HYDRAULICS

EVERYTHING IN MOTION

Filter systems and elements that keep production processes running

Filtration Group®
Safer | Healthier | More Productive

Suction Filter
Pi 200

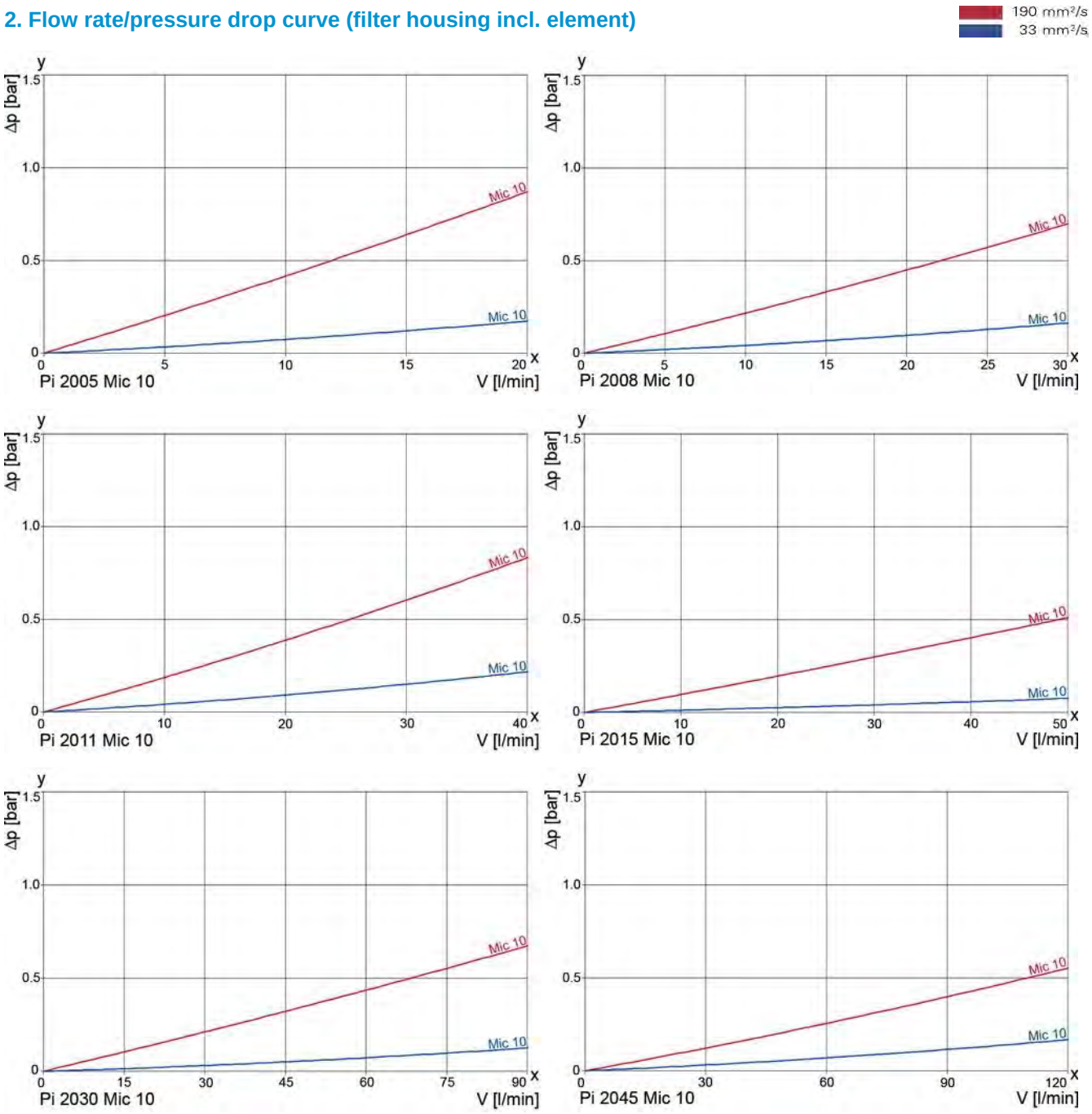
Nominal size up to 90

1. Features

High performance filters for modern hydraulic systems

- Provided for pipe installation
- Modular system
- Compact design
- Minimal pressure drop through optimal flow design
- Visual/electrical/electronic maintenance indicator
- Threaded connections
- Quality filters, easy to service
- Equipped with highly efficient Mic or PS filter elements
- Beta rated elements according to ISO 16889 multipass test
- Elements with high dirt holding capacity
- NPT and SAE connections on request
- Worldwide distribution

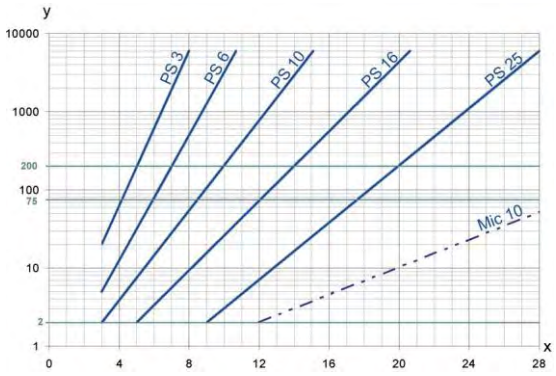
2. Flow rate/pressure drop curve (filter housing incl. element)



y = differential pressure Δp [bar]
x = flow rate V [l/min]

PS elements on request.

3. Separation grade characteristics



y = beta-value
x = particle size [µm]

determined by multipass tests (ISO 16889)
calibration according to ISO 11171 (NIST)

4. Filter performance data

tested according to ISO 16889 (multipass test)

PS elements with
max. Δ p 20 bar

PS	10	$\beta_{10(C)}$	≥ 200
PS	25	$\beta_{20(C)}$	≥ 200

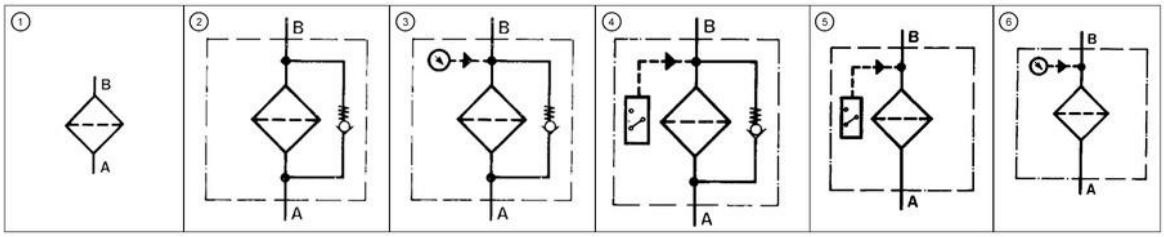
values guaranteed up to 10
bar differential pressure

5. Quality assurance

Filtration Group filters and filter elements are produced according to the following international standards:

Norm	Designation
DIN ISO 2941	Hydraulic fluid power filter elements; verification of collapse/burst resistance
DIN ISO 2942	Hydraulic fluid power filter elements; verification of fabrication integrity
DIN ISO 2943	Hydraulic fluid power filter elements; verification of material compatibility with fluids
DIN ISO 3723	Hydraulic fluid power filter elements; method for end load test
DIN ISO 3724	Hydraulic fluid power filter elements; verification of flow fatigue characteristics
ISO 3968	Hydraulic fluid power filters; evaluation of pressure drop versus flow characteristics
ISO 10771.1	Fatigue pressure testing of metal containing envelopes in hydraulic fluid applications
ISO 16889	Hydraulic fluid power filters; multipass method for evaluation filtration performance of a filter element

6. Symbols



7. Order numbers

Example for ordering filters:

1. Filter housing	2. Filter element
V=16 l/min and vacuum switch Type: Pi 2008-065 Order number: 77736937	PS 25 Type: Pi 4108 PS 25 Order number: 77680457

7.1 Housing design

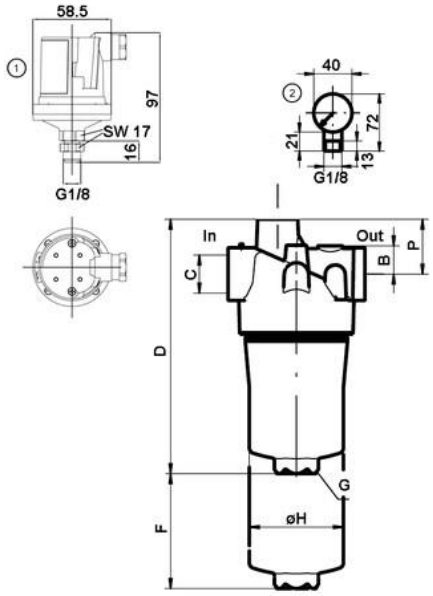
Nominal size NG [l/min]	Order number	Type	① no options	② with bypass valve	③ with bypass valve and vacuum gauge	④ with bypass valve and vacuum switch	⑤ with vacuum switch	⑥ with vacuum gauge
10	77665144	Pi 2005-060	■					
	77665151	Pi 2005-067		■				
	77736903	Pi 2005-062			■			
	77736911	Pi 2005-061				■		
	77736895	Pi 2005-065					■	
	77736887	Pi 2005-066						■
16	77665235	Pi 2008-060	■					
	77665268	Pi 2008-067		■				
	77665243	Pi 2008-062			■			
	77736945	Pi 2008-061				■		
	77736937	Pi 2008-065					■	
	77665250	Pi 2008-066						■
22	78205114	Pi 2011-060	■					
	70361602	Pi 2011-067		■				
	70361595	Pi 2011-062			■			
	79767013	Pi 2011-061				■		
	79373077	Pi 2011-065					■	
	76374318	Pi 2011-066						■
30	77840580	Pi 2015-060	■					
	N.N.	Pi 2015-067		■				
	N.N.	Pi 2015-062			■			
	N.N.	Pi 2015-061				■		
	76387880	Pi 2015-065					■	
	N.N.	Pi 2015-066						■
60	77665474	Pi 2030-060	■					
	77735921	Pi 2030-067		■				
	77665482	Pi 2030-062			■			
	77665490	Pi 2030-061				■		
	77665508	Pi 2030-065					■	
	77735939	Pi 2030-066						■
90	77664881	Pi 2045-060	■					
	77736986	Pi 2045-067		■				
	77664907	Pi 2045-062			■			
	77664899	Pi 2045-061				■		
	77664915	Pi 2045-065					■	
	77736978	Pi 2045-066						■

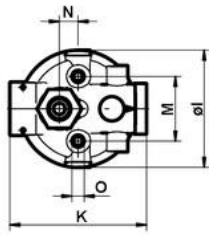
When filter with non bypass configuration is selected, the collapse pressure of the element must not be exceeded.

7.2 Filter elements (a wider range of element types is availble on request)					
Nominal size NG [l/min]	**Order number**	**Type**	**Filter material**	**max. Δp [bar]**	**Filter surface [cm²]**
10	77680325	Pi 3105 PS 10	PS 10	**20**	590
	77680440	Pi 4105 PS 25	PS 25		590
	77576630	Pi 1105 Mic 10	Mic 10		640
16	77680341	Pi 3108 PS 10	PS 10	**20**	1150
	77680457	Pi 4108 PS 25	PS 25		1150
	77680085	Pi 1108 Mic 10	Mic 10		1250
22	77680333	Pi 3111 PS 10	PS 10	**20**	1700
	77680465	Pi 4111 PS 25	PS 25		1700
	77680093	Pi 1111 Mic 10	Mic 10		1800
30	77680358	Pi 3115 PS 10	PS 10	**20**	2425
	77680473	Pi 4115 PS 25	PS 25		2425
	77680101	Pi 1115 Mic 10	Mic 10		2565
60	77680366	Pi 3130 PS 10	PS 10	**20**	4620
	77680481	Pi 4130 PS 25	PS 25		4620
	77680119	Pi 1130 Mic 10	Mic 10		4885
90	77680374	Pi 3145 PS 10	PS 10	**20**	6865
	77680499	Pi 4145 PS 25	PS 25		6865
	77680127	Pi 1145 Mic 10	Mic 10		7265

8. Technical specifications

Design:	in-line suction filter
Nominal pressure: Pi 2005 - 2011	63 bar (910 psi)
Pi 2015 - 2045	25 bar (360 psi)
Test pressure: Pi 2005 - 2011	82 bar (1190 psi)
Pi 2015 - 2045	33 bar (480 psi)
Temperature range:	-10 °C to +120 °C
	(other temperature ranges on request)
Bypass setting:	Δ p 0.25 bar $\pm$ 10 %
Filter head material:	GDAL
Filter housing material:	AL/St
Sealing material:	NBR/AL
Indicating range vacuum gauge:	-1 bar to -1.5 bar
Pressure setting vacuum switch:	-200 mbar
Electrical data of vacuum switch PiS 3070:	
Max. voltage:	230 V AC/DC
Max. current:	6 A
Contact:	change-over switch
Electrical connections:	AMP 6.3 DIN 46248 for bushings according to DIN 46247
Fitting position:	any fitting positions possible (fitting position has to be defined when ordering indicators with defined switch point)
Type of protection:	IP 00 without protecting cap IP 54 with protecting cap





In = Inlet
Out = Outlet

1 = Vacuum switch
2 = Vacuum gauge

Subject to technical alteration without prior notice.

We draw attention to the fact that all values indicated are average values and do not always occur in specific cases of application. Our products are continually being further developed. Values, dimensions and weights can change as a result of this. Our specialized department will be pleased to offer you advice.

We recommend you to contact us concerning applications of our filters in areas governed by the EU Directive 94/9 EC (ATEX 95). The standard version can be used for liquids based on mineral oil (corresponding to the fluids in Group 2 of Directive 97/23 EC Article 9). If you consider to use other fluids please contact us for additional support.

9. Dimensions

All dimensions except “C” in mm.

Type	B	C*	D	F	G SW	H	I	K	M	N	O	P	Weight [kg]
Pi 2005	19	G½	177	80	27	66	80	95	45	13.0	M8x10	37.5	0.9
Pi 2008	19	G¾	253	80	27	66	80	95	45	13.0	M8x10	37.5	1.0
Pi 2011	19	G¾	335	80	27	66	80	95	45	13.0	M8x10	37.5	1.1
Pi 2015	30	G1¼	244	110	32	109	128	150	60	24.5	M12x15	43.5	2.1
Pi 2030	30	G1¼	360	110	32	109	128	150	60	24.5	M12x15	43.5	2.4
Pi 2045	30	G1¼	475	110	24	109	128	150	60	24.5	M12x15	43.5	6.5

* NPT and SAE connections on request

10. Installation, operating and maintenance instructions

10.1 Filter installation

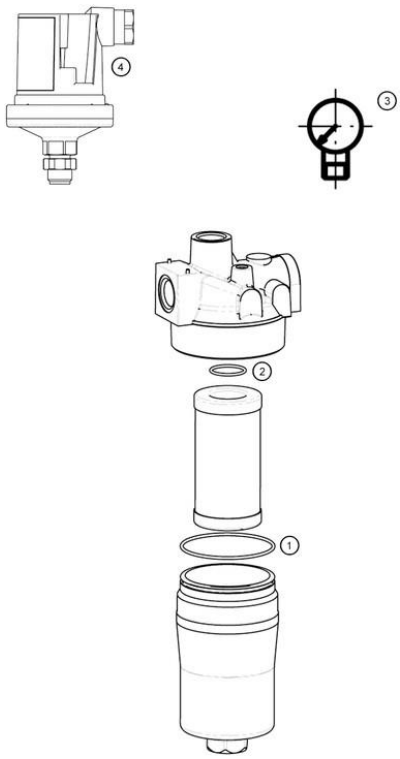
When installing the filter make sure that sufficient space is available to remove filter element and filter housing. Preferably the filter should be installed with the filter housing pointing downwards.
The maintenance indicator must be visible.

10.2 When should the filter element be replaced?

Filters equipped with visual and electrical maintenance indicator: During cold starts, the indicator may give a warning signal. If vacuummeter shows > 0,2 bar or the electrical signal has not switched off after reaching operating temperature, the filter element must be replaced or cleaned after the end of the shift. Please always ensure that you have original Filtration Group spare elements in stock: Disposable elements (Mic or PS) cannot be cleaned.

10.3 Element replacement

1. Stop system and relieve filter from pressure.
2. Unscrew the filter housing by turning counter-clockwise. Clean the housing using a suitable cleaning solvent.
3. Remove element by pulling down carefully.
4. Check O-ring on the filter housing for damage. Replace, if necessary.
5. Make sure that the order number on the spare element corresponds to the order number of the filter name-plate.
   To ensure no contamination occurs during the exchange of the element first open the plastic bag and push the element over the spigot in the filter head. Now remove plastic bag.
6. Lightly lubricate the threads of the filter housing a little bit and screw into the filter head. Maximum tightening torque for NG 50 to 110 = 60 Nm.



11. Spare parts list

Order numbers of spare parts		
Position	**Type**	**Order number**
① to ②	Seal kit for housing	
	Pi 2005 - Pi 2011	
	NBR	77550213
	FPM	77845795
	EPDM	77845803
	Pi 2015 - Pi 2045	
	NBR	77550221
	FPM	77845811
	EPDM	77845829
③	Vacuum gauge	
	NG 40 G 1/8	76345763
④	Vacuum switch	
	PiS 3070	77669724

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Low Pressure Filter/Suction Filter
Pi 220

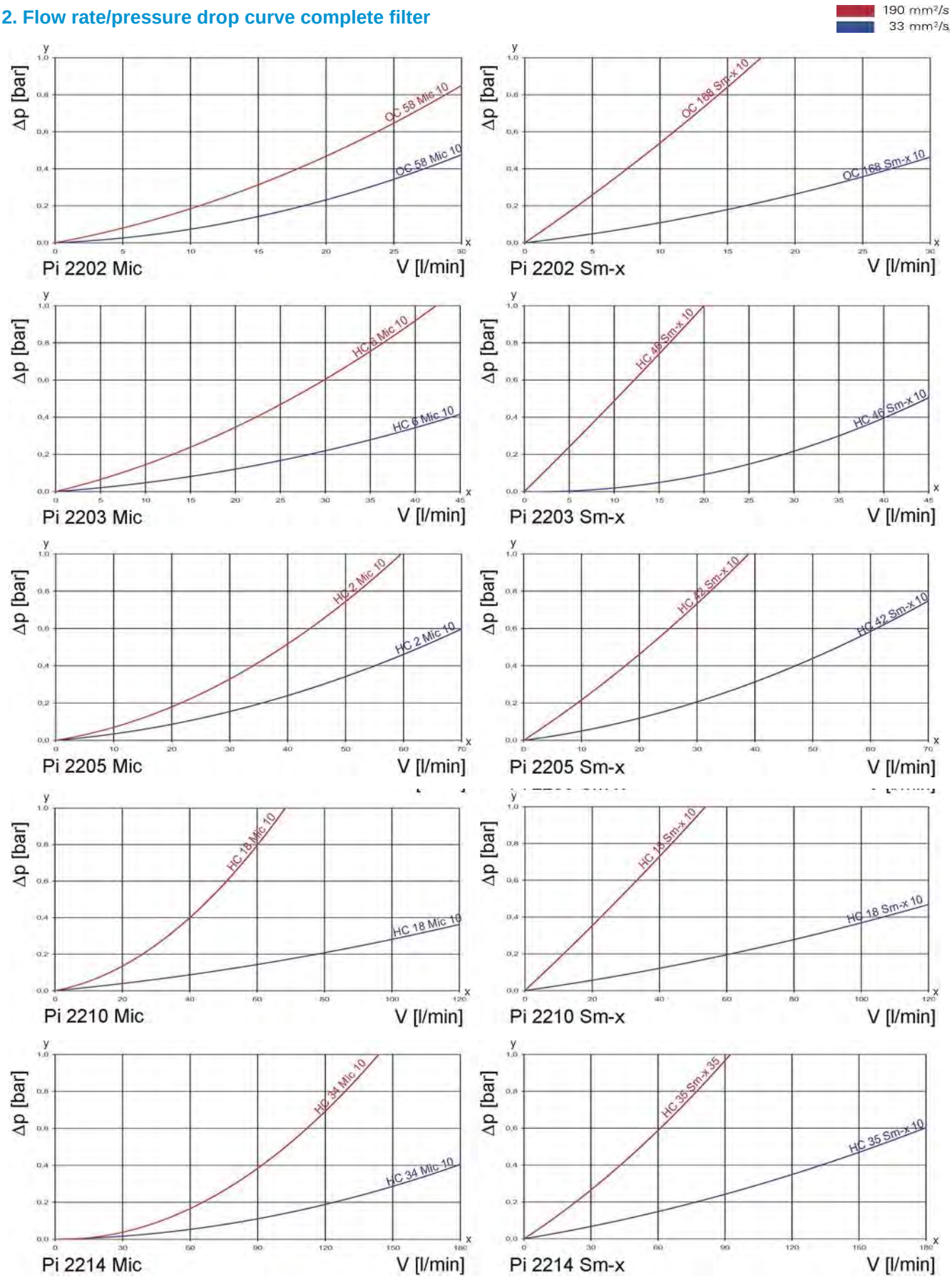
Nominal pressure 10 bar (140 psi), up to nominal size 160

1. Features

High performance filters for modern hydraulic systems

- Provided for pipe installation
- Modular system
- Compact design
- Minimal pressure drop through optimal flow design
- Visual/electronic/electronical maintenance indicator
- Threaded connections
- Quality filters, easy to service
- Equipped with highly efficient Mic or Sm-x filter elements
- Beta rated elements according to ISO 16889
- Elements with high differential pressure stability and dirt holding capacity
- Worldwide distribution

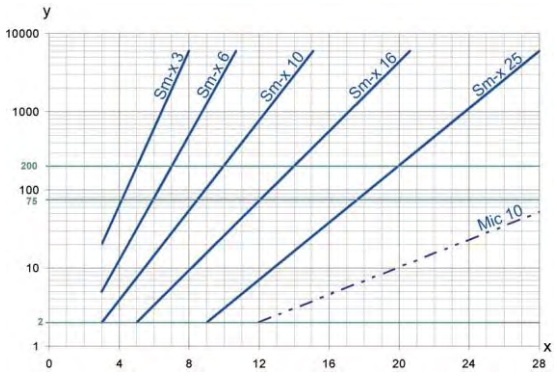
2. Flow rate/pressure drop curve complete filter



y = differential pressure Δp [bar]

x = flow rate V [l/min]

3. Separation grade characteristics



y = beta-value
x = particle size [µm]

determined by multipass tests (ISO 16889)
calibration according to ISO 11171 (NIST)

4. Filter performance data

tested according to ISO 16889 (multipass test)

Sm-x-elements with
max. Δ p 5 bar

Sm-x 10 $\beta_{10(C)} \geq 200$

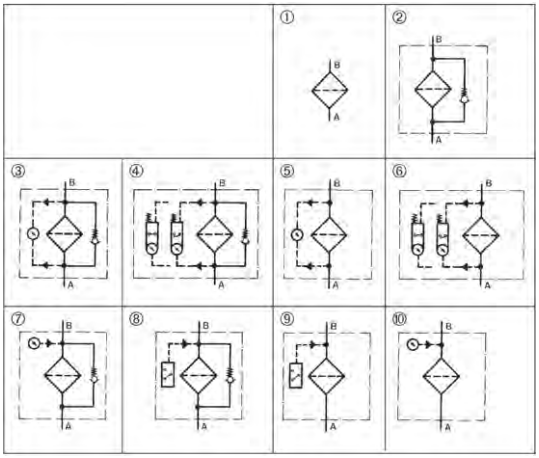
values guaranteed up to
5 bar differential pressure

5. Quality assurance

Filtration Group filters and filter elements are produced according to the following international standards:

Norm	Designation
DIN ISO 2941	Hydraulic fluid power filter elements; verification of collapse/burst resistance
DIN ISO 2942	Hydraulic fluid power filter elements; verification of fabrication integrity
DIN ISO 2943	Hydraulic fluid power filter elements; verification of material compatibility
DIN ISO 3723	Hydraulic fluid power filter elements; method for end load test
DIN ISO 3724	Hydraulic fluid power filter elements; verification of flow fatigue characteristics
ISO 3968	Hydraulic fluid power-filters-evaluation of pressure drop versus flow characteristics
ISO 10771.1	Fatigue pressure testing of metal containing envelopes in hydraulic fluid applications
ISO 16889	Hydraulic fluid power filters-multipass method for evaluation filtration performance of a filter element

6. Symbols



7. Order numbers

Example for ordering filters:

1. Housing design	2. Spin-on cartridge
V = 25 l/min, bypass, electrical maintenance indicator Type: Pi 2202-058 Order number: 77665649	Mic 10 Type: OC 58 Order number: 77785983

7.1 Housing design/order number for pressure-side installation

Nominal size NG [l/min]	Order number	Type	① no options	② with by-pass valve	③ with bypass valve and visual indicator	④ with bypass valve and electrical indicator	⑤ with visual indicator	⑥ with electrical indicator
25	77665656	Pi 2202-060	■					
	77665623	Pi 2202-056		■				
	77665631	Pi 2202-057			■			
	77665649	Pi 2202-058				■		
	77665664	Pi 2202-068					■	
	77665672	Pi 2202-069						■
40	77665714	Pi 2203-060	■					
	77665680	Pi 2203-056		■				
	77665698	Pi 2203-057			■			
	77665706	Pi 2203-058				■		
	77665748	Pi 2203-068					■	
	77665755	Pi 2203-069						■
63	77665813	Pi 2205-060	■					
	77665789	Pi 2205-056		■				
	77665797	Pi 2205-057			■			
	77665805	Pi 2205-058				■		
	77665847	Pi 2205-068					■	
	77665854	Pi 2205-069						■
100	77666001	Pi 2210-060	■					
	77665979	Pi 2210-056		■				
	77665987	Pi 2210-057			■			
	77665995	Pi 2210-058				■		
	77666050	Pi 2210-068					■	
	77666068	Pi 2210-069						■
160	77666126	Pi 2214-060	■					
	77666092	Pi 2214-056		■				
	77666100	Pi 2214-057			■			
	77666118	Pi 2214-058				■		
	77666183	Pi 2214-068					■	
	77666191	Pi 2214-069						■

When filter with non bypass configuration is selected, the collapse pressure of the spin-on cartridge must not be exceeded.

7.2 Spin-on cartridges

Nominal size NG [l/min] Press./Suct. side	Order number	Type	Filter material	max. Δ p [bar]	Filter surface [cm²]
25/10	77785983	OC 58	Mic 10	5	1775
	77500184	OC 168	Sm-x 10		1309
40/16	77501273	HC 6	Mic 10	5	3000
	77501232	HC 46	Sm-x 10		2075
63/25	72013241	HC 2	Mic 10	5	5440
	77501372	HC 42	Sm-x 10		3360
100/40	77643331	HC 18	Mic 10	5	7000
	77643398	HC 28	Sm-x 10		3400
160/63	77504194	HC 34	Mic 10	5	14025
	77643844	HC 35	Sm-x 10		7638

7.3 Housing design/order numbers for suction-side installation

Nominal size NG [l/min]	Order number	Type	① no options	② with bypass 0.25 bar	⑦ with bypass 0.25 bar and vacuum gauge	⑧ with bypass 0.25 bar and vacuum switch	⑨ with vacuum switch	⑩ with vacuum gauge
10	77665656	Pi 2202-060	■					
	77736614	Pi 2202-067		■				
	77736622	Pi 2202-062			■			
	77736630	Pi 2202-061				■		
	77736606	Pi 2202-065					■	
	77736598	Pi 2202-066						■
16	77665714	Pi 2203-060	■					
	77665730	Pi 2203-067		■				
	77736689	Pi 2203-062			■			
	77736697	Pi 2203-061				■		
	77736671	Pi 2203-065					■	
	77665722	Pi 2203-066						■
25	77665813	Pi 2205-060	■					
	77736747	Pi 2205-067		■				
	77665821	Pi 2205-062			■			
	77736754	Pi 2205-061				■		
	77665839	Pi 2205-065					■	
	77736739	Pi 2205-066						■
40	77666001	Pi 2210-060	■					
	77735947	Pi 2210-067		■				
	77666027	Pi 2210-062			■			
	77666019	Pi 2210-061				■		
	77666035	Pi 2210-065					■	
	77666043	Pi 2210-066						■
63	77666126	Pi 2214-060	■					
	77666175	Pi 2214-067		■				
	77666142	Pi 2214-062			■			
	77666134	Pi 2214-061				■		
	77666159	Pi 2214-065					■	
	77666167	Pi 2214-066						■

When filter with non bypass configuration is selected, the collapse pressure of the spin-on cartridge must not be exceeded.

8. Technical specifications

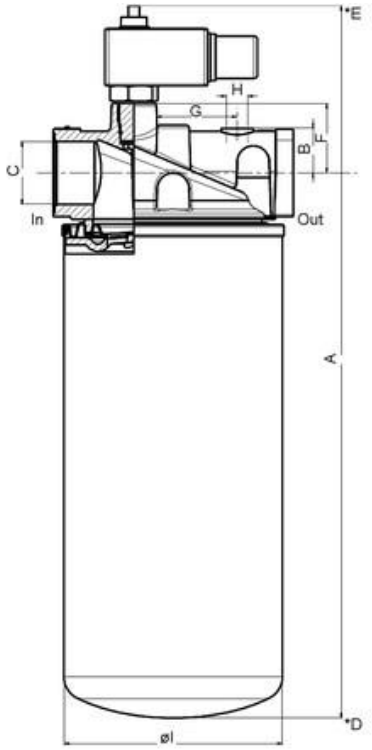
Design:	line mounting filter
Nominal pressure:	10 bar (140 psi)*
Test pressure:	13 bar (180 psi)
Temperature range:	-10 °C to +120 °C
	(other temperature ranges on request)
Bypass setting:	
Pressure side:	Δ p 3.5 bar ± 10%
Suction side:	Δ p 0.25 bar ± 10%
Filter head material:	GDAL
Filter housing material:	St
Sealing material:	NBR/AL
Maintenance indicator setting:	Δ p 2.2 bar ± 0.3 bar
Indicating range vacuum meter:	-1 bar to +1.5 bar
Pressure setting vacuum switch:	200 mbar
Type of protection (suction side):	IP 54
Electrical data of maintenance indicator:	
Max. voltage:	250 V AC/200 V DC
Max. current:	1 A
Contact load:	70 W
Type of protection:	IP 65 in inserted and secured status
Contact:	normally open/closed
Cable sleave:	M20x1.5

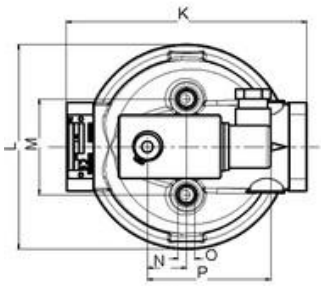
The switching function can be changed by turning the electric upper part by 180° (normally closed contact or normally open contact). The state on delivery is a normally closed contact. By inductivity in the direct current circuit the use of suitable protection circuit should be considered. Further maintenance indicator details and designs are available in the maintenance indicator data sheet.

We draw attention to the fact that all values indicated are average values which do not always occur in specific cases of appliacation. Our products are continually being further developed. Values, dimensions and weights can change as a result of this. Our specialized departement will be pleased to offer you advice.

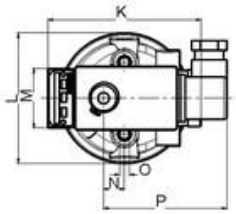
We recommend you to contact us concerning applications of our filters in areas governed by the EU Directive 94/9 EC (ATEX 95). The standard version can be used for liquids based on mineral oil (corresponding to the fluids in Group 2 of Directive 97/23 EC Article 9). If you consider to use other fluids please contact us for additional support.

* For the contamination of the housing designs as per 7.1 with medium-pressure spin-on cartriges refer to leaflet "spin-on cartridges" for dimensions and specifications. Operating pressure on request.





Pi 2210 - Pi 2214



Pi 2202 - Pi 2205

In = Inlet
Out= Outlet
*D = Height required for spin-on cartridge removal
*E = Height required for maintenance indicator removal
Subject to technical alteration without prior notice.

9. Dimensions

All dimensions except "C" and "H" in mm.

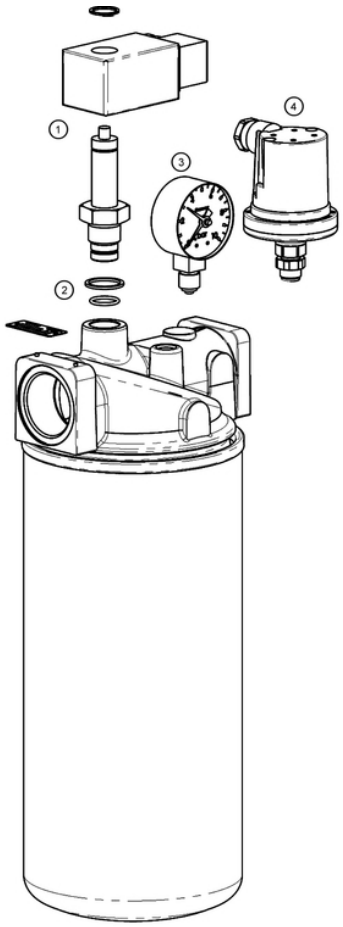
Type	A	B	C	D	E	F	G*	H*	I	K	L	M	N	O	P	Weight [kg]
Pi 2202	241	19	G½	30	45	37.5	23.5	G1/8	76	95	80	45	13.0	M8x10	78	0.90
Pi 2203	261	19	G½	30	45	37.5	23.5	G1/8	93	95	80	45	13.0	M8x10	78	1.00
Pi 2205	328	19	G¾	30	45	37.5	23.5	G1/8	93	95	80	45	13.0	M8x10	78	1.25
Pi 2210	302	30	G1¼	40	45	43.5	40.0	G1/8	136	150	128	60	24.5	M12x15	78	2.30
Pi 2214	442	30	G1¼	40	45	43.5	40.0	G1/8	136	150	128	60	24.5	M12x15	78	2.70

*with suction-side installation only.

10. Installation, operating and maintenance instructions

10.1 Filter installation

When installing the filter make sure that sufficient space is available to remove spin-on cardrige. Filter should be installed with the spin-on cartridge pointing downwards.
The maintenance indicator must be visible.



10.2 Connecting the electrical maintenance indicator

The electrical indicator is connected via a 2-pole appliance plug according to DIN EN 175301-803 with poles marked 1 and 2.
The electrical section can be inverted to change from normally open position to normally closed position or vice versa.

10.3 When should the filter element be replaced?

1. Filters equipped with visual and electrical maintenance indicator:
   During cold starts, the indicator may give a warning signal. Press the red button of the visual indicator once again only after operating temperature has been reached. If the red button immediately pops up again and/or the electrical signal has not switched off after reaching operating temperature, the filter element must be replaced after the end of the shift.
2. Filters without maintenance indicator:
   The filter element should be replaced after the trial run or flushing of the system. Afterwards follow instructions of the manufacturer.
3. Please always ensure that you have original Filtration Group spare elements in stock: disposable elements (Sm-x) cannot be cleaned.

10.4 Spin-on cartrige exchange

1. Stop system and relieve filter from pressure.
2. Unscrew the spin-on cartridge with the aid of a belt spanner by turning same to the left
3. Make sure that the order number on the spin-on cartridge corresponds to the order number of the plate.
4. The seal of the screw-on cartridge should be lightly oiled.
5. Screw cartridge on in accordance with the printed-on instructions.

