 bar



Warning: Pressurising of input pump port can cause spontaneous lever moving and injuring of operator.

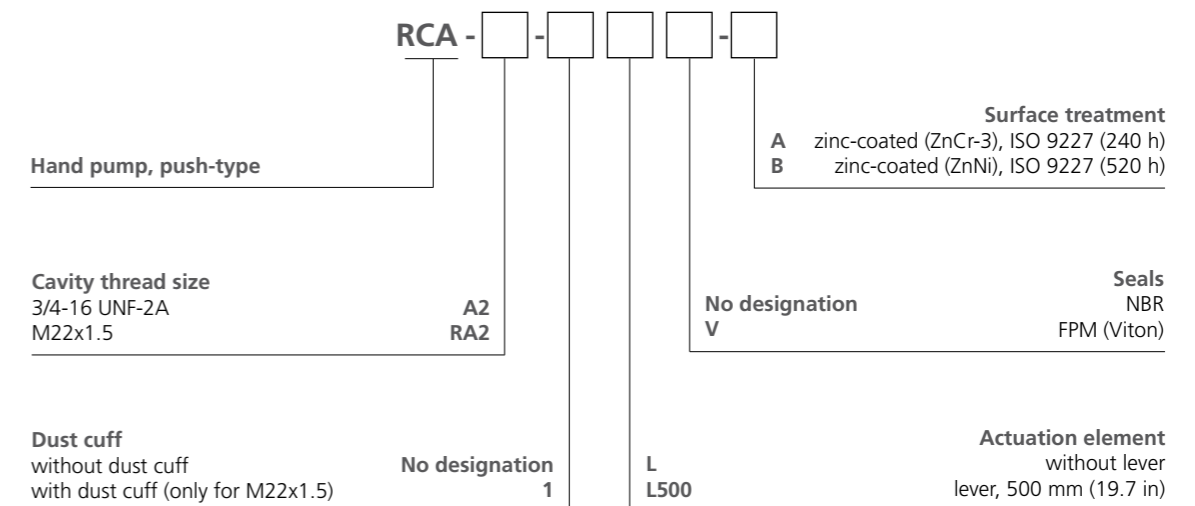


Dimensions in millimeters (inches)



Type	Ordering number
L500	23476200

Ordering Code



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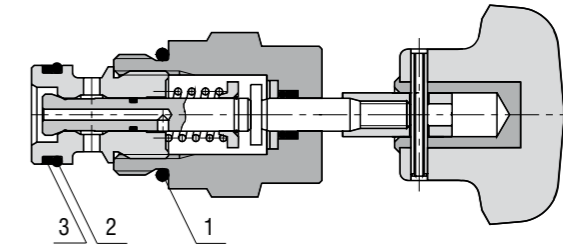
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1 Directional Control Valves and Poppet Valves

Product (Datasheet): **ROR3-062 (4025)**

Cavity QG2 M22x1.5

- 1 - O-ring
- 2 - O-ring
- 3 - Back-up ring



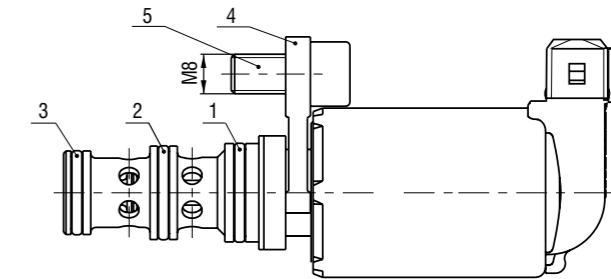
Position	ROR3-062											
1+2+3	Seal Kit	Pos.	O-ring	Pcs	Pos.	O-ring	Pcs	Pos.	Back-up ring	Pcs	Ordering No.	
	NBR	1	19.4x2.1	1	2	14x1.78	1	3	14.73x17.43x1.1	1	15650200	
	FPM		19.4x2.1	2		14x1.78	4		14.73x17.43x1.1	2	16954700	

Product (Datasheet): **PD2E1 (4050)**

Cavity D17/Y3

Cavity D20/X3, W3

- 1, 2, 3 - O-ring
- 4 - Fork Slip-In M8
- 5 - Bolt M8x16 (ISO 4762)

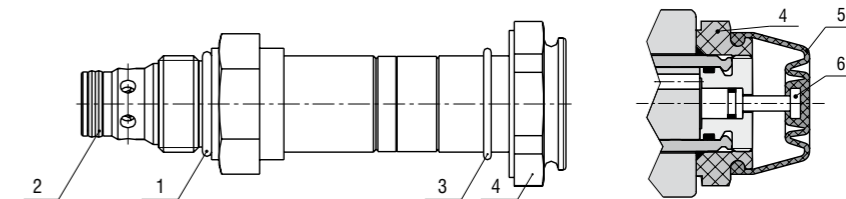


Position	PD2E1											
1+2+3	Seal Kit	Pos.	O-ring	Pcs	Pos.	O-ring	Pcs	Pos.	O-ring	Pcs	Ordering No.	
Cavity	NBR	3	11.2x1.8	1	2	12.42x1.78	1	1	14x1.78	1	17938600	
Y3	FPM	3	11.2x1.8	1	2	12.42x1.78	1	1	14x1.78	1	On request	
Cavity	NBR	3	14x1.78	1	2	16x1.8	1	1	17x1.8	1	16961300	
X3, W3	FPM	3	14x1.78	1	2	16x1.8	1	1	17x1.8	1	On request	
4+5	Kit - Fork+Bolt M8	Pos.		Pcs	Pos.		Pcs				Ordering No.	
		4	Fork SLIP-IN M8	1	5	Bolt M8x16 021143 Zn / PO-A	1				16961500	

Product (Datasheet): **SD1E-A2 (4070), SD2E-A2 (4040), SD3E-A2 (4043), SD1M-A2/L (4051)**

Cavity A2 3/4-16 UNF

- 1 - O-ring
- 2 - Dualseal
- 3 - O-ring
- 4 - Retaining nut
- 5 - Rubber boot protector
- 6 - Actuating pin



Position	SD2E-A2/L, SD3E-A2/L, SD1M-A2/L											
1+2	Seal Kit	Pos.	Dualseal SSA	Pcs	Pos.	O-ring NBR	Pcs	Pos.	O-ring Viton - FPM	Pcs	Ordering No.	
	NBR	2	10.3x12.7x3.1	1	1	17x1.8	1	-	-	-	20776700	
	FPM	2	10.3x12.7x3.1	1	-	-	-	1	17.17x1.78	1	17014300	
Position	SD2E-A2/L, SD3E-A2/L											
3+4	Nut Kit	Pos.	O-ring	Pcs	Pos.	Retaining nut	Pcs					
		3	13x2	1	4	Plastic	1				15691500	
Position	SD2E-A2/L											
5+6	Kit	Pos.	Rubber boot	Pcs	Pos.	Actuating pin	Pcs					
	for M2	5		1	6		1				29269100	
Position	SD1E-A2/H, SD2E-A2/H, SD3E-A2/H											
1+2	Seal Kit	Pos.	Dualseal SSA	Pcs	Pos.	O-ring NBR	Pcs	Pos.	O-ring Viton - FPM	Pcs	Ordering No.	
	NBR	2	10.3x12.7x3.1	1	1	17x1.8	1	-	-	-	20776700	
	FPM	2	10.3x12.7x3.1	1	-	-	-	1	17.17x1.78	1	17014300	
3+4	Nut Kit	Pos.	O-ring	Pcs	Pos.	Retaining nut	Pcs					
		3	18x1.5	1	4	Plastic	1				20777000	
5+6	Kit	Pos.	Rubber boot	Pcs	Pos.	Actuating pin	Pcs					
	for M2	5		1	6		1				24142700	

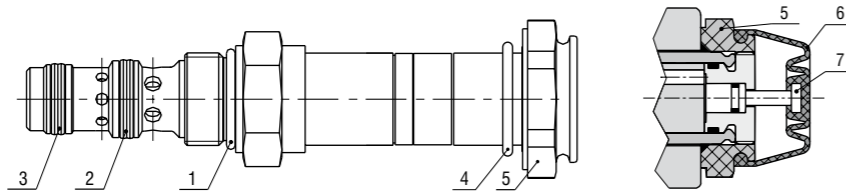
All dimensions are indicated in millimeters [mm].

1 Directional Control Valves and Poppet Valves

Product (Datasheet): **SD1E-A3 (4071), SD2E-A3 (4041)**

Cavity A3 3/4-16 UNF

- 1 - O-ring
- 2, 3 - Dualseal
- 4 - O-ring
- 5 - Retaining nut
- 6 - Rubber boot protector
- 7 - Actuating pin

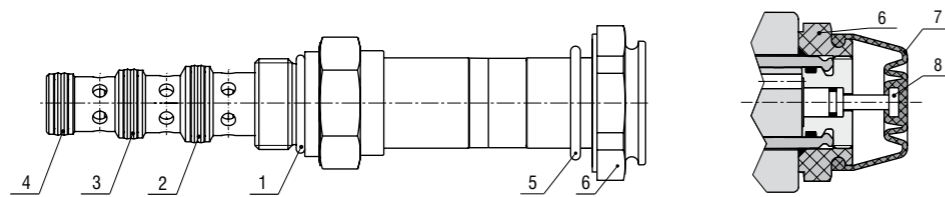


Position	SD2E-A3/L	Pos.	Dualseal SSA	Pcs	Pos.	O-ring NBR	Pcs	Pos.	O-ring Viton - FPM	Pcs	Ordering No.
1+2+3	Seal Kit	3	11.87x14.27x3.1	1	Pos.	O-ring NBR	1	Pos.	O-ring Viton - FPM	1	15661700
	NBR	2	13.47x15.87x3.1	1	1	17x1.8	1	-	-	-	20777200
	FPM	3	11.87x14.27x3.1	1	-	-	-	1	17.17x1.78	1	20777200
		2	13.47x15.87x3.1	1	-	-	-	1	17.17x1.78	1	20777200
Position	SD2E-A3/L	Pos.	O-ring	Pcs	Pos.	Retaining nut	Pcs				
4+5	Nut Kit	4	13x2	1	5	Plastic	1				15691500
Position	SD2E-A3/L	Pos.	Rubber boot	Pcs	Pos.	Actuating pin	Pcs				
6+7	Kit for M2	6		1	7		1				29269100
Position	SD1E-A3/H, SD2E-A3/H	Pos.	Dualseal SSA	Pcs	Pos.	O-ring NBR	Pcs	Pos.	O-ring Viton - FPM	Pcs	Ordering No.
1+2+3	Seal Kit	3	11.87x14.27x3.1	1	1	17x1.8	1	-	-	-	15661700
	NBR	2	13.47x15.87x3.1	1	-	-	-	1	17.17x1.78	1	20777200
	FPM	3	11.87x14.27x3.1	1	-	-	-	1	17.17x1.78	1	20777200
		2	13.47x15.87x3.1	1	-	-	-	1	17.17x1.78	1	20777200
4+5	Nut Kit	Pos.	O-ring	Pcs	Pos.	Retaining nut	Pcs				
		4	18x1.5	1	5	Plastic	1				20777000
6+7	Kit for M2	Pos.	Rubber boot	Pcs	Pos.	Actuating pin	Pcs				
		6		1	7		1				24142700

Product (Datasheet): **SD2E-A4 (4042)**

Cavity A4 3/4-16 UNF

- 1 - O-ring
- 2, 3, 4 - Dualseal
- 5 - O-ring
- 6 - Retaining nut
- 7 - Rubber boot protector
- 8 - Actuating pin



Position	SD2E-A4/L	Pos.	Dualseal SSA	Pcs	Pos.	O-ring NBR	Pcs	Pos.	O-ring Viton - FPM	Pcs	Ordering No.
1+2+3+4	Seal Kit	4	10.3x12.7x3.1	1	Pos.	O-ring NBR	1	Pos.	O-ring Viton - FPM	1	20777300
	NBR	3	11.87x14.27x3.1	1	1	17x1.8	1	-	-	-	20777400
		2	13.47x15.87x3.1	1	-	-	-	1	17.17x1.78	1	20777400
	FPM	4	10.3x12.7x3.1	1	-	-	-	1	17.17x1.78	1	20777400
		3	11.87x14.27x3.1	1	-	-	-	1	17.17x1.78	1	20777400
		2	13.47x15.87x3.1	1	-	-	-	1	17.17x1.78	1	20777400
Position	SD2E-A4/L	Pos.	O-ring	Pcs	Pos.	Retaining nut	Pcs				
5+6	Nut Kit	5	13x2	1	6	Plastic	1				15691500
Position	SD2E-A4/L	Pos.	Rubber boot	Pcs	Pos.	Actuating pin	Pcs				
7+8	Kit for M2	7		1	8		1				29269100
Position	SD2E-A4/H	Pos.	Dualseal SSA <th>Pcs</th> <th>Pos.</th> <th>O-ring NBR</th> <th>Pcs</th> <th>Pos.</th> <th>O-ring Viton - FPM</th> <th>Pcs</th> <th>Ordering No.</th>	Pcs	Pos.	O-ring NBR	Pcs	Pos.	O-ring Viton - FPM	Pcs	Ordering No.
1+2+3+4	Seal Kit	4	10.3x12.7x3.1	1							
	NBR	3	11.87x14.27x3.1	1		17x1.8	1	-	-	-	20777300
		2	13.47x15.87x3.1	1				-	-	-	20777400
	FPM	4	10.3x12.7x3.1	1				-	-	-	20777400
		3	11.87x14.27x3.1	1				-	-	-	20777400
		2	13.47x15.87x3.1	1				-	-	-	20777400
5+6	Nut Kit	Pos.	O-ring	Pcs	Pos.	Retaining nut	Pcs				
		5	18x1.5	1	6	Plastic	1				20777000
7+8	Kit for M2	Pos.	Rubber boot	Pcs	Pos.	Actuating pin	Pcs				
		7		1	8		1				24142700

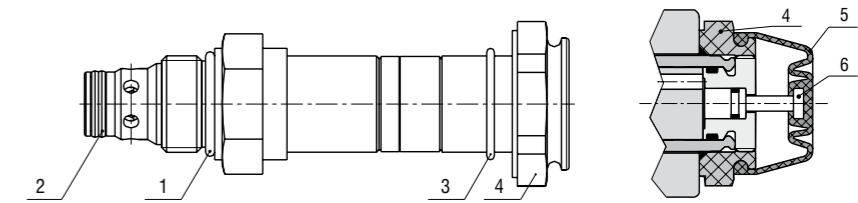
All dimensions are indicated in millimeters [mm].

1 Directional Control Valves and Poppet Valves

Product (Datasheet): **SD2E-B2 (4060), SD3E-B2 (4063)**

Cavity B2 7/8-14 UNF

- 1 - O-ring
- 2 - Dualseal
- 3 - O-ring
- 4 - Retaining nut
- 5 - Rubber boot protector
- 6 - Actuating pin

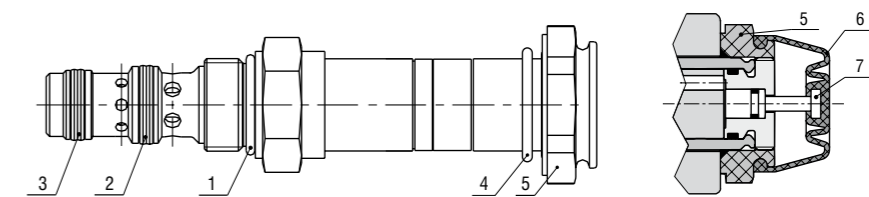


Position	SD2E-B2/L, SD3E-B2/L	Pos.	Dualseal SSA	Pcs	Pos.	O-ring NBR	Pcs	Pos.	O-ring Viton - FPM	Pcs	Ordering No.
1+2	Seal Kit	2	13.47x15.87x3.1	1	Pos.	O-ring NBR	1	Pos.	O-ring Viton - FPM	1	18960400
	NBR	3	11.87x14.27x3.1	1	1	19.4x2.1	1	-	-	-	18960500
	FPM	2	13.47x15.87x3.1	1	-	-	-	1	19.4x2.1	1	18960500
3+4	Nut Kit	Pos.	O-ring	Pcs	Pos.	Retaining nut	Pcs				
		3	18x1.5	1	4	Plastic	1				20777000
5+6	Kit for M2	Pos.	Rubber boot	Pcs	Pos.	Actuating pin	Pcs				
		5		1	6		1				24142700
Position	SD2E-B2/H, SD3E-B2/H	Pos.	Dualseal SSA <th>Pcs</th> <th>Pos.</th> <th>O-ring NBR</th> <th>Pcs</th> <th>Pos.</th> <th>O-ring Viton - FPM</th> <th>Pcs</th> <th>Ordering No.</th>	Pcs	Pos.	O-ring NBR	Pcs	Pos.	O-ring Viton - FPM	Pcs	Ordering No.
1+2	Seal Kit	2	13.47x15.87x3.1	1	1	19.4x2.1	1	-	-	-	18960400
	NBR	2	13.47x15.87x3.1	1	-	-	-	1	19.4x2.1	1	18960500
	FPM	2	13.47x15.87x3.1	1	-	-	-	1	19.4x2.1	1	18960500
3+4	Nut Kit	Pos.	O-ring	Pcs	Pos.	Retaining nut	Pcs				
		3	22x2	1	4	Plastic	1				15844600
5+6	Kit for M2	Pos.	Rubber boot	Pcs	Pos.	Actuating pin	Pcs				
		5		1	6		1				40099800

Product (Datasheet): **SD2E-B3 (4061)**

Cavity B3 7/8-14 UNF

- 1 - O-ring
- 2, 3 - Dualseal
- 4 - O-ring
- 5 - Retaining nut
- 6 - Rubber boot
- 7 - Actuating pin



Position	SD2E-B3/L	Pos.	Dualseal SSA	Pcs	Pos.	O-ring NBR	Pcs	Pos.	O-ring Viton - FPM	Pcs	Ordering No.
1+2+3	Seal Kit	3	13.47x15.87x3.1	1	Pos.	O-ring NBR	1	Pos.	O-ring Viton - FPM	1	18960700
	NBR	2	15.07x17.47x3.1	1	1	19.4x2.1	1	-	-	-	18960600
	FPM	3	13.47x15.87x3.1	1	-	-	-	1	19.4x2.1	1	18960600
		2	15.07x17.47x3.1	1	-	-	-	1	19.4x2.1	1	18960600
4+5	Nut Kit	Pos.	O-ring	Pcs	Pos.	Retaining nut	Pcs				
		4	18x1.5	1	5	Plastic	1				20777000
6+7	Kit for M2	Pos.	Rubber boot	Pcs	Pos.	Actuating pin	Pcs				
		6		1	7		1				24142700
Position	SD2E-B3/H	Pos.	Dualseal SSA <th>Pcs</th> <th>Pos.</th> <th>O-ring NBR</th> <th>Pcs</th> <th>Pos.</th> <th>O-ring Viton - FPM</th> <th>Pcs</th> <th>Ordering No.</th>	Pcs	Pos.	O-ring NBR	Pcs	Pos.	O-ring Viton - FPM	Pcs	Ordering No.
1+2+3	Seal Kit	3	13.47x15.87x3.1	1	1	17x1.8	1	-	-	-	18960700
	NBR	2	15.07x17.47x3.1	1	-	-	-	1	17.17x1.78	1	18960600
	FPM	3	13.47x15.87x3.1	1	-	-	-	1	17.17x1.78	1	18960600
		2	15.07x17.47x3.1	1	-	-	-	1	17.17x1.78	1	18960600
4+5	Nut Kit	Pos.	O-ring	Pcs	Pos.	Retaining nut	Pcs				
		4	22x2	1	5	Plastic	1				15844600
6+7	Kit for M2	Pos.	Rubber boot	Pcs	Pos.	Actuating pin	Pcs				
		6		1	7		1				40099800

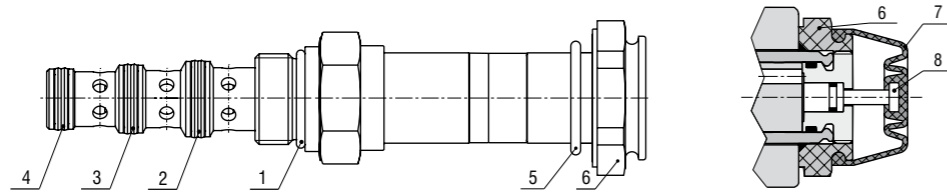
All dimensions are indicated in millimeters [mm].

1 Directional Control Valves and Poppet Valves

Product (Datasheet): **SD2E-B4 (4062)**

Cavity B4 7/8-14 UNF

- 1 - O-ring
- 2, 3, 4 - Dualseal
- 5 - O-ring
- 6 - Retaining nut
- 7 - Rubber boot
- 8 - Actuating pin



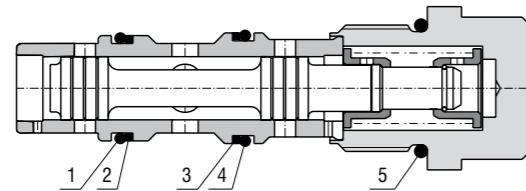
Position	SD2E-B4/L	Pos.	Dualseal SSA	Pcs	Pos.	O-ring NBR	Pcs	Pos.	O-ring Viton - FPM	Pcs	Ordering No.
1+2+3+4	Seal Kit	4	13.47x15.87x3.1	1							
	NBR	3	15.07x17.47x3.1	1	1	19.4x2.1	1	-	-	-	18960800
		2	16.65x19.05x3.1	1							
		4	13.47x15.87x3.1	1							
	FPM	3	15.07x17.47x3.1	1	-	-	-	1	19.4x2.1	1	18960900
		2	16.65x19.05x3.1	1							
		5	18x1.5	1	6	Plastic	1				20777000
5+6	Nut Kit	5	18x1.5	1	6	Plastic	1				20777000
7+8	Kit	7	Rubber boot	1	8	Actuating pin	1				24142700
	for M2	7		1	8		1				24142700

Position	SD2E-B4/H	Pos.	Dualseal SSA	Pcs	Pos.	O-ring NBR	Pcs	Pos.	O-ring Viton - FPM	Pcs	Ordering No.
1+2+3+4	Seal Kit	4	13.47x15.87x3.1	1							
	NBR	3	15.07x17.47x3.1	1	1	19.4x2.1	1	-	-	-	18960800
		2	16.65x19.05x3.1	1							
		4	13.47x15.87x3.1	1							
	FPM	3	15.07x17.47x3.1	1	-	-	-	1	19.4x2.1	1	18960900
		2	16.65x19.05x3.1	1							
		5	22x2	1	6	Plastic	1				15844600
5+6	Nut Kit	5	22x2	1	6	Plastic	1				15844600
7+8	Kit	7	Rubber boot	1	8	Actuating pin	1				40099800
	for M2	7		1	8		1				40099800

Product (Datasheet): **SD2H-LA3 (4080)**

Cavity LA3 M24x1.5

- 1 - O-ring
- 2 - Back-up ring
- 3 - Back-up ring
- 4 - O-ring
- 5 - O-ring



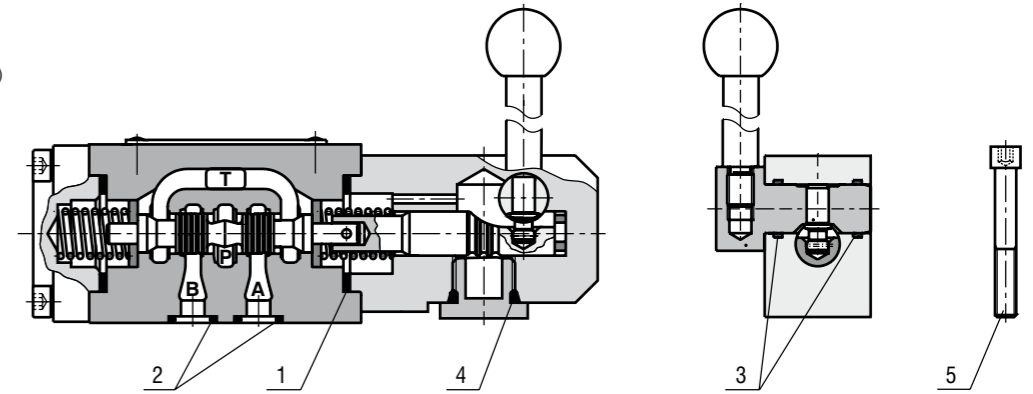
Position	SD2H-LA3	Pos.	O-ring NBR	Pcs	Pos.	Back-up ring (PTFE)	Pcs	Ordering No.
1+2+3+4+5	Seal Kit	1	16x2	1	2	17x20x1.4	1	
	NBR	4	17x2	1	3	18x21x1.4	1	40101900
		5	21.3x2.4	1	-	-	-	-
		1	16x2	1	2	17x20x1.4	1	
1+2+3+4+5	Seal Kit	1	16x2	1	2	17x20x1.4	1	
	FPM	4	17x2	1	3	18x21x1.4	1	On request
		5	21.3x2.4	1	-	-	-	-
		1	16x2	1	2	17x20x1.4	1	

1 Directional Control Valves and Poppet Valves

Product (Datasheet): **RPR3-04 (4018), RPR3-06 (4004)**

Valve size 04, 06

- 1 - O-ring
- 2 - Square ring (NBR), O-ring (FPM)
- 3 - O-ring
- 4 - O-ring
- 5 - Bolt



Position	RPR3-04	Pos.	O-ring	Pcs	Pos.	Ring	Pcs	Pos.	O-ring	Pcs	Pos.	O-ring	Pcs	Ordering No.
1+2+3+4	Seal Kit	1	22x2	2	2	Square ring 7.65x1.68	4	3	11x1.5	2	4	11.3x2.4	1	15673600
	NBR		22x2	2	2	O-ring 7.5x1.8	4		11x1.5	2	4	11.3x2.4	1	20897200
		FPM		22x2	2				11x1.5	2		11.3x2.4	1	
5	Bolt Kit	5	Mounting bolts for steel plates				4							Ordering No.
		5	Bolt M5x35				4							15874600

Bolts for flange M4x16

For studs see Datasheet Studs and Nuts_Dn04_06_10_0020

Position	RPR3-06	Pos.	O-ring	Pcs	Pos.	Ring	Pcs	Pos.	O-ring	Pcs	Pos.	O-ring	Pcs	Ordering No.
1+2+3+4	Seal Kit	1	22x2	2	2	Square ring 9.25x1.68	4	3	11x1.5	2	4	11.3x2.4	1	15700300
	NBR		22x2	2	2	O-ring 9.25x1.78	4		11x1.5	2	4	11.3x2.4	1	15700600
		FPM		22x2	2				11x1.5	2		11.3x2.4	1	
5	Bolt Kit	5	Mounting bolts for steel plates				4							Ordering No.
		5	Bolt M5x45				4							15845100

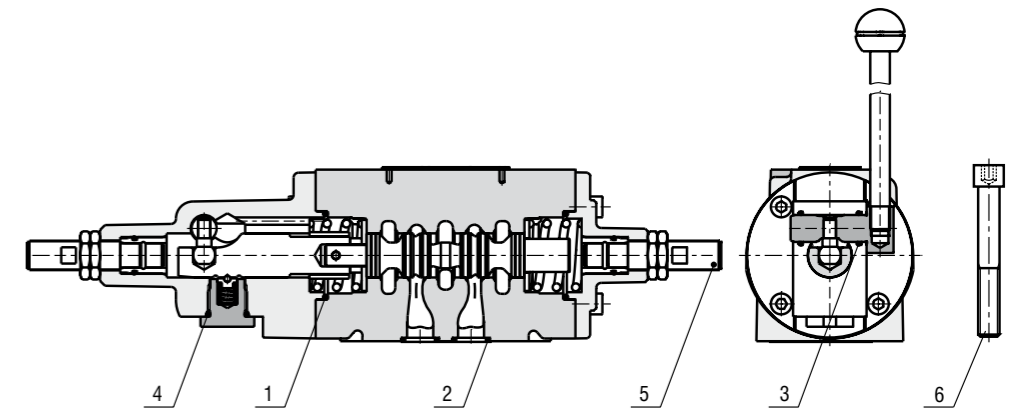
Bolts for flange M5x16

Mounting bolts for flange are not available
For studs see Datasheet Studs and Nuts_Dn04_06_10_0020

Product (Datasheet): **RPR1-10 (4084)**

Valve size 10

- 1 - O-ring
- 2 - Square ring
- 3 - O-ring
- 4 - O-ring
- 5 - Sensor
- 6 - Bolt



Position	RPR1-10	Pos.	O-ring	Pcs	Pos.	Square ring	Pcs	Pos.	O-ring	Pcs	Pos.	O-ring	Pcs	Ordering No.
1+2+3+4	Seal Kit	1	32x2	2	2	12.42x1.68	5	3	11x1.5	2	4	14x1.78	1	33830800
	NBR		32x2	2	2	12.42x1.68	5		11x1.5	2	4	14x1.78	1	34635600
		FPM		32x2	2				11x1.5	2		14x1.78	1	
5	Model	5					1	Max. input voltage						Ordering No.
	Sensor	SO					1	10...30 VDC						16688500
		SC					1							20725300
6	Bolt Kit	7					4							Ordering No.
		7	Bolt M6x40				4	for studs see Datasheet 0020						15847700

All dimensions are indicated in millimeters [mm].

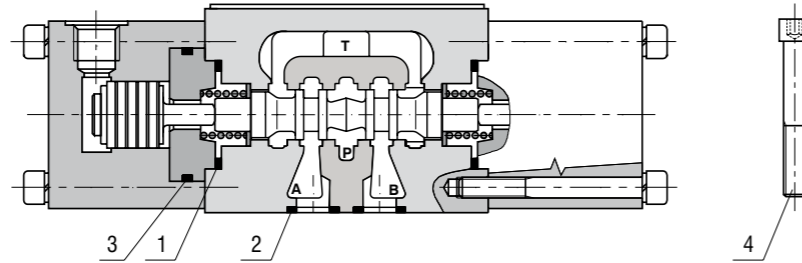
All dimensions are indicated in millimeters [mm].

1 Directional Control Valves and Poppet Valves

Product (Datasheet): **RPH2-06 (4005), RPH3-06 (4006)**

Valve size 06

- 1 - O-ring
- 2 - Square ring (NBR), O-ring (FPM)
- 3 - O-ring
- 4 - Bolt

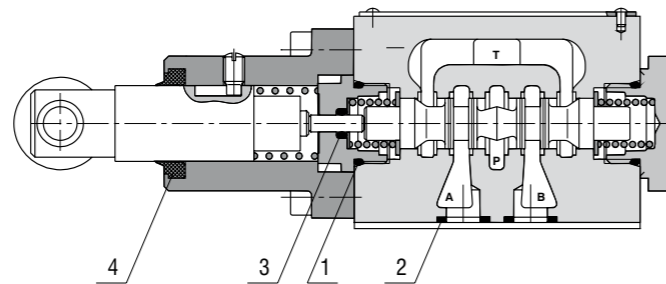


Position	RPH2-06												
1+2+3	Seal Kit	Pos.	O-ring	Pcs	Pos.	Ring	Pcs	Pos.	O-ring	Pcs	Ordering No.		
	NBR	1	22x2	2	2	Square ring 9.25x1.68	4	3	28x2	2	20980500		
	FPM		22x2	2		O-ring 9.25x1.78	4		28x2	2	20980600		
4	Bolt Kit	Pos.										Ordering No.	
		4	Bolt M5x45									15845100	
Mounting bolts for steel plates													
Position			RPH3-06										
1+2	Seal Kit	Pos.	O-ring	Pcs	Pos.	Ring	Pcs						Ordering No.
	NBR	1	17x1.8	2	2	Square ring 9.25x1.68	4						15845200
	FPM		17.17x1.78	2		O-ring 9.25x1.78	4						15845400
4	Bolt Kit	Pos.										Ordering No.	
		4	Bolt M5x45									15845100	
Mounting bolts for steel plates													
Bolts for flange			M5x16										
For studs see Datasheet Studs and Nuts_Dn04_06_10_0020			Mounting bolts for flange are not available										

Product (Datasheet): **RPK1-06 (4038)**

Valve size 06

- 1 - O-ring
- 2 - Square ring (NBR), O-ring (FPM)
- 3 - O-ring
- 4 - Wiper ring



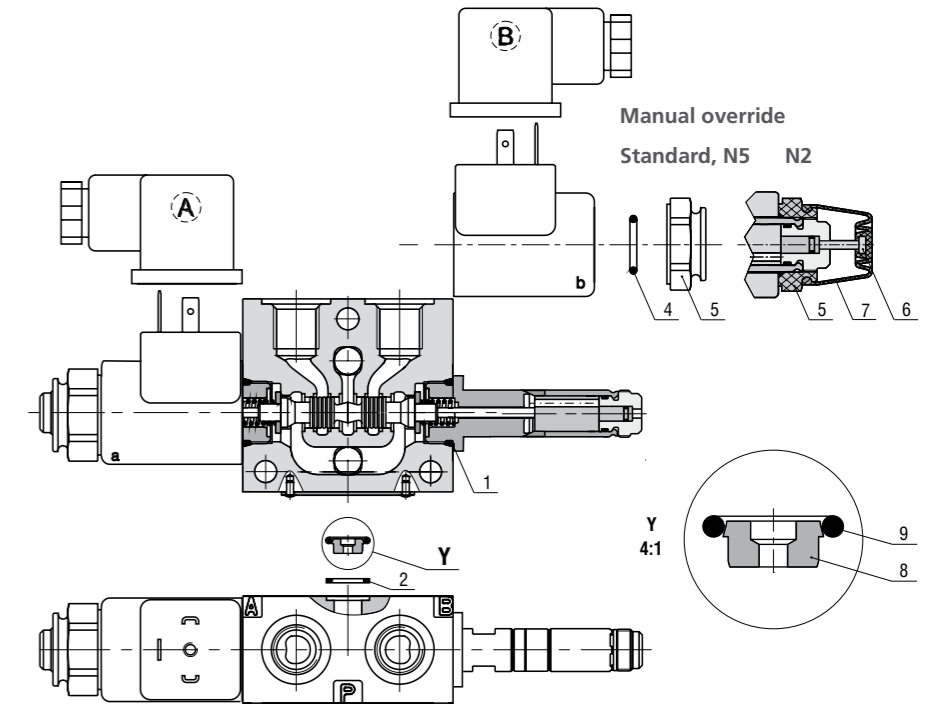
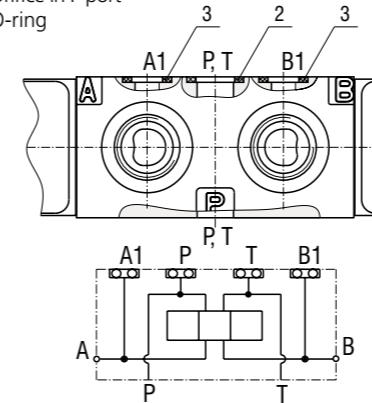
Position	RPK1-06													
1+2+3+4	Seal Kit	Pos.	O-ring	Pcs	Pos.	Ring	Pcs	Pos.	O-ring	Pcs	Pos.	Wiper ring	Pcs	Ordering No.
	NBR	1	17x1.8	2	2	Square ring 9.25x1.68	4	3	3.68x1.78	1	4	WSW 000180 ASW	1	20980900
	FPM		17.17x1.78	2		O-ring 9.25x1.78	4		3.68x1.78	1			1	34524700
5	Bolt Kit	Pos.	Mounting bolts for steel plates									Ordering No.		
		5	Bolt M5x45									15845100		
for studs see Datasheet 0020														

1 Directional Control Valves and Poppet Valves

Product (Datasheet): **RPEK1-03 (4027)**

Valve size 03

- 1 - O-ring
- 2 - Square ring (NBR), O-ring (FPM)
- 3 - Square ring (NBR), O-ring (FPM)
- 4 - O-ring
- 5 - Retaining nut
- 6 - Actuating pin
- 7 - Rubber boot
- 8 - Orifice in P port
- 9 - O-ring



For solenoid coil see datasheet C_8007.
For electrical connector see datasheet K_8008.

Position	RPEK1-03*												
1+2+3	Seal Kit	Pos.	O-ring	Pcs	Pos.	Ring	Pcs	Pos.	Ring	Pcs	Ordering No.		
Universal kit for all designations	NBR	1	16x2	2	2	Square ring 9.25x1.68	2	3	Square ring 7.65x1.68	2	28839800		
	FPM	1	16x2	2	2	O-ring 9.25x1.78	2	3	O-ring 7.65x1.78	2	28840100		
4+5	Nut Kit	Pos.	O-ring	Pcs	Pos.	Retaining nut	Pcs						Ordering No.
	Standard, N5, N2	4	13x2	1	5	Plastic	1						15691500
6+7	Kit	Pos.	Actuating pin	Pcs	Pos.	Rubber boot	Pcs						Ordering No.
	N2	6		1	7		1						29269100
8+9	Kit	Pos.	Orifice in P port	Pcs	Pos.	O-ring NBR	Pcs						Ordering No.
Orifice in P port with NBR seal		8	Ø1.0	1	9	9.25x1.78	1						On request
	Ø1.5		1										
	Ø2.0		1										
	Ø2.2		1										
	Ø2.5		1										
8+9	Kit	Pos.	Orifice in P port	Pcs	Pos.	O-ring FPM	Pcs						Ordering No.
Orifice in P port with FPM seal		8	Ø1.0	1	9	9.25x1.78	1						15845600
	Ø1.5		1						15845700				
	Ø2.0		1						15845800				
	Ø2.2		1						15846000				
	Ø2.5		1						15845900				

All dimensions are indicated in millimeters [mm].

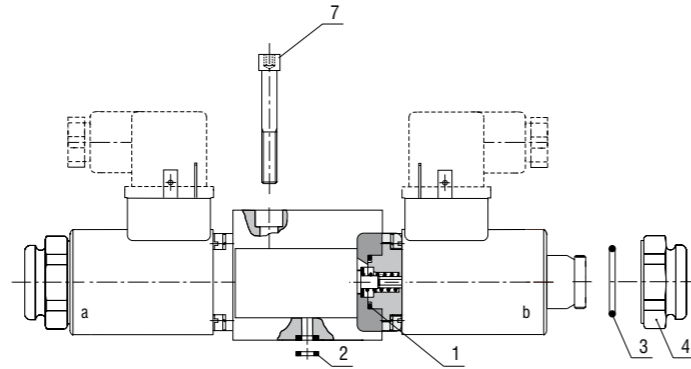
1 Directional Control Valves and Poppet Valves

Product (Datasheet): **RPE2-04 (4012)**

Valve size 04

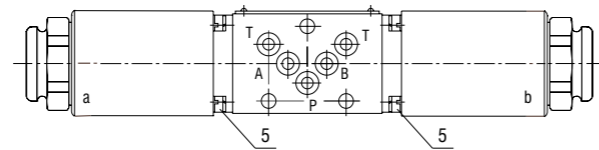
- 1 - O-ring
- 2 - Square ring (NBR)
- 3 - O-ring
- 4 - Retaining nut
- 5 - Bolts for mountage of flange
- 6 - Bolts for mountage of cover
- 7 - Mounting bolt

Valve with two solenoids
3-position valve



Mounting surface 2

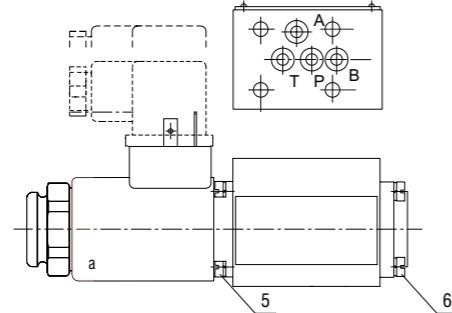
acc. to former CETOP-RP 121H



Mounting surface 3

acc. to former ISO 4401-AA-02-4-A

Valve with one solenoid
2-position valve



For solenoid coil see datasheet C_8007.
For electrical connector see datasheet K_8008.