11. Spare parts list

Order numbers for spare parts		
Position	**Type**	**Order number**
①	Maintenance indicator	
	Visual PiS 3098	77669971
	Electrical PiS 3097	77669948
	Electrical upper part only	77536550
②	Seal kit for maintenance indicator	
	NBR	77760309
③	Vacuum gauge	76345763
④	Vacuum switch PiS 3070	77669724

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78356610.06/2019

FG Fluid Solutions
Filtration Group

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Low Pressure Filter/Suction Filter
Pi 270

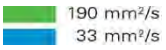
Nominal pressure 16 bar (230 psi), up to nominal size 315

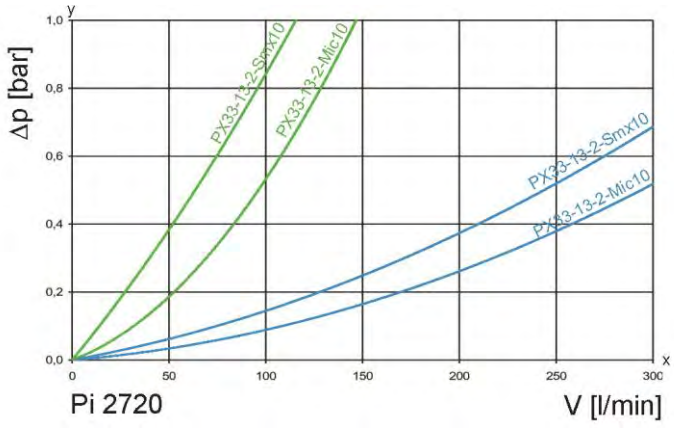
1. Features

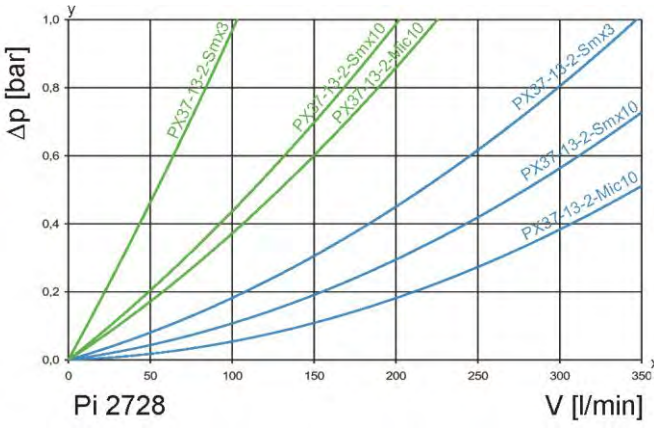
High performance filters for modern hydraulic systems

- Provided for pipe installation
- Modular system
- Compact design
- Minimal pressure drop through optimal flow design
- Visual/electrical/electronic maintenance indicator
- Threaded and flange connections
- Quality filters, easy to service
- Equipped with highly efficient cellulose or glass fibre filter elements (long life)
- Beta rated elements according to ISO 16889 multipass test
- Elements with high differential pressure stability and dirt holding capacity
- Worldwide distribution

2. Flow rate/pressure drop curve complete filter

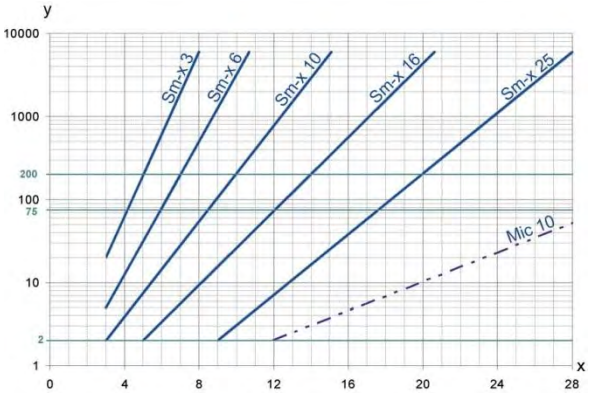






y = differential pressure Δp [bar]
x = flow rate V [l/min]

3. Separation grade characteristics



y = beta-value
x = particle size [µm]

determined by multipass tests (ISO 16889)
calibration according to ISO 11171 (NIST)

4. Filter performance data

tested according to ISO 16889 (multipass test)

Sm-x elements with max. Δp 5 bar

Sm-x	3 $ß_{5(C)} \geq 200$
Sm-x	10 $ß_{10(C)} \geq 200$
Mic	10 $ß_{10(C)} \geq 200$

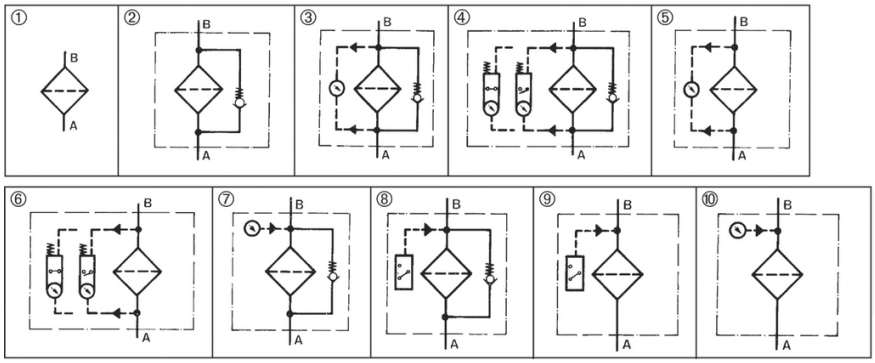
values guaranteed up to 5 bar differential pressure

5. Quality assurance

Filtration Group filters and filter elements are produced according to the following international standards:

Norm	Designation
DIN ISO 2941	Hydraulic fluid power filter elements; verification of collapse/burst resistance
DIN ISO 2942	Hydraulic fluid power filter elements; verification of fabrication integrity
DIN ISO 2943	Hydraulic fluid power filter elements; verification of material compatibility with fluids
DIN ISO 3723	Hydraulic fluid power filter elements; method for end load test
DIN ISO 3724	Hydraulic fluid power filter elements;verification of flow fatigue characteristics
ISO 3968	Hydraulic fluid power-filters-evaluation of pressure drop versus flow characteristics
ISO 10771.1	Fatigue pressure testing of metal containing envelopes in hydraulic fluid applications
ISO 16889	Hydraulic fluid power filters-multipass method for evaluation filtration performance of a filter element

6. Symbols



7. Order numbers

Example for ordering filters:

1. Filter design	2. 2x Filter elements
V = 250 l/min, bypass, electrical maintenance indicator Type: Pi 27020-058 Order number: 77694060	Mic 10 Type: PX33-13-2-Mic10 Order number: 70541525

7.1 Housing design/order numbers for pressure side installation *

Nominal size NG [l/min]	Order number	Type	① no options	② with bypass 3,5 bar	③ with bypass 3,5 bar and visual indicator	④ with bypass 3,5 bar and electrical indicator	⑤ with visual indicator	⑥ with electrical indicator
250	77694011	Pi 2720-060	■					
	77694029	Pi 2720-056		■				
	77694078	Pi 2720-057			■			
	77694060	Pi 2720-058				■		
	77694045	Pi 2720-068					■	
	77694037	Pi 2720-069						■
315	77665235	Pi 2728-060	■					
	77665201	Pi 2728-056		■				
	77665219	Pi 2728-057			■			
	77665227	Pi 2728-058				■		
	77665276	Pi 2728-068					■	
	77665284	Pi 2728-069						■

When filter with non bypass configuration is selected, the collapse pressure of the element must not be exceeded.
* a wider range of types is available on request

7.2 Spin-on cartridge/order numbers for pressure side installation*

Nominal size NG [l/min]	Order number	Type	Filter material	max. Δp [bar]	Filter surface [cm²]
250	70541525	PX33-13-2-Mic10	Mic10	5	7000
	70541523	PX33-13-2-Smx10	Smx10		3400
315	70541540	PX37-13-2-Mic10	Mic10	5	14025
	70541536	PX37-13-2-Smx3	Smx3		7638
	70541538	PX37-13-2-Smx10	Smx10		7638

7.3 Housing design/order numbers for suction side installation*								
Nominal size NG [l/min]	**Order number**	**Type**	**① no options**	**② with bypass 0,25 bar**	**③ with bypass 0,25 bar and Unterdruck-manometer**	**④ with bypass 0,25 bar and Unterdruck-schalter**	**⑤ with Unterdruck-schalter**	**⑥ with Unterdruck-manometer**
80	77694011	Pi 2720-060	■					
	77694094	Pi 2720-067		■				
	77694102	Pi 2720-062			■			
	77694110	Pi 2720-061				■		
	77694086	Pi 2720-065					■	
	77694052	Pi 2720-066						■
125	77665235	Pi 2728-060	■					
	77665201	Pi 2728-067		■				
	77665219	Pi 2728-062			■			
	77665227	Pi 2728-061				■		
	77665276	Pi 2728-065					■	
	77665284	Pi 2728-066						■

When filter with non bypass configuration is selected, the collapse pressure of the element must not be exceeded

7.4 Spin-on cartridge/order numbers for suction side installation*					
Nominal size NG [l/min]	**Order number**	**Type**	**Filter material**	**max. Δp [bar]**	**Filter surface [cm²]**
80	70541525	PX33-13-2-Mic10	Mic10	**5**	7000
125	70541540	PX37-13-2-Mic10	Mic10	**5**	14025

* a wider range of types is available on request

8. Technical specifications*

Design:	in-line filter
Nominal pressure:	16 bar (232 psi)
Test pressure:	24 bar (348 psi)
Fatigue strength:	min 10^5 Load changes at 0 – 16 bar (232 psi)
Temperature range:	-10 °C up to +120 °C
	(other temperature ranges on request)
Bypass setting:	
Pressure side:	Δp 3.5 bar ±10 %
Suction side:	Δp 2.5 bar ±10 %
Filter head material:	GAL
Spin-on cartridge material:	St
Sealing material:	NBR/AL
Maintenance indicator setting:	Δp 2.2 bar ±10 %
Indicating range vacuum gauge:	-1 bar up to +1.5 bar
Pressure setting vacuum switch:	-1 bar up to +1.5 bar
Type of protection (suction side):	IP 54
Electrical data of maintenance indicator:	
Maximum voltage:	250 V AC/200 V DC
Maximum current:	1 A
Contact load:	70 W
Type of protection:	IP 65 in inserted and secured status
Contact:	normally open/closed
Cable connection:	M20x1.5

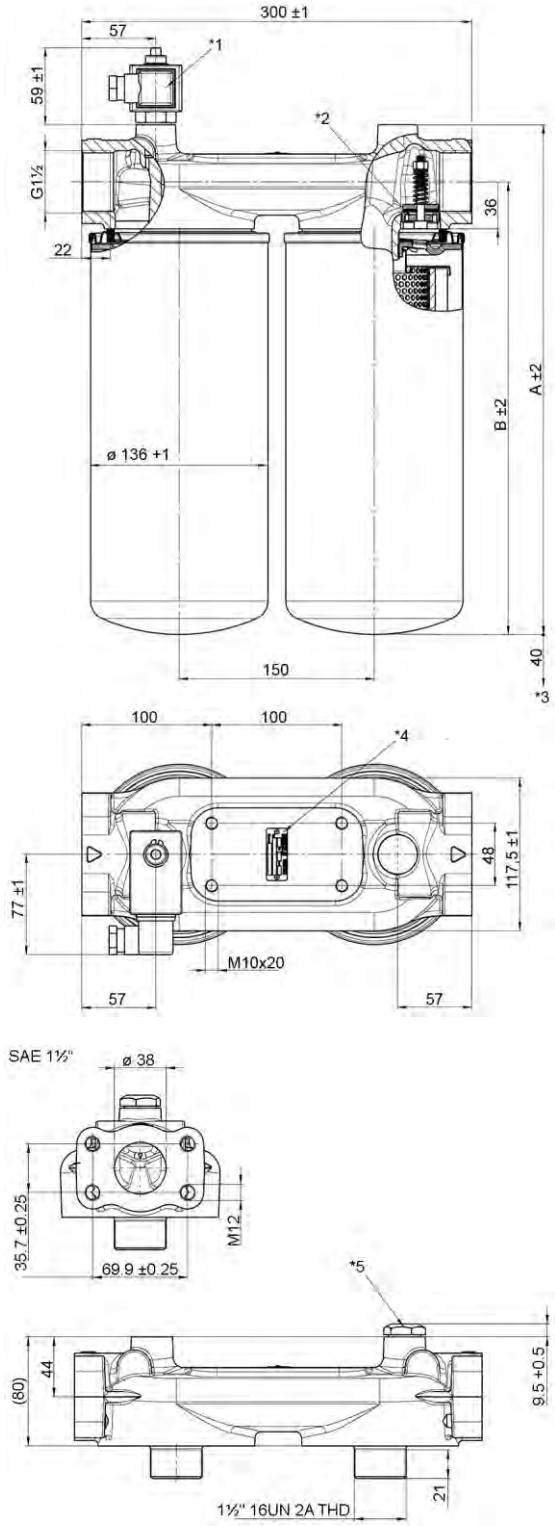
The switching function can be changed by turning the electric upper part by 180 ° (normally closed contact or normally open contact). The state on delivery is a normally closed contact. By inductivity in the direct current circuit the use of suitable protection circuit should be considered. Further maintenance indicator details and designs are available in the maintenance indicator data sheet.

We draw attention to the fact that all values indicated are average values which do not always occur in specific cases of application. Our products are continually being further developed. Values, dimensions and weights can change as a result of this. Our special-ized department will be pleased to offer you advice.

We recommend you to contact us concerning applications of our filters in areas governed by the EU Directive 94/9 EC (ATEX 95). The standard version can be used for liquids based on mineral oil (corresponding to the fluids in Group 2 of Directive 97/23 EC Article 9). If you consider to use other fluids please contact us for additional support.

* a wider range of types is available on request

Subject to technical alteration without prior notice!



*1 Electrical maintenance indicator
*2 Bypass valve only existing at suction side design
*3 Clearance required
*4 Name plate
*5 Blind plug

All dimensions in mm.

Type	A	B
Pi 2720	323	279
Pi 2728	391	347

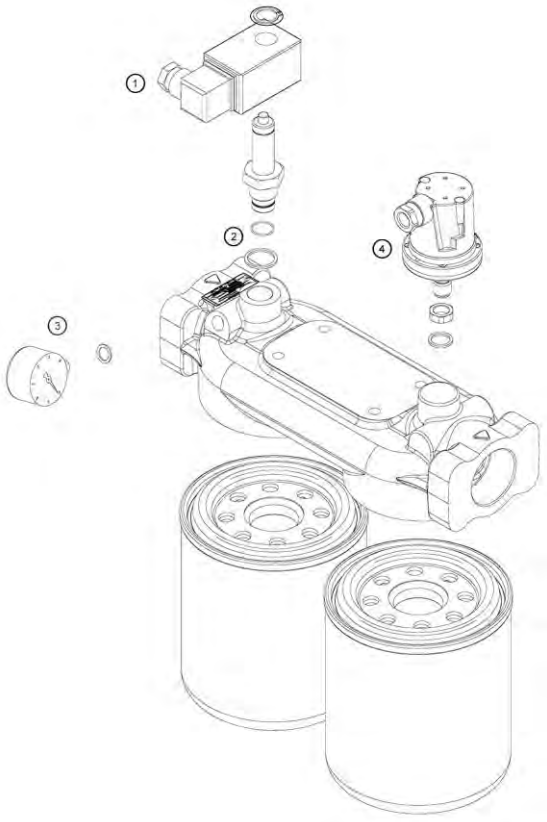
9. Installation, operating and maintenance instructions

10.1 Filter installation
When installing the filter make sure that sufficient space is available to remove spin-on cartridge. Filter should be installed with the spin-on cartridge pointing downwards. The maintenance indicator must be visible.

10.2 Connecting the electrical maintenance indicator
The electrical indicator is connected via a 2-pole appliance plug according to DIN EN 175301-803 with poles marked 1 and 2. The electrical section can be inverted to change from normally open position to normally closed position or vice versa. The state on delivery is a normally closed contact.

10.3 When should the filter element be replaced?
1. Filters equipped with visual and electrical maintenance indicator: During cold starts, the indicator may give a warning signal. Press the red button of the visual indicator once again only after operating temperature has been reached. If the red button immediately pops up again and/or the electrical signal has not switched off after reaching operating temperature, the spin- on cartridge must be replaced after the end of the shift.
2. Filters without maintenance indicator: The spin- on cartridge should be replaced after the trial run or flush- ing of the system. Afterwards follow instructions of the manu- facturer.
3. Please always ensure that you have original Filtration Group spare spin-on cartridges in stock.

10.4 Spin-on cartrige replacement
1. Stop system and relieve filter from pressure.
2. Unscrew the spin-on cartridge by using a filter wrench by turning counter-clockwise.
3. Make sure that the order number on the spin-on cartridge corresponds to the order number of the filter plate.
4. Oil the seal of the spin-on cartridge.
5. Spin-on cartridge must be installed according to the printed instructions.



10. Spare parts list

Order numbers for spare parts		
Position	**Type**	**Order number**
①	Maintenance indicator	
	Visual PiS 3098/2,2	77669971
	Electrical PiS 3097/2,2	77669948
	Electrical upper section only	77536550
②	Seal kit for maintenance indicator	
	NBR	77760309
③	Vacuum gauge	76345763
④	Vacuum switch PiS 3070/200 mbar	77669724

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Suction Filters
Pi 1710

Nominal size up to 480

1. Features

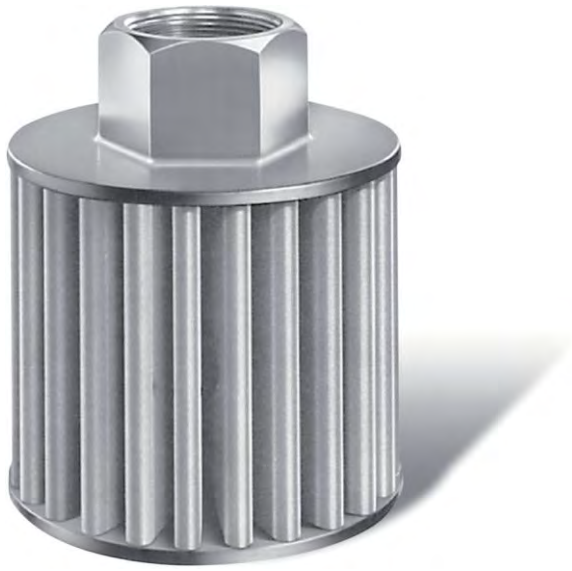
Pumps incorporated in hydraulic systems must be protected from coarse contaminants which when not removed by any other filtering devices may gain access to tank.

Filtration Group suction filters, series Pi 1710, stand out for their rugged construction and large filter surface area.

The filter surface is dimensioned to ensure long life at the proper corresponding flow rate.
The installation should be ahead of the pump in the tank for optimal protection.

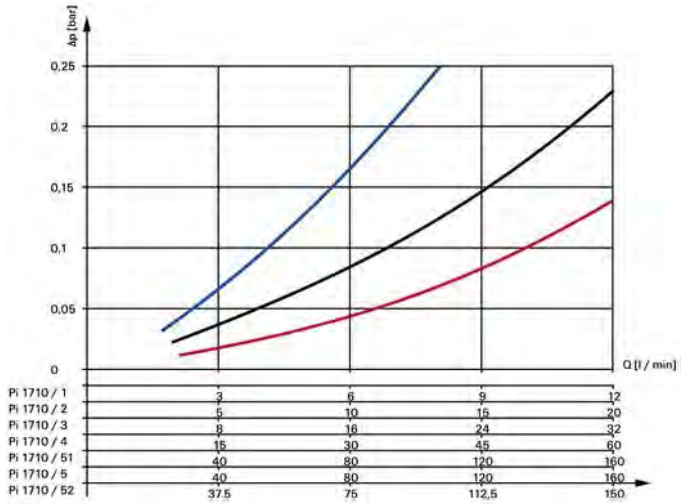
The standard filter material is a 100 µm stainless steal wire mesh.

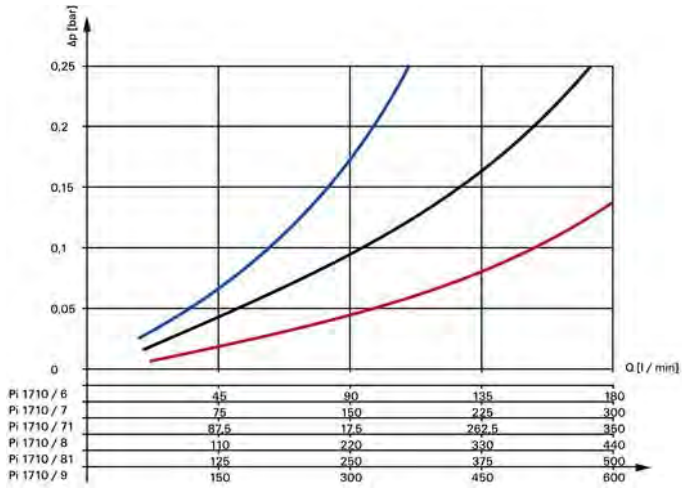
- Rugged construction
- Large filtering surface area
- Worldwide distribution



2. Flow rates/pressure drop curve

500 mm²/s
190 mm²/s
33 mm²/s





3. Order numbers

3.1 Housing design			
Nominal size NG [l/min]	**Order number**	**Type**	**Filter surface [cm²]**
10	77661598	Pi 1710/1	104
15	77661606	Pi 1710/2	104
30	77661614	Pi 1710/3	170
50	77661622	Pi 1710/4	394
60	77661697	Pi 1710/51	510
80	77661630	Pi 1710/5	642
120	77661705	Pi 1710/52	940
150	77661648	Pi 1710/6	1104
240	77661655	Pi 1710/7	1484
290	77661689	Pi 1710/71	1858
360	77661663	Pi 1710/8	2738
410	77661713	Pi 1710/81	3434
480	77661671	Pi 1710/9	3422

4. Technical specifications

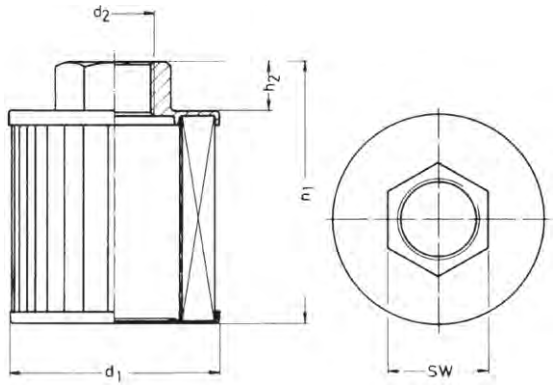
Flow capacity:	10 to 480 l/min at 33 mm ²/s viscosity and 0.1 bar Δ p
Temperature range:	-10 °C to +120 °C
Degree of filtration:	100 µ m
Other ratings:	on request
Material of connecting port + end cap:	PA 6 GF 30
Material of end cap:	galvanized steel
Material of inner tube:	galvanized steel
Material of wire mesh:	stainless steel 1.4301

We draw attention to the fact that all values indicated are average values and do not always occur in specific cases of applications. Our products are continually being further developed. Values, dimensions and weights can change as a result of this. Our specialized department will be pleased to offer you advice.

We recommend you to contact us concerning applications of our filters in areas governed by the EU Directive 94/9 EG (ATEX 95).

The standard version can be used for liquids based on mineral oil (corresponding to the fluids in Group 2 of Directive 97/23 EC Article 9). If you are planning to use other fluids please contact us for additional support.

Subject to technical alteration.



5. Dimensions

All dimensions except "d_2" in mm.

Type	d_1	d_2	h_1	h_2	SW	Weight [kg]
Pi 1710/1	46	G¼	59.5	18	22	0.10
Pi 1710/2	46	G3/8	59.5	18	22	0.10
Pi 1710/3	61	G½	53.5	13	27	0.14
Pi 1710/4	61	G¾	86.5	13	32	0.20
Pi 1710/51	87	G1	86.5	21	41	0.32
Pi 1710/5	87	G1	107.5	21	41	0.35
Pi 1710/52	87	G1	152.5	21	41	0.40
Pi 1710/6	99	G1¼	122	21.5	46	1.00
Pi 1710/7	99	G1½	159	28	50	1.00
Pi 1710/71	99	G1½	189	28	50	1.05
Pi 1710/8	131	G2	161	30	65	1.20
Pi 1710/81	131	G2	191	30	65	1.40
Pi 1710/9	131	G2½	198	37.5	80	1.50

6. Cleaning methods

a) Ultrasonic cleaning

Insert the contaminated suction filter element into an ultrasonic bath for approximately 3 minutes, then rinse in clean liquid. Afterwars, blow air into the filter from the clean side outward.
The cleaning effect is approximately 80-90 %.

b) Manual cleaning

1 . Remove coarse external contamination in a seperate cleaning tank using a brush and cleaning agent.
2 . Place filter in unused cleaning liquid (approximately 20 minutes).
3 . Wash filter with cleaning liquid from the inside to the outside. The cleaning effect is approximately 60-70 %.

Using either method be sure that no dirt is washed on the inside of the element.

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78357287.06/2019

Low Pressure Filter/Suction Filter
Pi 1941

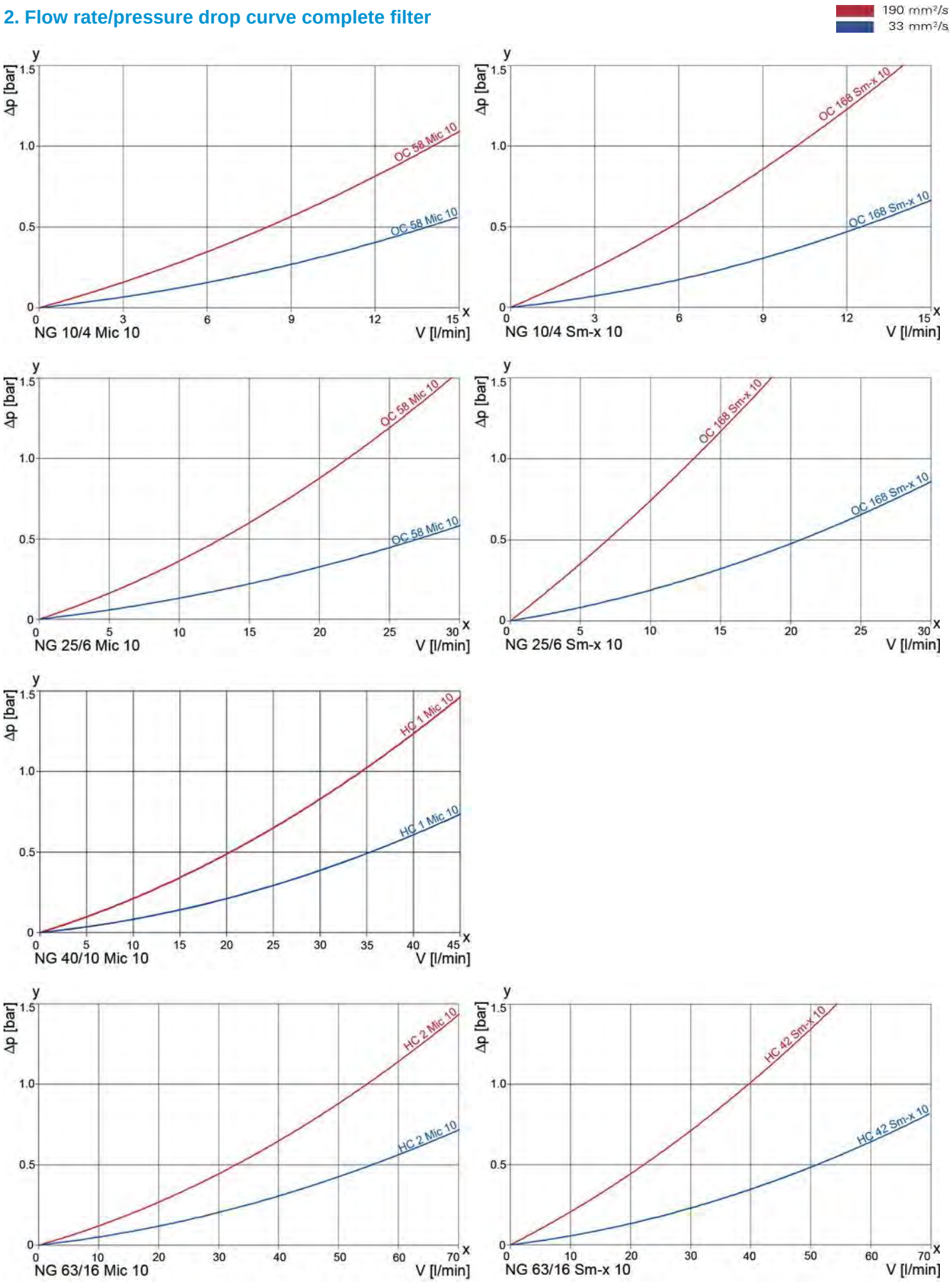
Nominal pressure 10/25 bar (140/360 psi), up to nominal size 63

1. Features

High performance filters for modern hydraulic systems

- Provided for pipe installation
- Modular system
- Compact design
- Minimal pressure drop through optimal flow design
- Visual maintenance indicator
- Threaded connections
- Quality filters, easy to service
- Equipped with highly efficient glass fibre Sm-x and Mic filter elements
- Beta reated elements according to ISO 16889 multipass test
- Elements with high differential pressure stability and dirt holding capacity
- Worldwide distribution

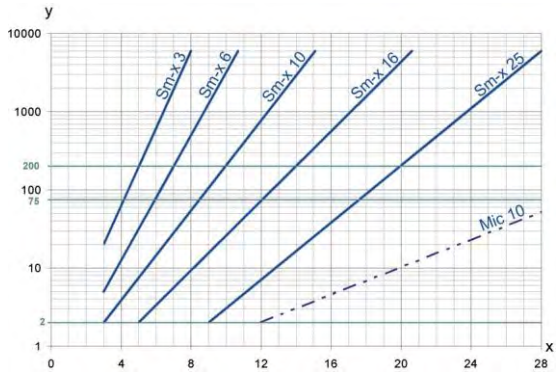
2. Flow rate/pressure drop curve complete filter



y = differential pressure Δp [bar]

x = flow rate V [l/min]

3. Separation grade characteristics



y = beta-value

x = particle size µm]

determined by multipass tests (ISO 16889)
calibration according to ISO 11171 (NIST)

4. Filter performance data

tested according to ISO 16889 (multipass test)

Sm-x elements with

max. Δ p 5 bar

Sm-x 10 $\beta_{10(C)} \geq 75$

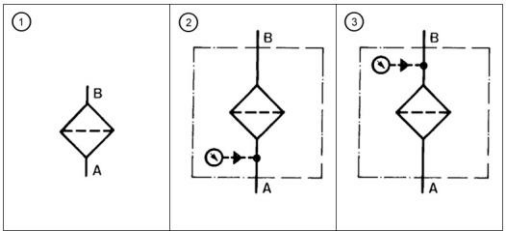
values guaranteed up to
5 bar differential pressure

5. Quality assurance

Filtration Group and filter elements are produced according to the following international standards:

Norm	Designation
DIN ISO 2941	Hydraulic filter elements: Verification of burst resistance
DIN ISO 2942	Hydraulic filter elements: Determination of fabrication integrity
DIN ISO 2943	Hydraulic filter elements: Verification of material compatibility with hydraulic fluids
DIN ISO 3723	Hydraulic filter elements: Method for testing end-cap load
DIN ISO 3724	Hydraulic filter elements: Verification of flow fatigue characteristics
ISO 3 968.2	Hydraulic filter elements: Evaluation of pressure drop versus flow
ISO 16889	Hydraulic filter elements: Testing of filter performance

6. Symbols



7. Order numbers

Example for ordering filters:

1. Housing design
V= 63 l/min, pressure gauge + spin-on cartridge Mic 10 Type Pi 1941/10/G¾/DM + HC 2 Order number 77807811 + 72013241

7.1 Housing design/order number for pressure-side installation

Nominal flow rate NG [l/min]	Order number	Type	① no options	② with pressure gauge
10	77664360	Pi 1941/10/G¼		
	77812225	Pi 1941/10/G¼/DM		
25	77664386	Pi 1941/10/G3/8		
	77815509	Pi 1941/10/G3/8/DM		
40	77664394	Pi 1941/10/G½		
	77664402	Pi 1941/10/G½/DM		
63	77664378	Pi 1941/10/G¾		
	77807811	Pi 1941/10/G¾/DM		

7.2 Spin-on cartridges

Nominal flow rate NG [l/min] press-/suct. side	Order number	Type	Filter material	max. Δ p [bar]	Filter surface [cm²]
10/4	77785983	OC 58	Mic 10	5	1775
	77500184	OC 168	Sm-x 10		1309
25/6	77785983	OC 58	Mic 10	5	1775
	77500184	OC 168	Sm-x 10		1309
40/10	77640899	HC 1	Mic 10	5	3000
63/16	72013241	HC 2	Mic 10	5	5440
	77501372	HC 42	Sm-x 10		3360

7.3 Housing design/order numbers for suction-side installation

Nominal flow rate NG [l/min]	Order number	Type	① no options	③ with vacuum gauge
4	77664360	Pi 1941/10/G¼		
	77894033	Pi 1941/10/G¼/UM		
6	77664386	Pi 1941/10/G3/8		
	77894041	Pi 1941/10/G3/8/UM		
10	77664394	Pi 1941/10/G½		
	77894058	Pi 1941/10/G½/UM		
16	77664378	Pi 1941/10/G¾		
	77658966	Pi 1941/10/G¾/UM		

8. Technical specifications

Design:	line mounting filter
Nominal pressure*:	10 bar (140 psi)
Test pressure:	13 bar (180 psi)
Temperature range:	-10 °C to +120 °C
	(other temperature ranges on request)
Filter head material:	GDAL
Spin-on cartridge material:	St
Sealing material:	NBR
Installation position:	preferably vertical
Indicating range pressure manometer:	0 to 10 bar
Indicating range vacuum gauge:	-1 to 0 bar

*For the combination of the housing designs as per 7.1 with medium-pressure spin-on cartrdiges at 25 bar presure refer to data sheet "spin-on cartridges" for dimensions and specifications.

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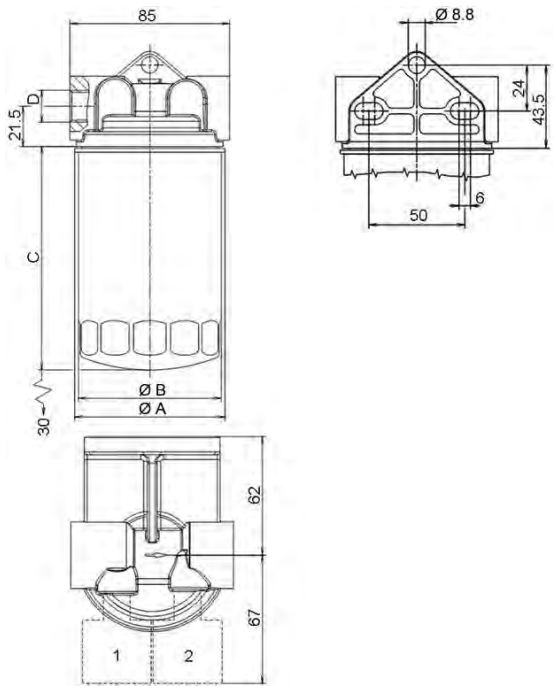


1 = pressure gauge
2 = vacuum gauge
Subject to technical alteration without prior notice.

9. Dimensions

All dimensions except "D" in mm.

Type	Ø A	Ø B	C	D	Weight [kg] Execution Mic*	Weight [kg] Execution Sm-x*
Pi 1941/10/G 1/4	80	76	120	G 1/4	0.67	0.82
Pi 1941/10/G 3/8	80	76	120	G 3/8	0.67	0.82
Pi 1941/10/G 1/2	95	93	141	G 1/2	0.82	1.02
Pi 1941/10/G 3/4	95	93	210	G 3/4	1.02	1.02

*Design with gauge + 0.1 kg

10. Installation, operating and maintenance instructions

10.1 Filter installation

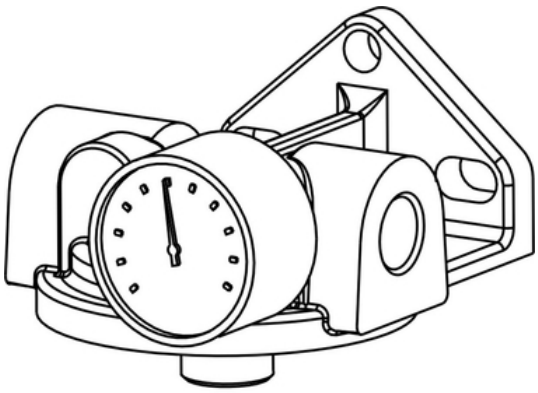
When installing the filter make sure that sufficient space is available to remove the spin-on cartridge.
Preferably the filter should be installed with the spin-on cartridge pointing downwards.

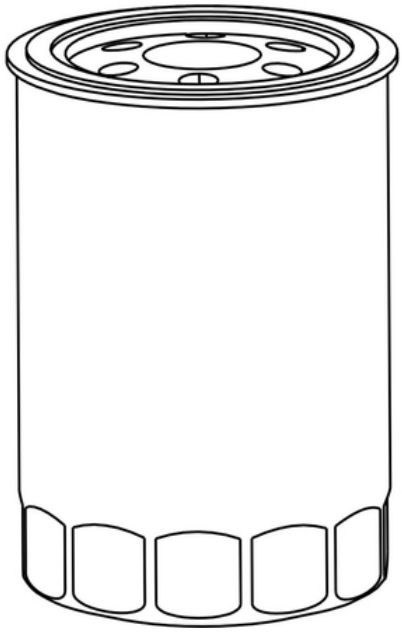
10.2 When should the spin-on cartridge be replaced?

1. Filter equipped with the vacuum gauge for suction-side installation: During cold start the vacuum gauge may for a short period indicate > 0.2 bar. With increasing operating temperature the indicator needle must drop clearly below the 0.2 bar mark. Should this not be the case, the spin-on cartridge must be replaced after the end of the shift.
2. Filters without maintenance indicator: The spin-on cartridge should be replaced after the trial run or flushing of the system. Afterwards follow instructions of the manufacturer.
3. Please always ensure that you have original Filtration Group spare
   cartridges in stock.

10.3 Change of spin-on cartridge

1. Stop system and relieve filter from pressure.
2. Unscrew the spin-on cartridge with the aid of a belt spanner by turning same to the left.
3. Make sure that the order number on the new spin-on cartridge corresponds to the order number of the name-plate.
4. The seal of the spin-on cartridge should be lightly oiled.
5. Screw cartridge on in accordance with the printed-on instructions.