Position	RPE2-04*2									
1+2	Seal Kit	Pos.	O-ring	Pcs	Pos.	Square ring	Pcs			Ordering No.
	NBR	1	15x1.8	2	2	5.28x1.68	5			20882100
	RPE2-04*3									
	Seal Kit	Pos.	O-ring	Pcs	Pos.	O-ring	Pcs			Ordering No.
	NBR	1	15x1.8	2	2	6x1.5	4			15669000
Position	RPE2-04*2, RPE2-04*3									
3+4	Nut Kit	Pos.	O-ring	Pcs	Pos.	Retaining nut	Pcs			Ordering No.
	Standard	3	18x1.5	1	4	Plastic	1			15874500
Position	3-position valve									
5+5	Bolt Kit	Pos.	Bolt	Pcs	Pos.	Bolt	Pcs	Pos.	Washer	Pcs
		5	M4x12	4	5	M4x12	4	-	D4.1	8
										34502000
Position	2-position valve									
5+6	Bolt Kit	Pos.	Bolt	Pcs	Pos.	Bolt	Pcs	Pos.	Washer	Pcs
		5	M4x12	4	6	M4x10	4	-	D4.1	8
										34502100
7	Bolt Kit	Pos.	Universal kit				Pcs			Ordering No.
		7	for Mounting surface 2 or 3				4	for studs see Datasheet 0020		15874600

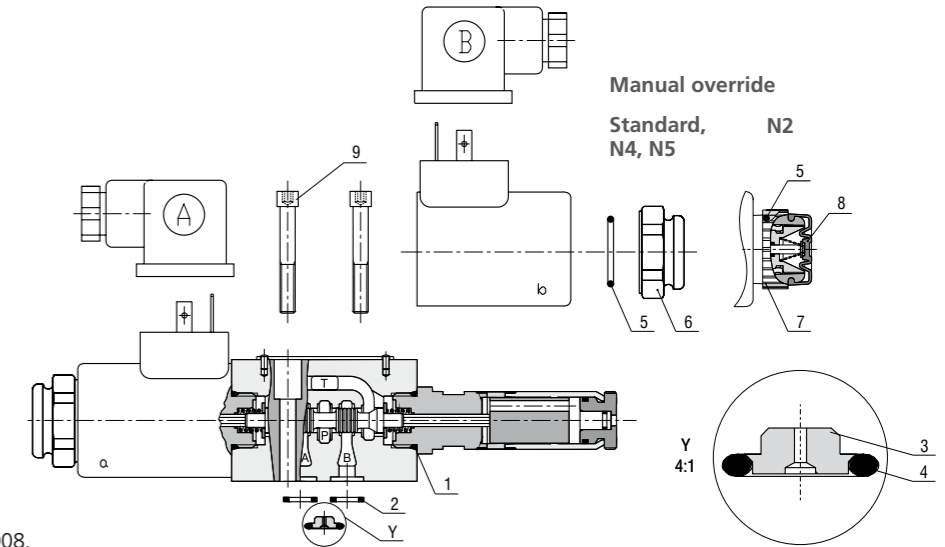
All dimensions are indicated in millimeters [mm].

1 Directional Control Valves and Poppet Valves

Product (Datasheet): **RPE3-04 (4014)**

Valve size 04

- 1 - O-ring
- 2 - Square ring (NBR), O-ring (FPM)
- 3 - Orifice in P port
- 4 - O-ring
- 5 - O-ring
- 6 - Retaining nut
- 7 - Retaining nut
- 8 - Rubber boot
- 9 - Mounting bolt



For solenoid coil see datasheet C_8007.
For electrical connector see datasheet K_8008.

Position	RPE3-04									
1+2	Seal Kit	Pos.	O-ring	Pcs	Pos.	Ring	Pcs			Ordering No.
	NBR	1	16x2	2	2	Square ring 7.65x1.68	4			15873800
	FPM		16x2	2		O-ring 7.5x1.8	4			15874400
3+4	Kit	Pos.	Orifice in P port	Pcs	Pos.	O-ring NBR	Pcs			Ordering No.
			Ø0.8	1						15874000
Orifice in P port with NBR seal		3	Ø1.0	1	4	7.65x1.78	1			15874100
	Ø1.2		1						15874200	
	Ø1.5		1						15874300	
	Ø0.7		1						15874900	
3+4	Kit	Pos.	Orifice in P port	Pcs		O-ring FPM	Pcs			Ordering No.
			Ø0.8	1						
Orifice in P port with FPM seal		3	Ø1.0	1	4	7.65x1.78	1			On request
	Ø1.2		1							
	Ø1.5		1							
	Ø0.7		1							
5+6	Nut Kit	Pos.	O-ring	Pcs	Pos.	Retaining nut	Pcs			Ordering No.
		5	18x1.5	1	6	Plastic	1			15874500
5+7+8	Nut Kit	Pos.	O-ring	Pcs	Pos.	Retaining nut	Pcs	Pos.	Rubber boot	Pcs
		5	18x1.5	1	7	Plastic	1	8		1
										15874800
9	Bolt Kit	Pos.					Pcs			Ordering No.
		9	Bolt M5x35				4	for studs see Datasheet 0020		15874600

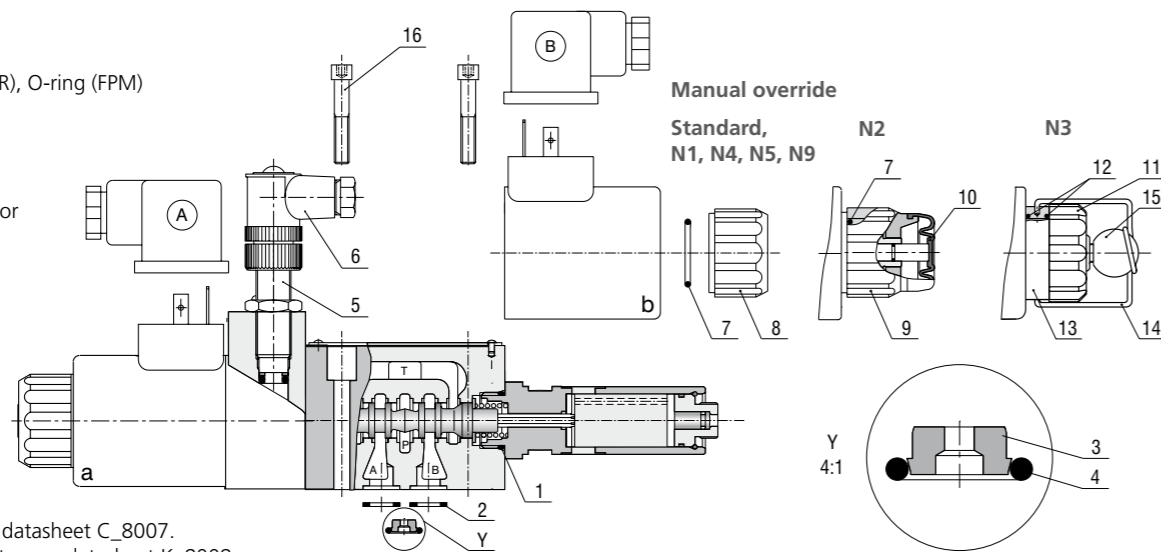
All dimensions are indicated in millimeters [mm].

1 Directional Control Valves and Poppet Valves

Product (Datasheet): **RPE3-06 (4010), RPEA3-06 (4029), RPEW4-06 (4035), RPER3-06 (4026)**

Valve size 06

- 1 - O-ring
- 2 - Square ring (NBR), O-ring (FPM)
- 3 - Orifice in P port
- 4 - O-ring
- 5 - Sensor
- 6 - Connector of position sensor with LED
- 7 - O-ring
- 8 - Retaining nut
- 9 - Retaining nut
- 10 - Rubber boot
- 11 - Nut
- 12 - O-ring
- 13 - Ring
- 14 - Bracket
- 15 - Ball
- 16 - Mounting bolt



For solenoid coil see datasheet C_8007.
For electrical connector see datasheet K_8008.

Position	RPE3-06, RPEA3-06, RPEW4-06, RPER3-06													
1+2	Seal Kit	Pos.	O-ring	Pcs	Pos.	Ring	Pcs	Ordering No.						
	NBR	1	17x1.8	2	2	Square ring 9.25x1.68	4	15845200						
	FPM	1	17.17x1.78	2	2	O-ring 9.25x1.78	4	15845400						
Position	RPE3-06, RPEA3-06, RPEW4-06													
3+4	Kit	Pos.	Orifice in P port	Pcs	Pos.	O-ring NBR	Pcs	Ordering No.						
			Ø1.0	1										
			Ø1.5	1										
			Ø2.0	1							4	9.25x1.78	1	On request
			Ø2.2	1										
Ø2.5	1													
3+4	Kit	Pos.	Orifice in P port	Pcs	Pos.	O-ring FPM	Pcs	Ordering No.						
			Ø1.0	1							15845600			
			Ø1.5	1							15845700			
			Ø2.0	1							4	9.25x1.78	1	15845800
			Ø2.2	1							15846000			
Ø2.5	1	15845900												
Position	RPE3-06													
5	Model	Pos.			Pcs	Max. input voltage		Ordering No.						
	S1 normally-open sensor (50 bar)				1			16688500						
	S2 normally-open sensor (210 bar)	5			1	10...30 VDC		18838900						
	S4 normally-closed sensor (50 bar)				1			20725300						
6	Connector	K02	connector of position sensor with LED	6	1	10...30 VDC		17364800						
Position	RPER3-06													
7+8	Nut Kit	Pos	O-ring	Pcs	Pos.	Retaining nut	Pcs	Ordering No.						
			Standard	7		22x2	1	8	Plastic	1	15844600			
Position	RPE3-06, RPEA3-06, RPEW4-06													
7+8	Nut Kit	Pos.	O-ring	Pcs	Pos.	Retaining nut	Pcs	Ordering No.						
			Standard, N4, N5, N9	7		22x2	1	8	Plastic	1	15844600			
			N1	7		22x2	1	8	Plastic	1	15844700			
7+9+10	Nut Kit	Pos.	O-ring	Pcs	Pos.	Retaining nut	Pcs	Rubber boot	Pcs	Ordering No.				
			N2	7		22x2	1	9	Plastic	1	10	1	15844800	
11+12+13+14	Nut Kit	Pos.	Retaining nut	Pcs	Pos.	O-ring	Pcs	Pos.	Bracket	Pcs	Ordering No.			
			11	Plastic		1	12	22x2	2	13	Steel	1	14	Steel
15	Pos.	Ball		Pcs					Ordering No.					
		15	D16 M6, bakelite	1					20346700					
Position	RPE3-06, RPEA3-06, RPEW4-06, RPER3-06													
16	Bolt Kit	Pos.			Pcs			Ordering No.						
Mounting bolts for steel plates			16	Bolt M5x45	4	for studs see Datasheet 0020		15845100						

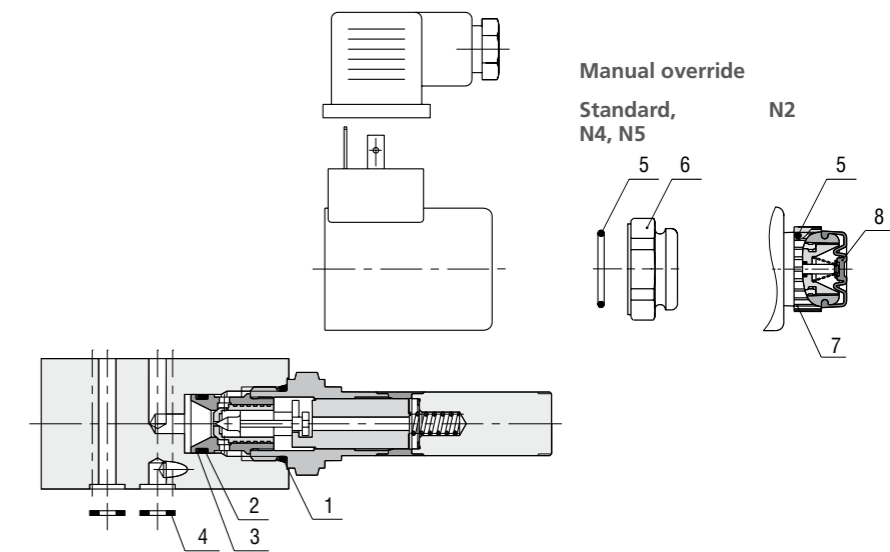
All dimensions are indicated in millimeters [mm].

1 Directional Control Valves and Poppet Valves

Product (Datasheet): **ROE3-042S5(S6) (4055), ROE3-062S2 (4022), ROE3-042S5(S6)M (4073), ROE3-062S2M (4072)**

Valve size 04, 06

- 1 - O-ring
- 2 - O-ring
- 3 - Back-up ring
- 4 - Square ring (NBR), O-ring (FPM)
- 5 - O-ring
- 6 - Retaining nut
- 7 - Retaining nut
- 8 - Rubber boot



Position	ROE3-042S5(S6), ROE3-062S2, ROE3-042S5(S6)M, ROE3-062S2M										
1+2+3	Seal Kit	Pos.	O-ring	Pcs	Pos.	O-ring	Pcs	Pos.	Back-up ring	Pcs	Ordering No.
	NBR	1	19.4x2.1	1	2	14x1.78	1	3	14.73x17.43x1.1	1	15650200
	FPM	1	19.4x2.1	2	2	14x1.78	4	3	14.73x17.43x1.1	2	16954700
Position	ROE3-042S5(S6)M, ROE3-062S2M										
4	Seal Kit	Pos.	Square ring	Pcs	Pos.	O-ring	Pcs	Ordering No.			
			size 04	4		7.65x1.68	4	-	-	20718400	
			size 06	4		9.25x1.68	4	-	-	15650300	
			size 04	-		-	-	4	7.65x1.78	4	22502600
size 06	-	-	-	4	9.25x1.78	4	22944700				
Position	ROE3-042S5(S6), ROE3-042S5(S6)M										
5+6	Nut Kit	Pos.	O-ring	Pcs	Pos.	Retaining nut	Pcs	Ordering No.			
			Standard, N4	5		18x1.5	1	6	Plastic	1	15874500
5+7+8	Nut Kit	Pos.	O-ring	Pcs	Pos.	Retaining nut	Pcs	Pos.	Rubber boot	Pcs	Ordering No.
			N2	5		18x1.5	1	7	Plastic	1	8
Position	ROE3-062S2, ROE3-062S2M										
5+6	Nut Kit	Pos.	O-ring	Pcs	Pos.	Retaining nut	Pcs	Ordering No.			
			Standard, N5	5		18x1.5	1	6	Plastic	1	15874500

All dimensions are indicated in millimeters [mm].

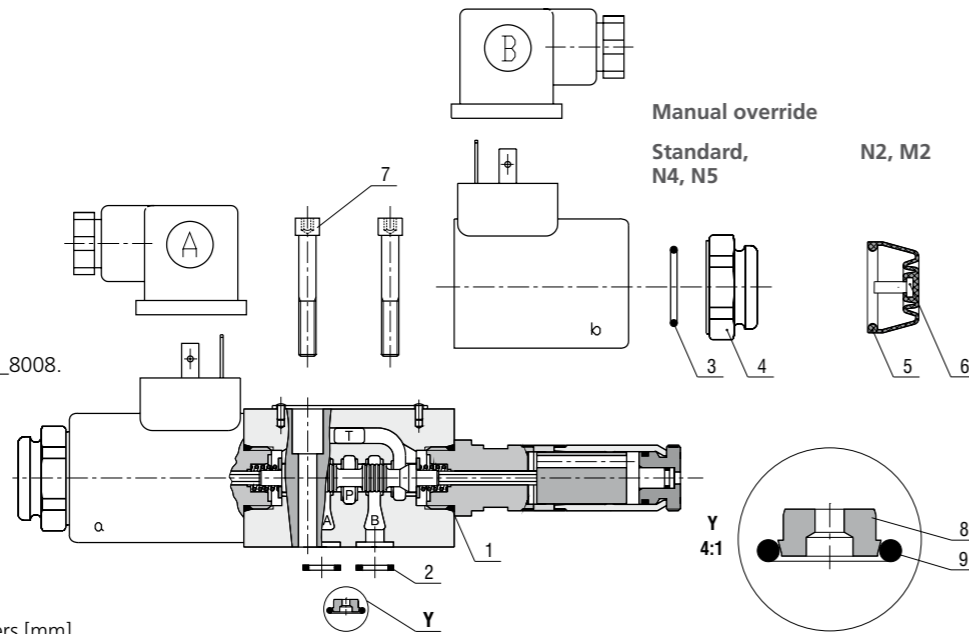
1 Directional Control Valves and Poppet Valves

Product (Datasheet): **RPEL1-04 (4037), RPEL1-06 (4056)**

Valve size 04, 06

- 1 - O-ring
- 2 - Square ring (NBR), O-ring (FPM)
- 3 - O-ring
- 4 - Retaining nut
- 5 - Rubber boot
- 6 - Actuating pin
- 7 - Mounting bolt
- 8 - Orifice in P port
- 9 - O-ring

For solenoid coil see datasheet C_8007.
For electrical connector see datasheet K_8008.



All dimensions are indicated in millimeters [mm].

Position	RPEL1-04	Pos.	O-ring	Pcs	Pos.	Ring	Pcs	Ordering No.		
1+2	Seal Kit	1	16x2	2	2	Square ring 7.65x1.68	4	15873800		
	NBR		16x2	2		O-ring 7.5x1.8	4	15874400		
3+4	Nut Kit	3	O-ring	1	4	Retaining nut	1	15691500		
	Standard, N5		13x2	1		Plastic	1	15691500		
5+6	Kit	5	Rubber boot	1	6	Actuating pin	1	29269100		
	N2			1			1	29269100		
7	Bolt Kit	7	Bolt	4				Ordering No.		
Mounting bolts for steel plates		7	Bolt M5x35 DIN 912-10.9		4			15874600		
8+9	Kit	8	Orifice in P port	Pcs	Pos.	O-ring NBR	1	Ordering No.		
								Ø0.8	1	15874000
								Ø1.0	1	15874100
								Ø1.2	1	15874200
								Ø1.5	1	15874300
Ø0.7	1	15874900								
8+9	Kit	8	Orifice in P port	Pcs	Pos.	O-ring FPM	1	Ordering No.		
								Ø0.8	1	
								Ø1.0	1	
								Ø1.2	1	7.65x1.78
								Ø1.5	1	
Ø0.7	1									
Position	RPEL1-06									
	1+2	Seal Kit	1	O-ring	Pcs	Pos.	Ring	Pcs	Ordering No.	
NBR										17x1.8
3+4	Nut Kit	3	O-ring	Pcs	Pos.	Retaining nut	Pcs	Ordering No.		
									FPM	17.17x1.78
5+6	Kit	5	Rubber boot	Pcs	Pos.	Actuating pin	Pcs	Ordering No.		
									Standard	18x1.5
7	Bolt Kit	7	Bolt	4				Ordering No.		
Mounting bolts for steel plates		7	Bolt M5x45		4			15845100		
8+9	Kit	8	Orifice in P port	Pcs	Pos.	O-ring NBR	1	Ordering No.		
								Ø1.0	1	
								Ø1.5	1	
								Ø2.0	1	9.25x1.78
								Ø2.2	1	
								Ø2.5	1	
8+9	Kit	8	Orifice in P port	Pcs	Pos.	O-ring FPM	1	Ordering No.		
								Ø1.0	1	
								Ø1.5	1	
								Ø2.0	1	9.25x1.78
								Ø2.2	1	
Ø2.5	1									

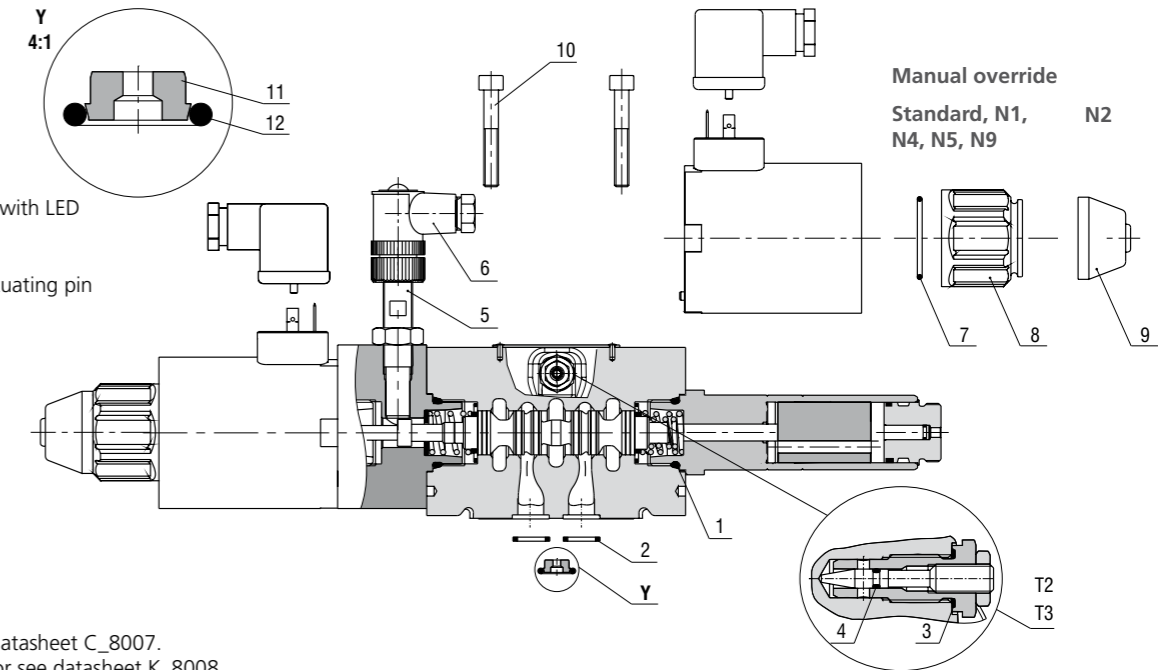
1 Directional Control Valves and Poppet Valves

Product (Datasheet): **RPE4-10 (4039), RPEW4-10 (4044)**

Valve size 10

- 1 - O-ring
- 2 - Square ring
- 3 - Seal
- 4 - Seal
- 5 - Sensor of position sensor with LED
- 6 - Connector
- 7 - O-ring
- 8 - Retaining nut
- 9 - Rubber boot + Actuating pin
- 10 - Mounting bolt
- 11 - Orifice in P port
- 12 - O-ring

For solenoid coil see datasheet C_8007.
For electrical connector see datasheet K_8008.



Position	RPE4-10, RPEW4-10	Pos.	O-ring	Pcs	Pos.	Square ring	Pcs	Pos.	Seal for T2, T3	Pcs	Pos.	O-ring for T3	Pcs	Ordering No.	
1+2+3+4	Seal Kit	1	23.81x2.62	2	2	12.42x1.68	5	3	10x1	1	4	1.8x1	1	15901000	
	NBR		23.47x2.62	2		12.42x1.68	5		10x1	1		1.8x1	1	15901100	
5	Sensor - model		Pos.				Pcs		Max. input voltage				Ordering No.		
	S1		5		normally-open sensor (50 bar)		1		10...30 VDC				16688500		
	S2		5		normally-open sensor (210 bar)		1		10...30 VDC				18838900		
		S4		5		normally-closed sensor (50 bar)		1				20725300			
6	Connector		Pos.				Pcs		Max. input voltage				Ordering No.		
	K02		6		connector of position sensor with LED		1		10...30 VDC				17364800		
7+8	Nut Kit		Pos.		O-ring		Pcs		Pos.		Retaining nut		Pcs		Ordering No.
	Standard, N1, N2, N4, N5, N9		7		30x2		1		8		Plastic		1		15900800
9	Kit		Pos.				Pcs						Ordering No.		
	N2		9		Rubber boot + Actuating pin		1						15900900		
10	Bolt Kit		Pos.				Pcs						Ordering No.		
Mounting bolts for steel plates		10	Bolt M6x40		4	for studs see Datasheet 0020								15847700	
11+12	Kit	11	Orifice in P port	Pcs	Pos.	O-ring NBR	1	Ordering No.							
								Ø0.5	1						
								Ø1.2	1						
								Ø1.5	1						
								Ø2.0	1	12.42x1.78					
								Ø2.5	1						
11+12	Kit	11	Orifice in P port	Pcs	Pos.	O-ring FPM	1	Ordering No.							
								Ø0.5	1						
								Ø1.2	1						
								Ø1.5	1						
								Ø2.0	1	12.42x1.78					
								Ø2.5	1						
Ø3.5	1														
Ø4.0	1														

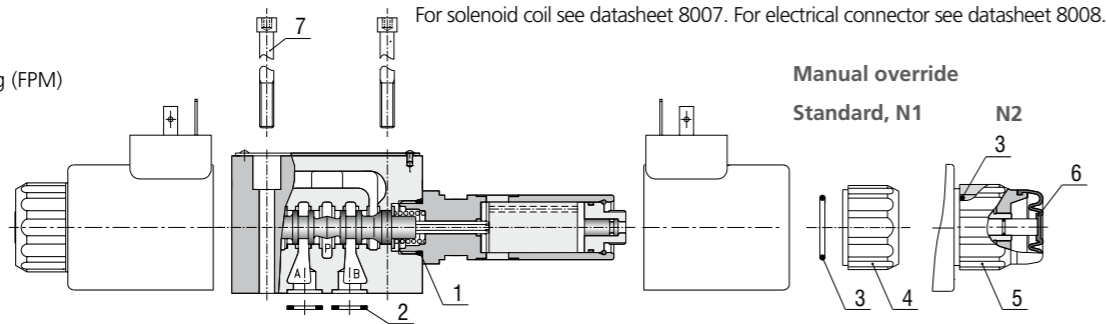
All dimensions are indicated in millimeters [mm].

1 Directional Control Valves and Poppet Valves

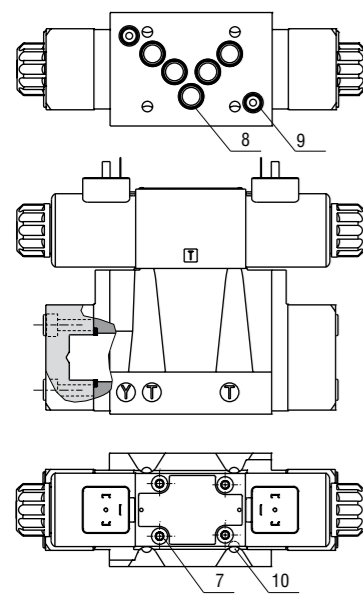
Product (Datasheet): **RNEH1-10** (4075), **RNEH5-16** (4023), **RNEH4-25** (4024)

RPE3-06

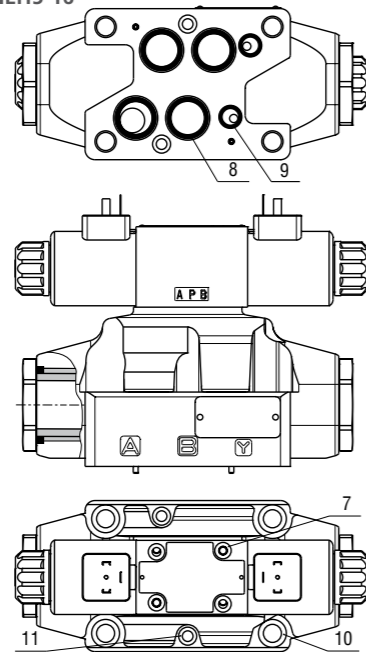
- 1 - O-ring
- 2 - Square ring (NBR), O-ring (FPM)
- 3 - O-ring
- 4 - Retaining nut
- 5 - Retaining nut
- 6 - Rubber boot + Actuating pin
- 7 - Mounting bolt



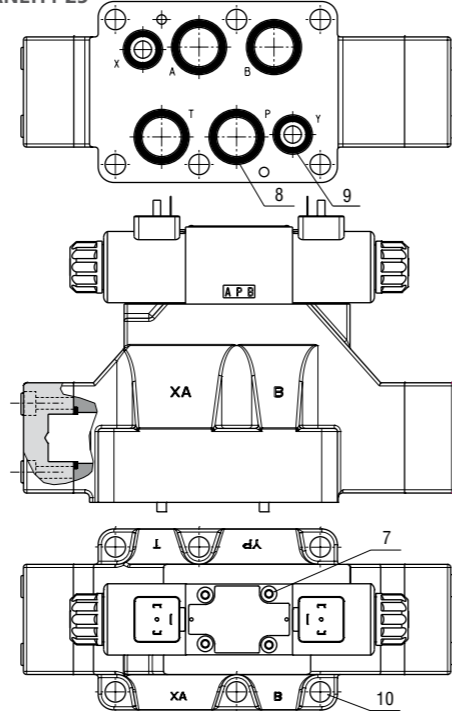
RNEH1-10



RNEH5-16



RNEH4-25



All dimensions are indicated in millimeters [mm].

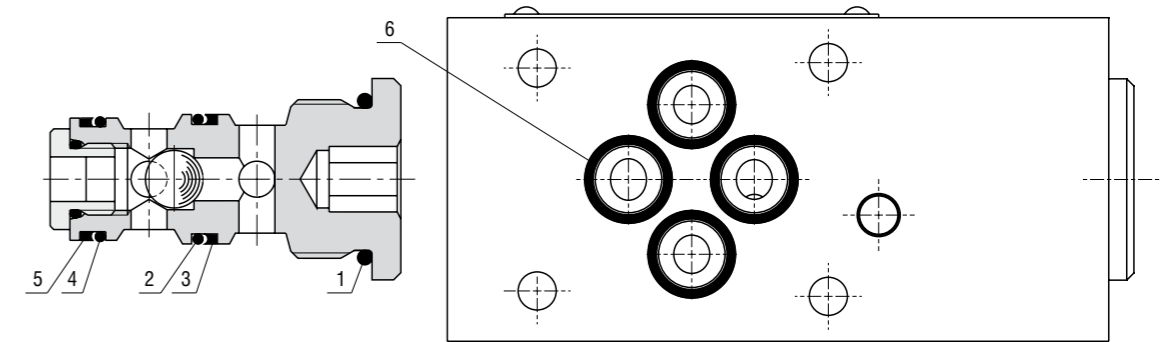
Position	RPE3-06	Pos.	O-ring	Pcs	Pos.	Ring	Pcs	Ordering No.
1+2	Seal Kit	1	NBR	2	2	Square ring 9.25x1.68	4	15845200
			FPM	2	2	O-ring 9.25x1.78	4	15845400
3+4	Nut Kit	3	O-ring	1	4	Retaining nut	1	15844600
						Standard	1	1
3+5+6	Nut Kit	3	O-ring	1	5	Retaining nut	1	15844800
						N2	1	6
7	Bolt Kit	7	Bolt M5x45	7				15845100
Mounting bolts for steel plates 7 Bolt M5x45 4 for studs see Datasheet 0020 15845100								
Position	RNEH1-10	Pos.	O-ring	Pcs	Pos.	O-ring	Pcs	Ordering No.
8+9	Seal Kit	8	NBR	5	9	9.25x1.78	2	40075900
			FPM	5	-	-	2	On request
10	Bolts	10	Bolt M6x35	4				
Mounting bolts 10 Bolt M6x35 4 Mounting bolts for steel plates are not available								
Position	RNEH5-16	Pos.	O-ring	Pcs	Pos.	O-ring	Pcs	Ordering No.
8+9	Seal Kit	8	NBR	4	9	10.82x1.78	2	40076000
			FPM	4	-	-	2	On request
10+11	Bolts	10	Bolt M10x60	4	11	Bolt M6x50	2	
Mounting bolts 10 Bolt M10x60 4 11 Bolt M6x50 2 Mounting bolts for steel plates are not available								
Position	RNEH4-25	Pos.	O-ring	Pcs	Pos.	O-ring	Pcs	Ordering No.
8+9	Seal Kit	8	NBR	4	9	20.29x2.62	2	40076200
			FPM	4	-	-	2	On request
10	Bolts	10	Bolt M12x60	6				
Mounting bolts 10 Bolt M12x60 6 Mounting bolts for steel plates are not available								

2 Check Valves

Product (Datasheet): **LV1-043** (5008), **LV2-043** (5028), **LV1-063/S** (5015), **LV1-063/M** (5030)

Valve size 04, 06

- 1 - O-ring
- 2 - O-ring
- 3 - Back-up ring
- 4 - O-ring
- 5 - Back-up ring
- 6 - Square ring (NBR), O-ring (FPM)

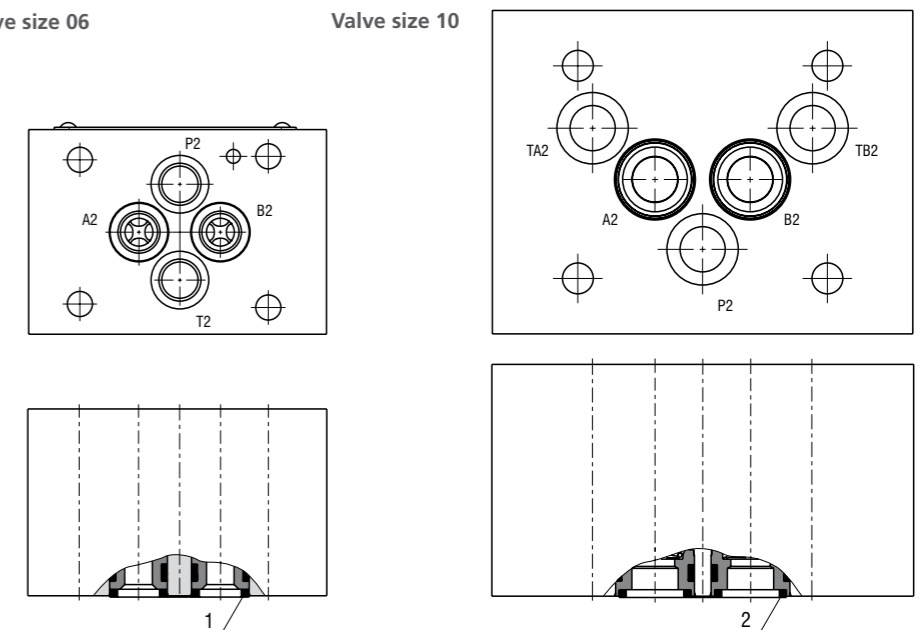


Pos.	LV1-043	Pos.	O-ring	Pcs	Pos.	Back-up ring (PT)	Pcs	Ordering No.		
2+3	Seal Kit	2	NBR	1	3	8.5x6.8x1	1	40110200		
			FPM	1	3	8.5x6.8x1	1	16755700		
Pos.	LV2-043	Pos.	O-ring	Pcs	Pos.	Back-up ring (PT)	Pcs	Ordering No.		
2-5	Seal Kit	2	NBR	1	3	6.6x9.5x1.4	1	30708000		
			FPM	1	3	6.6x9.5x1.4	1	30707900		
Pos.	LV1-063/S, LV1-063/M	1-5	Seal Kit	Pos.	O-ring	Pcs	Pos.	Back-up ring (PT)	Pcs	Ordering No.
			FPM	1	2,4	2	3,5	2	31920800	
Pos.	LV1-063/M	Pos.	Ring	Pcs	Ordering No.					
6	Seal Kit	6	NBR	4	28551800					
			FPM	4	28551900					

Product (Datasheet): **MVJ3-06** (5018), **MVJ3-10** (5020)

Valve size 06, 10

- 1 - Square ring (NBR), O-ring (FPM)
- 2 - Square ring



Position	MVJ3-06	Pos.	Ring	Pcs	Ordering No.
1	Seal Kit	1	NBR	4	28551800
			FPM	4	28551900
Position	MVJ3-10	Pos.	Ring	Pcs	Ordering No.
2	Seal Kit	4	Square ring	5	15991600
			FPM	5	40066700

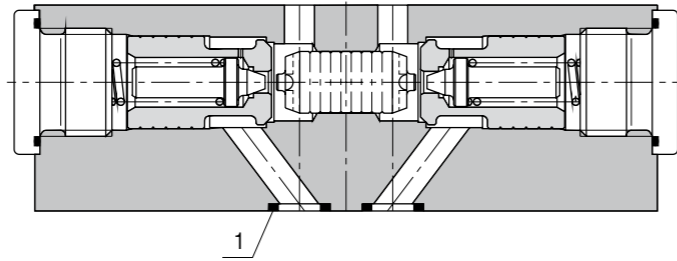
All dimensions are indicated in millimeters [mm].