11. Spare parts list

Position	Type	Order number
①	Pressure gauge (not shown)	77870611
②	Vacuum gauge	77617558

Filtration Group GmbH
Schleifbachweg 45
D-74613 Öhringen
Phone +49 7941 6466-0
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fm.de.sales@filtrationgroup.com
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78357337.06/2019

FG Fluid Solutions
Filtration Group

MAHLE Industrialfiltration is now Filtration Group. For more information, visit www.fluid.filtrationgroup.com

Desiccant Breathers
FG-BB/-1/-2/-3/-4 and CV

1. Features

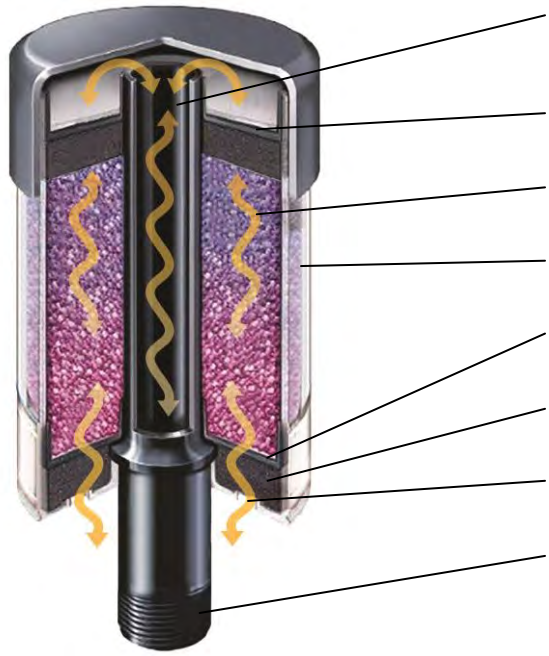
Desiccant breathers ventilating mobile and stationary hydraulic tanks

The FG desiccant breather replaces the customary dust caps or breathers often found on new equipment. When contaminated air enters the top of the breather, it passes through layered filter media, preventing solid particles from entering the breather and causing undue wear to your equipment surfaces. Filtered air passes through a bed of Power Breather silica gel, which removes harmful moisture from the air. The silica beads also work to attract moisture from inside the equipment reservoir during service or shut-down, keeping the equipment dry. FG Desiccant breathers protect lubricants and equipment from damage due to moisture and particulate intrusion. Extends service cycles and equipment life resulting in lower lifetime operating costs. FG desiccant breather are also optional available with a biasing valve (CV). Biasing valves reduce the air change to a necessary level and extend the desiccant breather service cycles.

Applications and industries

- Tanks
- Transformers
- Storage of fluids
- Hydraulics
- Wind Energy
- Power Generation
- Mining
- Aviation
- Manufacturing
- Petrochemical
- Pulp and Paper
- Versions with check valve available
- Worldwide distribution

2. Functional description



Center Tube
The center tube is constructed from rugged nylon material providing rigidity to the element and allowing for even airflow through the silica gel.

Secondary Filter Media
Second filter step prevents any possible migration of silica dust and is providing added system protection.

Moisture Absorbent
The silica gel provides industry leading moisture removal and holds up to 40 % of its weight.

Polycarbonate Outer Shell
Clear outer shell provides a visual indicator of silica gel condition allowing for optimum change out intervals.

Filter Media
3-micron absolute particulate filtration is provided by a multi-layer polyester filter media.

Oil Mist Collector
Polyurethane foam collects oil mist and distributes air evenly over filter media and moisture absorbing silica gel.

Air Intakes
Air intakes are opened for operation. Breathers are delivered closed to provide moisture protection while being shipped/stored.

Connection
Replaces filler/breather cap with versatile connection. Fits standard NPT and BSP.

3. Dimensions

Type	Height in mm	Diameter in mm
FG-BB	106,5	64,5
FG-1	142,0	
FG-2	155,0	104,0
FG-3	210,0	
FG-4	262,0	

4. Technical Data

Temperature range: -29 °C to +93 °C
(other temperature ranges on request)

Housing material:
Cover: Polycarbonate
Shell: Polycarbonate, clear
Center tube: Nylon material

Filter material:
Oil Mist Collector: Polyurethane foam
Filter media: Polyester filter media
Moisture Absorbent: Silica gel
Secondary Filter Media: Polyester fleece

Filter effiency:
all: 3 µm absolute

Connection threat:
FG-BB: 3/8 “
FG-1 to FG-4: 1“
(all NPT, BSPP or BSPT)

Type	max. air flow at 1 psid/69 mbar [l/min]	max. water retention [ml]	Order numbers
FG-BB	130	28	72447120
FG-1		60	72447126
FG-2	435	142	72447127
FG-3		264	72447129
FG-4		424	72447131
FG-BB CV	42	28	72447132
FG-1 CV		60	72447133
FG-2 CV	70	142	72447135
FG-3 CV		264	72447136
FG-4 CV		424	72447138

CV = Biasing valve

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72461274.06/2019

Safety Data Sheet
Silica Gel

1. Identification

Product Name: Silica Gel, Orange
Cat #: FG-…-Series Desiccant Breathers
Synonyms: N/A

Supplier:

Todd Technologies Inc.
4699 Nautilus Court, Ste. 404
Boulder, CO 80301
www.toddtechinc.com

2. Hazard(s) identification

Classification: Classification under 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Label Elements: None required

Hazards not otherwise classified (HNOC): None identified

3. Composition/Information on ingredients

Component	CAS-No	Weight %
Aluminum silicate	1327-36-2	> 90 %
Crystal Violet	548-62-9	< 10 %

4. First-aid measures

Eye Contact: Wash off immediately with plenty of water for at least 15 minutes. Get medical attention if symptoms occur.

Skin Contact: Wash off immediately with plenty of water for at least 15 minutes. Get medical attention if symptoms occur.

Inhalation: Move to fresh air. If breathing is difficult, give oxygen. Get medical attention if symptoms occur.

Ingestion: Do not induce vomiting. Obtain medical attention.

Most important symptoms/effects: No information available

Notes to Physician: Treat symptomatically

5. Fire-fighting measures

Unsuitable Extinguishing Media:	No information available
Flash Point:	No information available
Method:	No information available
Autoignition Temperature Explosion Limits:	
- Upper	
- Lower	No information available
- Sensitivity to Mechanical Impact	
- Sensitivity to Static Discharge	

Specific Hazards Arising from the Chemical

Thermal decomposition can lead to release of irritating gases and vapors. Keep product and empty container away from heat and sources of ignition.

Hazardous Combustion Products

Nitrogen oxides (NOx) Sulfur oxides

Protective Equipment and Precautions for Firefighters

As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

NFPA

Health	Flammability	Instability	Physical hazards
1	1	0	N/A

6. Accidental release measures

Personal Precautions:	Use personal protective equipment. Ensure adequate ventilation. Avoid dust formation. Avoid contact with skin, eyes and clothing.
Environmental Precautions:	Avoid release to the environment.
Methods for Containment and Clean Up:	Sweep up or vacuum up spillage and collect in suitable container for disposal. Avoid dust formation.

7. Handling and storage

Handling:	Wear personal protective equipment. Ensure adequate ventilation. Avoid dust formation. Avoid contact with skin, eyes and clothing. Avoid ingestion and inhalation.
Storage:	Keep in a dry, cool and well-ventilated place. Keep container tightly closed.

8. Exposure controls/personal protection

Exposure Guidelines:	This product does not contain any hazardous materials with occupational exposure limits established by the region specific regulatory bodies.
Engineering Measures:	None under normal use conditions.
Personal Protective Equipment:	
- Eye/face Protection	Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.
- Skin and body protection	Wear appropriate protective gloves and clothing to prevent skin exposure.
- Respiratory Protection	No protective equipment is needed under normal use conditions.
- Hygiene Measures	Handle in accordance with good industrial hygiene and safety practice.

9. Physical and chemical properties

Physical State/Appearance:	Solid bead form
Odor/Odor Threshold:	No information available
pH:	No information available
Melting & Boiling Point/Range:	No information available
Flash Point:	No information available
Evaporation Rate:	No information available
Flammability (solid/gas):	No information available
Vapor Pressure/Vapor Density:	No information available
Specific Gravity:	No information available

Solubility:	Insoluble
Autoignition Temperature Decomposition:	No information available
Temperature Viscosity:	No information available

10. Stability and reactivity

Reactive Hazard: Stability:	None known, based on information available.
Conditions to Avoid:	Stable under normal conditions.
Incompatible Materials:	Avoid dust formation. Incompatible products. Excess heat. Strong oxidizing agents.
Hazardous Decomposition Products:	Nitrogen oxides (NOx), Sulfur oxides.
Hazardous Polymerization:	No information available
Hazardous Reactions:	None under normal processing.

11. Toxicological information

Product Information:	No acute toxicity information is available for this product.
Toxicologically Synergistic Products:	No information available
Delayed and immediate effects as well as chronic effects from short and long-term exposure:	No information available
Irritation:	No information available
Sensitization:	No information available
Carcinogenicity:	The table below indicates whether each agency has listed any ingredient as a carcinogen.

Component	CAS-No.	IARC	NTP	ACGIH	OSHA	Mexico
Aluminum silicate	1327-36-2	Not listed	Not listed	Not listed	Not listed	Not listed

Mutagenic Effects:	No information available
Reproductive Effects:	No information available
Developmental Effects:	No information available
Teratogenicity:	No information available
STOT - single exposure:	None known
STOT - repeated exposure:	None known
Aspiration hazard:	No information available
Symptoms/effects,both acute and delayed:	No information available
Endocrine Disruptor Information:	No information available
Other Adverse Effects:	The toxicological properties have not been fully investigated.

12. Ecological information

Ecotoxicity:	Do not empty into drains.
Persistence and Degradability:	Insoluble in water
Bioaccumulation/Accumulation:	No information available
Mobility:	Is not likely mobile in the environment due its low water solubility.

13. Disposal considerations

Waste Disposal Methods:	Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. Chemical waste generators must also consult local, regional, and national hazardous waste regulations to ensure complete and accurate classification.

14. Ecological information

DOT:	Not regulated
TDG:	Not regulated
IATA:	Not regulated
IMDG/IMO:	Not regulated

15. Regulatory information

Component	TSCA	DSL	NDSL	EINECS	ELINCS	NLP	PICCS	ENCS	AICS	IECSC	KECL
Aluminum silicate	X	X	-	215-475-1	-		X	-	X	X	X

Legend:
X Listed
E Indicates a substance that is the subject of a Section 5(e) Consent order under TSCA.
F Indicates a substance that is the subject of a Section 5(f) Rule under TSCA.
N Indicates a polymeric substance containing no free-radical initiator in its inventory name but is considered to cover the designated polymer made with any free-radical initiator regardless of the amount used.
P Indicates a commenced PMN substance.
R Indicates a substance that is the subject of a Section 6 risk management rule under TSCA.
S Indicates a substance that is identified in a proposed or final Significant New Use Rule
T Indicates a substance that is the subject of a Section 4 test rule under TSCA.
XU Indicates a substance exempt from reporting under the Inventory Update Rule, i.e. Partial Updating of the TSCA Inventory Data Base Production and Site Reports (40 CFR 710(B).
Y1 Indicates an exempt polymer that has a number-average molecular weight of 1,000 or greater.
Y2 Indicates an exempt polymer that is a polyester and is made only from reactants included in a specified list of low concern reactants that comprises one of the eligibility criteria for the exemption rule.

U.S. Federal Regulations

TSCA 12(b)	Not applicable
SARA 313	Not applicable
SARA 311/312 Hazard Categories	
- Acute Health Hazard	No
- Chronic Health Hazard	No
- Fire Hazard	No
- Sudden Release of Pressure Hazard	No
- Reactive Hazard	No
- CWA (Clean Water Act)	Not applicable
- Clean Air Act	Not applicable
- OSHA	Not applicable
(Occupational Safety and Health Administration)	
- CERCLA	Not applicable
California Proposition 65	This product does not contain any Proposition 65 chemicals.
U.S. State Right-to-Know Regulations	Not applicable
U.S. Department of Transportation	
- Reportable Quantity (RQ)	N
- DOT Marine Pollutant	N
- DOT Severe Marine Pollutant	N
U.S. Department of Homeland Security	This product does not contain any DHS chemicals.

16. Other information

Prepared by Todd Technologies Inc.

Disclaimer
The information provided in this Safety Data Sheet is correct to the best of our knowledge, information, and belief at the date of its publication. This is given only as guidance for safe handling, use, storage, transportation, and disposal and should not be considered a warranty or quality specification. The information relates only to the specific material identified and is not valid for materials used in conjunction with any other materials or in any process.

Air Breather Filter
Pi 0101 - Pi 0185

1. Features

The Pi 0101 through Pi 0126 breather filters have housings made of non-corrosive material.

The air intake is located in the upper section, this prevents surface dust to be drawn in from the tank top. The cover is designed to prevent entry of splash-water. The disposable, pleated elements can be replaced in a matter of seconds.

The Pi 0140 through Pi 0185 breather filters have a housing made of galvanized sheet metal. The built-in o-ring provides accurate sealing at the tank connection. With the choice of Mic or Sm-L elements the CETOP RP 98 H requirements are fullfilled. These specify the same filtration degree for the breather filter as the system filter utilizes.

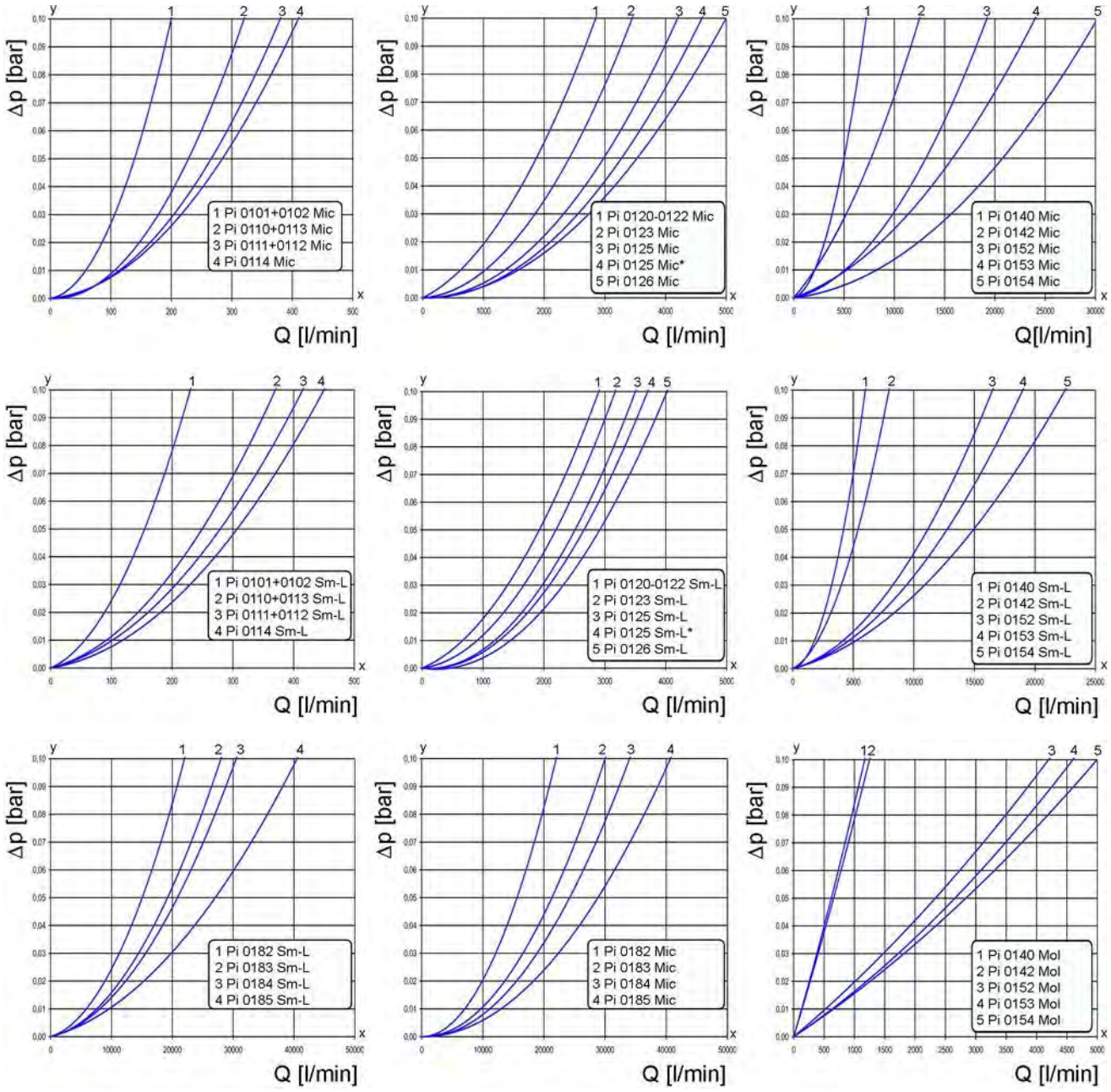
Mol-elements prevent oil mist from emerging the tank. The oil mist coagulate, forming drops within the pleated coalescer layer, which are returned to the tank.

Filters are fixed by threads, clamps or flanges.

Air breather filter Pi 0101 - 0185 are offering the following features

- Corrosion resistant
- Compact design
- Equipped with Mic, Sm-L and Mol elements
- High dirt holding capacity
- Versatile mounting option: screwed, clamped or flanged
- Versatile combination possibilities
- Wide range of accessories
- Worldwide distribution

2. Flow rate/pressure drop curve complete filter



y = differential pressure Δp [bar]

x = air flow rate Q [l/min]

* without grid

3.1 Filter complete							3.2 Filter elements		
Order number	Type	Mic	Sm-L	MoI	Cover with integrated service indicator (UM)	Connection for maintenance indicator (VA)	Order number	Type	Quantity per pack
77575830	Pi 0101 Mic	■					77687692	852 514 Mic	3
77575848	Pi 0101 Sm-L		■				77643562	852 514 Sm-L	3
77575806	Pi 0102 Mic	■					77687692	852 514 Mic	3
77575814	Pi 0102 Sm-L		■				77643562	852 514 Sm-L	3
77734700	Pi 0110 Mic	■					77687643	852 507 Mic	3
77734718	Pi 0110 Sm-L		■				77643547	852 507 Sm-L	3
77734734	Pi 0111 Mic	■					77687643	852 507 Mic	3
77734742	Pi 0111 Sm-L		■				77643547	852 507 Sm-L	3
77734767	Pi 0112 Mic	■					77687643	852 507 Mic	3
77734775	Pi 0112 Sm-L		■				77643547	852 507 Sm-L	3
77734791	Pi 0113 Mic	■					77687643	852 507 Mic	3
77734809	Pi 0113 Sm-L		■				77643547	852 507 Sm-L	3
77734825	Pi 0114 Mic	■					77687643	852 507 Mic	3
77734833	Pi 0114 Sm-L		■				77643547	852 507 Sm-L	3
77575681	Pi 0120 Mic	■					77687767	852 519 Mic	3
77575699	Pi 0120 Sm-L		■				77643554	852 519 Sm-L	3
70343778	Pi 0120 Mic- UM	■			■		77687767	852 519 Mic	3
70343781	Pi 0120 Sm-L/UM		■		■		77643554	852 519 Sm-L	3
77575657	Pi 0121 Mic	■					77687767	852 519 Mic	3
77575665	Pi 0121 Sm-L		■				77643554	852 519 Sm-L	3
79335928	Pi 0121 Mic/UM	■			■		77687767	852 519 Mic	3
79337494	Pi 0121 Sm-L/UM		■		■		77643554	852 519 Sm-L	3
77575624	Pi 0122 Mic	■					77687767	852 519 Mic	3
77575632	Pi 0122 Sm-L		■				77643554	852 519 Sm-L	3
70344281	Pi 0122 Mic/UM	■			■		77687767	852 519 Mic	3
70344282	Pi 0122 Sm-L/UM		■		■		77643554	852 519 Sm-L	3
77575590	Pi 0123 Mic	■					77687767	852 519 Mic	3
77575608	Pi 0123 Sm-L		■				77643554	852 519 Sm-L	3
79337486	Pi 0123 Mic/UM	■			■		77687767	852 519 Mic	3
76317812	Pi 0123 Sm-L/UM		■		■		77643554	852 519 Sm-L	3
77728223	Pi 0125 Mic	■					77687767	852 519 Mic	3
77728231	Pi 0125 Sm-L		■				77643554	852 519 Sm-L	3
79311853	Pi 0125 Mic/UM	■			■		77687767	852 519 Mic	3
79364241	Pi 0125 Sm-L/UM		■		■		77643554	852 519 Sm-L	3
77728165	Pi 0126 Mic	■					77687767	852 519 Mic	3
77728173	Pi 0126 Sm-L		■				77643554	852 519 Sm-L	3
79343260	Pi 0126 Mic/UM	■			■		77687767	852 519 Mic	3
79326695	Pi 0126 Sm-L/UM		■		■		77643554	852 519 Sm-L	3
77749732	Pi 0140 Mic	■					77687999	852 621 Mic	3
77749740	Pi 0140 Sm-L		■				77645625	852 621 Sm-L	3
77765498	Pi 0140 MoI			■			77789365	852 621 MoI	3
77749765	Pi 0140 Mic/VA	■				■	77687999	852 621 Mic	3
77749773	Pi 0140 Sm-L/VA		■			■	77645625	852 621 Sm-L	3
77765506	Pi 0140 MoI/VA			■		■	77789365	852 621 MoI	3
77730724	Pi 0142 Mic	■					77687999	852 621 Mic	3
77730732	Pi 0142 Sm-L		■				77645625	852 621 Sm-L	3
77765514	Pi 0142 MoI			■			77789365	852 621 MoI	3
77728272	Pi 0142 Mic/VA	■				■	77687999	852 621 Mic	3

3.1 Filter complete							3.2 Filter elements		
Order number	Type	Mic	Sm-L	Mol	Cover with integrated service indicator (UM)	Connection for maintenance indicator (VA)	Order number	Type	Quantity per pack
77728280	Pi 0142 Sm-L/VA		■			■	77645625	852 621 Sm-L	3
77765522	Pi 0142 Mol/VA			■		■	77789365	852 621 Mol	3
76102107	Pi 0145 Mic	■					76101174	852 985 Mic	2
76102123	Pi 0145 Sm-L		■				76101182	852 985 Sm-L	2
76102115	Pi 0145 Mic/UM	■			■		76101174	852 985 Mic	2
76102131	Pi 0145 Sm-L/UM		■		■		76101182	852 985 Sm-L	2
76102149	Pi 0146 Mic	■					76101174	852 985 Mic	2
76102164	Pi 0146 Sm-L		■				76101182	852 985 Sm-L	2
76102156	Pi 0146 Mic/UM	■			■		76101174	852 985 Mic	2
76102172	Pi 0146 Sm-L/UM		■		■		76101182	852 985 Sm-L	2
76102180	Pi 0147 Mic	■					76101174	852 985 Mic	2
76102206	Pi 0147 Sm-L		■				76101182	852 985 Sm-L	2
76102198	Pi 0147 Mic/UM	■			■		76101174	852 985 Mic	2
76102214	Pi 0147 Sm-L/UM		■		■		76101182	852 985 Sm-L	2
76102222	Pi 0148 Mic	■					76101174	852 985 Mic	2
76102248	Pi 0148 Sm-L		■				76101182	852 985 Sm-L	2
76102230	Pi 0148 Mic/UM	■			■		76101174	852 985 Mic	2
76102255	Pi 0148 Sm-L/UM		■		■		76101182	852 985 Sm-L	2
76102263	Pi 0149 Mic	■					76101174	852 985 Mic	2
76102289	Pi 0149 Sm-L		■				76101182	852 985 Sm-L	2
76102271	Pi 0149 Mic/UM	■			■		76101174	852 985 Mic	2
76102297	Pi 0149 Sm-L/UM		■		■		76101182	852 985 Sm-L	2
77749328	Pi 0152 Mic	■					77687726	852 516 Mic	2
77749336	Pi 0152 Sm-L		■				77687759	852 516 Sm-L	2
77765530	Pi 0152 Mol			■			77789381	852 516 Mol	2
77749351	Pi 0152 Mic/VA	■				■	77687726	852 516 Mic	2
77749369	Pi 0152 Sm-L/VA		■			■	77687759	852 516 Sm-L	2
77765548	Pi 0152 Mol/VA			■		■	77789381	852 516 Mol	2
77728306	Pi 0153 Mic	■					77687726	852 516 Mic	2
77728314	Pi 0153 Sm-L		■				77687759	852 516 Sm-L	2
77765555	Pi 0153 Mol			■			77789381	852 516 Mol	2
77728330	Pi 0153 Mic/VA	■				■	77687726	852 516 Mic	2
77728348	Pi 0153 Sm-L/VA		■			■	77687759	852 516 Sm-L	2
77765563	Pi 0153 Mol/VA			■		■	77789381	852 516 Mol	2
77749799	Pi 0154 Mic	■					77687726	852 516 Mic	2
77749807	Pi 0154 Sm-L		■				77687759	852 516 Sm-L	2
77765571	Pi 0154 Mol			■			77789381	852 516 Mol	2
77749823	Pi 0154 Mic/VA	■				■	77687726	852 516 Mic	2
77749831	Pi 0154 Sm-L/VA		■			■	77687759	852 516 Sm-L	2
77765589	Pi 0154 Mol/VA			■		■	77789381	852 516 Mol	2
77950918	Pi 0182 Mic	■					77950298	852 822 Mic	1
77950926	Pi 0182 Sm-L		■				77950348	852 822 Sm-L	1
77950934	Pi 0182 Mol			■			77873318	852 822 Mol	1
77950959	Pi 0182 Mic/VA	■				■	77950298	852 822 Mic	1
77950967	Pi 0182 Sm-L/VA		■			■	77950348	852 822 Sm-L	1

3.1 Filter complete							3.2 Filter elements		
Order number	Type	Mic	Sm-L	Mol	Cover with integrated service indicator (UM)	Connection for maintenance indicator (VA)	Order number	Type	Quantity per pack
77950975	Pi 0182 Mol/VA			■		■	77873318	852 822 Mol	1
77950538	Pi 0183 Mic	■					77950298	852 822 Mic	1
77950546	Pi 0183 Sm-L		■				77950348	852 822 Sm-L	1
77873219	Pi 0183 Mol						77873318	852 822 Mol	1
77950785	Pi 0183 Mic/VA	■				■	77950298	852 822 Mic	1
77950835	Pi 0183 Sm-L/VA		■			■	77950348	852 822 Sm-L	1
77950843	Pi 0183 Mol/VA			■		■	77873318	852 822 Mol	1
77950215	Pi 0184 Mic	■					77950298	852 822 Mic	1
77950223	Pi 0184 Sm-L		■				77950348	852 822 Sm-L	1
77950850	Pi 0184 Mol			■			77873318	852 822 Mol	1
77950876	Pi 0184 Mic/VA	■				■	77950298	852 822 Mic	1
77950884	Pi 0184 Sm-L/VA		■			■	77950348	852 822 Sm-L	1
77950892	Pi 0184 Mol/VA			■		■	77873318	852 822 Mol	1
77954498	Pi 0185 Mic	■					77950298	852 822 Mic	1
77954506	Pi 0185 Sm-L		■				77950348	852 822 Sm-L	1
77954514	Pi 0185 Mol			■			77873318	852 822 Mol	1
78224123	Pi 0185 Mic/VA	■				■	77950298	852 822 Mic	1
78224149	Pi 0185 Sm-L/VA		■			■	77950348	852 822 Sm-L	1
78224131	Pi 0185 Mol/VA			■		■	77873318	852 822 Mol	1

4. Technical specifications

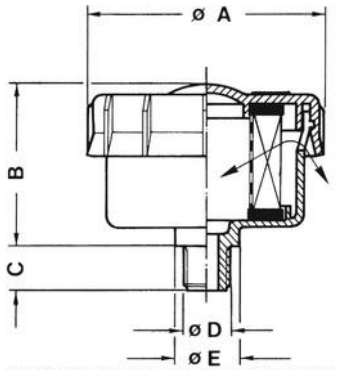
Separation:	
Mic	10 µm
Sm-L	3 µm
Mol	oil mist
Temperature range:	-30 °C to +100 °C (other temperature ranges on request)
Housing material:	
Pi 0101 to Pi 0126	polyamide
Pi 0140 to Pi 0142	galvanized sheet metal
Pi 0145 to Pi 0149	polyamide
Pi 0152 to Pi 0154	galvanized sheet metal
Pi 0182 to Pi 0185	steel/Al
Sealing material:	
Pi 0126	rubberized cork
Pi 0140 to Pi 0185	NBR
Resistance:	all hydraulic oils

Other elements for HFA, HFC and HFD fluids on request.

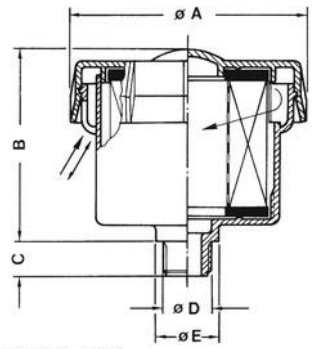
We draw attention to the fact that all values indicated are average values which do not always occur in specific cases of application. Our products are continually being further developed. Values, dimensions and weights can change as a result of this. Our specialized department would be pleased to offer you advice.

We recommend you to contact us concerning applications of our filters in areas governed by the EU Directive 94/9 EC (ATEX 95). The standard version can be used for liquids based on mineral oil (corresponding to the fluids in Group 2 of Directive 97/23 EC Article 9). If you consider to use other fluids please contact us for additional support.

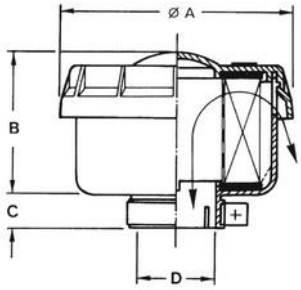
Subject to technical alteration without prior notice.



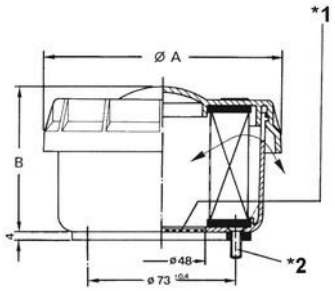
Pi 0101-0102/Pi 0120-0121/Pi 0149



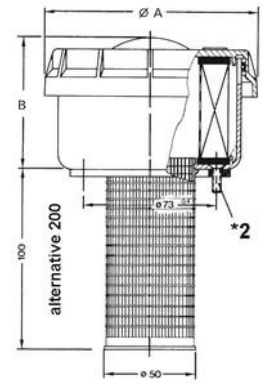
Pi 0110-0114



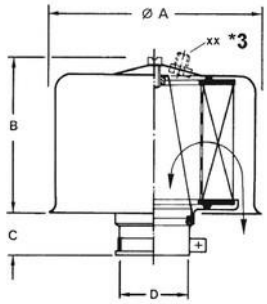
Pi 0122-0123/Pi 0147-0148



Pi 0125/Pi 0145



Pi 0126/Pi 0146



Pi 0140-0142/Pi 0120-0185

*1 mm dia screen removable
*2 6x screw M5x16 DIN 7500 (cross-slotted)
*3 optional connection for maintenance indicator

5. Dimensions

	Air flow rate [l/min]*			Dimensions				
				[mm/inch]	[mm]	[mm]	[mm]	[mm]
Type	**Mic**	**Sm-L**	**Mol**	**D**	**A**	**B**	**C**	**E**
Pi 0101	60	55	-	M12x1.5	62	44	12	17
Pi 0102	60	55	-	G1/4	62	44	12	17
Pi 0110	100	90	-	M16x1.5	80	67	12	21
Pi 0111	110	100	-	M22x1.5	80	67	13	27
Pi 0112	110	100	-	G1/2	80	67	13	26
Pi 0113	100	90	-	G3/8	80	67	12	22
Pi 0114	120	110	-	G3/4	80	67	15	32
Pi 0120	1000	900	-	M33x2	118	73	20	-
Pi 0121	1000	900	-	G1	118	73	19	-
Pi 0122	1000	900	-	Ø 25	118	73	16	-
Pi 0123	1450	1300	-	Ø 40	118	73	16	-
Pi 0125	750	650	-	Ø 73****	118	81	-	-
Pi 0125 (without enclosure)	1600	1400	-	Ø 73****	118	81	-	-
Pi 0126	1350	1150	-	Ø 73****	118	81	-	-
Pi 0140	2000	1700	130	Ø 40**	142	95	30	-
Pi 0142	2400	2000	140	Ø 52**	142	95	30	-
Pi 0145	2100	1800	***	Ø 73****	118	133	-	-
Pi 0146	1800	1500	***	Ø 73****	118	133	-	-
Pi 0147	2000	1700	***	Ø 40**	118	133	19	-
Pi 0148	2400	2000	***	Ø 52**	118	133	23	-
Pi 0149	1600	1300	***	G1½	118	135	17	38.5
Pi 0152	5300	4200	570	Ø 70**	230	117	30	-
Pi 0153	6300	4600	620	Ø 76**	230	117	30	-
Pi 0154	7700	5200	640	Ø 80**	230	117	30	-
Pi 0182	7200	5800	-	Ø 70**	230	320	30	-
Pi 0183	9600	7600	-	Ø 76**	230	320	30	-
Pi 0184	10500	8100	-	Ø 80**	230	320	30	-
Pi 0185	13000	9600	-	Ø 100**	230	320	30	-

*) when Δ p is 0.01 bar (air flow can be reduced by air humidifying)

**) clearance H11

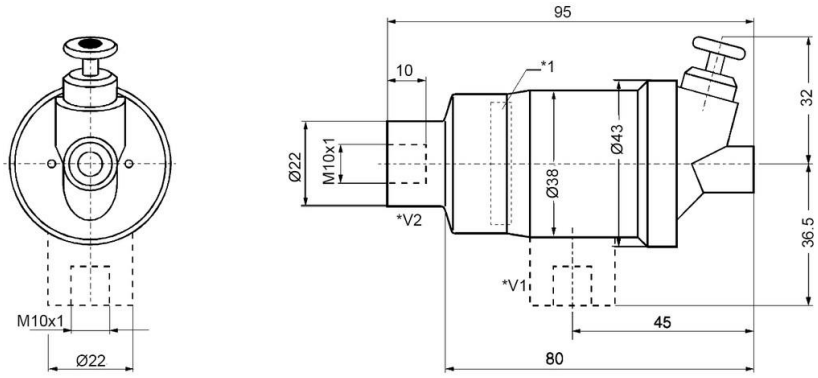
***) in preparation

****) connection according to DIN 24557 T2 (6x screw M5x16 and seal included in delivery)

6. Maintenance indicator

The types Pi 0101 - 0185 may be equipped with a maintenance indicator for optimal filter element exploitation. They indicate when the filter element must be serviced and thus save unnecessary costs.