2 Check Valves

Product (Datasheet): **VJR1-04/M (5023), VJR2-06/M (5024), 2RJV1-06/M (5021), VJR2-10/M (5025)**

Valve size 04, 06, 10

1 - Square ring (NBR), O-ring (FPM)

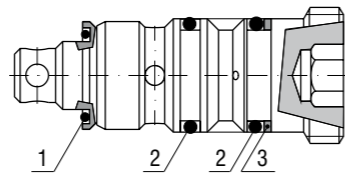


Position	VJR1-04/M									
1	Seal Kit	Pos.	Ring	Pcs						Ordering No.
	NBR	1	Square ring 7.65x1.68	4						20718400
	FPM		O-ring 7.65x1.78	4						22502600
Position	VJR2-06/M, 2RJV1-06/M									
1	Seal Kit	Pos.	Ring	Pcs						Ordering No.
	NBR	1	Square ring 9.25x1.68	4						15991700
	FPM		O-ring 9.25x1.78	4						22944700
Position	VJR2-10/M									
1	Seal Kit	Pos.	Square ring	Pcs						Ordering No.
	NBR	1	12.42x1.68	5						15991600
	FPM		12.42x1.68	5						40066700

Product (Datasheet): **RJV1-05 (5111)**

Valve size 05

1 - O-ring
2 - O-ring
3 - Back-up ring



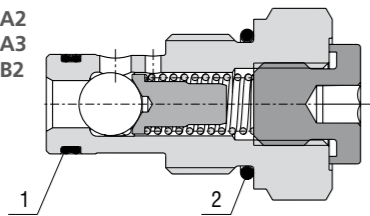
Position	RJV1-05										
1+2+3	Seal Kit	Pos.	O-ring	Pcs	Pos.	O-ring	Pcs	Pos.	Back-up ring	Pcs	Ordering No.
	NBR	1	12.42x1.78	1	2	15.08x2.62	2	3	14.66x19.02x1.14 (NBR)	1	15969700
	FPM		12.42x1.78	1		15.54x2.62	2		14.66x19.02x1.14 (PT)	1	22806000

Product (Datasheet): **SC1F-A2 (5010), SC1F-A3 (5016), SC1F-B2 (5017), SH1F-A3 (5029)**

Cavity A2, A3, B2

1 - O-ring
2 - Dualseal

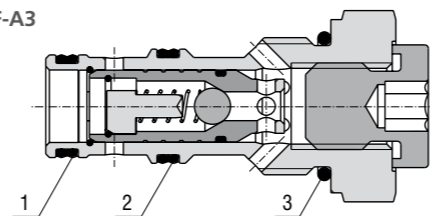
SC1F-A2
SC1F-A3
SC1F-B2



Cavity A3

1 - Dualseal
2 - Dualseal
3 - O-ring

SH1F-A3



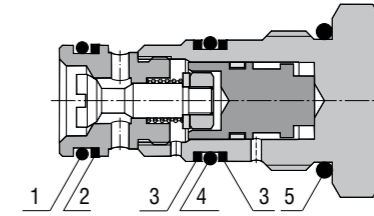
Position	SC1F-A2										
1+2	Seal Kit	Pos.	Dualseal SSA	Pcs	Pos.	O-ring NBR	Pcs	Pos.	O-ring - FPM	Pcs	Ordering No.
	NBR	1	10.3x12.7x3.1	1	2	17x1.8	1	-	-	-	20776700
	FPM	1	10.3x12.7x3.1	1	-	-	-	2	17.17x1.78	1	17014300
Position	SC1F-A3										
1+2	Seal Kit	Pos.	Dualseal SSA	Pcs	Pos.	O-ring NBR	Pcs	Pos.	O-ring - FPM	Pcs	Ordering No.
	NBR	1	11.87x14.27x3.1	1	2	17x1.8	1	-	-	-	15661700
	FPM	1	11.87x14.27x3.1	1	-	-	-	2	17.17x1.78	1	20777200
Position	SC1F-B2										
1+2	Seal Kit	Pos.	Dualseal SSA	Pcs	Pos.	O-ring NBR	Pcs	Pos.	O-ring - FPM	Pcs	Ordering No.
	NBR	1	13.47x15.87x3.1	1	2	19.4x2.1	1	-	-	-	18960400
	FPM	1	13.47x15.87x3.1	1	-	-	-	2	19.4x2.1	1	18960500
Position	SH1F-A3										
1+2+3	Seal Kit	Pos.	Dualseal SSA	Pcs	Pos.	Dualseal SSA	Pcs	Pos.	O-ring	Pcs	Ordering No.
	NBR	1	11.87x14.27x3.1	1	2	13.47x15.87x3.1	1	3	17x1.8 (NBR)	1	15661700
	FPM	1	11.87x14.27x3.1	1	2	13.47x15.87x3.1	1	3	17.17x1.78 (FPM)	1	20777200

2 Check Valves

Product (Datasheet): **SC5H-Q3/I (5217), SC5H-R3/I (5218), SC5H-S3/I (5220), SCD5H-R3/I (5219)**

Cavity Q3, R3, S3

1 - O-ring
2 - Back-up ring
3 - Back-up ring
4 - O-ring
5 - O-ring

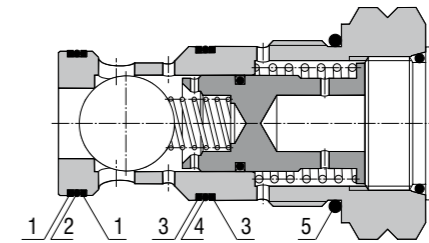


Position	SC5H-Q3/I, SC5H-R3/I, SC5H-S3/I																
1+2+3+4+5	Seal Kit	Pos.	O-ring	Pcs	Pos.	Back-up ring	Pcs	Pos.	Back-up ring	Pcs	Pos.	O-ring	Pcs	Pos.	O-ring	Pcs	Ordering No.
		1		1	2		1	3		2	4		1	5		1	On request

Product (Datasheet): **SCC5H-Q3/I (5221), SCC5H-S3/I (5222)**

Cavity Q3, S3

1 - Dualseal
2 - O-ring
3 - Dualseal
4 - O-ring
5 - O-ring

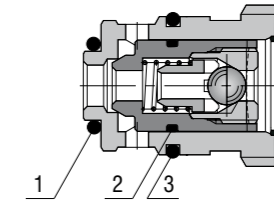


Position	SCC5H-Q3/I, SCC5H-S3/I																
1+2+3+4+5	Seal Kit	Pos.	Back-up ring	Pcs	Pos.	O-ring	Pcs	Pos.	Back-up ring	Pcs	Pos.	O-ring	Pcs	Pos.	O-ring	Pcs	Ordering No.
		1		2	2		1	3		2	4		1	5		1	On request

Product (Datasheet): **VJL2-304 (5007)**

Cavity Q3, S3

1 - O-ring
2 - O-ring
3 - O-ring



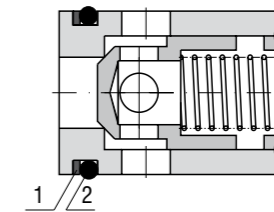
Position	VJL2-304										
1+2+3	Seal Kit	Pos.	O-ring	Pcs	Pos.	O-ring	Pcs	Pos.	O-ring	Pcs	Ordering No.
	NBR	1	9x1.8	1	2	10x1	1	3	14x1.78	1	22737500
	FPM		9.25x1.78	1		10x1	1		14x1.78	1	22737600

Product (Datasheet): **VJ3 (5009), VJS3 (5019)**

Valve size 06, 10, 16, 20

Model 02, 03

1 - Back-up ring
2 - O-ring



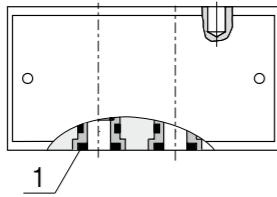
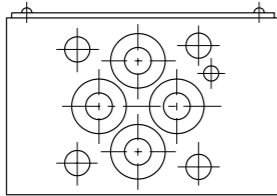
Position	VJ3, VJS3									
1+2	Seal Kit	Pos.	Back-up ring	Pcs	Pos.	O-ring	Pcs			Ordering No.
06	NBR	1	14.66x19.02x1.14	1	2	15.08x2.62	1			22701100
10			19.43x23.79x1.14			20x2.65		15954600		
16			8.98x34.98x1.02			28x3.55		15954700		
20			33.88x39.88x1.02			32.92x3.53		22701400		

2 Check Valves

Product (Datasheet): **VJO1-04/M (5012), VJO1-06/S (5004), VJO1-10/S (5307)**

Valve size 04 VJO1-04/M

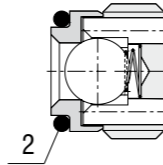
1 - Square ring (NBR),
O-ring (FPM)



Valve size 06, 10

2 - O-ring

VJO1-06/S
VJO1-10/S



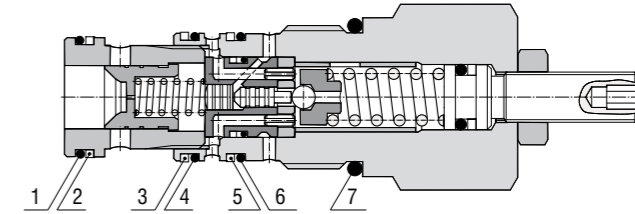
Position	VJO1-04/M		Pos.	Ring	Pcs	Ordering No.
1	Seal Kit		1	Square ring 6.07x1.68	4	15946100
	NBR			O-ring 6.07x1.78	4	22662600
FPM						
Position	VJO1-06/S		Pos.	O-ring	Pcs	Ordering No.
2	Seal Kit		2	8x1.5	1	16755400
	NBR	VJO1-06/S*-1		9x1	1	15949700
		VJO1-06/S*-2		8x1.5	1	16969800
	FPM	VJO1-06/S*-1		9x1	1	15949800
		VJO1-06/S*-2				
Position	VJO1-10/S		Pos.	O-ring	Pcs	Ordering No.
2	Seal Kit		2	11.4x2.1	1	20141900
	NBR			11.4x2.1	1	On request
FPM						

3 Pressure Control Valves

Product (Datasheet): **SU6A-U3/I (5224), SUD6A-V4/I (5225), SUD6A-U4/I (5226)**

Cavity U3, V4, U4

1 - O-ring
2 - Back-up ring
3 - Back-up ring
4 - O-ring
5 - Back-up ring
6 - O-ring
7 - O-ring



Position	SU6A-U3/I		Pos.	O-ring	Pcs	Pos.	Back-up ring	Pcs	Ordering No.
1+2+5+6+7	Seal Kit		1, 6, 7		3	2, 5		2	On request
Position	SUD6A-V4/I, SUD6A-U4/I		Pos.	O-ring	Pcs	Pos.	Back-up ring	Pcs	Ordering No.
1+2+3+4+5+6+7	Seal Kit		1, 4, 6, 7		4	2, 3, 5		3	On request

Product (Datasheet): **VPP2-04/S (5093), VPP2-04/M(R) (5094)**

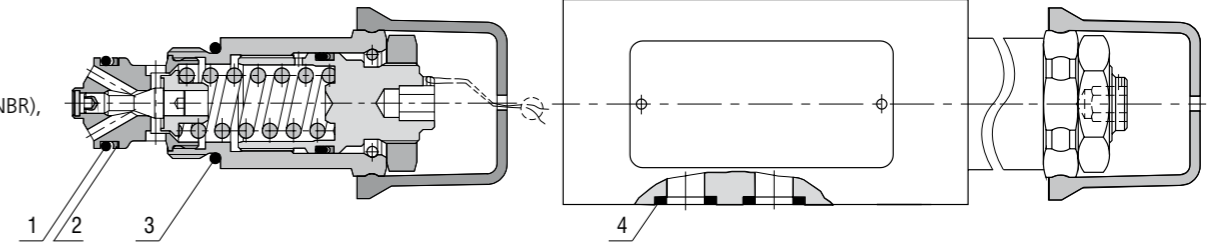
Valve size 04

VPP2-04/S, VPP2-04/M(R)

Modular plate size 04, 06

VPP2-04/M(R)

1 - O-ring
2 - Back-up ring
3 - O-ring
4 - Square ring (NBR),
O-ring (FPM)



Pos.	VPP2-04/S, VPP2-04/M(R)		Pos.	O-ring	Pcs	Pos.	Back-up ring	Pcs	Pos.	O-ring	Pcs	Ordering No.
1+2+3	Seal Kit		1	14x1.78	1	2	14.73x17.43x1.14	1	3	19.4x2.1	1	22752700
	NBR			14x1.78	1		14.73x17.43x1.14	1		19.4x2.1	1	31920800
FPM												
Pos.	VPP2-04/M(R)*04		Pos.	Ring	Pcs	Ordering No.						
4	Seal Kit		4	Square ring 7.65x1.68	4	20718400						
	NBR			O-ring 7.65x1.78	4	22502600						
FPM												
Pos.	VPP2-04/M(R)*06		Pos.	Ring	Pcs	Ordering No.						
4	Seal Kit		4	Square ring 9.25x1.68	4	15991700						
	NBR			O-ring 9.25x1.78	4	22944700						
FPM												

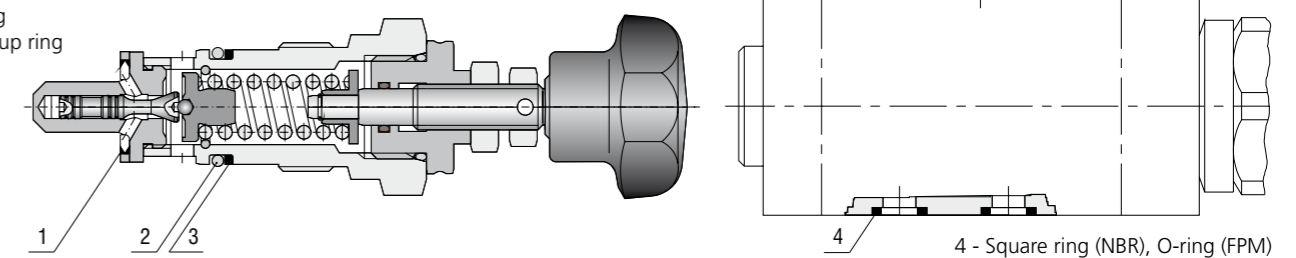
Product (Datasheet): **VPP2-06 (5062), VPP2-06-SV/xx-CE1017 (5066)**

Valve size 06

VPP2-06

VPP2-06*P

1 - U-seal
2 - O-ring
3 - Back-up ring



Pos.	VPP2-06, VPP2-06-SV/xx-CE1017		Pos.	O-ring	Pcs	Pos.	Back-up ring	Pcs	Ordering No.
1+2+3	Seal Kit		1	20x2.65	1	3	19.43x23.79x1.14	1	16757100
	NBR			17.4x24x1.5	1		20.29x2.62	1	19.43x23.79x1.14
FPM									
Pos.	VPP2-06*P		Pos.	Ring	Pcs	Ordering No.			
4	Seal Kit		4	Square ring 9.25x1.68	2	28551800			
	NBR			O-ring 9.25x1.78	2	28551900			
FPM									

All dimensions are indicated in millimeters [mm].

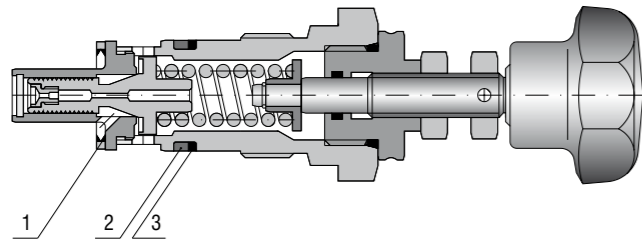
All dimensions are indicated in millimeters [mm].

3 Pressure Control Valves

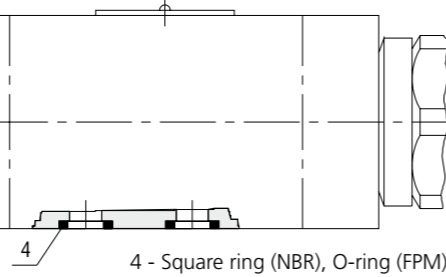
Product (Datasheet): **VPP1-06(08,10)** (5061)

Valve size 06, 08, 10 **VPP1-06(08,10)**

- 1 - U-seal
- 2 - O-ring
- 3 - Back-up ring



VPP1-06*P



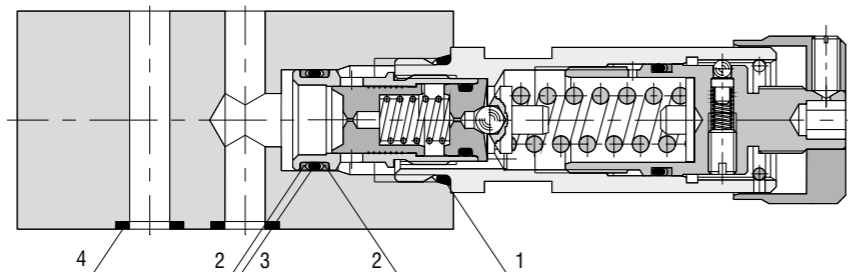
4 - Square ring (NBR), O-ring (FPM)

Pos.	VPP1-06										Ordering No.
1+2+3	Seal Kit	Pos.	U-seal	Pcs	Pos.	O-ring	Pcs	Pos.	Back-up ring	Pcs	
	NBR	1	17.4x24x1.5	1	2	20x2.65	1	3	19.43x23.79x1.14	1	16757100
	FPM	1	17.4x24x1.5	1	2	20.29x2.62	1	3	19.43x23.79x1.14	1	40112100
Pos.	VPP1-08, 10										Ordering No.
1+2+3	Seal Kit	Pos.	U-seal	Pcs	Pos.	O-ring	Pcs	Pos.	Back-up ring	Pcs	
	NBR	1	24.7x32x2	1	2	26.64x2.62	1	3	27.46x31.82x1.1	1	15972200
	FPM	1	24.7x32x2	1	2	26.64x2.62	1	3	27.46x31.82x1.1	1	15972000
Pos.	VPP1-06*P										Ordering No.
4	Seal Kit	Pos.	Ring	Pcs							
	NBR	4	Square ring 9.25x1.68	2							28551800
	FPM	4	O-ring 9.25x1.78	2							28551900
Pos.	VPP1-10*P										Ordering No.
4	Seal Kit	Pos.	Square ring	Pcs							
	NBR	4	12.42x1.68	2							15991600
	FPM	4	12.42x1.68	2							40066700

Product (Datasheet): **VPN1-06/S** (5161), **VPN1-06/M(R)** (5160)

Valve size 06

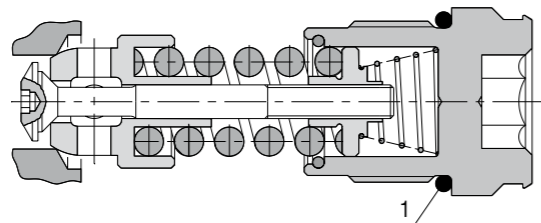
- 1 - O-ring
- 2 - Back-up ring
- 3 - O-ring
- 4 - Square ring (NBR), O-ring (FPM)



Pos.	VPN1-06										Ordering No.
1+2+3	Seal Kit	Pos.	O-ring	Pcs	Pos.	Back-up ring	Pcs	Pos.	O-ring	Pcs	
	NBR	1	19.4x2.1	1	2	14.73x17.43x1.14	2	3	14x1.78	1	22752700
	FPM	1	19.4x2.1	1	2	14.73x17.43x1.14	2	3	14x1.78	1	31920800
Pos.	VPN1-06/M(R)										Ordering No.
4	Seal Kit	Pos.	Ring	Pcs							
	NBR	4	Square ring 9.25x1.68	4							15991700
	FPM	4	O-ring 9.25x1.78	4							22944700

Product (Datasheet): **DBV3** (5092)

1 - O-ring



Position	DBV3										Ordering No.
1	Seal	Pos.	O-ring	Pcs							
	NBR	1	21.95x1.78	1							20146100
	FPM	1	21.95x1.78	1							30349500

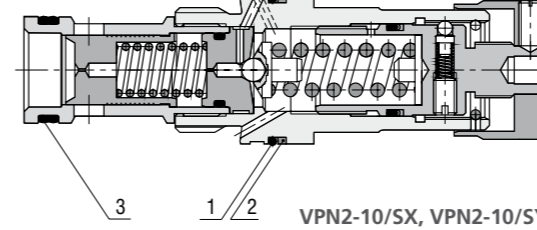
All dimensions are indicated in millimeters [mm].