Vacuum indicator/ Air breather					
Indicator setting [mbar ± 10 %]	**Temperature resistance [°C]**	**Execution**	**Type**	**Order number**	**Indication**
- 50	- 40 to + 110	1	TB 745	78309056	visual, self-locking
- 50		2	TB 745/1	78309064	



*1 Execution 1
*2 Execution 2
*3 Indication: Position of display at nominal value in mbar
Standard seal material of maintenance indicator: NBR
Seal material types LES/LEO: Silicone rubber

6. Maintenance indicator

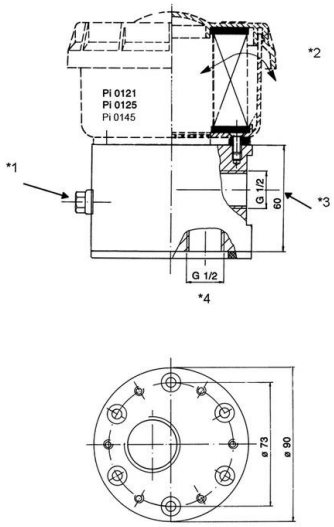
Retrofit cover with integrated service indicator	
Order number	**Type**
79343013	Retrofit cover with integrated service indicator for Pi 0120-0149/UM

- Integrated 3-step service indicator offers optimized filter element service life
- Switching level 100 % at 50 mbar
- Indication of 50 %, 75 %, 100 % of switching level by red gauge
- Gauge self-locking, handy turning knob to lock

7. Filling adapter

Order number	Type
78258956	Filling adapter
78259111	Filling adapter with Walther coupling and dust cap

Tank connection:	flange acc. DIN 24557 part 2
Material:	Al anodized
Sealing material:	cork
Fixing screws:	6 pcs M5x70 DIN 912 (included in delivery)



*1 Connection for vacuum indicator (G1/8)
*2 Parts shown as dotted lines not included in delivery
*3 Connection for filling coupling
*4 Connection for extension pipe

7. Filling adapter

Characteristics of filling adapter MD012 and MD019:

- Robust adapter for filling with big cross-section for optimized filling
- Coupling for filling with dust cap acc. delivery specifications of the automotive industry
- Filling barrier integrated in the air breather
- Cover with visual service indicator, 3-step, gauge, value self-locking
- Versatile connecting options

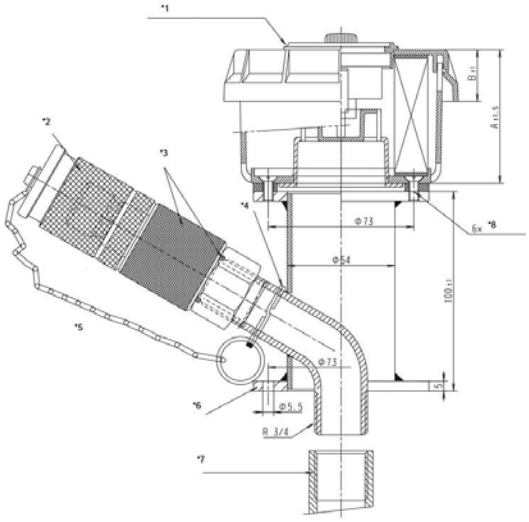


Fig. Pi 0125 - Pi 0145 UM MD012

*1 Maintenance switch LTB 9
*2 Dust cap 76319008 Walther MD-012-5-19
*3 Closing nipple
*4 Steel ring
*5 Walther MD-012-2WR 526
*6 Flange pattern DIN 24557 D 73
*7 Optional: Extension pipe DIN 2391;
Length acc. to customer specification
*8 On circumference

Order number	Type
76318968	Pi 0125 Mic-UM/OS/MD012
76318976	Pi 0125 Sm-L-UM/OS/MD012
76318984	Pi 0145 Mic-UM/OS/MD012
76318992	Pi 0145 Sm-L-UM/OS/MD012

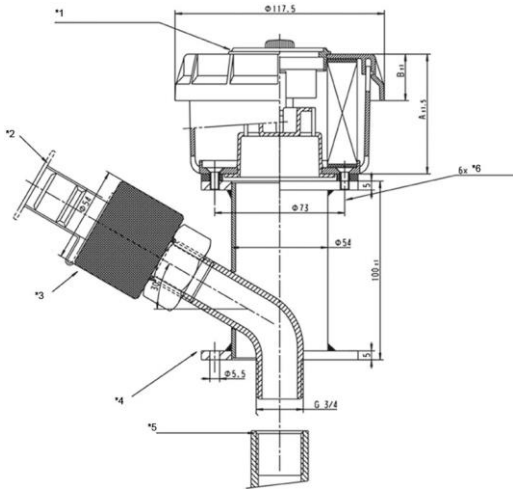


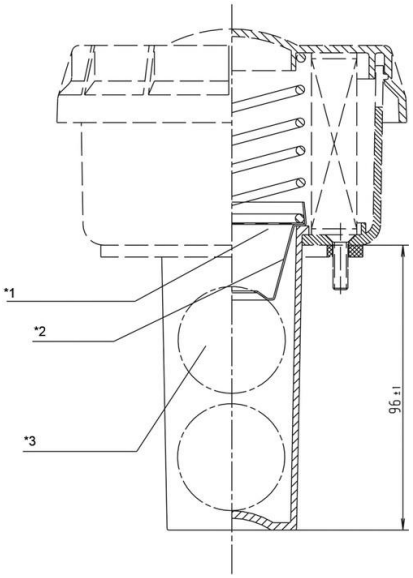
Fig. Pi 0125 - Pi 0145 UM MD019

*1 Maintenance switch LTB 9
*2 Dust cap PVC, Walther LP-019-5-74-KU
*3 Closing nippel, Walther MD-019-2-WR526-19-1VF
*4 Flange pattern DIN 24557 D 73
*5 Optional: Extension pipe DIN 2391;
Length acc. to costumer specification
*6 On circumference

Order number	Type
76101406	Pi 0125 Mic-UM/OS/MD019
76101430	Pi 0125 Sm-L-UM/OS/MD019
76101414	Pi 0145 Mic-UM/OS/MD019
76101448	Pi 0145 Sm-L-UM/OS/MD019

8. Accessories

Order number	Type
79343377	Expansion kit with spillage protection to combine with Pi 0125/0126

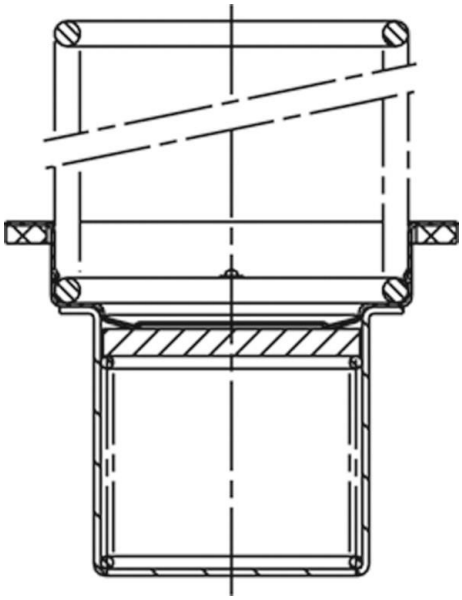


*1 Perforated disc
*2 Valve disc
*3 Float ball: Opening point, max. 0.15 bar

Operating principle of spillage protection:

The float ball (*3) is guided over the filling strainer. If the liquid level in the tank rises, the ball rises accordingly and closes the tank outlet by means of the valve disc (*2). The valve disc is flexibly loaded to prevent the permissible pressure inside the tank from being exceeded.

Order number	Type
79735382	Retrofit kit with preloaded valve to combine with Pi 0125/0126 Valve opening pressure: preload pressure 0.2 bar suction pressure -0.05 bar



Advantages of preloaded valve:

- Pump support due to preloaded reservoir
- Minimized air exchange with the contaminated/humid ambient
- Reduced ingress of humidity into the hydraulic system

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Tank air breather filter/aerosol separator
Pi 0190 Mol

Nominal size: 5000 l/min

1. Short description

High-performance filters for modern hydraulic systems

Fast and permanent extraction and return flow processes for hydraulic oils promote the formation of oil mist in the tanks and return containers. This oil mist gets through the tank air breather filters into the surrounding area and may contaminate it. This frequency interferes with the work because this type of oil mist is to some degree harmful to the employees' health.

The Pi 0190 with a Mol element is intended for the ventilation of hydraulic tanks. It prevents dirt particles getting into the hydraulic system when drawing in air and the spread of the oil mist into the ambient air when venting the tank.

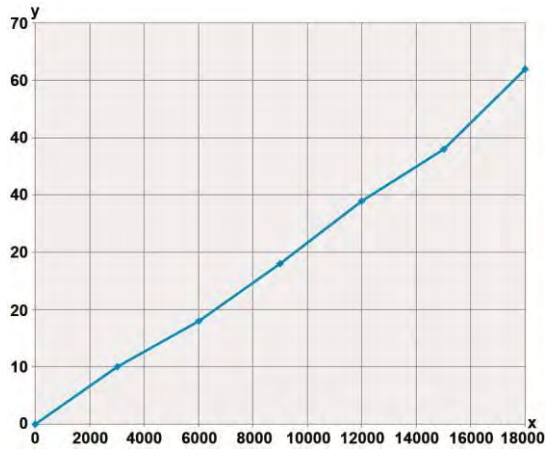
The Mol element has an excellent separation efficiency of 99.99 % with 1 µm particles, can prevent the oil mist escaping and separate up to 99 % of the oil content.

The oil mist flows through a fiberglass layer and becomes trapped on the individual fibers due to the effects of inertia, filtering action and diffusion. As they pass through the filter, the oil droplets in the fiberglass structure coalesce into larger droplets, thus forming an oil film. These droplets reach the outflow surface of the filter element with the air flow and are routed downwards into a drainage fleece by the force of gravity. The separated oil can be drained into a leakage tank. The oil with the necessary purity class again can be fed back into the oil reservoir through the additional use of a non-return valve and line filter.

Der Pi 0190 can also be used as an aerosol separator and air breather filter for containers and units that are under permanent overpressure.

- Modular principle
- Little space required thanks to compact design
- Equipped with highly efficient Mol oil separator elements
- Residual oil content < 1 mg/m³
- High dirt holding capacity and therefore a long service life
- Worldwide distribution

2. Flow rate/pressure drop curves - complete filter



y = differential pressure Δp [mbar]
x = volumetric flow V [l/min]

3. Order numbers

3.1 Complete filter		3.2 Clamping ring		3.3 Mol element		
Order number	**Type designation**	**Order number**	**Type designation**	**Order number**	**Type designation**	**Number per container**
72438673	Pi 0190 MOL FL	72405402	Clamping ring	72458413	852 830 MOL	1
72438676	Pi 0190 MOL DN150					

Customer-specific version on request

4. Technical data

Separation
Pi 0190 Mol … Aerosols

Operating temperature range -10°C to +80 °C

Material
Element housing Steel plate, EPS RAL 9005
Housing cover Plastic

Sealing material
Pi 0190 Mol FL O-ring 183.52x5.33 NBR

Connection
Pi 0190 Mol FL Flange
Pi 0190 Mol DN150 DN150 pipe

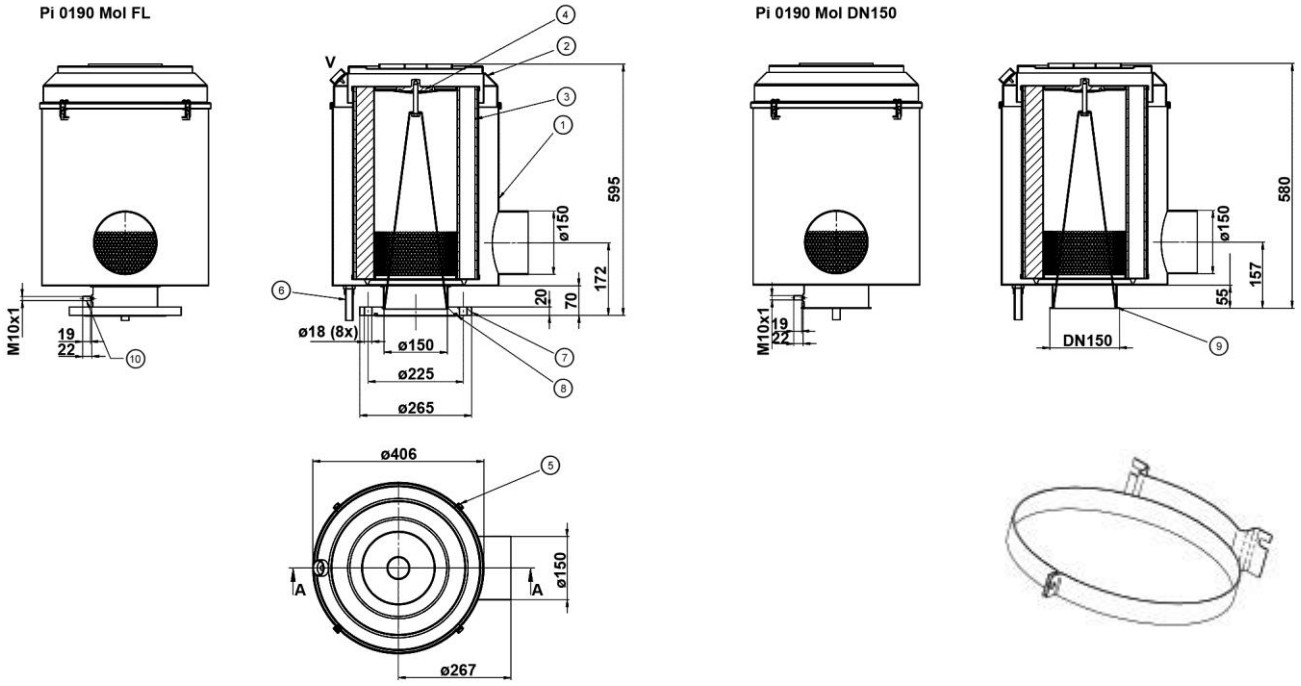
Resistance All hydraulic oils*
*Special versions for HFA, HFC and HFD on request

We draw attention to the fact that all values indicated are average values that do not always occur in specific individual cases. Our products are continually being further developed. Values, dimensions and weights can change as a result of this.
Our technical department will be happy to advise you

We recommend that you consult with us when using our filters in areas that are classified in accordance with EU Directive 94/9 EC (ATEX 95). The standard version is suitable for mineral oil-based liquids (corresponding fluids in Group 2 of Directive 97/23 EC Article 9). Please contact us when
using other media.

Subject to technical alteration without notice.

5. Dimensions



①	Filter housing	②	Filter cover	③	Oil separator element
④	Fastening nut with O-ring	⑤	Snap closure (4x)	⑥	Oil return hose (3 m)
⑦	Flange connection	⑧	O-ring 183.52x5.33 NBR	⑨	DN150 connection
⑩	Overpressure gauge connection (optional)	V	Bleed valve		

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06/2019

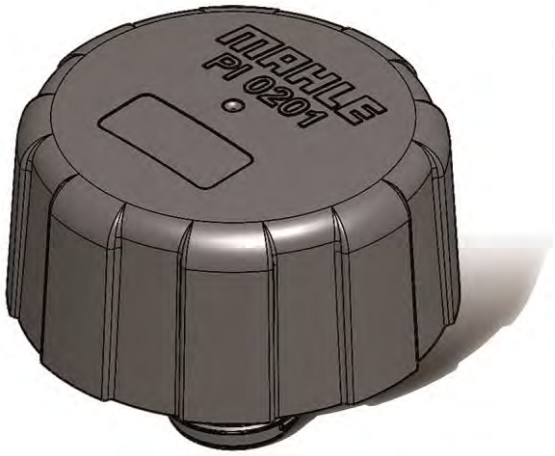
Air breather filter
Pi 0201

1. Features

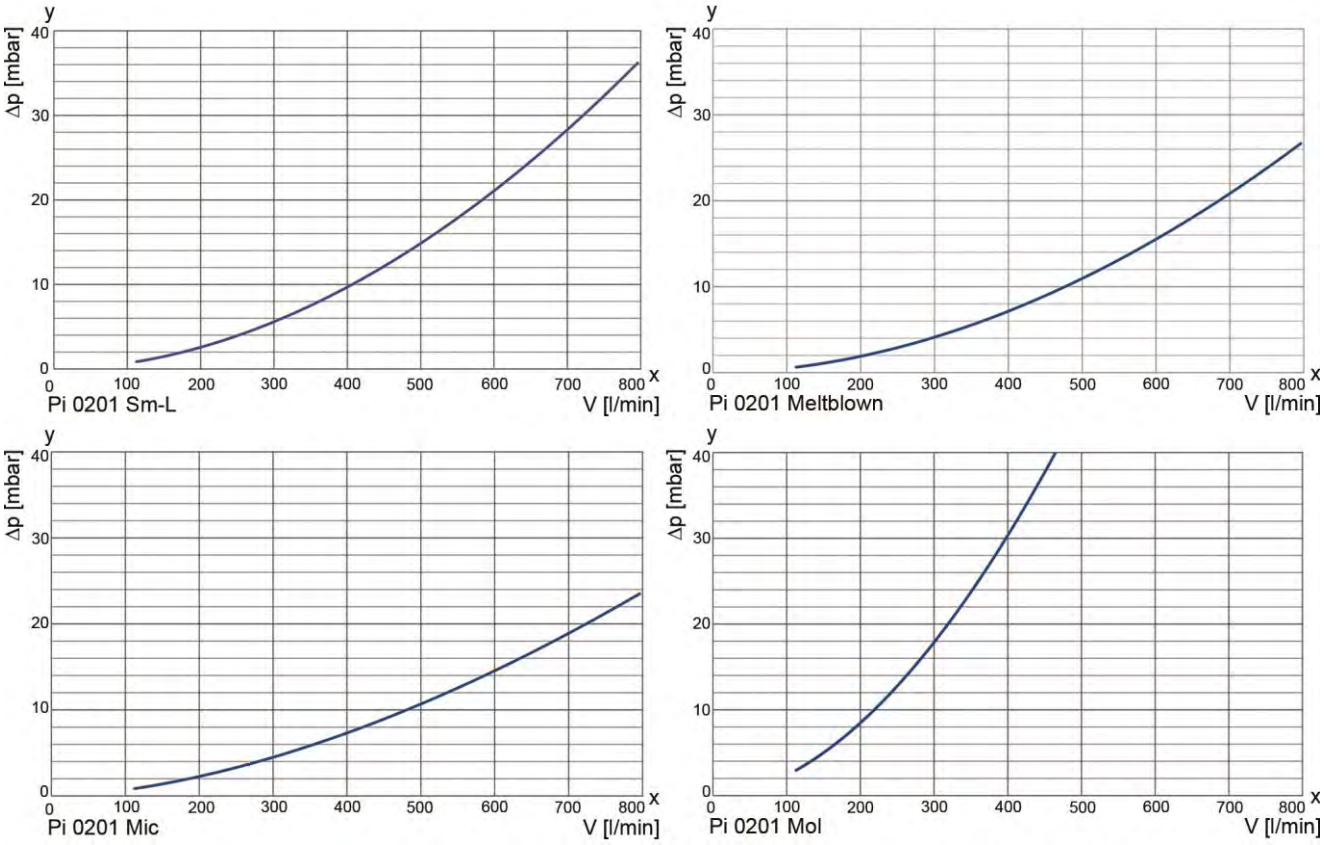
Filter for ventilating and bleeding mobile and stationary hydraulic tanks

The air breather filter Pi 0201 with preloaded valves are used for tanks which are under excess pressure or partial vacuum alternately. The air can flow in and out in a defined manner.
The preloaded valve for inflowing air ensures that a certain partial vacuum is maintained in the container or tank. The air is delayed in flowing in from the outside, the foaming effect is reduced.
The preloaded valve for the outflowing air has been designed to keep a certain excess pressure in the tank for a short time. This reduces the number of air exchanges with the environment. As a result, the service life of the filter cartridge is significantly increased. The excess pressure in the tank has a positive impact on the performance of the downstream pumps, thus enhancing the service life and efficiency of the pumps.
The Pi 0201 is also available in the version with Mol-elements. The Mol-elements prevent the oil mist from emerging. This can be produced by the fast two-way volume flows of the oil. With outflowing air, the oil mist is precipitated in the element. With inflowing air, the oil mist flows from the element back into the tank.

- Compact, sturdy and quickly changeable disposable plastic filter
- Different filter materials for optimum adaptation to customer requirements
- Long service lives thanks to high dirt holding capacity
- Optional separation of oil mist using FGC Mol-elements.
- Filter version with inlet and outlet valve available
- Versions with different connection threads available
- Individual marking possible
- Ergonomic design
- Worldwide distribution

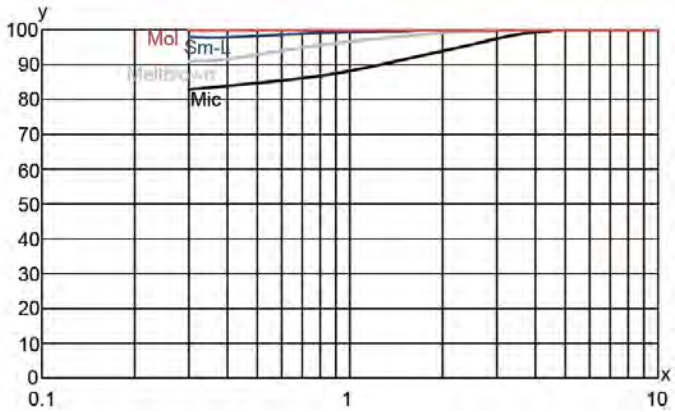


2. Performance curves complete filter



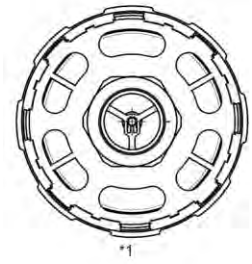
y = differential pressure Δp [mbar]
x = flow rate V [l/min]

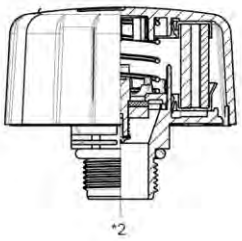
3. Curve showing degree of separation

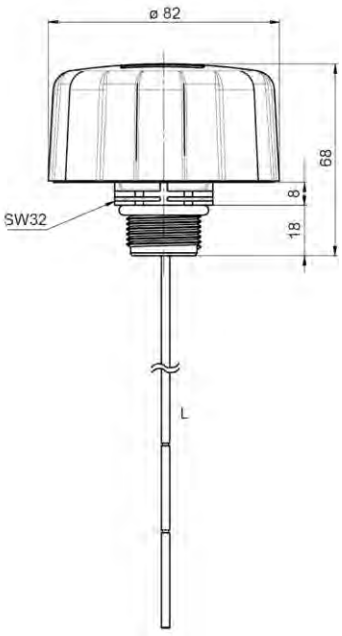


x = particle size n [µm]
y = degree of separation η [%]

4. Dimensions







*1 = version G ¾ with dipstick
*2 = version G ¾ with view inlet and outlet valve, Mol-element
L = length of dipstick optional

5. Technical data

Temperature range:	-30 °C to +100 °C (other temperature ranges on request)
Housing material:	
Cover	glass fibre reinforced polyamide
Lower part	glass fibre reinforced polyamide
Valve plate	glass fibre reinforced polyamide
Components:	
Spring	spring steel
Oil dipstick	stainless steel
Sealing material:	NBR
Filter cartridge material:	
Sm-L	glass fibre
Mic	cellulose
Mol	coalescence material
MBL	meltblown
Valve opening pressure:	
Inlet	0.03 bar
Outlet	0.20 bar 0.35 bar 0.50 bar 0.70 bar 1.00 bar
Connection thread:	G 3/4 M42x2 * M30x1.5 * NPT ¾ *
Connection flange:	DIN *
Resistance:	all HLP and HETG hydraulic oils **

***** on request
****** other oil types on request

We would like to point out that all values indicated are average values which do not always occur in specific cases of application. Our products are continually being further developed. Values, dimensions and weights can change as a result of this. Our specialist department would be pleased to offer you advice.

We recommend you contact us concerning applications for our filters in areas governed by the EU Directive 94/9 EC (ATEX 95). The standard version can be used for liquids based on mineral oil (corresponding to the fluids in Group 2 of Directive 97/23 EC Article 9). Please contact us if you intend using other media.

Subject to technical alteration without notice.

6. Type number key

Type number key with selection example for Pi 0201/Mic/0065/Z3/VV-0.2/P210/E*								
Series								
Pi 0201								
	Filter medium							
	Sm-L	glass fibre						
	Mic	cellulose						
	Mol	coalescence material						
	MBL	meltblown						
		Air flow rate						
		0001	10 l/min					
		0010	100 l/min					
		0100	1000 l/min					
		1000	10000 l/min					
		9999	99990 l/min					
			Connection code and dimension					
			Z	inch				
			3	G¾“	M22x1.5	NPT ¾“	3 hole DIN xxxxx	
				Valve				
				VV-x.x	Preloaded valve with opening pressure x.x bar			
					Optionen			
					Pxxx	dipstick of length xxx mm		
Pi 0201	**/Mic**	**/0065**	**/Z3**	**/VV-0.2**	**/P210**			

7. Order numbers

Complete filter													
		Filter cartridge					Switching pressure [mbar] Preloaded valve OFF					
Order number	Type designation	Mic	MBL	Sm-L	Mol	Air flow rate [l/min]	200	350	500	700	1000	Preloaded valve ON >100 mbar
72343041	Pi 0201/MIC/0050/Z3	■				500						
72399885	Pi 0201/MIC/0050/Z3/P210	■				500						
72343037	Pi 0201/MIC/0040/Z3/VV-0.2	■				400	■					■
72397581	Pi 0201/MIC/0040/Z3/VV-0.35	■				400		■				■
72399887	Pi 0201/MIC/0040/Z3/VV-0.35/P210	■				400		■				■
72397583	Pi 0201/MBL/0050/Z3		■			500						
72399889	Pi 0201/MBL/0050/Z3/P210		■			500						
72397584	Pi 0201/MBL/0040/Z3/VV-0.2		■			400	■					■
72397585	Pi 0201/MBL/0040/Z3/VV-0.35		■			400		■				■
72399890	Pi 0201/MBL/0040/Z3/VV-0.35/P210		■			400		■				■
72343044	Pi 0201/SML/0040/Z3			■		400						
72399891	Pi 0201/SML/0040/Z3/P210			■		400						
70594082	Pi 0201/SML/0035/Z3/VV-0.2			■		350	■					■
72397586	Pi 0201/SML/0035/Z3/VV-0.35			■		350		■				■
72399892	Pi 0201/SML/0035/Z3/VV-0.35/P210			■		350		■				■
72397588	Pi 0201/MOL/0025/Z3				■	250						
72399893	Pi 0201/MOL/0025/Z3/P210				■	250						
72397589	Pi 0201/MOL/0020/Z3/VV-0.2				■	200	■					■
72397590	Pi 0201/MOL/0020/Z3/VV-0.35				■	200		■				■
72399894	Pi 0201/MOL/0020/Z3/VV-0.35/P210				■	200		■				■

The FGC Pi 0201 series can replace almost all air breather filters from other manufacturers with a screw thread or connection flange in accordance with DIN 24557 without any problem. Please contact us.

Other versions and features on request.

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04/2019

Tank Top Return-Line Filter
Pi 530

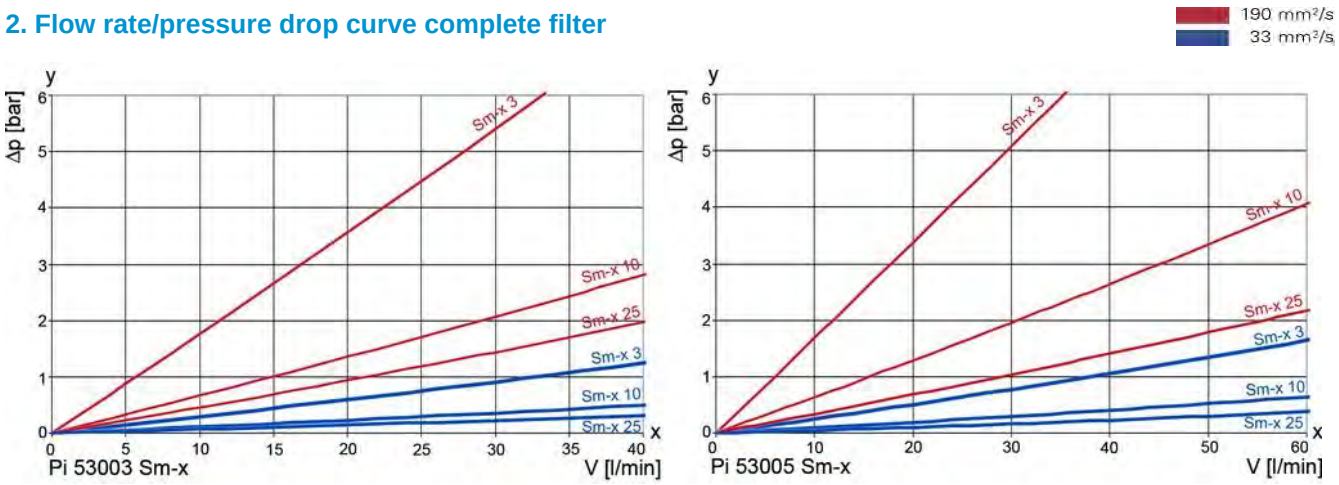
Nominal size 35 and 50

1.Features

High performance filters for modern hydraulic systems

- Provided for tank top installation
- Modular system
- Compact design
- Minimal pressure drop through optimal flow design
- Visual/electrical/electronic maintenance control
- Threaded alt. hose connections
- Quality filters, easy to service
- Equipped with highly efficient glass fibre Sm-x filter
- Beta rated elements according to ISO 16889 multipass test
- Elements with high differential pressure stability and dirt holding capacity
- Worldwide distribution

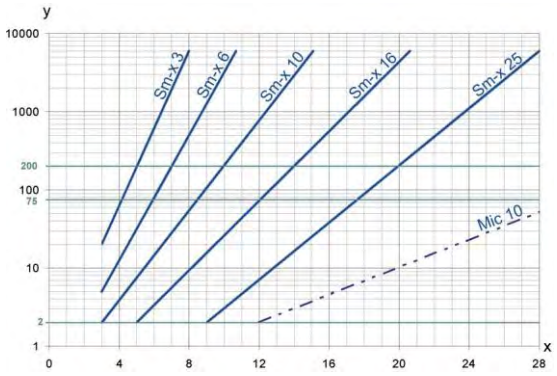
2. Flow rate/pressure drop curve complete filter



y = differential pressure p [bar

x = flow rate V [l/min]

3. Separation grade characteristics



y = beta-value
x = particle size [µm]

determined by multipass tests (ISO 16889)
calibration according to ISO 11171 (NIST)

4. Filter performance data

tested according to ISO 16889 (multipass test)

Sm-x-elements with
max. Δ p 10 bar

Sm-x	3	$\beta_{5(C)} \geq 200$
Sm-x	10	$\beta_{10(C)} \geq 200$
Sm-x	25	$\beta_{20(C)} \geq 200$

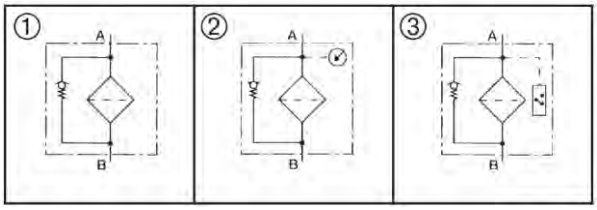
values guaranteed up to
5 bar differential pressure

5. Quality assurance

Filtration Group filters and filter elements are produced according to the following international standards:

Norm	Designation
DIN ISO 2 941	Hydraulic fluid power filter elements; verification of collapse/burst resistance
DIN ISO 2 942	Hydraulic fluid power filter elements; verification of fabrication integrity
DIN ISO 2 943	Hydraulic fluid power filter elements; verification of material compatibility with fluids
DIN ISO 3 723	Hydraulic fluid power filter elements; method for end load test
DIN ISO 3 724	Hydraulic fluid power filter elements; verification of flow fatigue characteristics
ISO 3 968	Hydraulic fluid power-filters-evaluation of pressure drop versus flow characteristics
ISO 10 771.1	Fatigue pressure testing of metal containing envelopes in hydraulic fluid applications
ISO 16 889	Hydraulic fluid power filters-multi-passmethod for evaluation filtration performance of a filter element

6. Symbols



7. Order numbers

Example for ordering filters:

1. Housing design	2. Filter element
Housing NG 35 with hose connection, bypass valve, breather and pressure gauge Type: Pi 53003/1-141	Mic 10 Type: 852 939 Mic 10

7.1 Housing design

Nominal size NG [l/min]	Type	Version filter head	① with bypass 1.5 bar	with breather	② with bypass and gauge	③ with pressure switch normally closed	③ with pressure switch normally open
35	Pi 53003/1-009	Filter head PA 6 with hose-connection DN20	■				
	Pi 53003/1-020		■	■			
	Pi 53003/1-144		■		■		
	Pi 53003/1-145		■			■	
	Pi 53003/1-146		■				■
	Pi 53003/1-141		■	■	■		
	Pi 53003/1-142		■	■		■	
	Pi 53003/1-143		■	■			■
	Pi 53003/2-009	Al-filter head G½	■				
	Pi 53003/2-020		■	■			
50	Pi 53005/1-009	Filter head PA 6 with hose-connection DN20	■				
	Pi 53005/1-020		■	■			
	Pi 53005/1-144		■		■		
	Pi 53005/1-145		■			■	
	Pi 53005/1-146		■				■
	Pi 53005/1-141		■	■	■		
	Pi 53005/1-142		■	■		■	
	Pi 53005/1-143		■	■			■
	Pi 53005/2-009	Al-filter head G½	■				
	Pi 53005/2-020		■	■			

7.2 Filter elements*

Nominal size NG [l/min]	Order number	Type	Filter material	max. Δ p [bar]	Filter surface [cm²]
35	78309387	852 939 Mic 10	Mic 10	5	870
	78206781	852 939 Mic 25	Mic 25		
	79312117	852 588 Sm-x 3	Sm-x 3	10	650
	79312125	852 588 Sm-x 10	Sm-x 10		
	79312133	852 588 Sm-x 25	Sm-x 25		
50	78309395	852 940 Mic 10	Mic 10	5	1100
	79312315	852 940 Mic 25	Mic 25		
	79312158	852 945 Sm-x 3	Sm-x 3	10	810
	79312166	852 945 Sm-x 10	Sm-x 10		
	79312174	852 945 Sm-x 25	Sm-x 25		

* a wider range of element types is available on request

7.3 Breather element (only for filter head PA 6, batch size 3 pcs.)				
Nominal size NG [l/min]	**Order number**	**Type**	**Filter material**	**Filter surface [cm²]**
35	78206831	852 937	Mic	40
50				

8. Technical Specifications

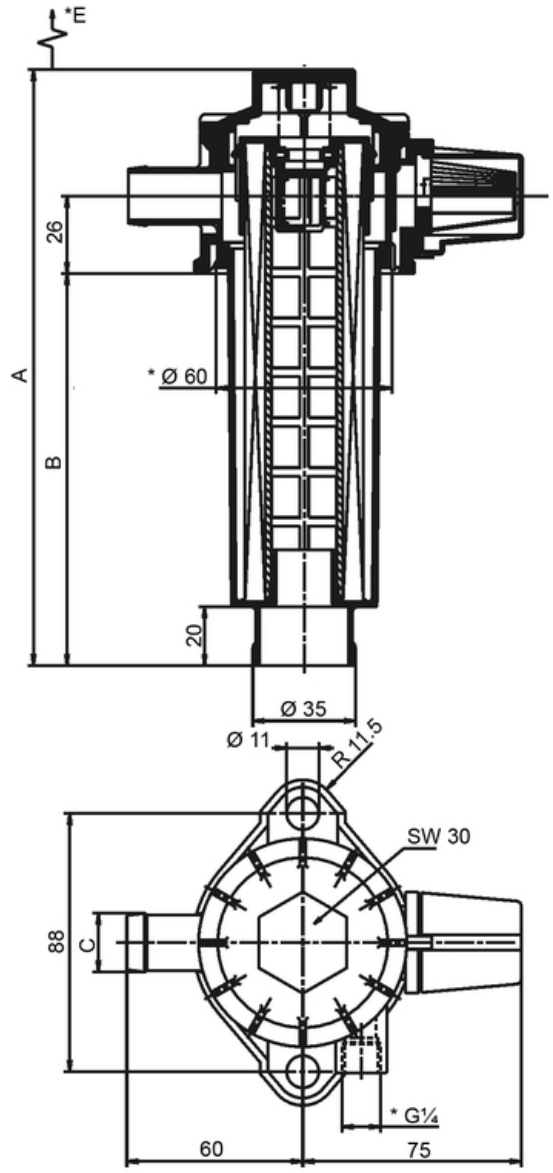
Design:	tank mounting filter
Nominal pressure:	6 bar (90 psi)
Test pressure:	9 bar (130 psi)
Temperature range:	-10 °C to +80 °C
	(other temperature ranges on request)
Bypass setting:	Δ p 1.5 bar
Filter head material:	plastic-PA 6/Al
Filter housing material:	plastic PA 6
Filter cover material:	plastic PA 6
Indication range of pressure gauge:	0 to 4 bar
Activating pressure of pressure switch:	1.2 bar
Electrical data of pressure switch:	
Max. voltage:	42 V
Max. current	2 A
Contact load:	100 VA
Type of protection:	IP 65 - with protection cap
Contact:	normally open/closed
Electrical connection:	AMP 6,3 DIN 46248 connector according to DIN 46247, connection method 2-pole

We draw attention to the fact that all values indicated are average values which do not always occur in specific cases of application. Our products are continually being further developed. Values, dimensions and weights can change as a result of this. Our specialized department will be pleased to offer you advice.

We recommend to contact us concerning applications of our filters in areas governed by the EU Directive 94/9 EC (ATEX 95). The standard version can be used for liquids based on mineral oil (corresponding to the fluids in Group 2 of Directive 97/23 EC Article 9). If you consider to use other fluids please contact us for additional support.

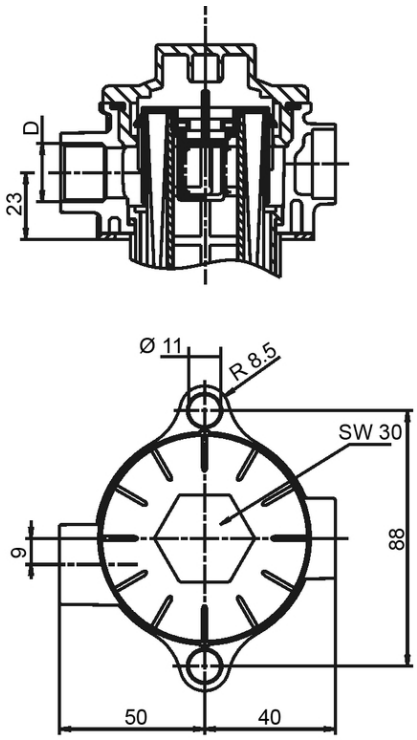
Subject to technical alteration without prior notice.

9. Dimensions

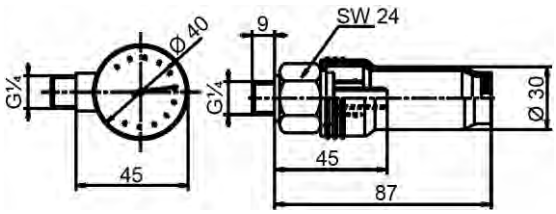


Version with filter head PA 6

*E= Minimum clearance for filter element removal
* Ø 60= Mounting hole Ø 60
*G¼= Option



Version with filter head Al



All dimensions except "D" in mm.

Type	A	B	C	D	E
Pi 53003/1	203	133,5	DN20	-	130
Pi 53003/2	203	135,5	-	G½	130
Pi 53005/1	241	171,5	DN20	-	180
Pi 53005/2	241	173,0	-	G½	180

10. Installation, operating and maintenance instructions

10.1 Filter installation

When installing the filter make sure that :

a) Sufficient space is available to remove filter element and filter housing

b) The mounting hole in the tank top is not excessively large, to ensure proper sealing,

c) The filter is free of tension after installation, max. torque 7 Nm.

Preferably the filter should be installed with the filter housing pointing downwards.

10.2 Connecting the electrical pressure switch

The electrical pressure switch is connected via connectors according to DIN 46247.

10.3 When should the filter element be replaced?

1 . Filters equipped with pressure gauge:
When the dynamic pressure reaches 1.2 bar (red/green indication), the filter element must be replaced.

2 . Filters equipped with pressure switch:
During cold starts, the pressure switch may give a signal.
If the electrical signal has not switched off after reaching operating temperature, the filter element must be replaced after the end of the shift.

3 . Filters without indicator:
The filter element should be replaced after trial run or flushing of the system.
Afterwards follow instructions of manufacturer.

4 . Please, always ensure that you have original Filtration Group spare elements in stock: Disposable elements (MIc, Sm-x) cannot be cleaned.

10.4 Element replacement

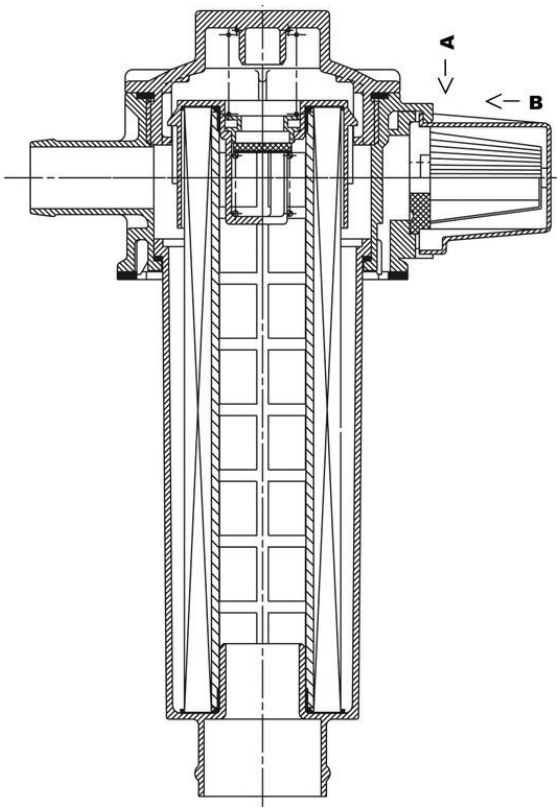
1 . Stop system and relieve filter from pressure.
2 . Unscrew cover, turning counter-clockwise.
3 . Remove filter housing and filter element by pulling upwards.
4 . Remove filter element with a side-to-side motion.
5 . Clean the filter housing with a suitable medium.
6 . Check O-rings on filter cover and filter housing for damage. Replace, if necessary.
7 . Make sure that the order number on the spare element corresponds to the order number of the filter name-plate.
8 . Remove filter element from plastic bag and reassemble in reverse order (items 1 to 4). The cover have to tightened with max. 20 Nm.
9 . Contaminated Mic elements can be reduced to ashes. Sm-x filter elements must be disposed in another way.

10.5 Replacement of air breather filter element (plastic filter head only)

1 . Push slightly on the lid and air breather element downwards (lid A).
2 . Remove lid and element from the lower hook.
3 . Pull out element from the lid.
4 . Install new element in the lid.
5 . Installation in reverse order.
6 . Check correct position of the lid.

Note: Filter element and air breather element should be always replaced at the same time.

Subject to technical alteration without prior notice.



11. Spare parts list

Order numbers for spare parts	
Type	**Order number**
Seal kit NBR	
Pi 530.../1	78309072
Pi 530.../2	78206062
Pressure gauge	79358326
Pressure switch	
normally closed	77870587
normally open	77863814
Breather element for Pi 530.../1 (batch size 3 pcs.)	78206831

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70329496.06/2019

FG Fluid Solutions
Filtration Group

MAHLE Industrialfiltration is now Filtration Group. For more information, visit www.fluid.filtrationgroup.com

Suction return line filter
Pi 550

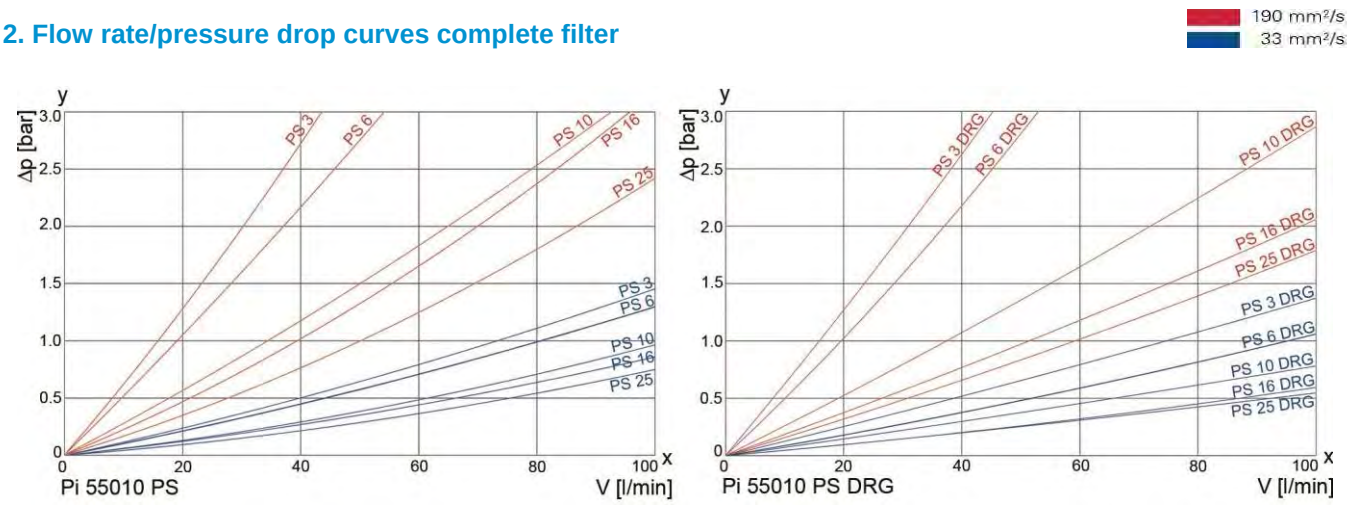
Nominal pressure 10 bar, nominal size 100

1. Features

High-performance filters for modern stationary and mobile hydraulic systems

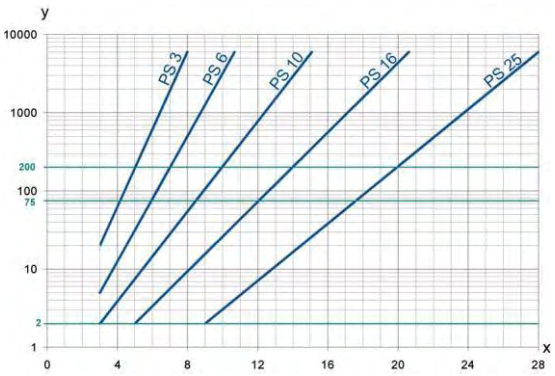
- Provided for tank top installation
- Very low overall height since suction and return line connections are very close together
- Minimum pressure drop through optimum flow design
- Electrical maintenance indicator
- Version with threaded connectors
- Service-friendly
- Equipped with highly efficient PS filter elements, with optional feeding filter stage
- Optional elements with filtration of the feeding volume flow available
- Beta rated elements according to ISO 16889 multipass test
- High dirt holding capacity thanks to large filter surface
- Worldwide distribution

2. Flow rate/pressure drop curves complete filter



y = differential pressure Δp [bar]
x = flow rate V [l/min]

3. Separation grade characteristics



y = beta value
x = particle size [µm]

determined by multipass tests (ISO 16889)
calibration in accordance with ISO 11171 (NIST)

4. Filter performance data

tested in accordance with ISO 16889 (multipass test)

PS elements with
max. Δp 20 bar

PS 3 $ß_{5(C)} \geq 200$
PS 6 $ß_{7(C)} \geq 200$
PS 10 $ß_{10(C)} \geq 200$
PS 16 $ß_{15(C)} \geq 200$
PS 25 $ß_{20(C)} \geq 200$

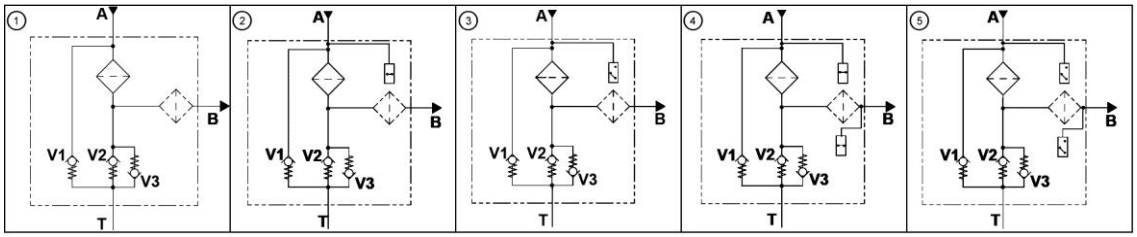
up to 10 bar differential pressure up to 20 bar differential pressure

5. Quality assurance

FGC filters and filter elements are manufactured and/or tested in compliance with the following international standards:

Norm	Designation
DIN ISO 2941	Hydraulic fluid power filter elements; verification of collapse/burst resistance
DIN ISO 2942	Hydraulic fluid power filter elements; verification of fabrication integrity
DIN ISO 2943	Hydraulic fluid power filter elements; verification of material compatibility with fluids
DIN ISO 3723	Hydraulic fluid power filter elements; method for end load test
DIN ISO 3724	Hydraulic fluid power filter elements; verification of flow fatigue characteristics
ISO 3968	Hydraulic fluid power-filters-evaluation of pressure drop versus flow characteristics
ISO 10771.1	Fatigue pressure testing of metal containing envelopes in hydraulic fluid applications
ISO 16889	Hydraulic fluid power filters-multipass method for evaluating filtration performance of a filter element

6. Symbols



V1 = bypass valve
V2 = preloaded valve
V3 = feeding valve

7. Order numbers

Example for ordering filters:

1. Filter housing	2. Filter element
V=100 l/min Type: Pi 55010/01/-200 Order number: 72338649	PS 10 DRG Type: Pi 852 101 PS 10 DRG Order number: 70530136

7.1 Housing design

Nominal size NG [l/min]	Order number	Type	① without DS	② DSO	③ DSS	④ DSO/USO	⑤ DSS/USS
100	72338649	Pi 55010/01/-200	■				
	72338651	Pi 55010/01/-201		■			
	72338652	Pi 55010/01/-202			■		
	72338654	Pi 55010/01/-203				■	
	72338655	Pi 55010/01/-204					■

All versions with bypass valve 3.5 bar, preloaded valve 0.5 bar and feeding valve

DSO Pressure switch normally closed Δp 2,2 bar
DSS Pressure switch normally open Δp 2,2 bar
USO Ported vacuum switch normally closed Δp 0,2 bar
USS Ported vacuum switch normally open Δp 0,2 bar

7.2 Filter elements (other element versions on request)

Nominal size NG [l/min]	Order number	Type designation	Filter material	max. Δp [bar]	Filter surface [cm²]
100	72397561	852 101 PS 3	PS 3	10	1800
	72397562	852 101 PS 6	PS 6		
	70530086	852 101 PS 10	PS 10		
	70530087	852 101 PS 16	PS 16		
	72397563	852 101 PS 25	PS 25		
	72397565	852 101 PS 3 DRG	PS 3 DRG		1800
	72397566	852 101 PS 6 DRG	PS 6 DRG		
	70530136	852 101 PS 10 DRG	PS 10 DRG		
	70530137	852 101 PS 16 DRG	PS 16 DRG		
	72397567	852 101 PS 25 DRG	PS 25 DRG		

8. Technical data

Design:	Suction return line filter
Nominal pressure Pi 55010	10 bar
Test pressure Pi 55010	15 bar
Temperature range:	-30 °C to +100 °C
	Survival temperature -40 °C
	(other temperature ranges on request)
Charging pressure:	Δp 0.5 bar
Switching pressure vacuum switch:	200 mbar
Switching pressure dynamic pressure switch:	2.2 bar
Bypass opening pressure:	Δp 3.5 bar
Filter head material:	AL
Filter housing material:	PA
Sealing material:	NBR

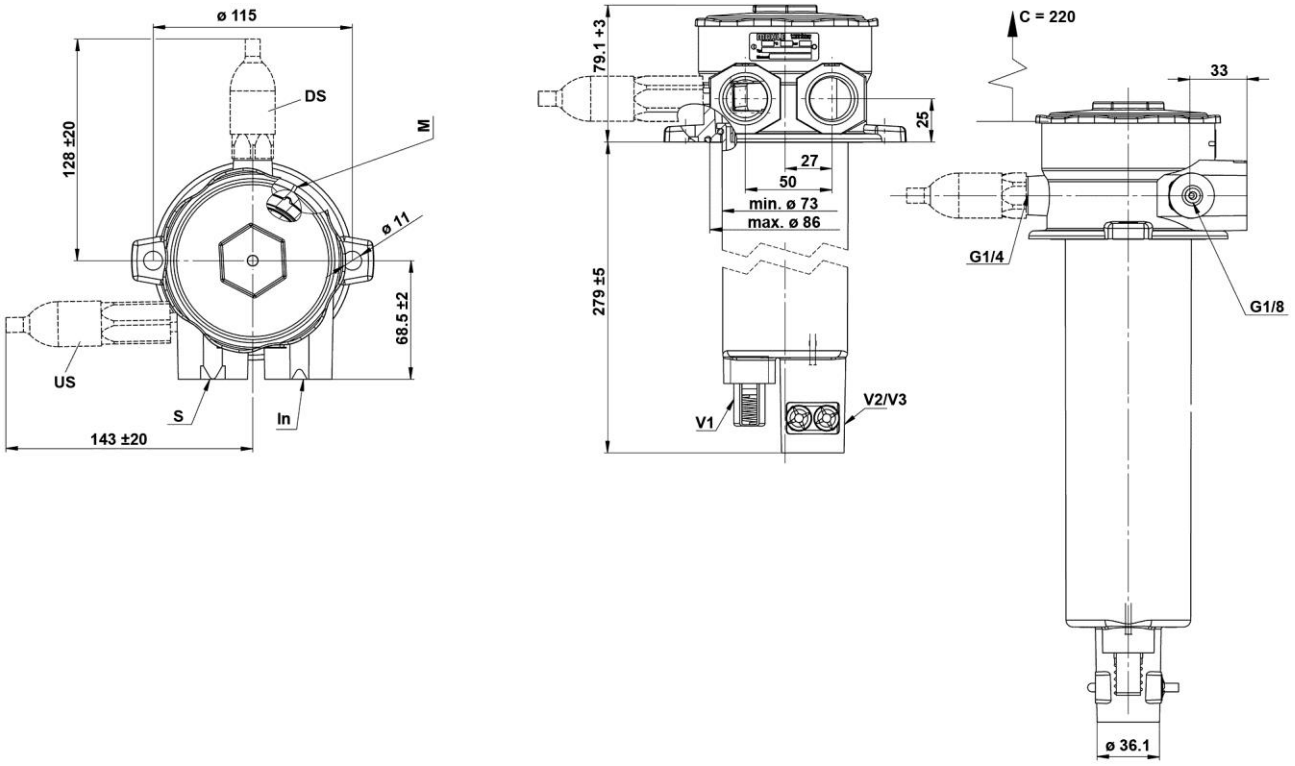
The maintenance indicator data sheet contains further details and other maintenance indicator versions.

We draw attention to the fact that all values indicated are average values. Our products are continually being further developed. Values, dimensions and weights can change as a result of this. Our specialist department would be pleased to offer you advice.

We recommend you contact us concerning applications for our filters in areas governed by the EU Directive 94/9 EC (ATEX 95). The standard version can be used for liquids based on mineral oil (corresponding to the fluids in Group 2 of Directive 97/23 EC Article 9). Please contact us if you intend using other media.

Subject to technical alteration without notice.

9. Dimensions



C = dismantling height required 220 mm
DS = pressure switch
US = vacuum switch
In = inlet G1
M = marking for housing installation
S = suction connection G1
V1 = bypass valve
V2 = preloaded valve
V3 = feeding valve

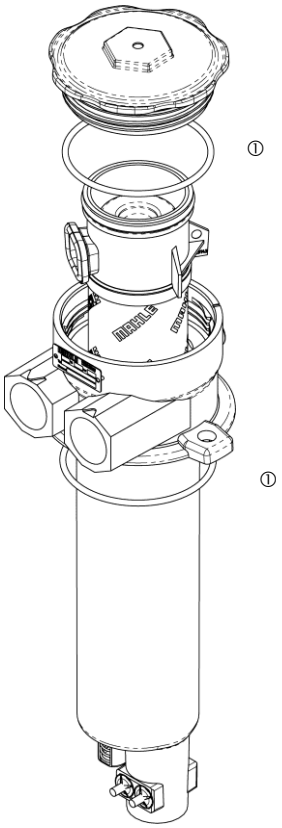
10. Installation, operating and maintenance instructions

10.1 Filter installation
When installing the filter, make sure that
a) sufficient space is available to remove the filter element and the filter housing,
b) the filter mounting hole in the tank top is not excessively large, to ensure proper sealing,
c) the filter is free of tension after installation. Preferably the filter should be installed with the filter housing pointing downwards. In this position the optical dynamic pressure indicator is accessible and visible.

10.2 Connection of the electrical dynamic pressure indicator
The electrical dynamic pressure indicator is connected via a blade terminal 2x6.3x0.8. The electrical vacuum pressure switch is connected via a blade terminal 2x6.3x0.8.

10.3 When must the filter element be replaced?
1. Filters equipped with electrical dynamic pressure indicator: There may be an electrical signal during cold starts. If the electrical signal does not go out at operating temperature, the filter element has to be replaced after the end of the shift.
2. Filters without dynamic pressure indicator: The filter element should be replaced after the trial run or flushing of the system. Afterwards follow the manufacturer's instructions.
3. Always make sure you have original FGC spare elements in stock. Disposable elements (PS and Mic) cannot be cleaned.

10.4 Element replacement
1. Stop the system and relieve the filter from pressure.
2. Unscrew the filter housing by turning counter-clockwise.
3. Pull the filter housing with element upwards and out.
4. Remove the filter element by moving it gently backwards and forwards.
5. Clean the filter housing with a suitable medium.
6. Check the O-rings on the filter cover and the filter housing for damage. Replace these if necessary.
7. Make sure that the order number on the spare element corresponds to the order number on the filter name plate.
8. Remove the filter element from the plastic sleeve and reassemble the filter in reverse order (points 1-4).



11. Spare parts list

Order numbers for spare parts		
Position	**Designation**	**Order number**
①	**Pi 55010**	
	Seal kit for housing	
	NBR	72355714
	Fluororubber	72355715
	EPDM	72355716

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72403143.06/2019

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Filtration Group

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Tank top return-line filter
Pi 5000

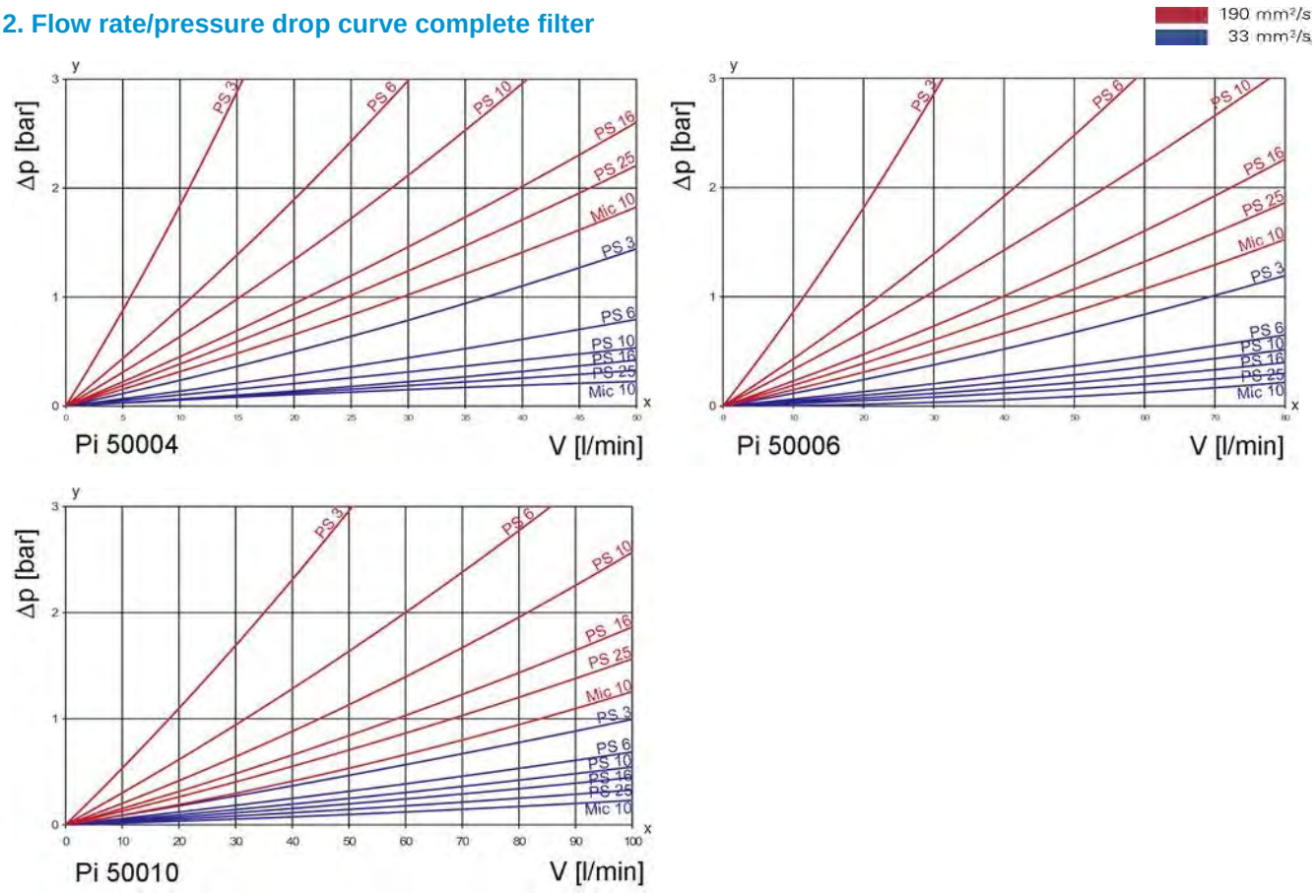
Nominal size 40 up to 100
according to DIN 24550

1. Features

High performance filters for modern hydraulic system

- Provided for tank top installation
- Modular system
- Compact design
- Minimal pressure drop through optimal flow design
- Visual/electrical/electronic maintenance indicator
- Threaded connections
- Quality filters, easy to service
- Equipped with highly efficient Mic or PS filter elements
- Beta rated elements according to ISO 16889 multipass test
- Elements with high differential pressure stability and dirt holding capacity
- NPT- and SAE-connections on request
- Worldwide distribution

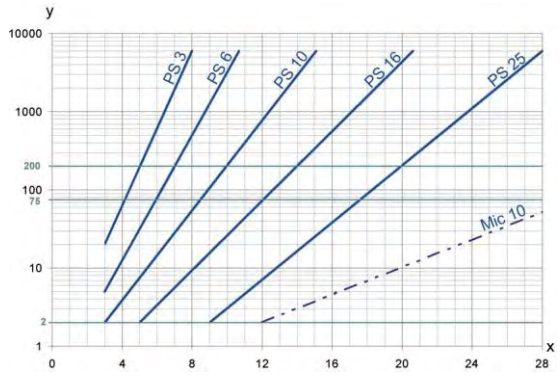
2. Flow rate/pressure drop curve complete filter



y = differential pressure Δ p [bar]

x = flow rate V [l/min]

3. Separation grade characteristics



y = beta-value
x = particle size [µm]

determined by multipass tests (ISO 16889)
calibration according to ISO 11171 (NIST)

4. Filter performance data

tested according to ISO 16889 (multipass test)

PS elements with
max. Δ p 10 bar

PS	3	β_3	≥200
PS	6	β_6	≥200
PS	10	β_{10}	≥200
PS	16	β_{16}	≥200
PS	25	β_{25}	≥200

values guaranteed up to
10 bar differential pressure

5. Quality assurance

Filtration Group filters and filter elements are produced according to the following international standards:

Norm	Designation
DIN ISO 2 941	Hydraulic fluid power filter elements; verification of collapse/burst resistance
DIN ISO 2 942	Hydraulic fluid power filter elements; verification of fabrication integrity
DIN ISO 2 943	Hydraulic fluid power filter elements; verification of material compatibility with fluids
DIN ISO 3 723	Hydraulic fluid power filter elements; method for end load test
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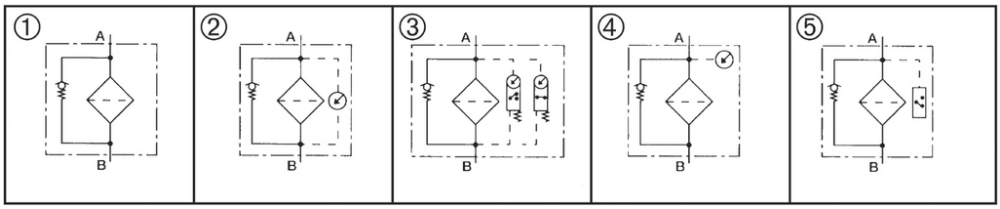
ISO 3 968	Hydraulic fluid power-filters-evaluation of pressure drop versus flow characteristics
ISO 10 771.1	Fatigue pressure testing of metal containing envelopes in hydraulic fluid applications
ISO 16 889	Hydraulic fluid power filters-multi-passmethod for evaluation filtration performance of a filter element

6. Symbols



7. Order numbers

Example for ordering filters:

1. Filter housing	2. Filter element
Housing design = Bypass valve 3.5 bar Pressure switch normally closed (DSS) Type: Pi 50006-050 = NG 63	Type: Pi 25006 RN = PS 25

7.1 Housing design*

Nominal size NG [l/min]	Housing code	① with bypass valve 3.5 bar	② with visual indicator 2.2 bar	③ with electr. indicator 2.2 bar	④ with pressure gauge (DM)	⑤ with pressure switch normally closed (DSS)	⑤ with pressure switch normally open (DSO)	with breather MIC-element (BE-MIC)	with breather Sm-L-element (BE-SML)	with filling connection (BA)	with anti spillage sleeve
50004 50006 50010	- 056	■									
	- 057	■	■								
	- 058	■	■	■							
	- 059	■			■						
	- 050	■									
	- 052	■					■				
	- 076	■	■					■			■
	- 077	■	■						■		■
	- 078	■	■	■				■			■
	- 079	■	■	■					■		■
	- 080	■			■			■			■
	- 081	■			■				■		■
	- 082	■				■		■			■
	- 083	■				■			■		■
	- 084	■					■	■			■
	- 085	■					■		■		■
	- 086	■			■			■		■	■
	- 087	■			■				■	■	■
	- 088	■				■		■		■	■
	- 089	■				■			■	■	■
	- 090	■					■	■		■	■
	- 091	■					■		■	■	■

* a wider range of executions is available on request.

7.2 Filter elements*					
Nominal size NG [l/min]	**Order number**	**Type**	**Filter material**	**max. Δ p [bar]**	**Filter surface [cm²]**
40	77925001	Pi 13004 RN Mic 10 NBR	Mic 10	**10**	900
	77962210	Pi 15004 RN Mic 25 NBR	Mic 25		900
	77923998	Pi 21004 RN PS 3 NBR	PS 3		820
	77964034	Pi 22004 RN PS 6 NBR	PS 6		820
	77924004	Pi 23004 RN PS 10 NBR	PS 10		820
	77962244	Pi 24004 RN PS 16 NBR	PS 16		820
	77960206	Pi 25004 RN PS 25 NBR	PS 25		820
63	77925019	Pi 13006 RN Mic 10 NBR	Mic 10	**10**	1585
	77962228	Pi 15006 RN Mic 25 NBR	Mic 25		1585
	77924012	Pi 21006 RN PS 3 NBR	PS 3		1445
	77964042	Pi 22006 RN PS 6 NBR	PS 6		1445
	77924020	Pi 23006 RN PS 10 NBR	PS 10		1445
	77962251	Pi 24006 RN PS 16 NBR	PS 16		1445
	77960214	Pi 25006 RN PS 25 NBR	PS 25		1445
100	77925027	Pi 13010 RN Mic 10 NBR	Mic 10	**10**	2610
	77962236	Pi 15010 RN Mic 10 NBR	Mic 25		2610
	77924038	Pi 21010 RN PS 3 NBR	PS 3		2380
	77940844	Pi 22010 RN PS 6 NBR	PS 6		2380
	77924046	Pi 23010 RN PS 10 NBR	PS 10		2380
	77962269	Pi 24010 RN PS 16 NBR	PS 16		2380
	77960222	Pi 25010 RN PS 25 NBR	PS 25		2380

* a wider range of element types is available on request

8. Technical specifications

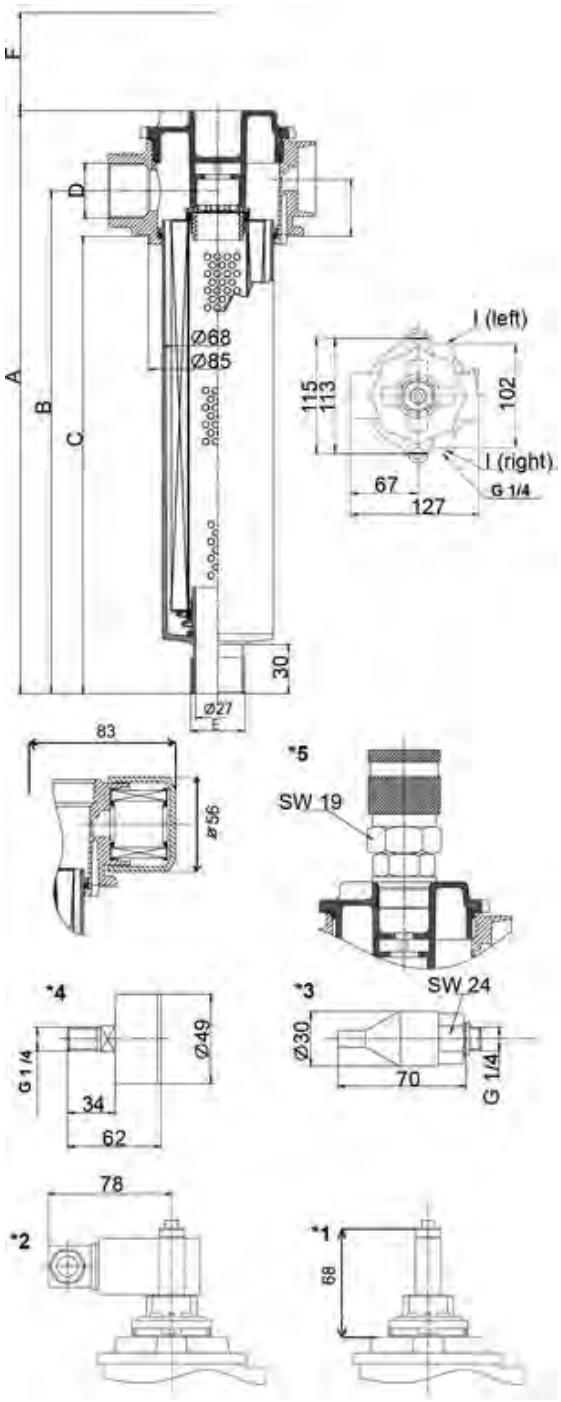
Design:	tank top installation
Nominal pressure:	10 bar (140 psi)
Test pressure:	13 bar (180 psi)
Temperature range:	-10 °C to +80 °C
	(other temperature ranges on request)
Bypass setting:	3.5 bar ± 10%
Filter head material:	GD Al
Filter housing material:	plastic
Sealing material:	plastic
Maintenance indicator setting	2.2 bar ± 10 %
PiS 3084/85:	
Electrical data of maintenance indicator:	
Max. voltage:	250 V AC/200 V DC
Max. current:	1 A
Contact load:	70 W
Type of protection:	IP 65 in inserted and secured status
Contact:	normally open/closed
Cable sleave:	M20x1.5

The switching function can be changed by turning the electric upper part by 180° (normally closed contact or normally open contact). The state on delivery is a normally closed contact. By inductivity in the direct current circuit the use of suitable protection circuit should be considered. Further maintenance indicator details and designs are available in the maintenance indicator data sheet.

We draw attention to the fact that all values indicated are average values which do not always occur in specific cases of application. Our products are continually being further developed. Values, dimensions and weights can change as a result of this. Our specialized department will be pleased to offer you advice.

With the inrush current of 70 VA the indicator can trigger small contactors or contactor relays.
Inductivity in the direct current may require the use of a signal suppressor.

Recommended max. flow rate of the filling unit at viscosity of 500 mm²/ s and a degree of filtration 3 µm: NG 40 = 8 l /min, NG 63 = 15 l /min, NG 100 = 25 l /min.



1 = Standard maintenance indicator visual PiS 3084
1 + 2 = Standard maintenance indicator electrical PiS 3085
3 = Pressure switch
4 = Pressure gauge 0 to 6 bar
5 = Quick release coupling for filing

9. Dimensions

All dimensions except "D" in mm.

Type	A	B	C	D*	E DIN 2999	F	Weight [kg]
Pi 50004	208	159	131	G1	G1	100	0.65
Pi 50006	268	219	191	G1	G1	130	0.68
Pi 50010	358	309	281	G1	G1	200	0.74

*NPT- and SAE- connections on request

10. Installation, operating and maintenance instructions

10.1 Filter installation

When installing the filter make sure that:
a) that sufficient space is available to remove filter element and filter housing,
b) the mounting hole in the tank top is not excessively large, to ensure proper sealing,
c) the filter is free of tension after installation
Preferably the filter should be installed with the filter housing pointing downwards. Inthis position the visual pressure indicator is accessible and visible.

10.2 Connecting the electrical pressure indicator

The electrical pressure indicator is connected via a 2-pole appliance plug according to DIN EN 17 5301-803 with poles marked 1 and 2. The electrical section can be inverted to change from normally open position to normally closed position or vice versa.

10.3 When must the filter element be replaced?

1. Filters equipped with visual and/or electrical pressure indicator: During cold starts, the indicator may give a warning signal. Press the button of the visual indicator once again only after operating temperature has been reached. If the red button immediately pops up again and/or the electrical signal has not switched off after reaching operating temperature, the filter element must be replaced after the end of the shift.
2. Filters without pressure indicator:
   The filter element should be replaced after trial run or flushing of the system. Afterward follow instructions of the manufacturer.
3. Please always ensure that you have original MAHLE spare elements in stock: Disposable elements (PS and Mic) cannot be cleaned.

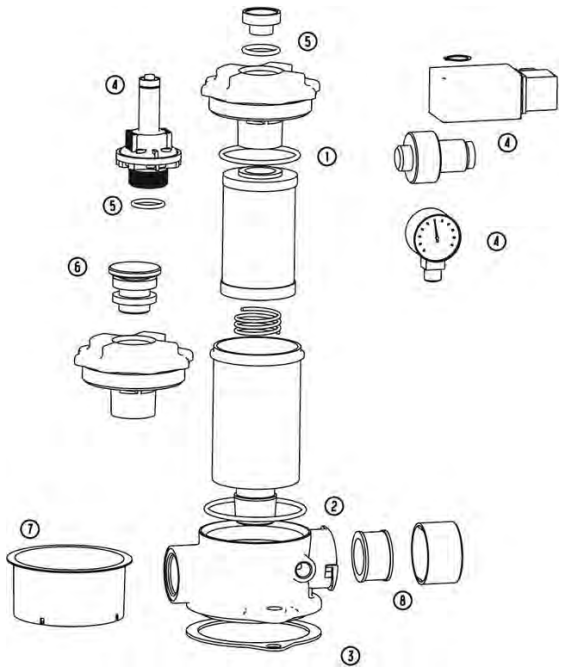
10.4 Element replacement

1. Stop system and relieve filter from pressure.
2. Unscrew cover, turning counter-clockwise.
3. Remove filter housing and filter element by pulling upwards.
4. Remove filter element with a side-to-side motion.
5. Clean the housing using a suitable cleaning solvent.
6. Check O-ring on filter cover and filter housing for damage. Replace, if necessary.
7. Make sure that the order number on the spare element corresponds to the order number of the filter name-plate.
8. Remove filter element from the plastic bag and reassemble filter in reverse order (items 1 to 6).

Subject to technical alteration without prior notice.