3 Pressure Control Valves

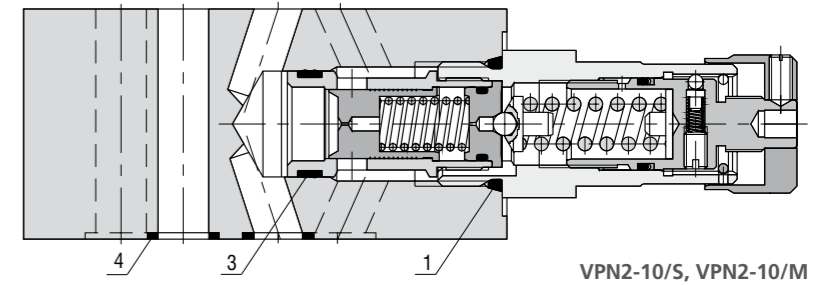
Product (Datasheet): **VPN2-10/S** (5163), **VPN2-10/M(R)** (5164)

Valve size 10

- 1 - O-ring
- 2 - Back-up ring
- 3 - Dualseal
- 4 - Square ring



VPN2-10/SX, VPN2-10/SY



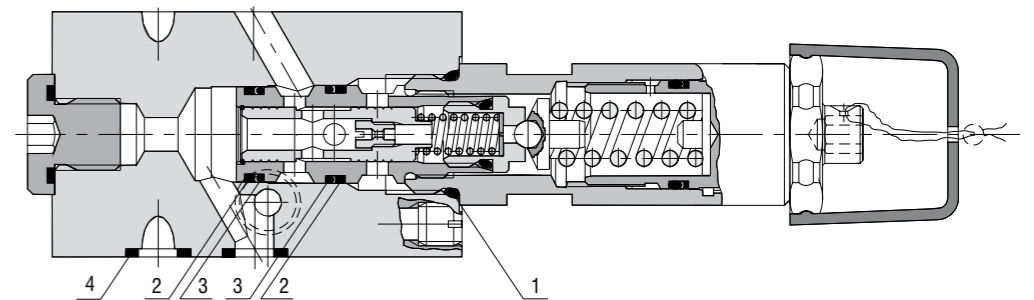
VPN2-10/S, VPN2-10/M

Pos.	VPN2-10/S										Ordering No.
1+3	Seal Kit	Pos.	O-ring	Pcs				Pos.	Dualseal SSA	Pcs	
	NBR	1	23.47x2.95	1				3	19.6x23x4.4	1	15991500
	FPM	1	23.47x2.95	1				3	19.6x23x4.4	1	22943400
Pos.	VPN2-10/SX, VPN2-10/SY										Ordering No.
1+2+3	Seal Kit	Pos.	O-ring	Pcs	Pos.	Back-up ring	Pcs	Pos.	Dualseal SSA	Pcs	
	NBR	1	28.3x1.78	1	2	29.03x31.73x1.14	1	3	19.6x23x4.4	1	22943500
	FPM	1	28.3x1.78	1	2	29.03x31.73x1.14	1	3	19.6x23x4.4	1	22943600
Pos.	VPN2-10/M										Ordering No.
4	Seal Kit	Pos.	Square ring	Pcs							
	NBR	4	12.42x1.68	5							15991600
	FPM	4	12.42x1.68	5							40066700

Product (Datasheet): **VRN2-06/S** (5153), **VRN2-06/M** (5155), **VRN2-10/S** (5154), **VRN2-10/M** (5156)

Valve size 06, 10

- 1 - O-ring
- 2 - Back-up ring
- 3 - O-ring
- 4 - Square ring, O-ring



Pos.	VRN2-06/S, VRN2-06/M										Ordering No.
1+2+3	Seal Kit	Pos.	O-ring	Pcs	Pos.	Back-up ring	Pcs	Pos.	O-ring	Pcs	
	NBR	1	19.4x2.1	1	2	14.73x17.43x1.14	2	3	14x1.78	2	22752700
	FPM	1	19.4x2.1	1	2	14.73x17.43x1.14	2	3	14x1.78	2	31920800
Pos.	VRN2-06/M										Ordering No.
4	Seal Kit	Pos.	Ring	Pcs							
	NBR	4	Square ring 9.25x1.68	4							15991700
	FPM	4	O-ring 9.25x1.78	4							22944700
Pos.	VRN2-10/S, VRN2-10/M										Ordering No.
1+2+3	Seal Kit	Pos.	O-ring	Pcs	Pos.	Back-up ring	Pcs	Pos.	O-ring	Pcs	
	NBR	1	23.47x2.95	1	2	17.91x20.61x1.14	2	3	17x1.8	2	22916600
	FPM	1	23.47x2.95	1	2	17.91x20.61x1.14	2	3	17x1.8	2	22916700
Pos.	VRN2-10/M										Ordering No.
4	Seal Kit	Pos.	Square ring	Pcs							
	NBR	4	12.42x1.68	5							15991600
	FPM	4	12.42x1.68	5							40066700

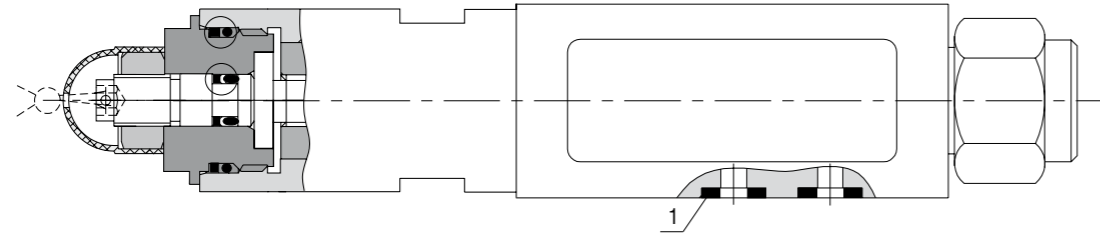
All dimensions are indicated in millimeters [mm].

3 Pressure Control Valves

Product (Datasheet): **VRP2-04 (5142), VRP2-06 (5145)**

Valve size 04, 06

- 1 - Square ring (NBR), O-ring (FPM)

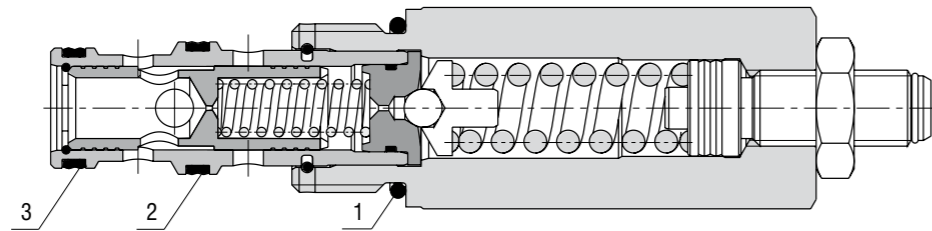


Position		VRP2-04		Pos.		Ring		Pcs	Ordering No.
1	Seal Kit								
	NBR	1	Square ring 7.65x1.68	4				20718400	
	FPM	1	O-ring 7.65x1.78	4				22502600	
Position		VRP2-06		Pos.		Ring		Pcs	Ordering No.
1	Seal Kit								
	NBR	1	Square ring 9.25x1.68	4				15991600	
	FPM	1	O-ring 9.25x1.78	4				22943800	

Product (Datasheet): **SS4A-A3 (5049), SP2A-A3 (5143), SP2A-B3 (5146), SP4A-B3 (5144)**

Cavity A3, B3

- 1 - O-ring
- 2, 3 Dualseal

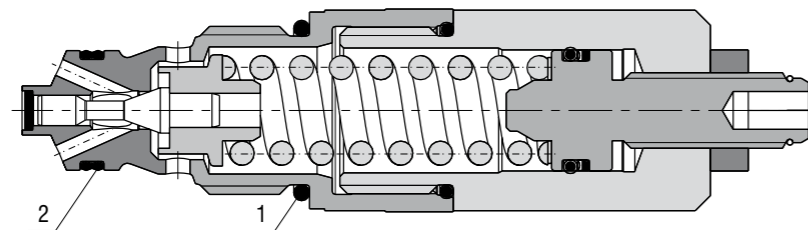


Position		SS4A-A3, SP2A-A3		Pos.		Dualseal SSA		Pcs	Pos.	O-ring NBR		Pcs	Pos.	O-ring Viton - FPM		Pcs	Ordering No.	
1+2+3	Seal Kit	NBR	3	11.87x14.27x3.1	1				1	17x1.8	1	-	-	-	-	-	15661700	
			2	13.47x15.87x3.1	1													
			3	11.87x14.27x3.1	1									1	17.17x1.78	1	20777200	
	FPM	2	13.47x15.87x3.1	1														
		Position SP2A-B3, SP4A-B3																
		1+2+3	Seal Kit	NBR	3	13.47x15.87x3.1	1				1	19.4x2.1	1	-	-	-	-	-
2	15.07x17.47x3.1				1													
3	13.47x15.87x3.1				1									1	19.4x2.1	1	18960600	
FPM	2	15.07x17.47x3.1	1															

Product (Datasheet): **SR1A-A2 (5063), SR1A-B2 (5064), SR1A-B2*CE1017 (5084), SR4A-B2 (5065), SR4E2-B2 (5068)**

Cavity A3, B3

- 1 - O-ring
- 2 - Dualseal



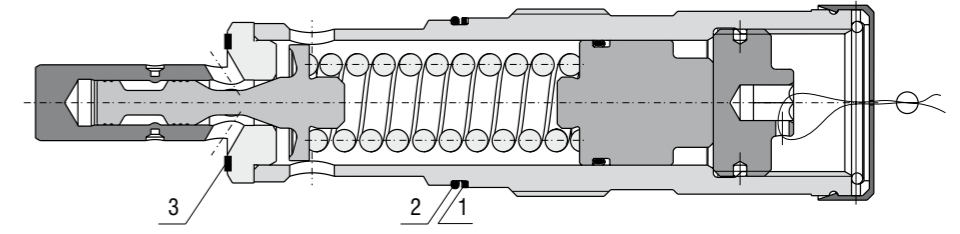
Position		SR1A-A2		Pos.		Dualseal SSA		Pcs	Pos.	O-ring NBR		Pcs	Pos.	O-ring Viton - FPM		Pcs	Ordering No.	
1+2	Seal Kit	NBR	2	10.3x12.7x3.1	1	1	17x1.8	1	-	-	-	-	-	-	-	-	20776700	
			2	10.3x12.7x3.1	1									1	17.17x1.78	1	17014300	
			FPM	Position SR1A-B2, SR1A-B2*CE1017, SR4A-B2, SR4E2-B2														
1+2	Seal Kit	NBR		2	13.47x15.87x3.1	1	1	19.4x2.1	1	-	-	-	-	-	-	-	-	18960400
				2	13.47x15.87x3.1	1												
			FPM	2	13.47x15.87x3.1	1									1	19.4x2.1	1	18960500

3 Pressure Control Valves

Product (Datasheet): **VPP-R-16(25) (5300), VPP-R-16-xx-L-CE1017 (5095)**

Valve size 16, 25

- 1 - Back-up ring
- 2 - O-ring
- 3 - Seal



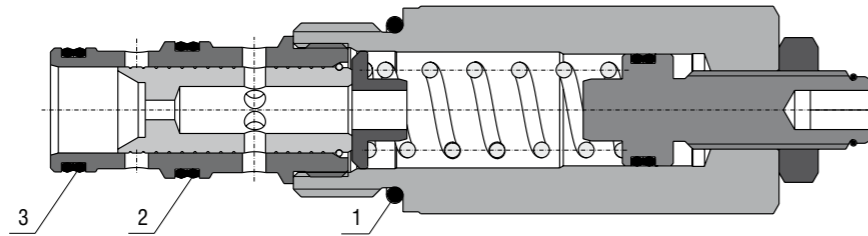
Position		VPP-R-16		Pos.		Back-up ring		Pcs	Pos.	O-ring NBR		Pcs	Ordering No.	
1+2	Seal Kit	NBR	1	27.38x33.38x1.0 (PT)	1	2	26.57x3.53	1					34158400	
			FPM	1		1								On request
				Position VPP-R-25										
1+2	Seal Kit	NBR	1	35.38x38.08x1.14	1	2	34.65x1.78	1					40124600	
			FPM	1		1								On request
				Position VPP-R-16-xx-L-CE1017										
1+2+3	Seal Kit	NBR	1	27.38x33.38x1.0 (PT)	1	2	26.57x3.53	1	3	Seal HTR 24				
			FPM	1		1					HTR 24	1	34158400	
													1	On request

4 Flow Control Valves

Product (Datasheet): **SF22A-A2/H (5060), SF22A-B2/H (5067), SF32A-B3/H (5070), ST2C1A-A2 (5133), ST21A-B2 (5134)**

Cavity A2, B2, B3

- 1 - O-ring
- 2 - Dualseal
- 3 - Dualseal

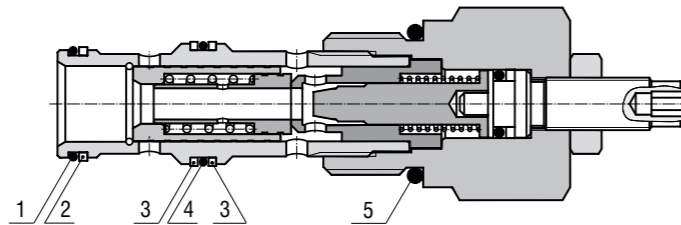


Position	SF22A-A2/H, ST2C1A-A2
1+3	Seal Kit
	NBR
	FPM
Position	SF22A-B2/H, ST21A-B2
1+3	Seal Kit
	NBR
	FPM
Position	SF32A-B3/H
1+2+3	Seal Kit
	NBR
	FPM

Product (Datasheet): **SF2C2A-K2/I (5236), SF32A-K3/I (5227)**

Cavity K2, K3

- 1 - O-ring
- 2 - Back-up ring
- 3 - Back-up ring
- 4 - O-ring
- 5 - O-ring

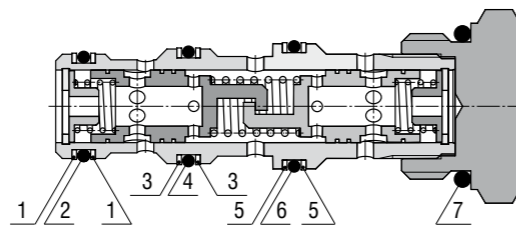


Position	SF2C2A-K2/I
1+2+5	Seal Kit
	NBR
	FPM
Position	SF32A-K3/I
1+2+3+4+5	Seal Kit
	NBR
	FPM

Product (Datasheet): **SFD2F-B4/I (5234), SFD2F-D4/I (5235)**

Cavity B4, D4

- 1 - Back-up ring
- 2 - O-ring
- 3 - Back-up ring
- 4 - O-ring
- 5 - Back-up ring
- 6 - O-ring
- 7 - O-ring



Position	SFD2F-B4/I, SFD2F-D4/I
1+2+3+4+5+6+7	Seal Kit
	NBR
	FPM

4 Flow Control Valves

Product (Datasheet): **VSK (5121), VSO1-04/R (5054)**

VSK	Replacement seals for VSK valve is not offered!
VSO1-04/R	Replacement seals for VSO1-04/R valve is not offered!

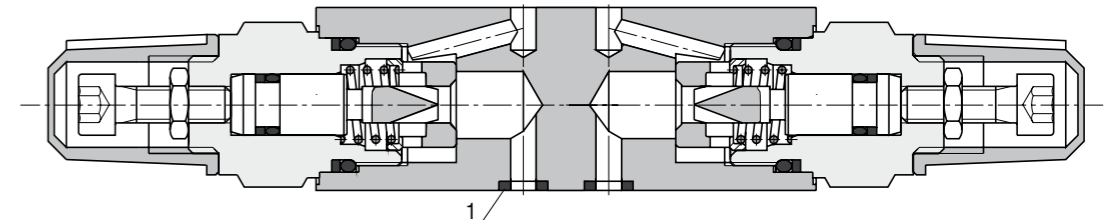
Product (Datasheet): **VSO1-04/M (5053)**

Product (Datasheet): **2V53-06 (5051), VSS1-206 (5032), VSS1-306 (5033), VSS2-206 (5041)**

Product (Datasheet): **VSO2-10/M (5056), VSO3-10/M (5076)**

Valve 04, 06, 10

- 1 - Square ring (NBR), O-ring (FPM)

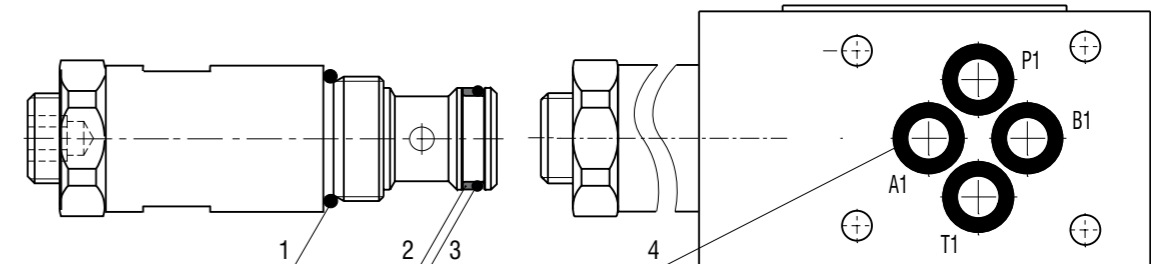


Position	VSO1-04/M
1	Seal Kit
	NBR
	FPM
Position	2V53-06, VSS1-206, VSS1-306, VSS2-206
1	Seal Kit
	NBR
	FPM
Position	VSO2-10/M, VSO3-10/M
1	Seal Kit
	NBR
	FPM

Product (Datasheet): **VSS3-062/S (5057), VSS3-062/M (5050)**

Valve 06

- 1 - O-ring
- 2 - Back-up ring
- 3 - O-ring
- 4 - Square ring (NBR), O-ring (FPM)



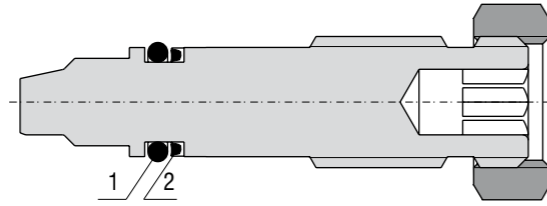
Pos.	VSS3-062/S, VSS3-062/M
1-3	Seal Kit
	NBR
	FPM
Pos.	VSS3-062/M
4	Seal Kit
	NBR
	FPM

4 Flow Control Valves

Product (Datasheet): **VSV2 (5132)**

Cavity QC2

- 1 - O-ring
- 2 - Back-up ring



Pos.	VSV2-1, VSV2-J1, VSV2-J2						Ordering No.	
1, 2	Seal Kit	Pos.	O-ring	Pcs	Pos.	Back-up ring	Pcs	
	NBR	1	6.9x1.8	1	2	6.73x9.43x1.14	1	40125400
	FPM	1	6.9x1.8	1	2	6.73x9.43x1.14	1	40125300

5 Overcentre Valves

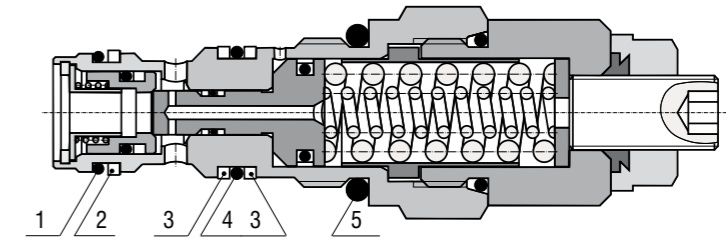
Product (Datasheet): **SO5A-Q3/I (5200), SOP5A-Q3/I (5201), SOB5A-Q3/I (5202)**

Product (Datasheet): **SO5A-R3/I (5205), SOP5A-R3/I (5206), SOB5A-R3/I (5207), SOBD5A-R4/I (5208)**

Product (Datasheet): **SO5A-T3/I (5214), SOP5A-T3/I (5215)**

Cavity Q3, R3, R4, T3

- 1 - O-ring
- 2 - Back-up ring
- 3 - Back-up ring
- 4 - O-ring
- 5 - O-ring

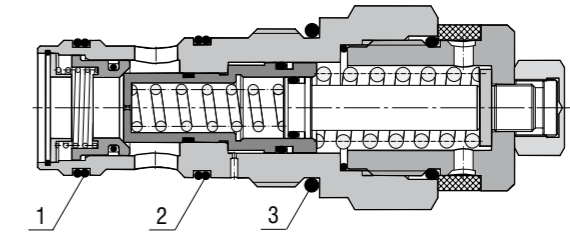


Position	Seal Kit	Pos.	O-ring	Pcs	Pos.	Back-up ring	Pcs	Ordering No.
1+2+3+4+5		1, 4, 5		3	2, 3		3	On request

Product (Datasheet): **SOB5A-S3/I (5211), SOBD5A-S4/I (5212)**

Cavity S3, S4

- 1, 2, 3 - Seal



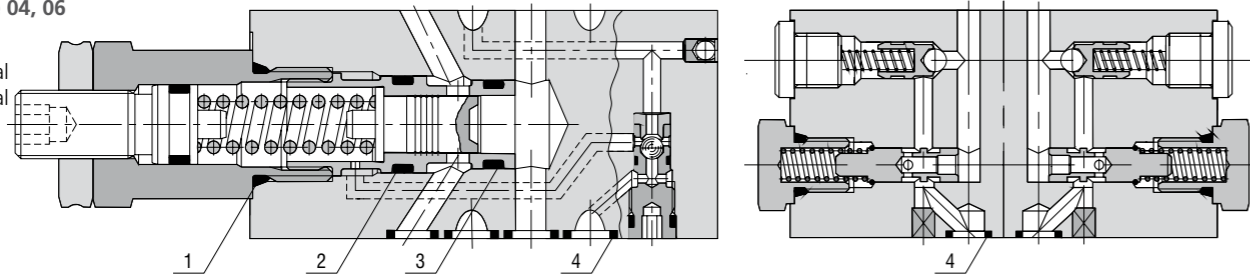
Position	Seal Kit	Pos.	Ordering No.
1+2+3		1, 2, 3	On request

6 Proportional Valves

Product (Datasheet): [TV2-063/S \(5158\)](#), [TV2-062/M \(5166\)](#), [TV2-063/M \(5168\)](#), [TV2-042/M \(5167\)](#), [TV2-043/M \(5188\)](#)

Valve size 04, 06

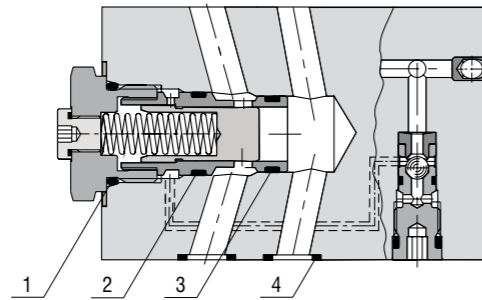
- 1 - O-ring
- 2 - Dualseal
- 3 - Dualseal



Pos.	TV2-063/S										Ordering No.
1+2+3	Seal Kit	Pos.	O-ring	Pcs	Pos.	Dualseal SSA	Pcs	Pos.	Dualseal SSA	Pcs	
	NBR	1	18x2	1	2	14.6x17x3.4	1	3	13.1x15.5x3.4	1	40125600
	FPM	1	18x2	1	2	14.6x17x3.4	1	3	13.1x15.5x3.4	1	34312500
Pos.	TV2-062/M, TV2-063/M										Ordering No.
4	Seal Kit	Pos.	Ring	Pcs							
	NBR	4	Square ring 9.25x1.68	4							15991700
	FPM	4	O-ring 9.25x1.78	4							22944700
Pos.	TV2-042/M, TV2-043/M										Ordering No.
4	Seal Kit	Pos.	Ring	Pcs							
	NBR	4	Square ring 7.65x1.68	4							20718400
	FPM	4	O-ring 7.5x1.8	4							17246100

Product (Datasheet): [TV2-102/S \(5179\)](#), [TV2-103/S \(5180\)](#), [TV2-102/M \(5169\)](#), [TV2-103/M \(5170\)](#)

Valve size 10



Pos.	TV2-102/S, TV2-103/S										Ordering No.
1+2+3	Seal Kit	Pos.	O-ring	Pcs	Pos.	Dualseal SSA	Pcs	Pos.	Dualseal SSA	Pcs	
	NBR	1	23.47x2.95	1	2	20.6x23x3.4	1	3	18.6x21x3.6	1	16755901
	FPM	1	23.47x2.95	1	2	20.6x23x3.4	1	3	18.6x21x3.6	1	40125900
Pos.	TV2-102/M, TV2-103/M										Ordering No.
4	Seal Kit	Pos.	Square ring	Pcs							
	NBR	4	12.42x1.68	5							15991600
	FPM	4	12.42x1.68	5							40066700

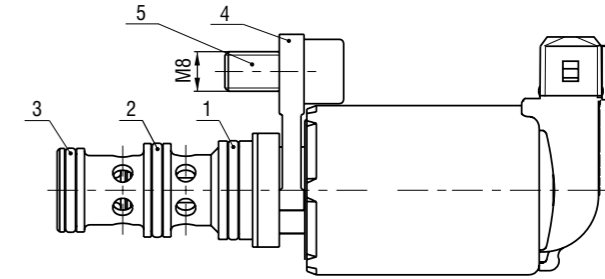
All dimensions are indicated in millimeters [mm].

6 Proportional Valves

Product (Datasheet): [PP2P1-W3 \(5125\)](#), [PP2P3-W3 \(5147\)](#)

Cavity W3

- 1, 2, 3 - O-ring
- 4 - Fork Slip-In M8
- 5 - Bolt M8x16 (ISO 4762)

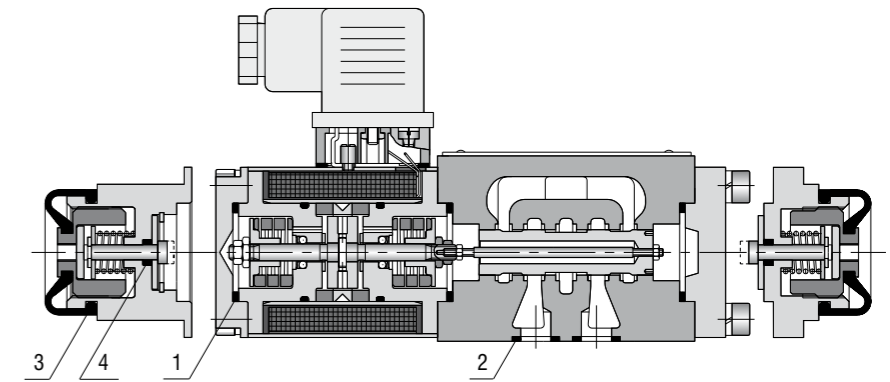


Position	PP2P1-W3, PP2P3-W3										Ordering No.
1+2+3	Seal Kit	Pos.	O-ring	Pcs	Pos.	O-ring	Pcs	Pos.	O-ring	Pcs	
	NBR	3	14x1.78	1	2	16x1.8	1	1	17x1.8	1	16961300
	FPM	3	14x1.78	1	2	16x1.8	1	1	17x1.8	1	On request
4+5	Kit - Fork+Bolt M8	Pos.		Pcs	Pos.		Pcs				Ordering No.
		4	Fork SLIP-IN M8	1	5	Bolt M8x16 Zn / PO-A	1				16961500

Product (Datasheet): [PRL1 \(5101\)](#)

Size 06

- 1 - O-ring
- 2 - Square ring (NBR)
- 3 - Rubber boot
- 4 - O-ring

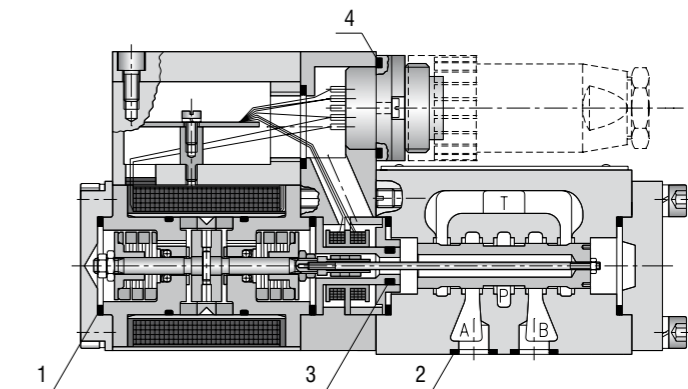


Position	PRL1* without manual override										Ordering No.
1+2	Seal Kit	Pos.	O-ring	Pcs	Pos.	Ring	Pcs				
	NBR	1	22x2	3	2	Square ring 9.25x1.68	4				23043600
	FPM	1	-	3	2	-	4				On request
Position	PRL1*N										Ordering No.
1+2+3+4	Seal Kit	Pos.	O-ring	Pcs	Pos.	Ring	Pcs	Pos.	Manual override	Pcs	
	NBR	1	22x2	3	2	Square ring 9.25x1.68	4	3	Rubber boot	1	23043700
	FPM	1	-	3	2	-	4	3	Rubber boot	1	On request
Position	PRL1*NN										Ordering No.
1+2+3+4	Seal Kit	Pos.	O-ring	Pcs	Pos.	Ring	Pcs	Pos.	Manual override	Pcs	
	NBR	1	22x2	3	2	Square ring 9.25x1.68	4	3	Rubber boot	2	23043800
	FPM	1	-	3	2	-	4	3	Rubber boot	2	On request

Product (Datasheet): [PRL2 \(5103\)](#)

Size 06

- 1 - O-ring
- 2 - Square ring (NBR)
- 3, 4 - O-ring



All dimensions are indicated in millimeters [mm].

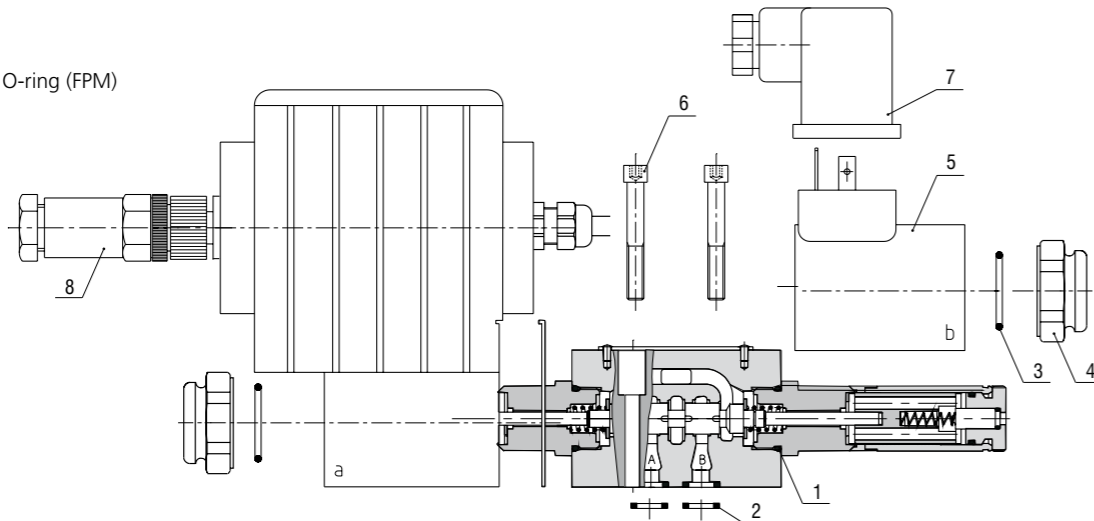
Position	PRL1* without manual override										Ordering No.
1+2+3+4	Seal Kit	Pos.	O-ring	Pcs	Pos.	Ring	Pcs	Pos.	O-ring	Pcs	
	NBR	1	22x2	4	2	Square ring 9.25x1.68	4	3	6x2	1	23043900
	FPM	1	-	4	2	-	4	3	-	1	On request

6 Proportional Valves

Product (Datasheet): **PRM2-04** (5105), **PRM2-06** (5104), **PRM6-10** (5115)

Size 04, 06, 10

- 1 - O-ring
- 2 - Square ring (NBR), O-ring (FPM)
- 3 - O-ring
- 4 - Retaining nut
- 5 - Solenoid coil
- 6 - Mounting bolt
- 7, 8 - Connector



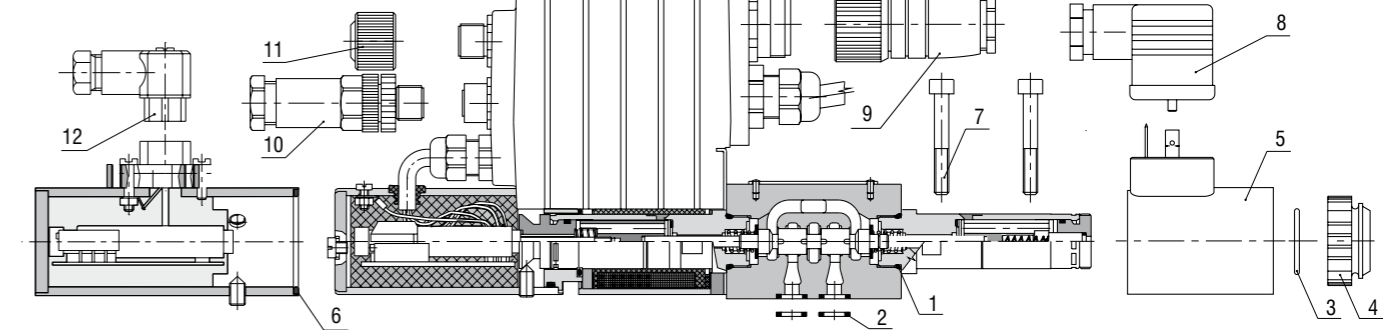
Position	PRM2-04	Pos.	O-ring	Pcs	Pos.	Ring	Pcs	Ordering No.
1+2	Seal Kit							
	NBR	1	16x2	2	2	Square ring 7.65x1.68	4	15873800
	FPM		16x2	2		O-ring 7.5x1.8	4	15874400
3+4	Nut Kit							
		3	18x1.5	1	4	Plastic	1	15874500
5	Solenoid Coil Kit							
		5	Nominal supply voltage 12 V	1			1	16186100
			Nominal supply voltage 24 V	1			1	16186200
6	Bolt Kit							
		6	Mounting bolt					
			Bolt M5x35	4			4	15874600
Position	PRM2-06	Pos.	O-ring	Pcs	Pos.	Ring	Pcs	Ordering No.
1+2	Seal Kit							
	NBR	1	17x1.8	2	2	Square ring 9.25x1.68	4	15845200
	FPM		17.17x1.78	2		O-ring 9.25x1.78	4	15845400
3+4	Nut Kit							
		3	22x2	1	4	Plastic	1	15844600
5	Solenoid Coil Kit							
		5	Nominal supply voltage 12 V	1			1	16186400
			Nominal supply voltage 12 V (1.6 A) for 12 V electronic unit integrated	1			1	16187500
			Nominal supply voltage 24 V	1			1	16186800
6	Bolt Kit							
		6	Mounting bolt					
			M5x45	4			4	15845100
Position	PRM6-10	Pos.	O-ring	Pcs	Pos.	Square ring	Pcs	Ordering No.
1+2	Seal Kit							
	NBR	1	23.81x2.62	2	2	12.42x1.68	5	23114300
	FPM		23.47x2.62	2		12.42x1.68	5	23114400
3+4	Nut Kit							
		3	30x2	1	4	Plastic	1	15900800
5	Solenoid Coil Kit							
		5	Nominal supply voltage 12 V	1			1	16195800
			Nominal supply voltage 24 V	1			1	16196200
6	Bolt Kit							
		6	Mounting bolt					
			M6x40	4			4	15847700
Position	PRM2-04, PRM2-06, PRM6-10	Pos.	Type K5 without rectifier M16x1.5 bushing bore Ø 4-6 mm (0.16-0.24 in)	Pcs	Ordering No.			
7	Connector							
		7	Maximum input voltage 230 V DC	1	16202600			
			Connector plug	1	16202500			
			A gray	1	16202500			
			B black	1	16202500			
8	Connector							
		8	M12x1 (4-pin connector)	1	15634200			

All dimensions are indicated in millimeters [mm].

6 Proportional Valves

Product (Datasheet): **PRM7-04** (5120), **PRM7-06** (5119), **PRM7-10** (5116)

Size 04, 06, 10



- 1 - O-ring
 - 2 - Square ring (NBR), O-ring (FPM)
 - 3 - O-ring
 - 4 - Retaining nut
 - 5 - Solenoid coil
 - 6 - O-ring
 - 7 - Mounting bolt
 - 8, 9, 10 - Connector
 - 11 - Cover of connector
 - 12 - Connector
- All dimensions are indicated in millimeters [mm].

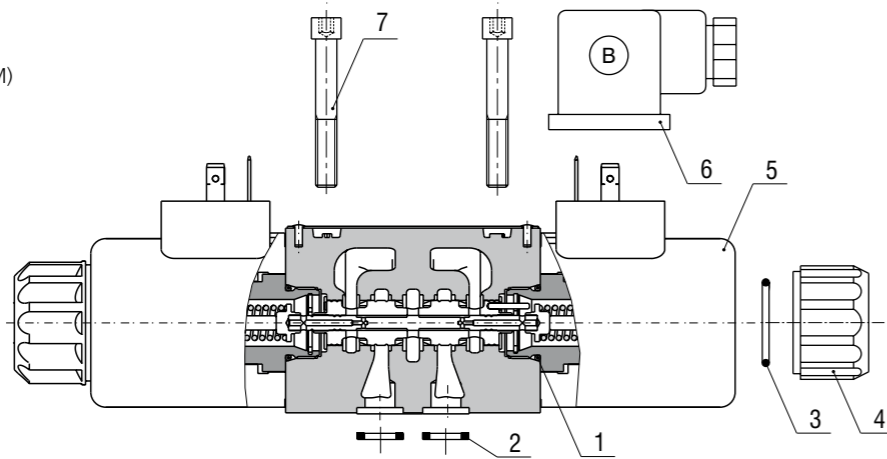
Position	PRM7-04	Pos.	O-ring	Pcs	Pos.	Ring	Pcs	Ordering No.
1+2	Seal Kit							
	NBR	1	16x2	2	2	Square ring 7.65x1.68	4	15873800
	FPM		16x2	2		O-ring 7.5x1.8	4	15874400
3+4	Nut Kit							
		3	18x1.5	1	4	Plastic	1	15874500
5	Solenoid Coil Kit							
		5	Nominal supply voltage 12 V	1			1	16186100
			Nominal supply voltage 24 V	1			1	16186200
6	Seal							
		6	O-ring					
			28x2	1			1	15605600
7	Bolt Kit							
		7	Mounting bolt					
			Bolt M5x35	4			4	15874600
Position	PRM7-06	Pos.	O-ring	Pcs	Pos.	Ring	Pcs	Ordering No.
1+2	Seal Kit							
	NBR	1	17x1.8	2	2	Square ring 9.25x1.68	4	15845200
	FPM		17.17x1.78	2		O-ring 9.25x1.78	4	15845400
3+4	Nut Kit							
		3	22x2	1	4	Plastic	1	15844600
5	Solenoid Coil Kit							
		5	Nominal supply voltage 12 V	1			1	16186400
			Nominal supply voltage 12 V (1.6 A) for 12 V electronic unit integrated	1			1	16187500
			Nominal supply voltage 24 V	1			1	16186800
6	Seal							
		6	O-ring					
			32x2	1			1	15606000
7	Bolt Kit							
		7	Mounting bolt					
			M5x45	4			4	15845100
Position	PRM7-10	Pos.	O-ring	Pcs	Pos.	Square ring	Pcs	Ordering No.
1+2	Seal Kit							
	NBR	1	23.81x2.62	2	2	12.42x1.68	5	23114300
	FPM		23.47x2.62	2		12.42x1.68	5	23114400
3+4	Nut Kit							
		3	30x2	1	4	Plastic	1	15900800
5	Solenoid Coil Kit							
		5	Nominal supply voltage 12 V	1			1	16195800
			Nominal supply voltage 24 V	1			1	16196200
6	Seal							
		6	O-ring					
			32x2	1			1	15606000
7	Bolt Kit							
		7	Mounting bolt					
			M6x40	4			4	15847700
Position	PRM7-04, PRM7-06, PRM7-10	Pos.	Type K5 without rectifier M16x1.5 bushing bore Ø 4-6 mm (0.16-0.24 in)	Pcs	Ordering No.			
8	Connector							
		8	Maximum input voltage 230 V DC	1	16202600			
			Connector plug	1	16202500			
			A gray	1	16202500			
			B black	1	16202500			
9	Connector							
		9	M23 7-pin connector (female)	1	17508300			
10	Connector							
		10	M12x1 5-pin connector (male), only for E03 and E04S01 configurations	1	17661100			
11	Cover of connector							
		11	M12x1	1	23090600			
12	Connector							
		12	G4W1F	1	20607000			