11. Spare parts list

Order numbers for spare parts		
Pos.	**Type**	**Order number**
	Pi 50004-50010	
① - ③	Seal kit for housing	
	Without air breather	
	NBR	77999709
	FPM	77999725
	EPDM	77999741
	With air breather	
	NBR	77999717
	FPM	77999733
	EPDM	77999758
④	Maintenance indicator	
	Visual PiS 3084/ 2.2 bar	77737802
	Electrical PiS 3085/ 2.2 bar	77738032
	Electrical upper section only	77536550
	Pressure Gauge	70521417
	Pressure switch normally closed	77845845
	Pressure switch normally open	77870595
⑤	Seal kit for maintenance indicator	
	NBR	77760218
	FPM	77760226
	EPDM	77760234
⑥	Thread connection for filling	77969017
	Quick release coupling	77965130
⑦	Anti spillage sleeve	77927643
⑧	Air breather element	
	Paper 852 514 Mic	77687692
	Glas fibre 852 514 Sm-L	77643562



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Tank top return-line filter
Pi 5000

Nominal size 160 up to 1000
according to DIN 24550

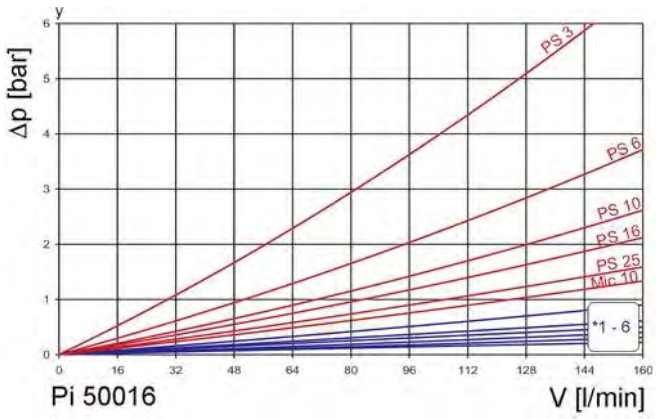
1. Features

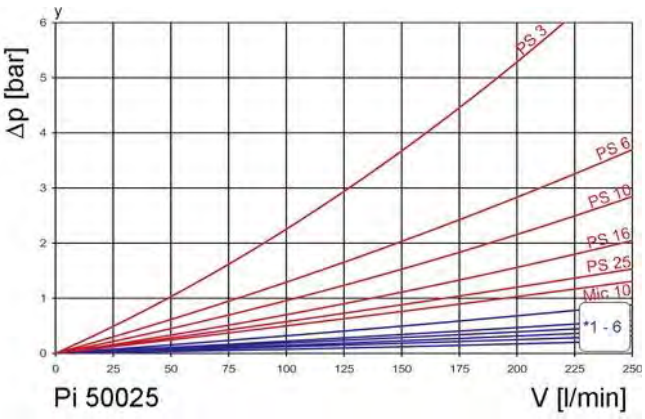
High performance filters for modern hydraulic systems

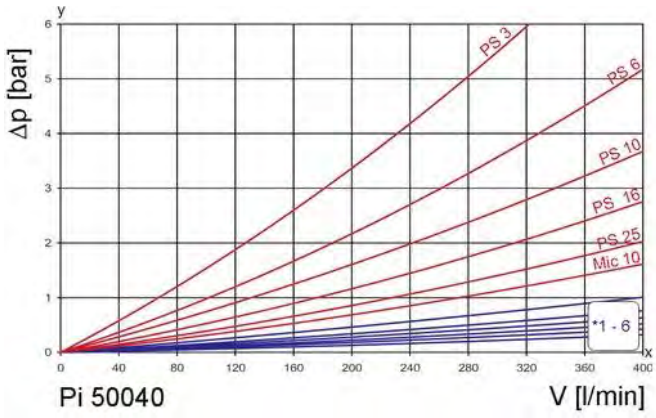
- Provided for tank top installation
- Modular system
- Compact design
- Minimal pressure drop through optimal flow design
- Visual/electrical/electronic maintenance indicator
- Threaded or flanged connections
- Quality filters, easy to service
- Equipped with highly efficient glass fibre PS filter elements
- Beta rated elements according to ISO 16889 multipass test
- Elements with high differential pressure stability and dirt holding capacity
- NPT- and SAE-connections on request
- Worldwide distribution

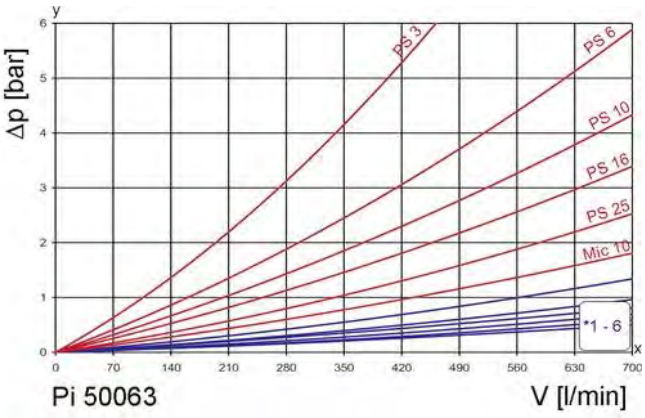
2. Flow rate/pressure drop curve complete filter

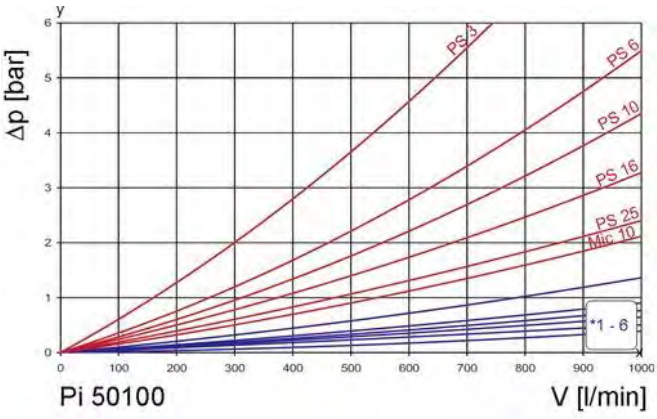
190 mm²/s
33 mm²/s







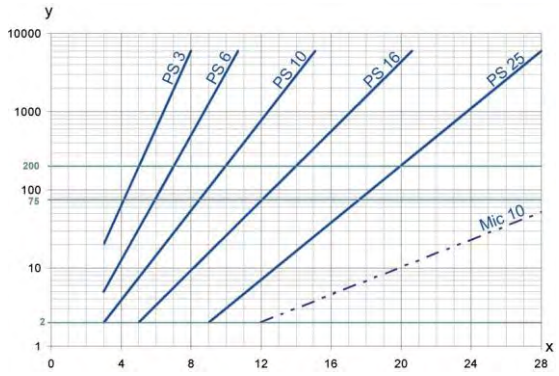




y = differential pressure Δp [bar]
x = flow rate V [l/min]

*1 - 6
1. PS 3
2. PS 6
3. PS 10
4. PS 16
5. PS 25
6. Mic 10

3. Separation grade characteristics



y = beta-value
x = particle size [µm]

determined by multipass tests (ISO 16889)
calibration according to ISO 1171 (NIST)

4. Filter performance data

tested according to ISO 16889 (multipass test)

PS elements with
max. Δ p 10 bar

PS	3	$\beta_{5(C)}$	≥200
PS	6	$\beta_{7(C)}$	≥200
PS	10	$\beta_{10(C)}$	≥200
PS	16	$\beta_{15(C)}$	≥200
PS	25	$\beta_{20(C)}$	≥200

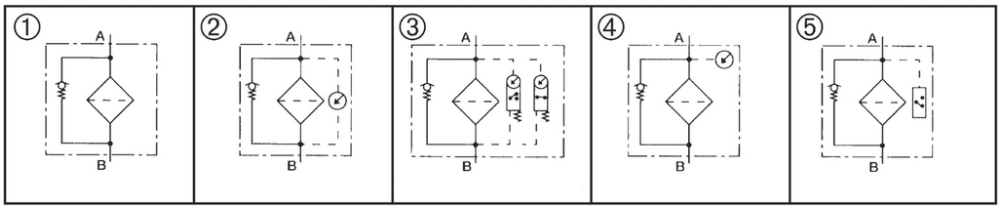
values guaranteed up to
10 bar differential pressure

5. Quality assurance

Filtration Group filters and filter elements are produced according to the following international standards:

Norm	Designation
DIN ISO 2941	Hydraulic fluid power filter elements; verification of collapse/burst resistance
DIN ISO 2942	Hydraulic fluid power filter elements; verification of fabrication integrity
DIN ISO 2943	Hydraulic fluid power filter elements; verification material compatibility with fluids
DIN ISO 3723	Fluidtechnik-Hydraulik Filterelemente; method for end load test
DIN ISO 3724	Hydraulic fluid power filter elements; verification of flow fatigue characteristics
ISO 3968	Hydraulic fluid power filters; evaluation of pressure drop versus flow characteristics
ISO 10771.1	Fatigue pressure testing of metal containing envelopes in hydraulic fluid applications
ISO 16889	Hydraulic fluid power filters; multipass method for evaluation filtration performance of a filter element

6. Symbols



7. Order numbers

Example for ordering filters:

1. Housing design	2. Filter element
Bypass valve 3.5 bar, Connection execution 2 = DN 38 Type: Pi 50016-056/NG 160	PS 25 NBR Type: Pi 2516 RN

7.1 Housing design* Pi 50016- Pi 50025 - Pi 50040 - Pi 50063 - Pi 50100-

Nominal size NG [l/min]	Hous-ing code	① with bypass valve 3.5 bar	① with indicator cavity	② with visual main-tenance indicator 2.2 bar	③ with electrical main-tenance indicator 2.2 bar	④ with pressure gauge (DM)	⑤ with pressure switch normally open (DSS)	⑤ with pressure switch normally closed (DSO)	with filling connection (BA)
160 250 400 630 1000	- 047	■	■						
	- 056	■							
	- 057	■		■					
	- 058	■			■				
	- 059	■				■			
	- 050	■					■		
	- 052	■						■	
	- 092	■							■
	- 093	■		■					■
	- 094	■		■	■				■
	- 095	■				■			■
	- 096	■					■		■
	- 097	■						■	■

* a wider range of executions is available on request

7.2 Connection executions

Nominal size NG [l/min]	Type	Standard connection according DIN 24550 part 1	/1	/2	/3	/4	/5	/6
160	Pi 50016-...	G1¼	G1½	DN 38				
250	Pi 50025-...	G1½		DN 38	G1¼			
400	Pi 50040-...	DN 51	G1½			G2	DN 64	
630	Pi 50063-...	DN 64	G1½			G2		DN 51
1000	Pi 50100-...	DN 76						

DN 38 = SAE 1½ " DN 51 = SAE 2" DN 64 = SAE 2½" DN 76 = SAE 3" 3000 psi

7.3 Filter elements*					
Nominal size NG [l/min]	**Order number**	**Type**	**Filter material**	**max. Δ p [bar]**	**Filter surface [cm²]**
160	77925035	Pi 13016 RN Mic 10 NBR	Mic 10	**10**	3750
	77924137	Pi 21016 RN PS 3 NBR	PS 3		3750
	77964067	Pi 22016 RN PS 6 NBR	PS 6		3750
	77924145	Pi 23016 RN PS 10 NBR	PS 10		3750
	77963648	Pi 24016 RN PS 16 NBR	PS 16		3750
	77960230	Pi 25016 RN PS 25 NBR	PS 25		3750
250	77925043	Pi 13025 RN Mic 10 NBR	Mic 10	**10**	6050
	77924152	Pi 21025 RN PS 3 NBR	PS 3		6050
	77964075	Pi 22025 RN PS 6 NBR	PS 6		6050
	77924160	Pi 23025 RN PS 10 NBR	PS 10		6050
	77963655	Pi 24025 RN PS 16 NBR	PS 16		6050
	77960248	Pi 25025 RN PS 25 NBR	PS 25		6050
400	77925050	Pi 13040 RN Mic 10 NBR	Mic 10	**10**	9450
	77924178	Pi 21040 RN PS 3 NBR	PS 3		8250
	77964083	Pi 22040 RN PS 6 NBR	PS 6		8250
	77924186	Pi 23040 RN PS 10 NBR	PS 10		8250
	77963663	Pi 24040 RN PS 16 NBR	PS 16		8250
	77960255	Pi 25040 RN PS 25 NBR	PS 25		8250
630	77925068	Pi 13063 RN Mic 10 NBR	Mic 10	**10**	15500
	77924194	Pi 21063 RN PS 3 NBR	PS 3		13515
	77964091	Pi 22063 RN PS 6 NBR	PS 6		13515
	77924202	Pi 23063 RN PS 10 NBR	PS 10		13515
	77963671	Pi 24063 RN PS 16 NBR	PS 16		13515
	77960263	Pi 25063 RN PS 25 NBR	PS 25		13515
1000	77925076	Pi 13100 RN Mic 10 NBR	Mic 10	**10**	18335
	77924210	Pi 21100 RN PS 3 NBR	PS 3		18335
	77964109	Pi 22100 RN PS 6 NBR	PS 6		18335
	77924228	Pi 23100 RN PS 10 NBR	PS 10		18335
	77963689	Pi 24100 RN PS 16 NBR	PS 16		18335
	77960271	Pi 25100 RN PS 25 NBR	PS 25		18335

*a wider range of element types is available on request

8. Technical specifications

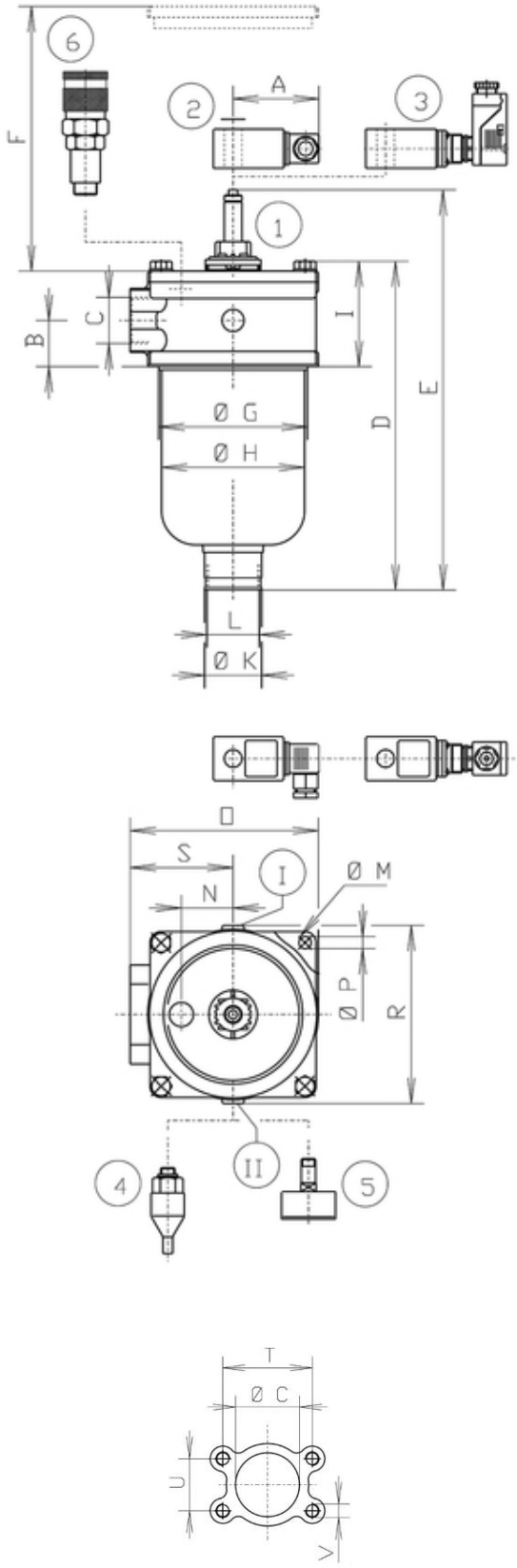
Design:	tank top installation
Nominal pressure:	10 bar (140 psi)
Test pressure:	13 bar (180 psi)
Temperature range:	- 10 °C to +80 °C
	(other temperature ranges on request)
Bypass setting:	Δ p 3.5 bar ± 10 %
Filter head material:	GD Al
Filter housing material:	St.
Filter cover material:	GD Al/G Al
Maintenance indicator setting:	Δ p 2.2 bar ± 10 %
Electrical data of maintenance indicator:	
Maximum voltage:	250 V AC/200 V DC
Maximum current:	1 A
Contact load:	70 W
Type of protection:	IP 65 in inserted and secured status
Contact:	normally open/closed
Cable sleave:	M20x1.5

The switching function can be changed by turning the electric upper part by 180° (normally closed contact or normally open contact). The state on delivery is a normally closed contact. By inductivity in the direct current circuit the use of suitable protection circuit should be considered. Further maintenance indicator details and designs are available in the maintenance indicator data sheet.

We draw attention to the fact that all values indicated are average values and do not always occur in specific cases of application. Our products are continually being further developed. Values, dimensions and weights can change as a result of this. Our specialized department will be pleased to offer you advice.

We recommend you to contact us concerning applications of our filters in areas governed by the EU Directive 94/9 EC (ATEX 95). The standard version can be used for liquids based on mineral oil (corresponding to the fluids in Group 2 of Directive 97/23 EC Article 9). If you consider to use other fluids please contact us for additional support.

Subject to technical alteration without prior notice.



1 = Standard maintenance indicator visual PiS 3084
1 + 2 = Standard maintenance indicator electrical PiS 3085
3 = Further executions see data sheet maintenance indicator
4 = Pressure switch
4 + 5 = Can be mounted at I or II alternatively
5 = Pressure gauge
6 = Coupling for filling

9. Dimensions

All Dimensions except "L" in mm.

Type	A	B	C	D	E	F	G	H	I	K	L	M	N	O	P	R	S	T	U	V	Weight [kg]
Pi 50016 - ...	78	42	see 7.2	298	361	180	135.0	130	96	52	G1½	185	47	171	11	183	93.5	70	35.7	M12	3.2
Pi 50025 - ...	78	42		391	454	270	135.0	130	96	52	G1½	185	47	171	11	183	93.5	70	35.7	M12	3.4
Pi 50040 - ...	78	57		427	489	270	175.5	163	120	70	G2	220	56	216	11	218	110	77.8	42.9	M12	6.4
Pi 50063 - ...	78	57		577	639	420	175.5	163	120	70	G2	220	56	216	11	218	110	89	50.8	M12	6.9
Pi 50100 - ...	78	72		579	639	420	200.0	190	151	-	G3	250	70	257	11	256	135	106	62.0	M16	11.1

10. Installation, operating and maintenance instructions

10.1 Filter installation

When installing the filter make sure that:

a) that sufficient space is available to remove filter element and filter housing,

b) the mounting hole in the tank top is not excessively large, to ensure proper sealing,

c) the filter is free of tension after installation

Preferably the filter should be installed with the filter housing pointing downwards. In this position the maintenance indicator is accessible and visible.

10.2 Connecting the electricalmaintenance indicator

The electrical maintenance indicator is connected via a 2-pole appliance plug according to DIN EN 17 5301-803 with poles marked 1 and 2. The electrical section can be inverted to change from normally open position to normally closed position or vice versa.

10.3 When must the filter element be replaced?

1. Filters equipped with visual and/or electrical maintenance indicator:
   During cold starts, the indicator may give a warning signal. Press the button of the visual indicator once again only after operating temperature has been reached. If the red button immediately pops up again and/or the electrical signal has not switched off after reaching operating temperature, the filter element must be replaced after the end of the shift.
2. Filters without maintenance indicator:
   The filter element should be replaced after trial run or flushing of the system. Afterward folow instructions of the manufacturer.
3. Please always ensure that you have original Filtration Group spare elements in stock: Disposable elements (PS and Mic) cannot be cleaned.

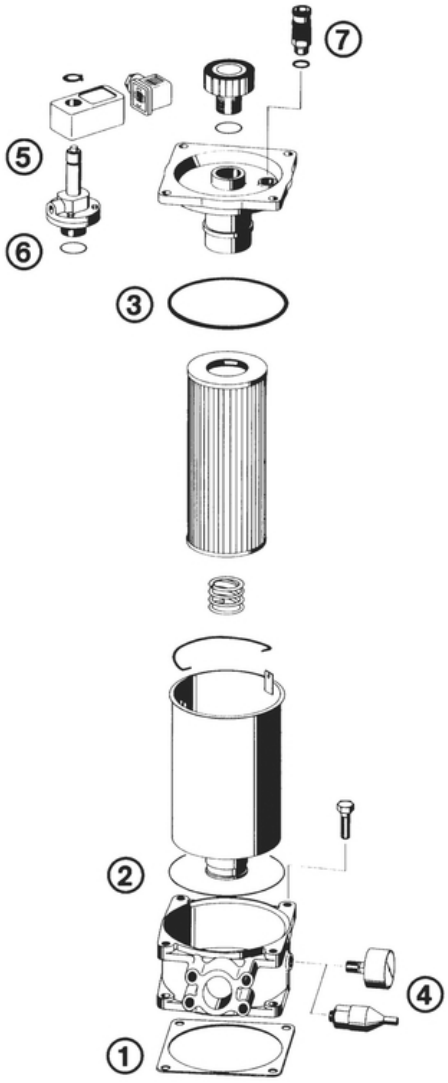
10.4 Element replacement

1. Stop system and relieve filter from pressure.
2. Unscrew cover, turning counter-clockwise.
3. Remove filter housing and filter element by pulling upwards.
4. Remove filter element with a side-to-side motion.
5. Clean the housing using a suitable cleaning solvent.
6. Check O-ring on filter cover and filter housing for damage. Replace, if necessary.
7. Make sure that the order number on the spare element corresponds to the order number of the filter name-plate.
8. Remove filter element from the plastic bag and reassemble filter in reverse order (items 1 to 6).

Subject to technical alteration without prior notice.

11. Spare parts list

Order numbers for spare parts		
Position	**Type**	**Order number**
① to ③	Seal kit for housing	
	NG 160/250	
	NBR	78227902
	FPM	78227910
	EPDM	78227928
	NG 400/630	
	NBR	78227936
	FPM	78227944
	EPDM	78227951
	NG 1000	
	NBR	78227969
	FPM	78227977
	EPDM	78227985
④	Pressure gauge	78381998
	Pressure gauge normally open	77845845
	Pressure gauge normally closed	77870595
⑤	Maintenance indicator	
	Visual PiS 3084/2,2	77737802
	Electrical PiS 3085/2,2	77738032
	Electrical upper section only	77536550
⑥	Seal kit for maintenance indicator + blind plug	
	NBR	78383382
	FPM	78383390
	EPDM	78383408
⑦	Quick-release coupling	77965130



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Duplex-tank top return line filter
Pi 5100

Nominal size 40 up to 1000
according DIN 24550

1. Features

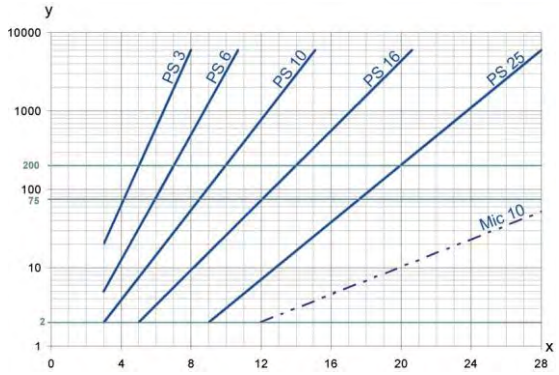
High performance filters for modern hydraulic systems

- Provided for tank top installation
- Modular system
- Compact design
- Minimal pressure drop through optimal flow design
- Visual/electrical/electronic maintenance indicator
- Threaded and flanged connections
- Quality filters, easy to service
- Equipped with highly efficient glass fibre PS filter elements
- Beta rated elements according to ISO 16889 multipass test
- Elements with high differential pressure stability and dirt holding capacity
- Worldwide distribution

2. Flow rate/pressure drop curve complete filter

see data sheet Pi 5000

3. Separation grade characteristics



y = beta-value
x = particle size [µm]

determined by multipass tests (ISO 16889)
calibration according to ISO 1171 (NIST)

4. Filter performance data

tested according to ISO 16889 (multipass test)
PS elements with

max. Δ p 10 bar

PS	3	$\beta_{5(C)}$	≥200
PS	6	$\beta_{7(C)}$	≥200
PS	10	$\beta_{10(C)}$	≥200
PS	16	$\beta_{15(C)}$	≥200
PS	25	$\beta_{20(C)}$	≥200

values guaranteed up to
5 bar differential pressure

5. Quality assurance

Filtration Group filters and filter elements are produced according to the following international standards:

Norm	Designation
DIN ISO 2941	Hydraulic fluid power filter elements; verification of collapse/burst resistance
DIN ISO 2942	Hydraulic fluid power filter elements; verification of fabrication integrity
DIN ISO 2943	Hydraulic fluid power filter elements; verification material compatibility with fluids
DIN ISO 3723	Fluidtechnik-Hydraulik Filterelemente; method for end load test
DIN ISO 3724	Hydraulic fluid power filter elements; verification of flow fatigue characteristics
ISO 3968	Hydraulic fluid power filters; evaluation of pressure drop versus flow characteristics
ISO 10771.1	Fatigue pressure testing of metal containing envelopes in hydraulic fluid applications
ISO 16889	Hydraulic fluid power filters; multipass method for evaluation filtration performance of a filter element

6. Symbols

see data sheet Pi 5000

7. Order numbers

7.1 Housing design						
Nominal size NG [l/min]	Order number	Type	① with bypass 3.5 bar and indicator cavity	② with bypass 3.5 bar and visual indicator 2.2 bar	③ with bypass 3.5 bar and electrical indicator 2.2 bar	with electrical indicator (2 setting points, 3 LED)
40	78337438	Pi 51004-047	■			
	78275729	Pi 51004-057		■		
	78275737	Pi 51004-058			■	
	78278202	Pi 51004-058/PiS 3103				■
63	78337446	Pi 51006-047	■			
	78275513	Pi 51006-057		■		
	78275307	Pi 51006-058			■	
	78337453	Pi 51006-058/PiS 3103				■
100	77994320	Pi 51010-047	■			
	78274110	Pi 51010-057		■		
	77993306	Pi 51010-058			■	
	78337461	Pi 51010-058/PiS 3103				■
160	78276453	Pi 51016-047	■			
	78337479	Pi 51016-057		■		
	78276644	Pi 51016-058			■	
	78267775	Pi 51016-058/PiS 3103				■
250	78276479	Pi 51025-047	■			
	78336323	Pi 51025-057		■		
	78316044	Pi 51025-058			■	
	78276420	Pi 51025-058/PiS 3103				■
400	78276487	Pi 51040-047	■			
	78337495	Pi 51040-057		■		
	78337503	Pi 51040-058			■	
	78337511	Pi 51040-058/PiS 3103				■
630	78276495	Pi 51063-047/6	■			
	78336844	Pi 51063-057/6		■		
	78336547	Pi 51063-058/6			■	
	78337529	Pi 51063-058/6/PiS 3103				■
1000	78337537	Pi 51100-047	■			
	78337545	Pi 51100-057		■		
	78337420	Pi 51100-058			■	
	78337552	Pi 51100-0/PiS 3103				■

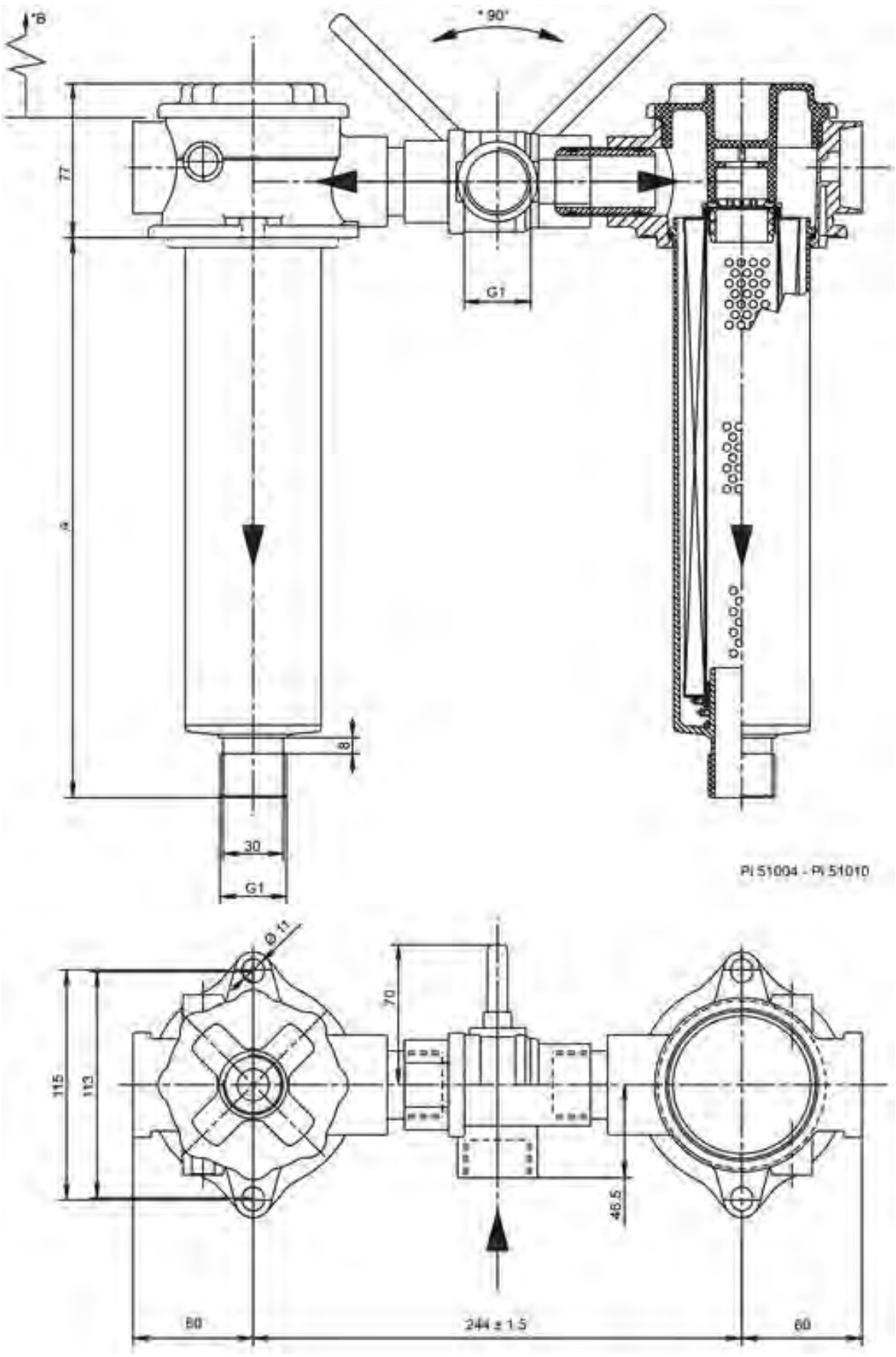
When filter with non bypass configuration is selected, the collapse pressure of the element must not be exceeded.

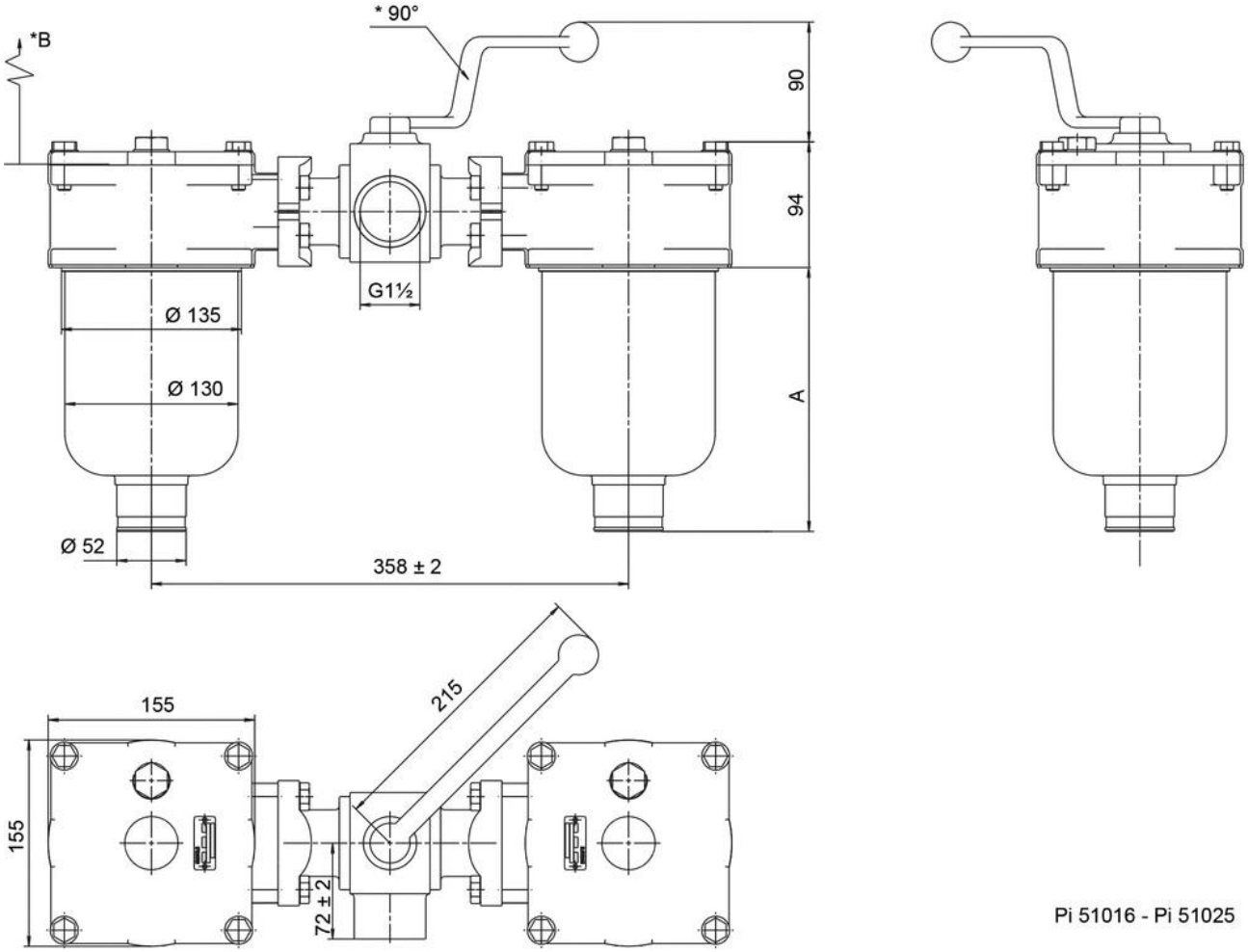
7.2 Filter elements
see data sheet Pi 5000

8. Technical specifications

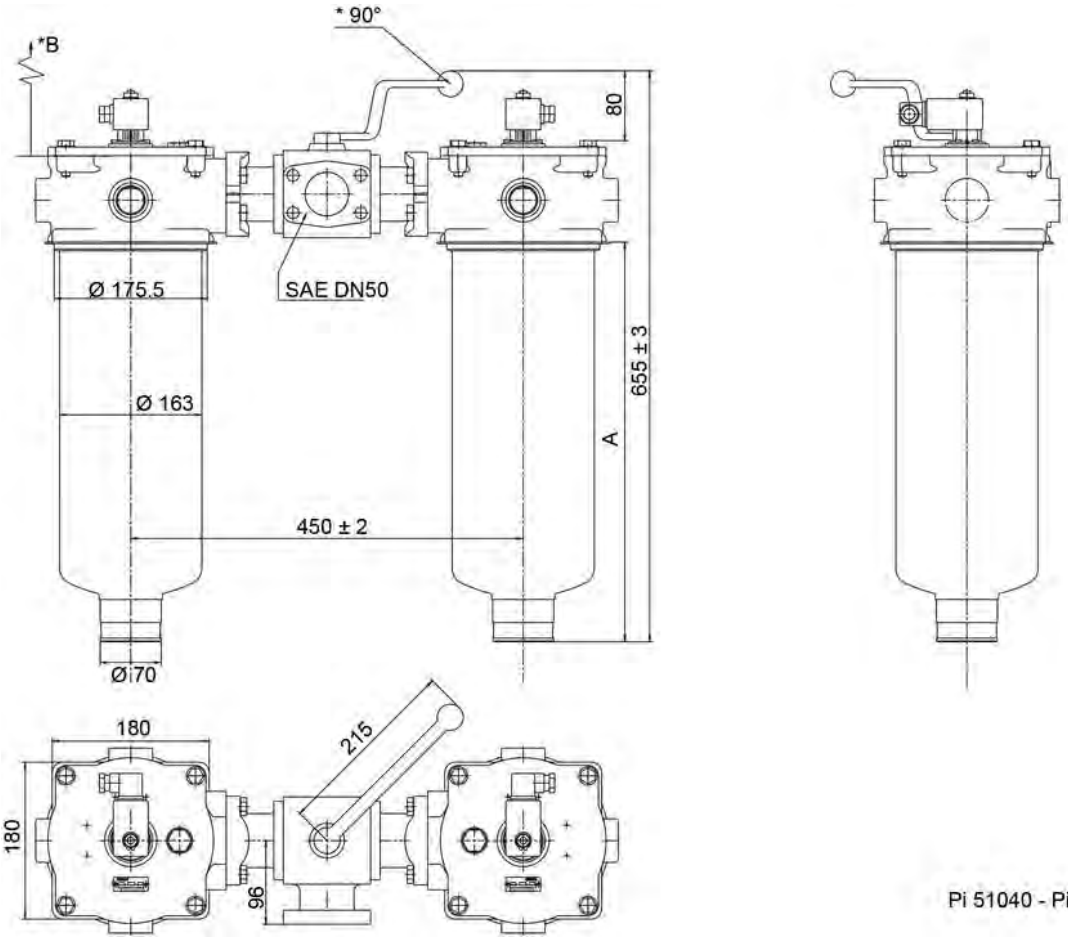
see data sheet Pi 5000

9. Dimensions

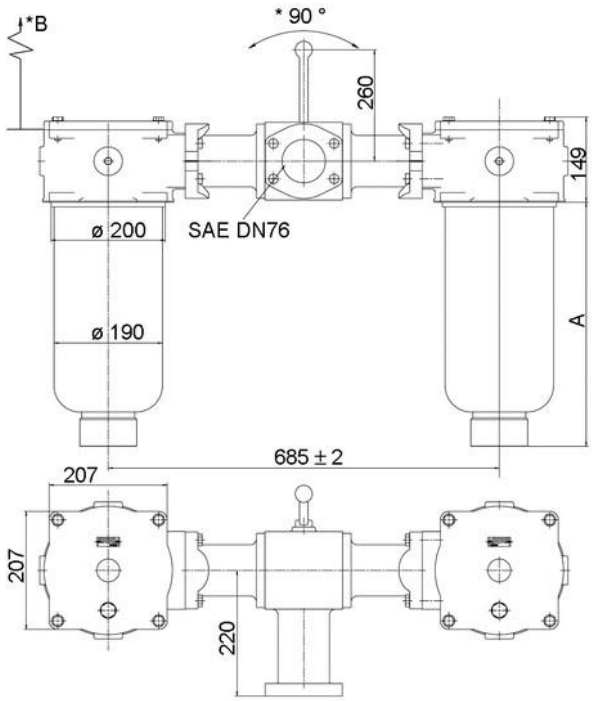




Pi 51016 - Pi 51025



Pi 51040 - Pi 51063



Pi 51100

*B= Minimum clearance for filter element removal

* 90°= Pivoting range

Type	A	B
Pi 51004	130	150
Pi 51006	190	210
Pi 51010	280	300
Pi 51016	207	220
Pi 51025	297	310
Pi 51040	309	480
Pi 51063	459	480
Pi 51100	427	450

10. Installation, operating and maintenance instructions

see data sheet Pi 5000

11. Spare parts list

see data sheet Pi 5000

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Filtration Group

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Low Pressure Filter
Spin-on Cartridges HC/OC

Nominal pressure 10/16/25 bar (140/230/360 psi), nominal size up to 160

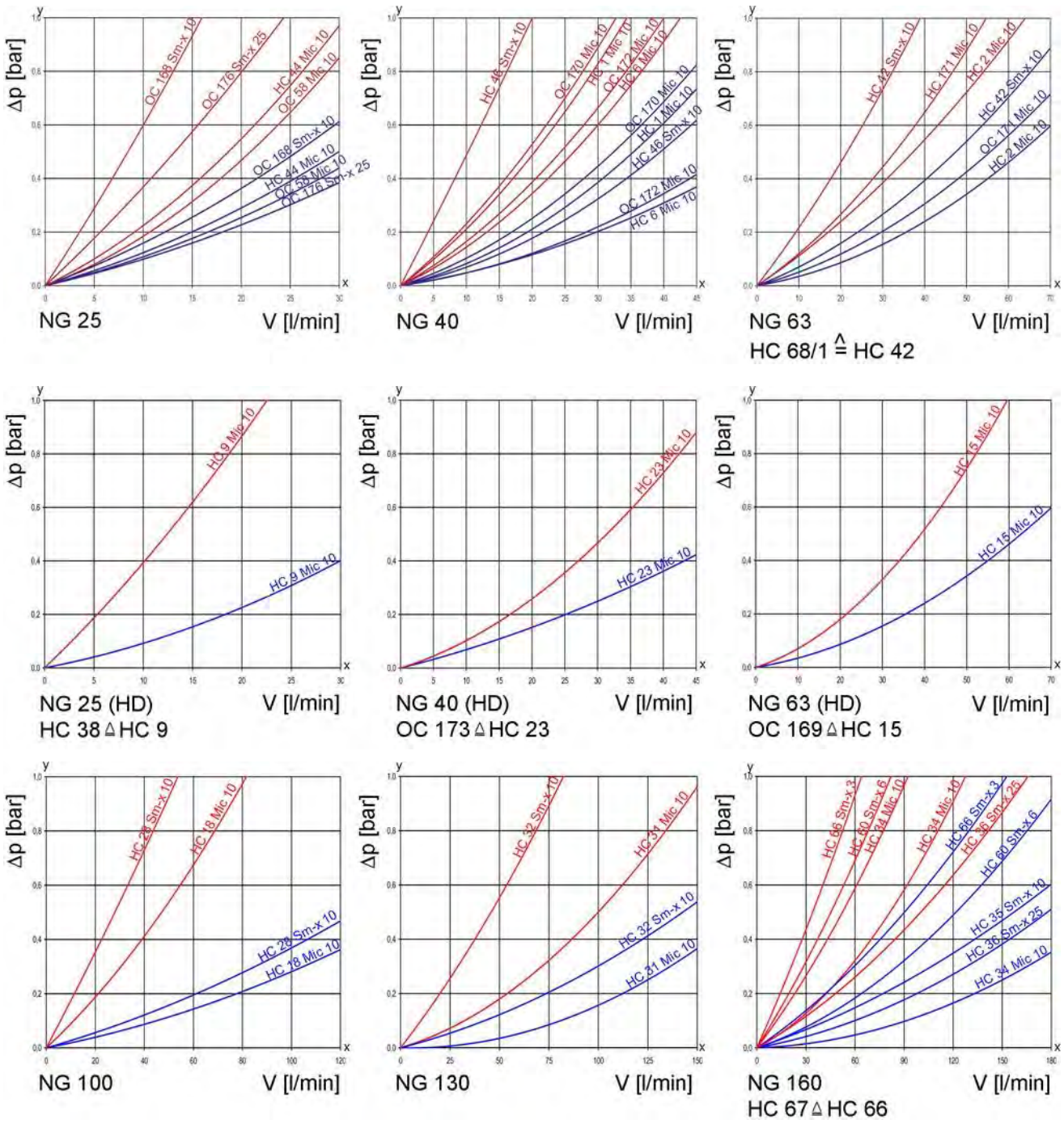
1. Features

High performance filters for modern hydraulic systems

- Modular design
- Compact design
- Minimal pressure drop through optimal flow design
- Quality filters, easy to service
- Equipped with highly efficient Mic or Sm-x filter elements
- Beta rated elements according to ISO 16889 multipass test
- Elements with high differential pressure stability and dirt holding capacity
- Worldwide distribution

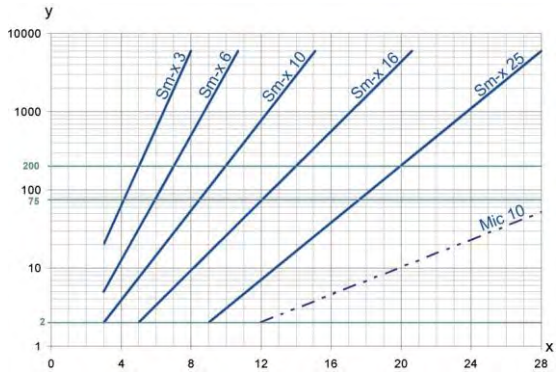
2. Flow rate/pressure drop curve complete filter

190 mm²/s
33 mm²/s



y = differential pressure Δp [bar]
x = flow rate V [l/min]

3. Separation grade characteristics



y = beta-value
x = particle-size [µm]
determined by multipass tests (ISO 16889)

calibration according to ISO 11171 (NIST)

4. Filter performance data

measured according to ISO 16889 (multipass test)

Sm-x elements with max. Δ p 5 bar

Sm-x	3	$\beta_{5(C)}$	≥	200
Sm-x	6	$\beta_{7(C)}$	≥	200
Sm-x	10	$\beta_{10(C)}$	≥	200
Sm-x	25	$\beta_{20(C)}$	≥	200

values guaranteed up to 5 bar differential pressure

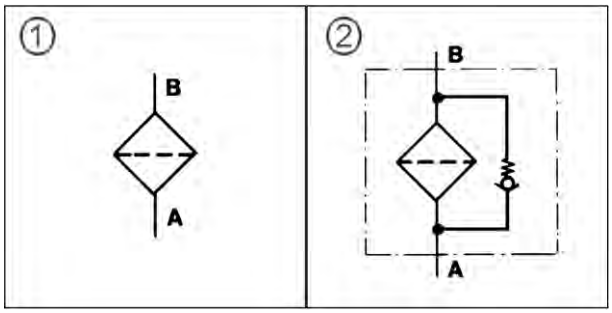
Subject to technical alteration without prior notice.

5. Quality assurance

Filtration Group filters and filter elements are produced according to the following international standards:

Norm	Designation
DIN ISO 2941	Hydraulic fluid power; filter elements; verification of collapse/burst resistance
DIN ISO 2942	Hydraulic fluid power; filter elements; verification of fabrication integrity
DIN ISO 2943	Hydraulic fluid power; filter elements; verification of material compatibility with fluids
DIN ISO 3723	Hydraulic fluid power; filter elements; method for end load test
DIN ISO 3724	Hydraulic fluid power; filter elements; verification of flow fatigue characteristics
ISO 3968	Hydraulic fluid power filters; evaluation of pressure drop versus flow characteristics
ISO 10771.1	Fatigue pressure testing of metal containing envelopes in hydraulic fluid applications
ISO 16889	Hydraulic fluid power filters; multipass method for evaluation filtration performance of a filter element

6. Symbols



1. without bypass
2. with bypass

7. Order numbers

7.1 Housing design							
Nominal size NG [l/min]	**Order number**	**Type**	**Nominal pressure [bar]**	**Filter material**	**Filter surface [cm²]**	**Bypass valve [bar]**	**Check valve**
25	77785983	OC 58	**10**	Mic 10	1775		
	77500184	OC 168		Sm-x 10	1309		
	77500341	HC 44		Mic 10	1775	2.5	x
40	77640899	HC 1		Mic 10	3000		
	77844780	OC 170		Mic 10	3000	2.5	x
	77501273	HC 6		Mic 10	3000		
	77501232	HC 46		Sm-x 10	2075		
	71348143	OC 172		Mic 10	3000	2.5	x
63	72013241	HC 2		Mic 10	5440		
	77501372	HC 42		Sm-x 10	3360		
	72013027	OC 171		Mic 10	5440	2.5	x
100	77643331	HC 18		Mic 10	7000		
	77643398	HC 28		Sm-x 10	3400		
	77727183	HC 4		Mic 10	7260		
130	77500077	HC 31		Mic 10	9755		
	77500051	HC 32		Sm-x 10	5400		
160	77504194	HC 34	**16**	Mic 10	14025		
	78714750	HC 66		Sm-x 3	7638		
	77478829	HC 60		Sm-x 6	7638		
	77643844	HC 35		Sm-x 10	7638		
	77643851	HC 36		Sm-x 25	7638		
	78714768	HC 67	**10**	Sm-x 3	7638		
25	77373020	HC 9	**25**	Mic 10	2050	3.5	
	77503964	HC 38		Mic 10	2050		
40	77803257	OC 173		Mic 10	4100	2.5	
	77502180	HC 23		Mic 10	4100		
63	77502511	OC 169		Mic 10	5440	2.5	
	77502628	HC 15		Mic 10	5440		
	78787921	HC 68/1		Sm-x 3	3360		

8. Technical specifications

Nominal pressure:	10/16/25 bar (140/230/360 psi)
Temperature range:	- 10 °C to + 120 °C
Housing material:	steel
Sealing material:	perbunan
Opening pressure check valve:	≤ 0.12 bar
Installation:	preferably vertical
Collapse pressure of element:	$\Delta p \geq 5$ bar (70 psi)
Long time rupture strength:	min. 10^5 load alterations at nominal pressure

Spin-on cartridges are resistant against mineral oil.

We draw attention to the fact that all values indicated are average values which do not always occur in specific cases of application. Our products are continually being further developed. Values, dimensions and weights can change as a result of this. Our specialized department would be pleased to offer you advice.

We recommend to contact us concerning applications of our filters in areas governed by the EU directive 94/9 EG (ATEX 95). The standard version can be used for liquids based on mineral oil (corresponding to the fluids in Group 2 of Directive 97/23 EG Article 9). If you consider to use other fluids please contact us for additional support.

Subject to technical alteration without prior notice.

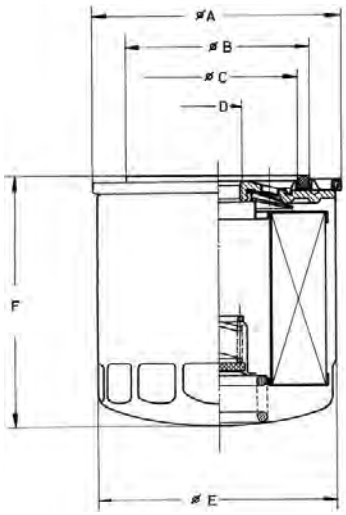


Figure shows spin-on cartridge with relief valve and check valve (optional).

9. Dimensions

All dimensions except "D" in mm.

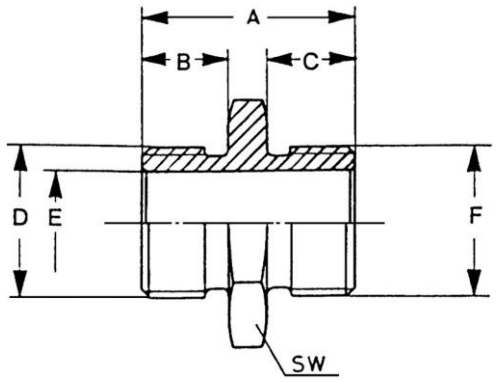
Type	Ø A	Ø B	Ø C	D	Ø E	F	Weight [kg]
OC 58	80	72	62	¾" 16 UNF 2B	76	120	0.40
OC 168	80	72	62	¾" 16 UNF 2B	76	120	0.55
HC 44	80	72	62	¾" 16 UNF 2B	76	120	0.40
HC 1	95	72	62	¾" 16 UNF 2B	93	141	0.55
OC 170	95	72	62	¾" 16 UNF 2B	93	141	0.55
HC 6	95	72	62	1" 12 UNF 2B	93	141	0.55
HC 46	95	72	62	1" 12 UNF 2B	93	141	0.75
OC 172	95	72	62	1" 12 UNF 2B	93	141	0.55
HC 2	95	72	62	1" 12 UNF 2B	93	210	0.75
HC 42	95	72	62	1" 12 UNF 2B	93	210	0.75
OC 171	95	72	62	1" 12 UNF 2B	93	210	0.75
HC 18	143	111	100	1½" 16 UN 2B	136	172	1.50
HC 28	143	111	100	1½" 16 UN 2B	136	172	1.80
HC 4	143	111	100	G 1¼	136	172	1.50
HC 31	143	111	100	1½" 16 UN 2B	136	240	1.70
HC 32	143	111	100	1½" 16 UN 2B	136	240	2.20
HC 34	143	111	100	1½" 16 UN 2B	136	310	1.95
HC 66	143	111	100	1½" 16 UN 2B	136	310	2.65
HC 60	143	111	100	1½" 16 UN 2B	136	310	2.65
HC 35	143	111	100	1½" 16 UN 2B	136	310	2.65
HC 36	143	111	100	1½" 16 UN 2B	136	310	2.65
HC 67	143	111	100	G 1¼	136	310	2.65
HC 9	80	72	62	¾" 16 UNF 2B	76	140	0.55
HC 38	80	72	62	¾" 16 UNF 2B	76	140	0.55
OC 173	95	72	62	1" 12 UNF 2B	93	180	0.80
HC 23	95	72	62	1" 12 UNF 2B	93	180	0.80
OC 169	95	72	62	1" 12 UNF 2B	93	215	0.90
HC 15	95	72	62	1" 12 UNF 2B	93	215	0.90
HC 68/1	95	72	62	1" 12 UNF 2B	93	215	1.20

10. Accessories

All dimensions except "D" in mm.

	Adapter						
Order number	A	B	C	D	E	SW	F
77802382	32	15	12	¾" 16 UNF 2A	13	27	M18x1.5
77802390	35	15	15	1" 12 UNF 2A	17	27	M24x1.5
77893860	27	15	10	1" 12 UNF 2A	16	27	M22x1.5
77802408	35	15	15	1 ½" 16 UNF 2A	25	41	M38x1.5

The sealing surface for block mounting should be in accordance with ISO 6415.



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Low Pressure Filter
Spin-on Cartridges PX-…-Mic..

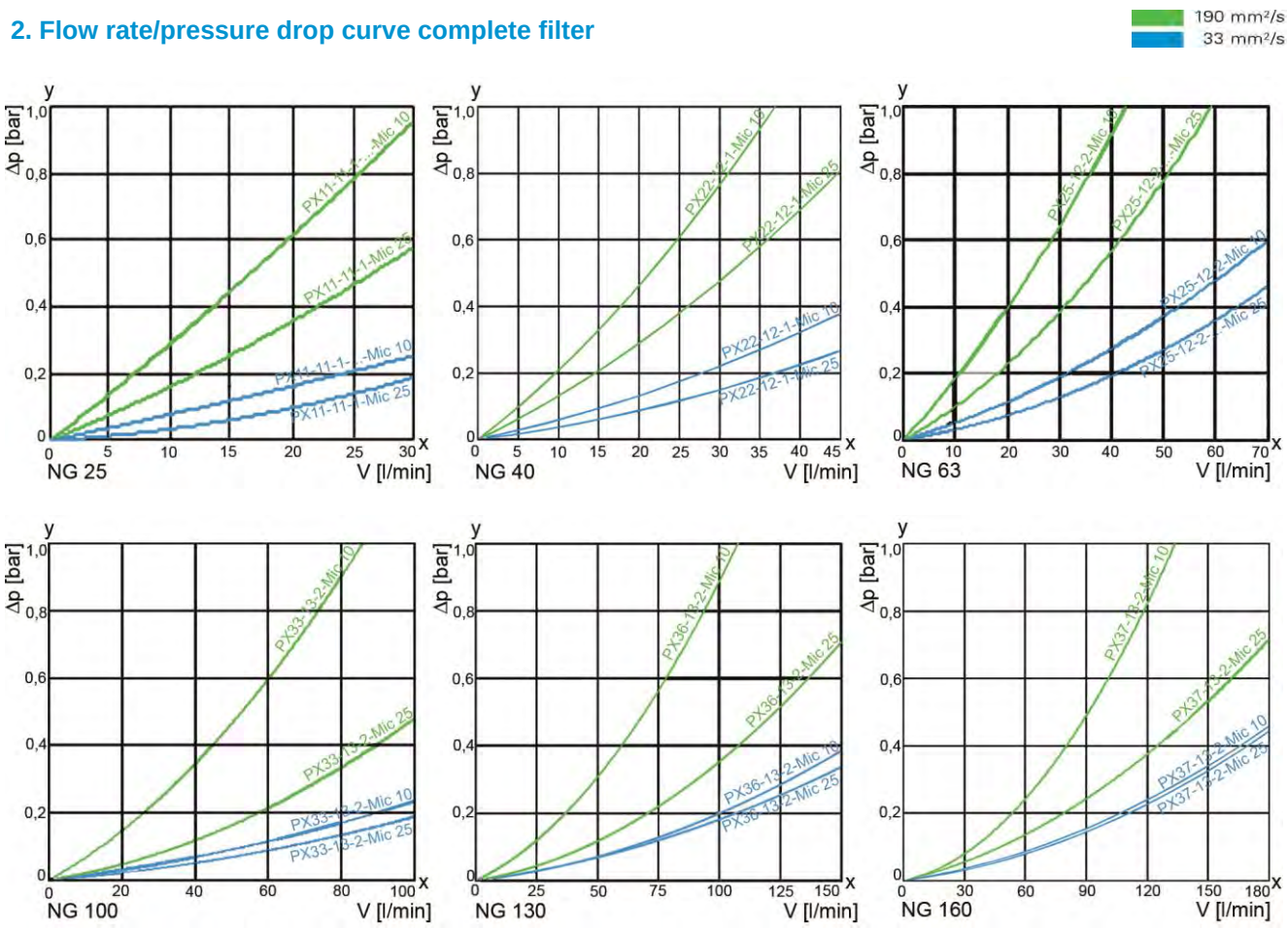
Nominal pressure up to 35 bar (500 psi), nominal size up to 160

1. Features

High performance filters for modern hydraulic systems

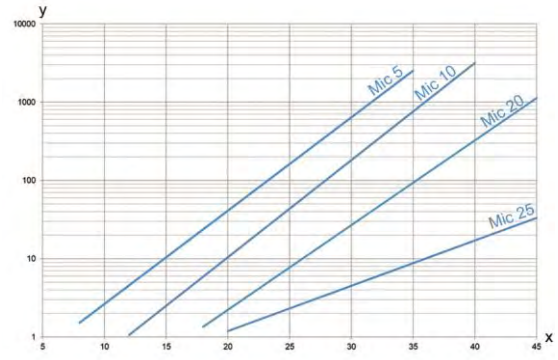
- Compact design
- Minimal pressure drop through optimal flow design
- Quality filters, easy to service
- Customer-specific printing and design on request
- Equipped with highly efficient Mic (cellulose) elements
- Elements with high differential pressure stability and dirt holding capacity
- Worldwide distribution

2. Flow rate/pressure drop curve complete filter



y = differential pressure Δp [bar]
x = flow rate V [l/min]

3. Separation grade characteristics



y = beta-value
x = particle size [µm]

determined by multipass tests (ISO 16889)
calibration according to ISO 11171 (NIST)

4. Quality assurance

Filtration Group filters and filter elements are produced according to the following international standards:

Norm	Designation
DIN ISO 2941	Hydraulic fluid power; filter elements; verification of collapse/burst resistance
DIN ISO 2942	Hydraulic fluid power; filter elements; verification of fabrication integrity
DIN ISO 2943	Hydraulic fluid power; filter elements; verification of material compatibility with fluids
DIN ISO 3723	Fluidtechnik-Hydraulik Filterelemente, Verfahren zur Prüfung der Endscheibenbelastung
DIN ISO 3724	Fluidtechnik-Filterelemente, Nachweis der Durchfluss-Ermüdungseigenschaften
ISO 3968	Hydraulic fluid power-filters-evaluation of pressure drop versus flow characteristics
ISO 10771.1	Fatigue pressure testing of metal containing envelopes in hydraulic fluid applications
ISO 16889	Hydraulic fluid power filters; multipass method for evaluation filtration performance of a filter element

5. Type number key and order numbers

5.1 Type number key

Type	Housing diameter*	Hight*	Deckscheibenform	Connection thread	Nominal pressure*	Option 1	Option 2	Filter material	Mic**	Fineness	
PX											Spin-on cartridge
	1										≤ 82 mm
	2										90 - 120 mm
	3										≥ 135 mm
		0									< 120 mm
		1									120 - 130 mm
		2									135 - 150 mm
		3									170 - 175 mm
		4									178 - 190 mm
		5									205 - 220 mm
		6									240 mm
		7									310 mm
			1								Standard
				0							Special*
				1							¾“ 16UNF-2B
				2							1“ 12UNF-2B
				3							1½“ 16UNF-2B
				4							G1¼“
				5							M39x1,5
				6							M42x2
					1						10 - 14 bar
					2						16 - 18 bar
					3						20 - 25 bar
					4						> 25 bar
						Vx.x					Bypass valve with x.x bar
							R				Back stop
							RC				Back stop clean side
							RD				Back stop dirt side
								-Mic			
									1	1 µm	
									3	3 µm	
									5	5 µm	
									6	6 µm	
									10	10 µm	
									15	15 µm	
									16	16 µm	
									25	25 µm	
									30	30 µm	
PX	**3**	**7-**	**1**	**3-**	**2-**			**-Mic**	**10**		Order example

5.2 Housings**											
Nominal size NG [l/min]*	**Order number**	**Type**	**Nom. press. [bar]**	**Filter fine-ness***	A [Inch]	H ±1 [mm]	D1 ±0.5 [mm]	D2 ±0.5 [mm]	D3 ±0.5 [mm]	Bypass-valve [bar]	Back stop*
25	72456726	PX11-11-1-MIC10	10	Mic10	¾"-16UNF-2B	118	76	62	72	-	-
	72456679	PX11-11-1-V2.5-RD-MIC10	14			118	76	62	72	2.5 ± 0.5	D
	72456709	PX12-11-3-MIC10	25			138	76	62	72	-	-
	72456678	PX12-11-4-V3.5-MIC10	35			137	76	63	72	2.5 ± 0.5	-
	72456729	PX11-11-1-MIC25	10	Mic25		118	76	62	72	-	-
	72457059	PX10-11-1-MIC25	14			78.5	76	62	72	-	-
40	72463892	PX22-12-1-MIC10/N	10	Mic10	1"-12UNF-2B	139.5	93	62	72	-	-
	72456721	PX22-11-1-V2.5-RD-MIC10	14		¾"-16UNF-2B	139.5	93	62	72	2.5 ± 0.5	D
	72456725	PX22-12-1-V2,5-RD-MIC10			1"-12UNF-2B	139.5	93	62	72	2.5 ± 0.5	D
	72456713	PX22-11-2-MIC10	16		¾"-16UNF-2B	139.5	93	62	72	-	-
	72456704	PX24-12-3-MIC10	25		1"-12UNF-2B	178.5	93	62	72	-	-
	72456731	PX24-12-3-V2.5-MIC10			1"-12UNF-2B	178.5	93	62	72	2.5 ± 0.5	-
	72456714	PX22-12-1-MIC25	10	Mic25	1"-12UNF-2B	139.5	93	62	72	-	-
	72456712	PX22-11-3-V2.5-MIC25	25		¾"-16UNF-2B	142.5	93	62	72	2.5 ± 0.5	-
63	72456723	PX25-12-2-V2.5-RD-MIC10	16	Mic10	1"-12UNF-2B	207.5	93	62	72	2.5 ± 0.5	D
	72456681	PX25-12-2-MIC10			1"-12UNF-2B	207.5	93	62	72	-	-
	72456706	PX25-12-3-MIC10	25		1"-12UNF-2B	212.5	93	62	72	-	-
	72456722	PX25-12-3-V2.5-MIC10			1"-12UNF-2B	212.5	93	62	72	2.5 ± 0.5	-
	72456711	PX25-12-1-MIC25	10	Mic25	1"-12UNF-2B	207.5	93	62	72	-	-
	72456730	PX25-12-2-V2.5-RD-MIC25	16		1"-12UNF-2B	207.5	93	62	72	2.5 ± 0.5	D
100	70541528	PX33-14-1-MIC10	10	Mic10	G1 1/4"	172	136	100	111	-	-
	70541525	PX33-13-2-MIC10	16		1 1/2"-16UN-2B	172	136	100	111	-	-
	70541527	PX33-13-2-MIC25		Mic25	1 1/2"-16UN-2B	172	136	100	111	-	-
130	70541534	PX36-13-2-MIC10	16	Mic10	1 1/2"-16UN-2B	240	136	100	111	-	-
	70541535	PX36-13-2-MIC25		Mic25	1 1/2"-16UN-2B	240	136	100	111	-	-
160	70541540	PX37-13-2-MIC10	16	Mic10	1 1/2"-16UN-2B	310	136	100	111	-	-
	70541541	PX37-13-2-MIC25		Mic25	1 1/2"-16UN-2B	310	136	100	111	-	-

* C = clean side/D = dirt side/C+D = both/max. 0.12 bar
** Other versions on request

6. Technical specifications

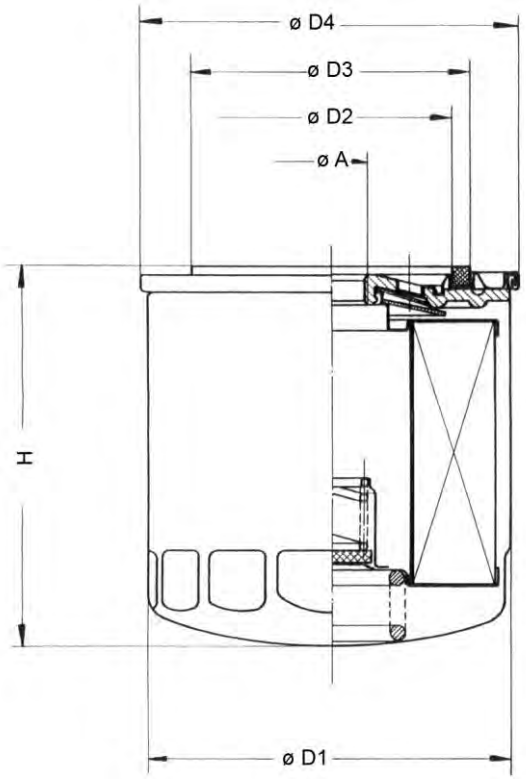
Nominal pressure:	10/14/16/25/32/35 bar
Temperature range:	-10 °C up to +120 °C
Housing material:	Steel
Sealing material:	NBR
Opening pressure back stop	≤ 0.12 bar
Installation:	preferably vertical
Collapse pressure of element:	Δp ≥ 5 bar
Burst pressure:	min. 2x nominal pressure

Spin-on cartridges are resistant against mineral oil.

We draw attention to the fact that all values indicated are average values which do not always occur in specific cases of application. Our products are continually being further developed. Values, dimensions and weights can change as a result of this. Our specialized department would be pleased to offer you advice.

We recommend to contact us concerning applications of our filters in areas governed by the EU directive 94/9 EG (ATEX 95). The standard version can be used for liquids based on mineral oil (corresponding to the fluids in Group 2 of Directive 97/23 EG Article 9). If you consider to use other materials please contact us for additional support..

Subject to technical alteration without prior notice.



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Low pressure filter
Spin-on cartridges

Nominal pressure 10/16 bar (140/230 psi), nominal size up to 160
comparison list HC/PX

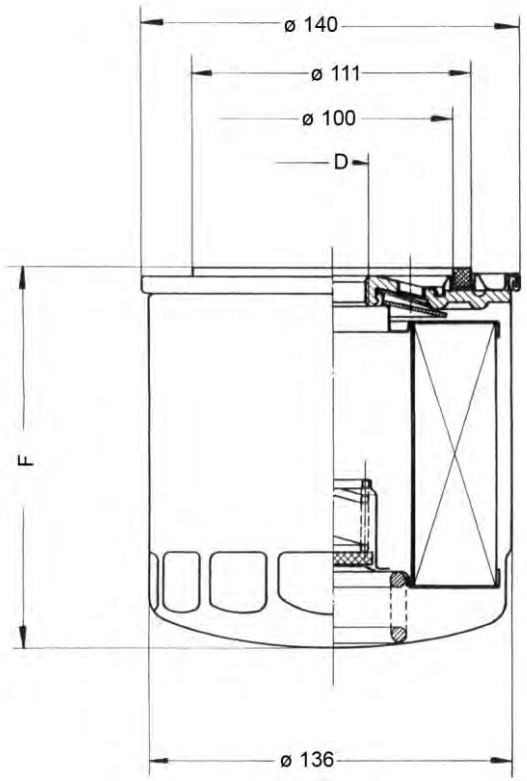
1. Features

Efficient filter for modern hydraulic systems

- Modular system for optimum filter selection
- Small space requirement through compact design
- Minimal pressure drop through optimal flow design of components
- Equipped with highly efficient Mic, Sm-N or Sm-x Filter elements
- Guaranteed separation according to ISO 16889 multipass test
- Elements with high differential pressure stability and dirt holding capacity
- Customer-specific printing on request
- Worldwide sales

2. Order numbers and dimensions

Order numbers and dimensions						
Nominal size NG [l/min]	**Order number**	**Type designation**	**Alternative for**		**D**	**F**
100	70548477	PX33-13-2-SmN2	Neu		$1^1/_2$" 16 UN 2B	172
	70541521	PX33-13-2-Smx3	Neu		$1^1/_2$" 16 UN 2B	
	70541522	PX33-13-2-Smx6	Neu		$1^1/_2$" 16 UN 2B	
	70541523	PX33-13-2-Smx10	HC 28	77643398	$1^1/_2$" 16 UN 2B	
	70541524	PX33-13-2-Smx25	HC 29	77643406	$1^1/_2$" 16 UN 2B	
	70541525	PX33-13-2-Mic10	HC 18	77643331	$1^1/_2$" 16 UN 2B	
	70541527	PX33-13-2-Mic25	HC 27	77643380	$1^1/_2$" 16 UN 2B	
	70541528	PX33-14-1-Mic10	HC 4	77727183	$G1^1/_4$	
130	70553366	PX36-13-2-SmN2	Neu		$1^1/_2$" 16 UN 2B	240
	70541529	PX36-13-2-Smx3	Neu		$1^1/_2$" 16 UN 2B	
	70541531	PX36-13-2-Smx6	Neu		$1^1/_2$" 16 UN 2B	
	70541532	PX36-13-2-Smx10	HC 32	77500051	$1^1/_2$" 16 UN 2B	
	70541533	PX36-13-2-Smx25	HC 33	77500069	$1^1/_2$" 16 UN 2B	
	70541534	PX36-13-2-Mic10	HC 31	77500077	$1^1/_2$" 16 UN 2B	
	70541535	PX36-13-2-Mic25	HC 30	77500085	$1^1/_2$" 16 UN 2B	
160	70553384	PX37-13-2-SmN2	Neu		$1^1/_2$" 16 UN 2B	310
	70541536	PX37-13-2-Smx3	HC 66	78714750	$1^1/_2$" 16 UN 2B	
	70541537	PX37-13-2-Smx6	HC 60	77478829	$1^1/_2$" 16 UN 2B	
	70541538	PX37-13-2-Smx10	HC 35	77643844	$1^1/_2$" 16 UN 2B	
	70541539	PX37-13-2-Smx25	HC 36	77643851	$1^1/_2$" 16 UN 2B	
	70541540	PX37-13-2-Mic10	HC 34	77504194	$1^1/_2$" 16 UN 2B	
	70541541	PX37-13-2-Mic25	HC 41	77770035	$1^1/_2$" 16 UN 2B	
	70541543	PX37-14-1-Smx3	HC 67	78714768	$G1^1/_4$	



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Low Pressure Filter
Pi 150

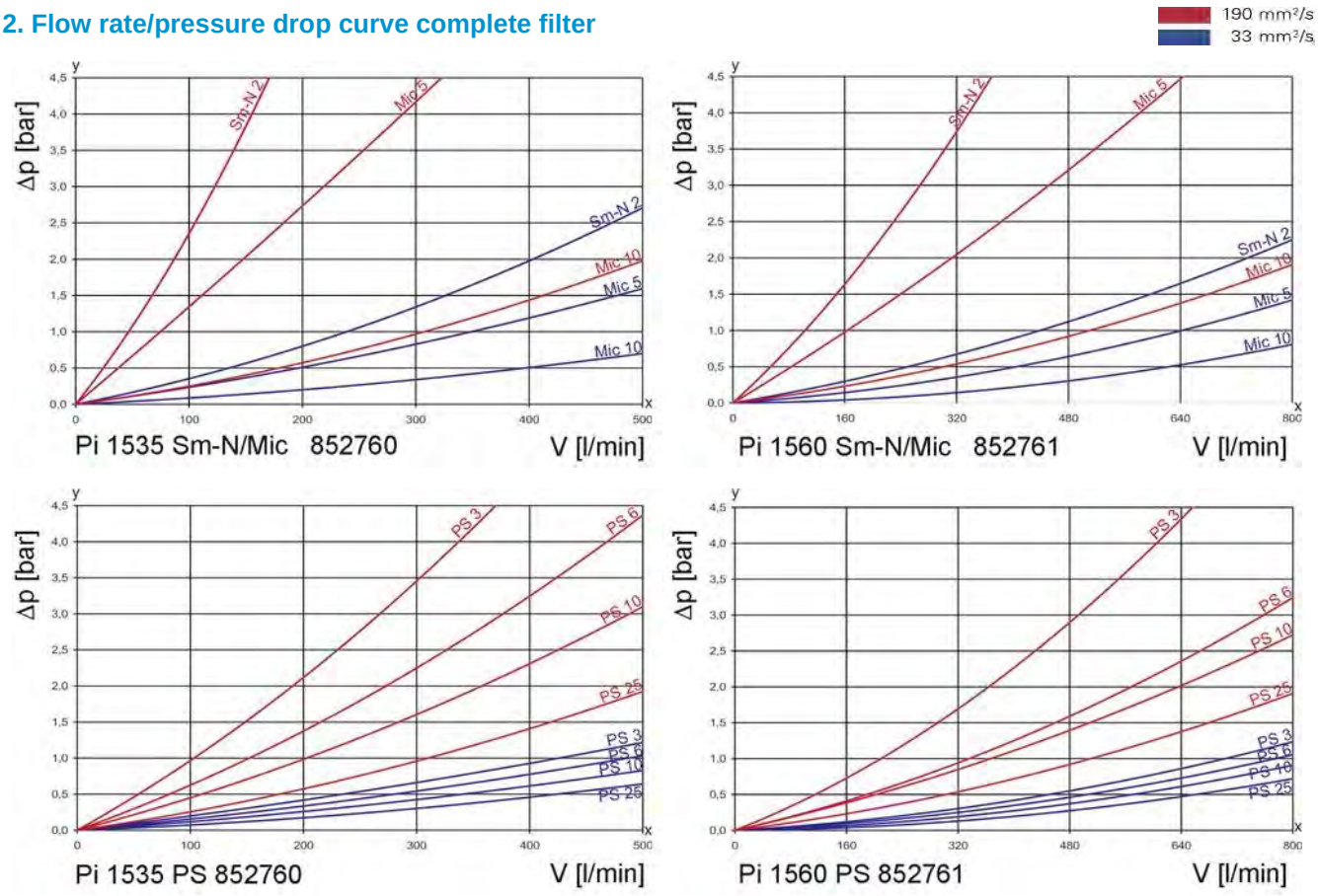
Nominal pressure 10/25 bar (140/360 psi), nominal size up to 630

1. Features

High performance filters for modern hydraulic systems

- Provided for pipe installation
- Modular system
- Compact design
- Minimal pressure drop through optimal flow design
- Visual/electrical/electronic maintenance indicator
- Threaded connections
- Quality filters, easy to service
- Equipped with highly efficient glass fibre PS filter elements
- Beta rated elements according to ISO 16889 multipass test
- Elements with high differential pressure stability and dirt holding capacity
- Worldwide distribution

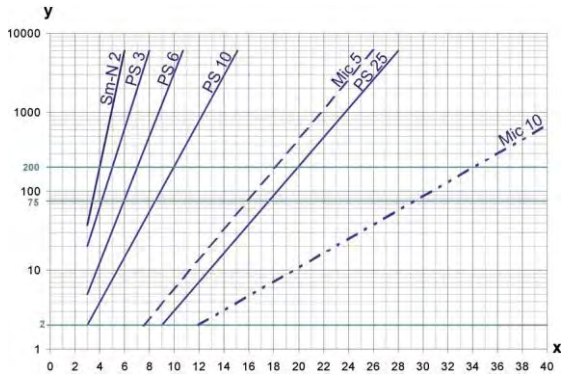
2. Flow rate/pressure drop curve complete filter



y = differential pressure Δp [bar]

x = flow rate V [l/min]

3. Separation grade characteristics



y = beta-value
x = particle size [µm]

determined by multipass tests (ISO 16889)
calibration according to ISO 11171 (NIST)

4. Filter performance data

measured according to ISO 16889 (multipass test)

PS elements with max. Δ p 10 bar

Sm-N 2 elements with max. Δ p 5 bar

Sm-N	2	$\beta_{4(C)}$	≥	200
PS	3	$\beta_{5(C)}$	≥	200
PS	6	$\beta_{7(C)}$	≥	200
PS	10	$\beta_{10(C)}$	≥	200
PS	25	$\beta_{20(C)}$	≥	200

values guaranteed up to 10 bar differential pressure, Sm-N 2 elements up to 5 bar differential pressure

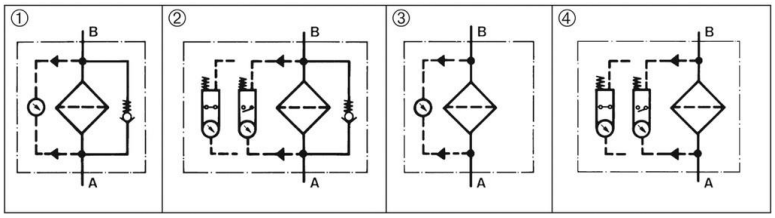
The filter element Sm-N 2 is an element with a very large dirt holding capacity, especially for bypass filtration.