6 Proportional Valves

Product (Datasheet): **PRM8-06 (5178)**

Size 06

- 1 - O-ring
- 2 - Square ring (NBR), O-ring (FPM)
- 3 - O-ring
- 4 - Retaining nut
- 5 - Solenoid coil
- 6 - Connector
- 7 - Mounting bolt

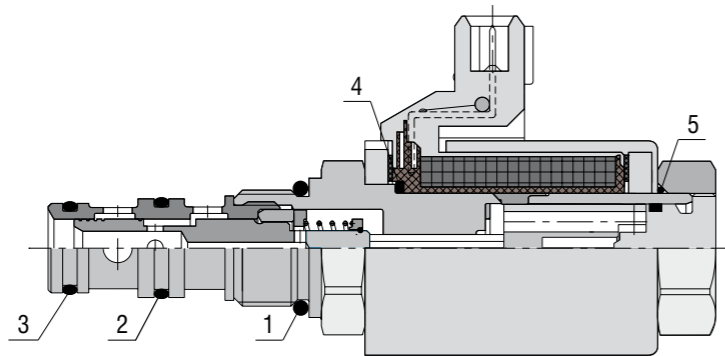


Position	PRM8-06	Pos.	O-ring	Pcs	Pos.	Ring	Pcs	Ordering No.
1+2	Seal Kit							
	NBR	1	17x1.8	2	2	Square ring 9.25x1.68	4	15845200
	FPM		17.17x1.78	2		O-ring 9.25x1.78	4	15845400
3+4	Nut Kit	Pos.	O-ring	Pcs	Pos.	Retaining nut	Pcs	Ordering No.
		3	22x2	1	4	Plastic	1	15844600
5	Solenoid coil	E1			E3A		E12	E13
		Nominal supply voltage	Pos.	Ordering No. (1pc)				
		12 V	5	18838500		19744700		19696100
	24 V		18838300		19744300		19696200	30691600
6	Connector	Pos.	Type K5 without rectifier M16x1.5 bushing bore Ø 4-6 mm (0.16-0.24 in)				Pcs	Ordering No.
		to EN 175301-803	6	Maximum input voltage 230 V AC/DC		Connector plug	B gray	1
						B black	1	16202100
7	Bolt Kit	Pos.	Mounting bolt				Pcs	Ordering No.
		7	M5x30				4	40101700

Product (Datasheet): **PVRM1-063/S (5108), PVRM3-10 (5118)**

Size 06, 10

- 1, 2, 3, 4 - O-ring



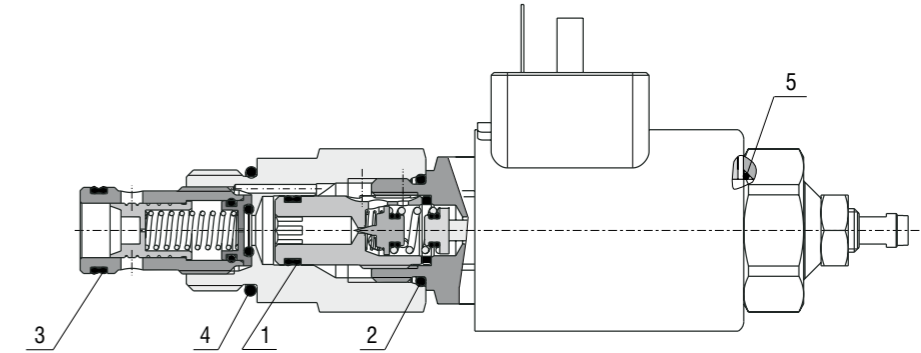
Position	PVRM1-063/S	Pos.	O-ring	Pcs	Pos.	O-ring	Pcs	Pos.	O-ring	Pcs	Pos.	O-ring	Pcs	Ordering No.	
1 - 5	Seal Kit														
	NBR	1	18x1.5	1	2	14x1.78	1	3	12.42x1.78	1	4	20x2	1	23128400	
	FPM		18x1.5	1		14x1.78	1		12.42x1.78	1		20x2	1	16030500	
Position	PVRM3-10	Pos.	O-ring	Pcs	Pos.	O-ring	Pcs	Pos.	O-ring	Pcs	Pos.	O-ring	Pcs	Ordering No.	
		1 - 5	1	22x1.5	1	2	17x1.8	1	3	15x1.8	1	4	20.3x2.4	1	23128500
				22x1.5	1		17.17x1.78	1		14x1.78	1		20.3x2.4	1	40102800

6 Proportional Valves

Product (Datasheet): **SR1P2-A2 (5122), SR4P2-B2 (5117), SRN1P1-A2 (5137), SRN4P1-B2 (5138)**

Cavity A2, B2

- 1 - Dualseal
- 2 - O-ring
- 3 - Dualseal
- 4 - O-ring
- 5 - O-ring

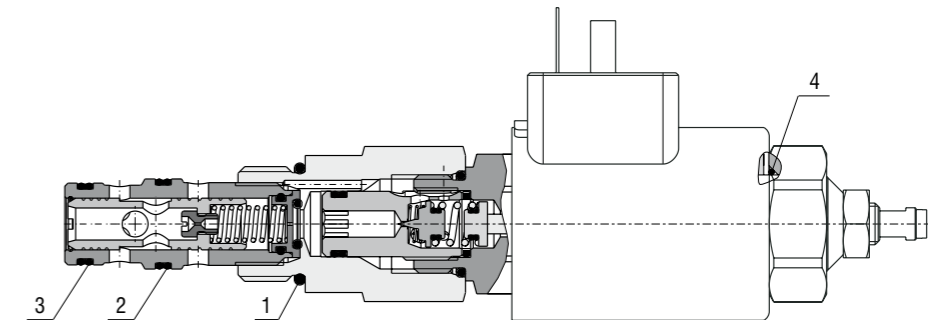


Position	SR1P2-A2, SRN1P1-A2	Pos.	Dualseal PU	Pcs	Pos.	O-ring	Pcs	Pos.	O-ring	Pcs	Ordering No.	
1+2+5	Seal Kit											
	NBR	1	10.3x12.7x3.1	1	2	17.17x1.78	1	5	18x1.5	1	40102100	
	FPM		10.3x12.7x3.1	1		17.17x1.78	1		18x1.5	1	40102000	
Position	SR4P2-B2, SRN4P1-B2	Pos.	Dualseal PU <td>Pcs <td>Pos.</td> <td>O-ring <td>Pcs <td>Pos.</td> <td>O-ring <td>Pcs</td> <td>Ordering No.</td> </td></td></td></td>	Pcs <td>Pos.</td> <td>O-ring <td>Pcs <td>Pos.</td> <td>O-ring <td>Pcs</td> <td>Ordering No.</td> </td></td></td>	Pos.	O-ring <td>Pcs <td>Pos.</td> <td>O-ring <td>Pcs</td> <td>Ordering No.</td> </td></td>	Pcs <td>Pos.</td> <td>O-ring <td>Pcs</td> <td>Ordering No.</td> </td>	Pos.	O-ring <td>Pcs</td> <td>Ordering No.</td>	Pcs	Ordering No.	
		3+4+5	3	13.47x15.87x3.1	1	4	19.4x2.1	1	5	18x1.5	1	40102700
				13.47x15.87x3.1	1		19.4x2.1	1		18x1.5	1	40102300

Product (Datasheet): **SP4P2-B3 (5123), SPN4P1-B3 (5139)**

Cavity B3

- 1 - O-ring
- 2 - Dualseal
- 3 - Dualseal
- 4 - O-ring

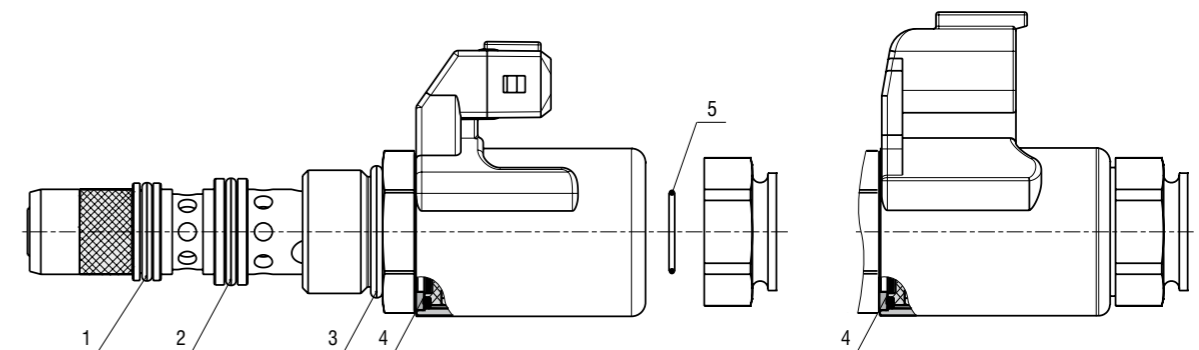


Position	SP4P2-B3, SPN4P1-B3	Pos.	O-ring	Pcs	Pos.	Dualseal PU	Pcs	Pos.	Dualseal PU	Pcs	Ordering No.
1+2+3	Seal Kit										
	NBR	1	19.4x2.1	1	2	15.07x17.47x3.1	1	3	13.47x15.87x3.1	1	28197400
	FPM		19.4x2.1	1		15.07x17.47x3.1	1		13.47x15.87x3.1	1	28197500
4	Seal										
	NBR							Pos.	O-ring	Pcs	Ordering No.
	FPM							4	18x1.5	1	20150800
								4	18x1.5	1	20131900

Product (Datasheet): **SP4P1-B4 (5124)**

Cavity B4

- 1, 2, 3 - O-ring
- 4 - Dualseal
- 5 - O-ring



Position	SP4P1-B4	Pos.	O-ring	Pcs	Pos.	O-ring	Pcs	Pos.	O-ring	Pcs	Pos.	Seal	Pcs	Pos.	O-ring	Pcs	Ordering No.
1+2+3+4+5	Seal Kit																
	NBR	1	14x1.78	1	2	15.6x1.78	1	3	19.4x2.1	1	4	Silikon seal	1	5	13x2	1	34321700
	FPM		14x1.78	1		15.6x1.78	1		19.4x2.1	1					13x2	1	34321800

All dimensions are indicated in millimeters [mm].

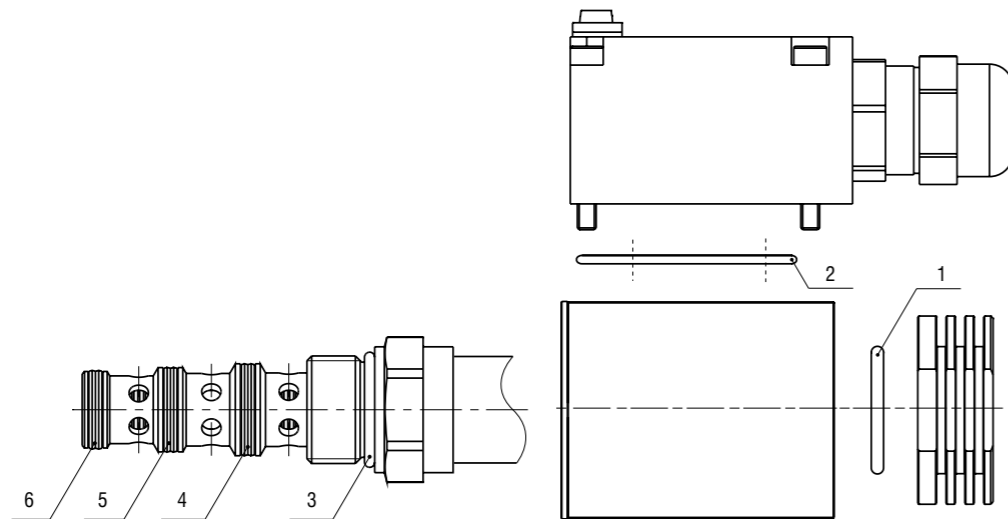
All dimensions are indicated in millimeters [mm].

7 Explosion Proof Valves (ATEX)

Product (Datasheet): **SD1EX-A3 (4068), SD2EX-B2 (4064), SD2EX-B3 (4065), SD2EX B4 (4066), SD3EX-B2 (4067)**

Cavity A3, B2, B3, B4

- 1 - O-ring
- 2 - O-ring
- 3 - O-ring
- 4, 5, 6 - Dualseal



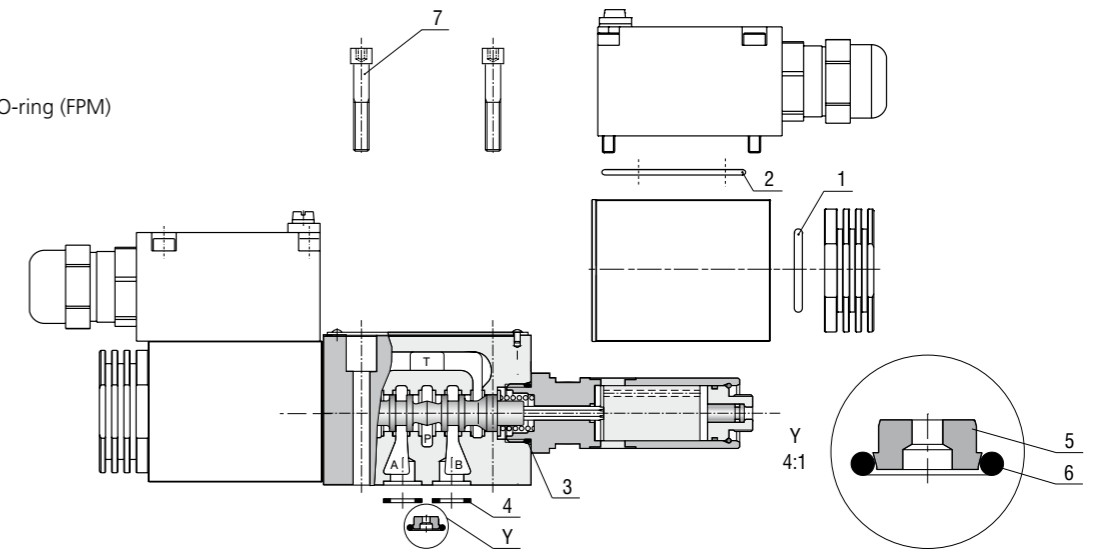
Position	SD1EX-A3, SD2EX-B2, SD2EX-B3, SD2EX-B4, SD3EX-B2											
1	Seal	Pos.	O-ring	Pcs						Ordering No.		
	MVQ (Silikon)	1	21.89x2.62	1						33053300		
2	Seal	Pos.	O-ring	Pcs						Ordering No.		
	MVQ (Silikon)	2	46x2	1						34950700		
Position	SD1EX-A3											
3+4+5	Seal Kit	Pos.	Dualseal SSA	Pcs	Pos.	O-ring NBR	Pcs	Pos.	O-ring Viton - FPM	Pcs	Ordering No.	
	NBR	5	11.87x14.27x3.1	1	3	17x1.8	1	-	-	-	15661700	
		4	13.47x15.87x3.1	1								
	FPM	5	11.87x14.27x3.1	1	-	-	-	3	17.17x1.78	1	20777200	
4		13.47x15.87x3.1	1									
Position	SD2EX-B2, SD3EX-B2											
3+4	Seal Kit	Pos.	Dualseal SSA	Pcs	Pos.	O-ring NBR	Pcs	Pos.	O-ring Viton - FPM	Pcs	Ordering No.	
	NBR	4	13.47x15.87x3.1	1	3	19.4x2.1	1	-	-	-	18960400	
		FPM	4	13.47x15.87x3.1	1	-	-	-	3	19.4x2.1	1	18960500
Position	SD2EX-B3											
3+4+5	Seal Kit	Pos.	Dualseal SSA	Pcs	Pos.	O-ring NBR	Pcs	Pos.	O-ring Viton - FPM	Pcs	Ordering No.	
	NBR	5	13.47x15.87x3.1	1	3	19.4x2.1	1	-	-	-	18960700	
		4	15.07x17.47x3.1	1								
	FPM	5	13.47x15.87x3.1	1	-	-	-	3	19.4x2.1	1	18960600	
4		15.07x17.47x3.1	1									
Position	SD2EX-B4											
3+4+5+6	Seal Kit	Pos.	Dualseal SSA	Pcs	Pos.	O-ring NBR	Pcs	Pos.	O-ring Viton - FPM	Pcs	Ordering No.	
	NBR	6	13.47x15.87x3.1	1	3	19.4x2.1	1	-	-	-	-	18960800
		5	15.07x17.47x3.1	1								
		4	16.65x19.05x3.1	1								
	FPM	6	13.47x15.87x3.1	1	-	-	-	3	19.4x2.1	1	-	18960900
		5	15.07x17.47x3.1	1								
4		16.65x19.05x3.1	1									

7 Explosion Proof Valves (ATEX)

Product (Datasheet): **RPEX3-06 (4054)**

Valve size 06

- 1, 2 - O-ring
- 3 - O-ring
- 4 - Square ring (NBR), O-ring (FPM)
- 5 - Orifice in P port
- 6 - O-ring
- 7 - Mounting bolt



Position	RPEX3-06											
1	Seal	Pos.	O-ring	Pcs						Ordering No.		
	MVQ (Silikon)	1	21.89x2.62	1						33053300		
2	Seal	Pos.	O-ring	Pcs						Ordering No.		
	MVQ (Silikon)	2	46x2	1						34950700		
3+4	Seal Kit	Pos.	O-ring	Pcs	Pos.	Ring	Pcs				Ordering No.	
	NBR	3	17x1.8	2	4	Square ring 9.25x1.68	4				15845200	
		FPM	2	17.17x1.78	2	O-ring 9.25x1.78		4				15845400
5+6	Kit	Pos.	Orifice in P port	Pcs	Pos.	O-ring NBR	Pcs				Ordering No.	
	Orifice in P port with NBR seal	5	Ø1.0	1	6	9.25x1.78	1				On request	
			Ø1.5	1								
			Ø2.0	1								
			Ø2.2	1								
			Ø2.5	1								
5+6	Kit	Pos.	Orifice in P port	Pcs	Pos.	O-ring FPM	Pcs				Ordering No.	
			Ø1.0	1								15845600
			Ø1.5	1								15845700
			Ø2.0	1								15845800
			Ø2.2	1								15846000
Ø2.5	1				15845900							
7	Bolt Kit	Pos.								Pcs	Ordering No.	
	Mounting bolts for steel plates	7	Bolt M5x45	4	for studs see Datasheet 002		4			15845100		

All dimensions are indicated in millimeters [mm].

All dimensions are indicated in millimeters [mm].

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