5. Quality assurance

Filtration Group filters and filter elements are produced according to the following international standards:

Norm	Designation
DIN ISO 2941	Hydraulic fluid power filter elements; verification of collapse/burst resistance
DIN ISO 2942	Hydraulic fluid power filter elements; verification of fabrication integrity
DIN ISO 2943	Hydraulic fluid power filter elements; verification of material compatibility with fluids
DIN ISO 3723	Hydraulic fluid power filter elements; method for end load test
DIN ISO 3724	Hydraulic fluid power filter elements; verification of flow fatigue characteristics
ISO 3968	Hydraulic fluid power filters; evaluation of pressure drop versus flow characteristics
ISO 10771.1	Fatigue pressure testing of metal containing envelopes in hydraulic fluid applications
ISO 16889	Hydraulic fluid power filters; multipass method for evaluation filtration performance of a filter element

6. Symbols



7. Order numbers

Example for ordering filters:

1. Housing design	2. Filter element
V = 400 l/min, bypass, electrical indication, nominal pressure 10 bar Type: Pi 1535 / 10-058 Order number: 77774631	PS 10 Type: 852 760 PS 10 Order number: 77774425

7.1 Housing design

Nominal size NG [l/min]	Order number	Type	Nominal pressure [bar]	① with bypass valve and visual indicator	② with bypass valve and electrical indicator	③ with visual indicator	④ with electrical indicator
400	77774649	Pi 1535/10-057	10	■			
	77774631	Pi 1535/10-058			■		
	77804909	Pi 1535/10-068				■	
	77804917	Pi 1535/10-069					■
	77955982	Pi 1535/25-057	25	■			
	77907892	Pi 1535/25-058			■		
630	77774623	Pi 1560/10-057	10	■			
	77774615	Pi 1560/10-058			■		
	77804941	Pi 1560/10-068				■	
	77804958	Pi 1560/10-069					■
	77955990	Pi 1560/25-057	25	■			
	77970718	Pi 1560/25-058			■		

When filter with non bypass configuration is selected the collapse pressure of the element must not be exceeded.

7.2 Filter elements*

Nominal size NG [l/min]	Order number	Type	Filter material	max. Δ p [bar]	Filter surface [cm²]
400	77774458	852 760 Mic 5	Mic 5	5	23800
	77774441	852 760 Mic 10	Mic 10		23800
	77955859	852 760 Sm-N 2	Sm-N 2		16000
	77774433	852 760 PS 3	PS 3	10	14500
	78299042	852 760 PS 6	PS 6		14500
	77774425	852 760 PS 10	PS 10		14500
	77806565	852 760 PS 25	PS 25		14500
630	77774417	852 761 Mic 5	Mic 5	5	47600
	77774409	852 761 Mic 10	Mic 10		47600
	78375867	852 761 Sm-N 2	Sm-N 2		32000
	77774391	852 761 PS 3	PS 3	10	29000
	78225898	852 761 PS 6	PS 6		29000
	77774383	852 761 PS 10	PS 10		29000
	77806573	852 761 PS 25	PS 25		29000

* a wider range of element types is available on request.

8. Technical specifications

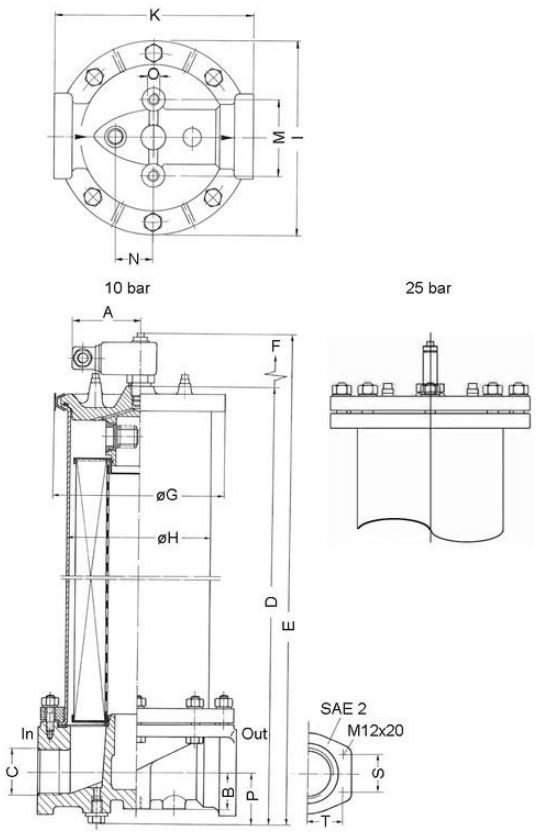
Nominal pressure:	10/25 bar (140/360 psi)
Temperature range:	-10 °C to +120 °C
	(other temperature ranges on request)
Bypass setting:	Δp 3.5 bar ± 10 %
Material filter head/cover:	GAL
Material filter housing:	St
Sealing material:	NBR
Maintenance indicator setting:	Δp 2.2 bar ± 10 %
Electrical data of maintenance indicator:	
Max. voltage:	250 V AC/200 V DC
Max. current:	1 A
Contact load:	70 W
Type of protection:	IP 65 in inserted and secured status
Contact:	normally open/closed
Cable sleave:	M20x1.5

The switching function can be changed by turning the electric upper part by 180° (normally closed contact or normally open contact). The state on delivery is a normally closed contact. By inductivity in the direct current circuit the use of suitable protection circuit should be considered. Further maintenance indicator details and designs are available in the maintenance indicator data sheet.

We draw attention to the fact that all values indicated are average values and do not always occur in specific cases of application. Our products are continually being further developed. Values, dimensions and weights can change as a result of this. Our specialized department will be pleased to offer you advice.

We recommend you to contact us concerning applications of our filters in areas governed by the EU Directive 94/9 EC (ATEX 95). The standard version can be used for liquids based on mineral oil (corresponding to the fluids in Group 2 of Directive 97/23 EC Article 9). If you consider to use other fluids please contact us for additional support.

Housings with nominal pressure 10 bar (140 psi) are fitted standard with air bleeder valve, housings with nominal pressure 25 bar (360 psi) with a venting screw.



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9. Dimensions

All dimensions except "C" in mm.

Type	A	B	C	D	E	F	G 10 bar	G 25 bar	H	I	K	M	N	O	P	S	T	Weight [kg]
Pi 1535	78	42	G1½	643	680	425	190	225	165	225	230	90	44	M12x20	59	-	-	17.1
Pi 1560	78	42	SAE 2	1005	1045	850	190	225	165	225	230	90	44	M12x20	59	42.9	77.8	27.1

NPT- and SAE connections on request.

* Standard pressure series hole pattern 3000 PSI

10. Installation, operating and maintenance instructions

10.1 Filter installation

When installing the filter make sure that sufficient space is available to remove filter element and filter housing.

10.2 Connecting the electrical maintenance indicator

The electrical indicator is connected via a 2-pole appliance plug according to DIN EN 175301–803 with poles marked 1 and 2. The electrical section can be inverted to change from normally open position to normally closed position or vice versa.

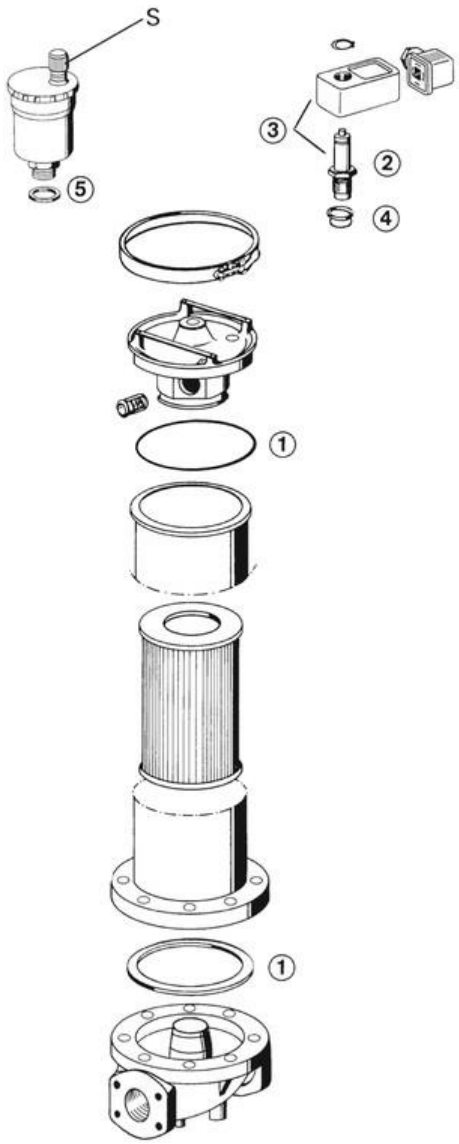
10.3 When should the filter element be replaced?

1. Filters equipped with visual and electrical maintenance indicator:
   During cold starts, the indicator may give a warning signal. Press the red button of the visual indicator once again only after operating temperature has been reached. If the red button immediately pops up again and/or the electrical signal has not switched off after reaching operating temperature, the filter element must be replaced after the end of the shift.
2. Filters without maintenance indicator:
   The filter element should be replaced after the trial run or flushing of the system. Afterwards follow instructions of the manufacturer.
3. Please always ensure that you have original Filtration Group spare elements in stock: Disposable elements (PS, Sm-N, Mic) cannot be cleaned.

10.4 Element replacement

1. Stop system and relieve filter from pressure.
2. Loosen quick-action clamp (10 bar version) or screws of flanged cover, remove cover, and open drain valve. Housing completely vented.
3. Remove filter element from the filter housing.
4. Check seal for damages, replace if necessary.
5. Make sure that the order number on the spare element corresponds to the order number of the filter name-plate.
   Remove the plastic bag and push element over the spigot in the filter head.
6. 10 bar version: Close drain valve, relocate cover, and close the quick-action clamp. Filters are automatically vented via the air bleeder valve, the protection cap S has to be turned 2 times for being open.
7. 25 bar version: Close drain valve, and put the cover plate on so that the stud bolts go into the holes of the cover plate. Make sure not to squeeze the O-ring on the bottom side of the cover plate. Hand-tighten the 8 mounting nuts with spring rings. Then draw up the nuts tight crosswise with a turn-screw SW19 without canting the cover plate. Tightening torque for mountings nuts is 50 Nm. After bringing the hydraulic unit to service de-aerate the filter via vent-screw.

11. Spare parts list



Order numbers for spare parts		
Position	**Type**	**Order number**
①	Seal kit	
	NBR	77831407
	FPM	77831415
	EPDM	77831423
② + ③	Maintenance indicator	
	Visual PiS 3098/2.2	77669971
	Electrical PiS 3097/2.2	77669948
	Electrical upper part only	77536550
④	Seal kit for maintenance indicator PiS 3098/2.2 + PiS 3097/2.2	
	NBR	77760309
	FPM	77760317
	EPDM	77760325
⑤	Air bleeder valve	70323353

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Low Pressure Filter
Pi 200

Nominal pressure 32/63 bar (460/910 psi), nominal size up to 600

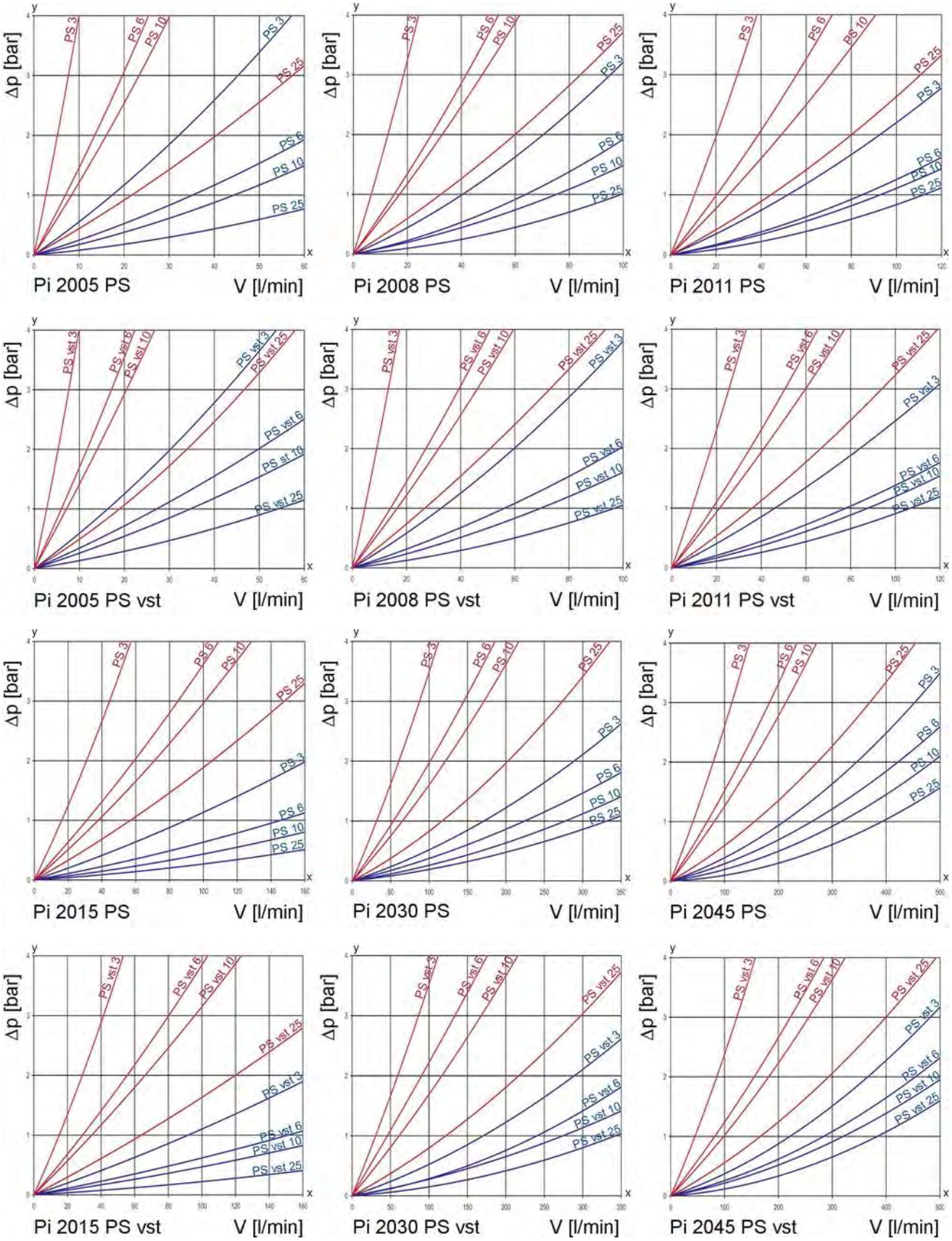
1. Features

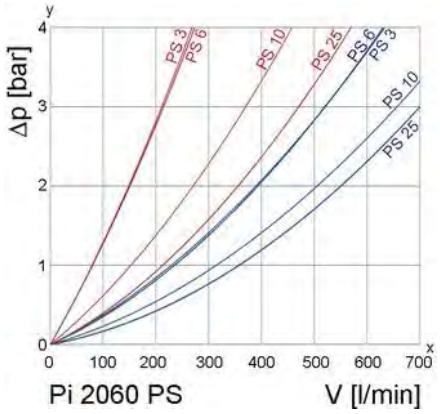
High performance filters for modern hydraulic systems

- Provided for pipe installation
- Modular system
- Compact design
- Minimal pressure drop through optimal flow design
- Visual/electrical/electronic maintenance indicator
- Threaded connections
- Quality filters, easy to service
- Equipped with highly efficient glass fibre PS filter elements
- Beta rated elements according to ISO 16889 multipass test
- Elements with high differential pressure stability and dirt holding capacity
- Other connections on request
- Worldwide distribution

2. Flow rate/pressure drop curve (filter housing incl. element)

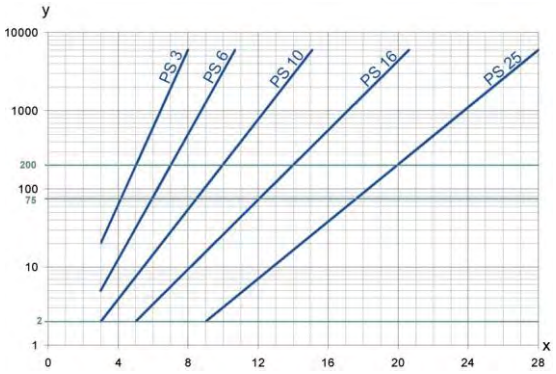
190 mm²/s
33 mm²/s





y = differential pressure Δ p [bar]
x = flow rate V [l/min]

3. Separation grade characteristics



y = beta-value
x = particle size [µm]

determined by multipass tests (ISO 16889)
calibration according to (NIST)

4. Filter performance data

tested according to ISO 16889 (multipass test)

PS elements with
max. Δ p 20 bar

PS	3	$\beta_{5(C)}$	≥	200
PS	6	$\beta_{7(C)}$	≥	200
PS	10	$\beta_{10(C)}$	≥	200
PS	25	$\beta_{20(C)}$	≥	200

values guaranteed up to
10 bar differential pressure

PS vst elements with
max. Δ p 210 bar

PS vst	3	$\beta_{5(C)}$	≥	200
PS vst	6	$\beta_{7(C)}$	≥	200
PS vst	10	$\beta_{10(C)}$	≥	200
PS vst	25	$\beta_{20(C)}$	≥	200

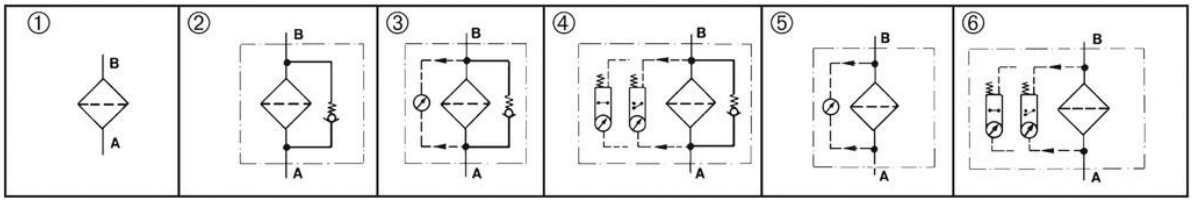
values guaranteed up to
20 bar differential pressure

5. Quality assurance

Filtration Group filters and filter elements are produced according to the following international standards:

Norm	Designation
DIN ISO 2941	Hydraulic fluid power filter elements; verification of collapse/burst resistance
DIN ISO 2942	Hydraulic fluid power filter elements; verification of fabrication integrity
DIN ISO 2943	Hydraulic fluid power filter elements; verification of material compatibility with fluids
DIN ISO 3723	Hydraulic fluid power filter elements; method for end load test
DIN ISO 3724	Hydraulic fluid power filter elements; verification of flow fatigue characteristics
ISO 3968	Hydraulic fluid power-filters-evaluation of pressure drop versus flow characteristics
ISO 10771.1	Fatigue pressure testing of metal containing envelopes in hydraulic fluid applications
ISO 16889	Hydraulic fluid power filters-multipass method for evaluation filtration performance of a filter element

6. Symbols



7. Order numbers

Example for ordering filters:

1. Filter housing	2. Filter element
V = 80 l/min and visual/electrical maintenance indicator Type: Pi 2008-069 Order number: 77665284	PS vst 3 Type: Pi 2208 PS vst 3 Order number: 77680200

7.1 Housing design

Nominal size NG [l/min]	Order number	Type	① no options	② with bypass valve	③ with bypass valve and visual indicator	④ with bypass valve and electrical indicator	⑤ with visual indicator	⑥ with electrical indicator
50	77665144	Pi 2005-060	■					
	77665110	Pi 2005-056		■				
	77665128	Pi 2005-057			■			
	77665136	Pi 2005-058				■		
	77665169	Pi 2005-068					■	
	77665177	Pi 2005-069						■
80	77665235	Pi 2008-060	■					
	77665201	Pi 2008-056		■				
	77665219	Pi 2008-057			■			
	77665227	Pi 2008-058				■		
	77665276	Pi 2008-068					■	
	77665284	Pi 2008-069						■
110	78205114	Pi 2011-060	■					
	78205122	Pi 2011-056		■				
	78205130	Pi 2011-057			■			
	78205148	Pi 2011-058				■		
	78205155	Pi 2011-068					■	
	78205163	Pi 2011-069						■
150	77840580	Pi 2015-060	■					
	76165203	Pi 2015-056		■				
	76165211	Pi 2015-057			■			
	79320748	Pi 2015-058				■		
	76165229	Pi 2015-068					■	
	78396616	Pi 2015-069						■
300	77665474	Pi 2030-060	■					
	77665441	Pi 2030-056		■				
	77665458	Pi 2030-057			■			
	77665466	Pi 2030-058				■		
	77665516	Pi 2030-068					■	
	77665532	Pi 2030-069						■

7.1 Housing design

Nominal size NG [l/min]	Order number	Type	① no options	② with bypass valve	③ with bypass valve and visual indicator	④ with bypass valve and electrical indicator	⑤ with visual indicator	⑥ with electrical indicator
450	77664881	Pi 2045-060	■					
	77664873	Pi 2045-056		■				
	77664865	Pi 2045-057			■			
	77664857	Pi 2045-058				■		
	77664923	Pi 2045-068					■	
	77664931	Pi 2045-069						■
600	70576046	Pi 2060-060	■					
	70576045	Pi 2060-056		■				
	70534876	Pi 2060-057			■			
	79714171	Pi 2060-058				■		
	78205254	Pi 2060-068					■	
	70576047	Pi 2060-069						■

When filter with non bypass configuration is selected, the collapse pressure of the element must not be exceeded.

7.2 Filter elements (a wider range of element types is availble on request)

Nominal size NG [l/min]	Order number	Type	Filter material	max. Δp [bar]	Filter surface [cm²]
50	77680135	Pi 2105 PS 3	PS 3	20	590
	77943509	Pi 5105 PS 6	PS 6		590
	77680325	Pi 3105 PS 10	PS 10		590
	77680440	Pi 4105 PS 25	PS 25		590
	77680192	Pi 2205 PS vst 3	PS vst 3	210	425
	77943533	Pi 5205 PS vst 6	PS vst 6		425
	77680382	Pi 3205 PS vst 10	PS vst 10		425
	77680507	Pi 4205 PS vst 25	PS vst 25		425
80	77680143	Pi 2108 PS 3	PS 3	20	1150
	77943517	Pi 5108 PS 6	PS 6		1150
	77680341	Pi 3108 PS 10	PS 10		1150
	77680457	Pi 4108 PS 25	PS 25		1150
	77680200	Pi 2208 PS vst 3	PS vst 3	210	850
	77943541	Pi 5208 PS vst 6	PS vst 6		850
	77681190	Pi 3208 PS vst 10	PS vst 10		850
	77680515	Pi 4208 PS vst 25	PS vst 25		850
110	77680150	Pi 2111 PS 3	PS 3	20	1700
	77943525	Pi 5111 PS 6	PS 6		1700
	77680333	Pi 3111 PS 10	PS 10		1700
	77680465	Pi 4111 PS 25	PS 25		1700
	77680218	Pi 2211 PS vst 3	PS vst 3	210	1275
	77943558	Pi 5211 PS vst 6	PS vst 6		1275
	77680390	Pi 3211 PS vst 10	PS vst 10		1275
	77680523	Pi 4211 PS vst 25	PS vst 25		1275
150	77680168	Pi 2115 PS 3	PS 3	20	2425
	77955099	Pi 5115 PS 6	PS 6		2425
	77680358	Pi 3115 PS 10	PS 10		2425
	77680473	Pi 4115 PS 25	PS 25		2425

7.2 Filter elements (a wider range of element types is availble on request)					
Nominal size NG [l/min]	**Order number**	**Type**	**Filter material**	**max. Δp [bar]**	**Filter surface [cm²]**
150	77680226	Pi 2215 PS vst 3	PS vst 3	**210**	2010
	77955123	Pi 5215 PS vst 6	PS vst 6		2010
	77680408	Pi 3215 PS vst 10	PS vst 10		2010
	77680531	Pi 4215 PS vst 25	PS vst 25		2010
300	77680176	Pi 2130 PS 3	PS 3	**20**	4620
	77955107	Pi 5130 PS 6	PS 6		4620
	77680366	Pi 3130 PS 10	PS 10		4620
	77680481	Pi 4130 PS 25	PS 25		4620
	77680234	Pi 2230 PS vst 3	PS vst 3	**210**	3800
	77955131	Pi 5230 PS vst 6	PS vst 6		3800
	77680416	Pi 3230 PS vst 10	PS vst 10		3800
	77680549	Pi 4230 PS vst 25	PS vst 25		3800
450	77680184	Pi 2145 PS 3	PS 3	**20**	6865
	77955115	Pi 5145 PS 6	PS 6		6865
	77680374	Pi 3145 PS 10	PS 10		6865
	77680499	Pi 4145 PS 25	PS 25		6865
	77680242	Pi 2245 PS vst 3	PS vst 3	**210**	5600
	77955149	Pi 5245 PS vst 6	PS vst 6		5600
	77680424	Pi 3245 PS vst 10	PS vst 10		5600
	77680556	Pi 4245 PS vst 25	PS vst 25		5600
600	70346506	Pi 2160 PS 3	PS 3	**20**	9398
	76114318	Pi 5160 PS 6	PS 6		9398
	79393380	Pi 3160 PS 10	PS 10		9398
	79748047	Pi 4160 PS 25	PS 25		9398

8. Technical specifications

Design:	in-line filter
Nominal pressure:	
Pi 2005 - 2011	10^7 load changes 63 bar (900 psi)
Pi 2015 - 2060	10^7 load changes 25 bar (360 psi)
	2x 10^6 load changes 32 bar (460 psi)
Test pressure:	
Pi 2005 - 2011	95 bar (1370 psi)
Pi 2015 - 2060	48 bar (690 psi)
Temperature range:	-30 °C to +120 °C
survival temperature -40 °C (other temperature ranges on request)	
Bypass setting:	Δ p 3.5 bar ± 10 %
Filter head material:	GDAL
Filter housing material:	AL/St
Sealing material:	NBR/AL
Maintenance indicator setting:	Δ p 2.2 bar ± 10 %
Electrical data of maintenance indicator:	
Max. voltage:	250 V AC/200 V DC
Max. current:	1 A
Max. current:	70 W
Type of protection:	IP 65 in inserted and secured status
Contact:	normally open/closed
Cable sleave:	M20x1.5

The switching function can be changed by turning the electric upper part by 180° (normally closed contact or normally open contact). The state on delivery is a normally closed contact. By inductivity in the direct current circuit the use of suitable protection circuit should be considered. Further maintenance indicator details and designs are available in the maintenance indicator data sheet.

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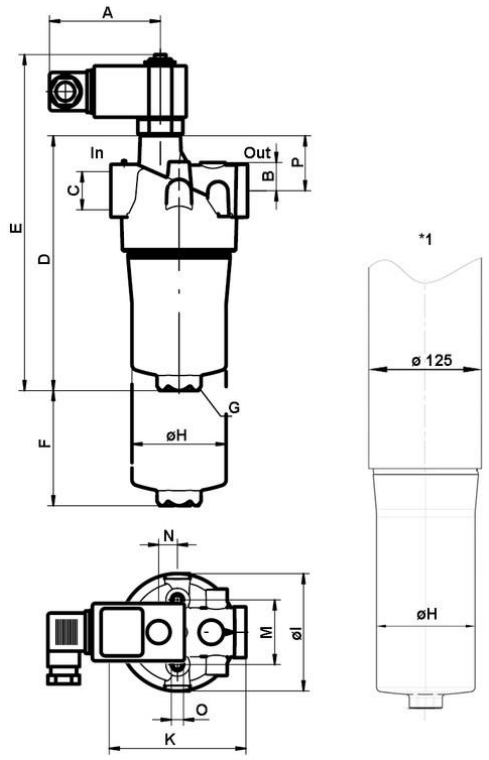
We recommend you to contact us concerning applications of our filters in areas governed by the EU Directive 94/9 EC (ATEX 95). The standard version can be used for liquids based on mineral oil (corresponding to the fluids in Group 2 of Directive 97/23 EC Article 9). If you consider to use other fluids please contact us for additional support.

Subject to technical alteration without prior notice.

9. Dimensions



In Inlet
Out Outlet
*1 Housing design for NG 600

All dimensions except “C” in mm.

Type	A	B	C*	D	E	F	G SW	H	I	K	M	N	O	P	Weight [kg]
Pi 2005	78	19	G½	177	235	80	27	66	80	95	45	13.0	M8x10	37,5	0.9
Pi 2008	78	19	G¾	253	311	80	27	66	80	95	45	13.0	M8x10	37,5	1.0
Pi 2011	78	19	G¾	335	393	80	27	66	80	95	45	13.0	M8x10	37,5	1.2
Pi 2015	78	30	G1¼	244	302	110	32	109	128	150	60	24.5	M12x15	43,5	2.1
Pi 2030	78	30	G1¼	360	418	110	32	109	128	150	60	24.5	M12x15	43,5	2.4
Pi 2045	78	30	G1¼	475	533	110	24	109	128	150	60	24.5	M12x15	43,5	6.5
Pi 2060	78	30	G1¼	615	643	110	32	109	128	150	60	24.5	M12x15	43,5	5.5

* NPT and SAE connections on request

10. Installation, operating and maintenance instructions

10.1 Filter installation

When installing the filter make sure that sufficient space is available to remove filter element and filter housing.
Preferably the filter should be installed with the filter housing pointing downwards.
The maintenance indicator must be visible.

10.2 Connecting the electrical maintenance indicator

The electrical indicator is connected via a 2-pole appliance plug according to DIN EN 175301-803 with poles marked 1 and 2. The electrical section can be inverted to change from normally open position to normally closed position or vice versa.
The state on delivery is a normally closed contact
.

10.3 When should the filter element be replaced?

1 . Filters equipped with visual and electrical maintenance indicator:
During cold starts, the indicator may give a warning signal. Press the red button of the visual indicator once again only after operating temperature has been reached. If the red button immediately pops up again and/or the electrical signal has not switched off after reaching operating temperature, the filter element must be replaced after the end of the shift.
2 . Filters without maintenance indicator:
The filter element should be replaced after the trial run or flushing of the system. Afterwards follow instructions of the manufacturer.
3 . Please always ensure that you have original Filtration Group spare elements in stock: Disposable elements cannot be cleaned.

10.4 Element replacement

1 . Stop system and relieve filter from pressure.
2 . Unscrew the filter housing by turning counter-clockwise. Clean the housing using a suitable cleaning solvent.
3 . Remove element by pulling down carefully.
4 . Check O-ring on the filter housing for damage. Replace, if necessary.
5 . Make sure that the order number on the spare element corresponds to the order number of the filter name-plate.
To ensure no contamination occurs during the exchange of the element first open the plastic bag and push the element over the spigot in the filter head. Now remove plastic bag.
6 . Lightly lubricate the threads of the filter housing a little bit and screw into the filter head. Maximum tightening torque for NG 50 to 110 = 30 Nm, for NG 150 to 600 = 50 Nm.

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78356446.06/2019

11. Spare parts list

Order numbers of spare parts		
Position	**Type**	**Order number**
① - ②	Seal kit for filter	
	Pi 2005 - Pi 2011	
	NBR	77550213
	FPM	77845795
	EPDM	77845803
	Pi 2015 - Pi 2060	
	NBR	77550221
	FPM	77845811
	EPDM	77845829
③	Maintenance indicator	
	Visual PiS 3098/2,2	77669971
	Electrical PiS 3097/2,2	77669948
	Electrical upper section only	77536550
④	Seal kit for maintenance indicator	
	NBR	77760309
	FPM	77760317
	EPDM	77760325

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Low Pressure Filter
Pi 230

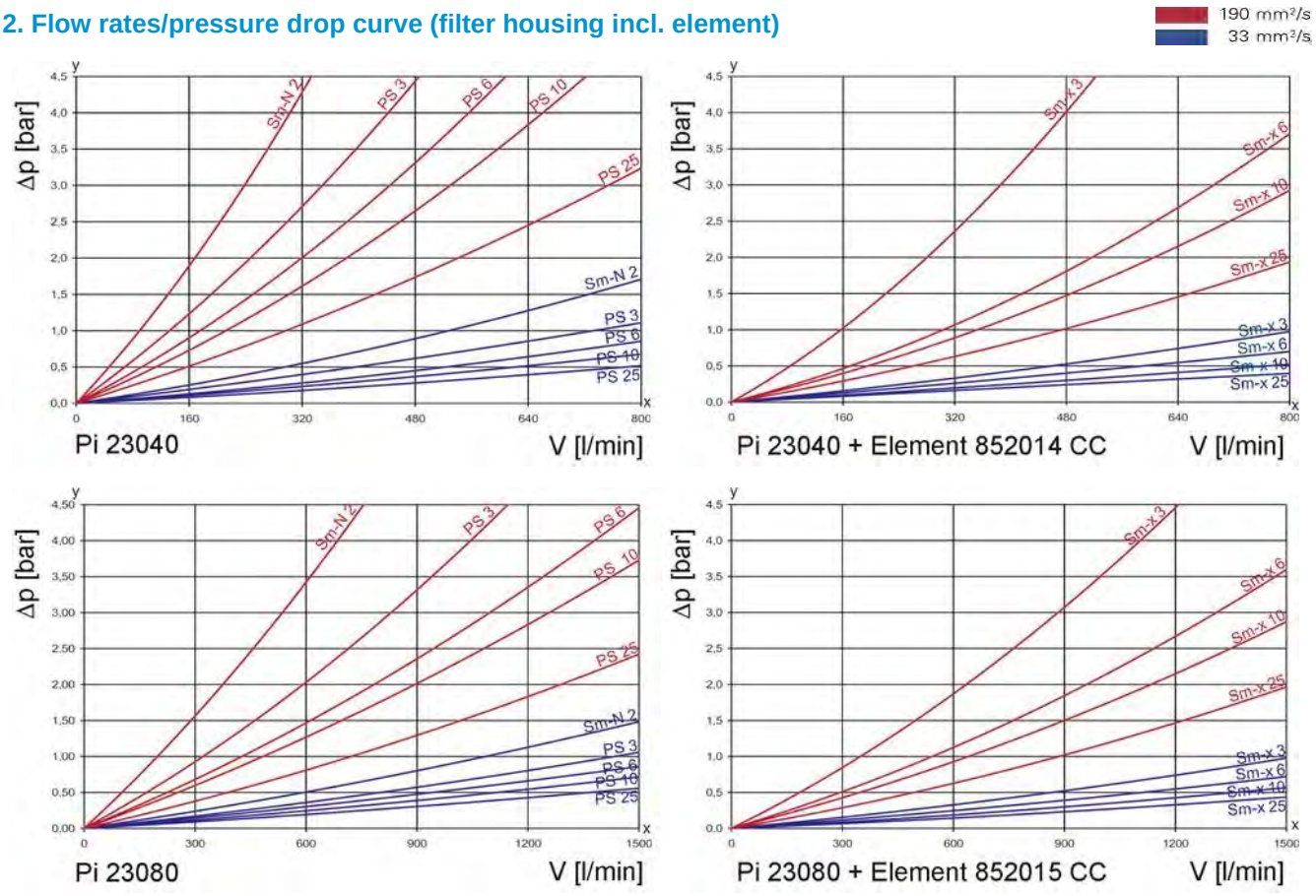
Nominal pressure 25/40 bar, (360/570 psi), nominal size up to 1400

1. Features

High performance filters for modern hydraulic systems

- Provided for pipe installation
- Modular system
- Compact design
- Minimal pressure drop through optimal flow design
- Visual/electrical/electronic maintenance indicator
- Quality filters, easy to service
- Equipped with highly efficient glass fibre PS and Sm-x filter elements
- Beta rated elements according to ISO 16889 multipass test
- Elements with high differential pressure stability and dirt holding capacity
- Worldwide distribution

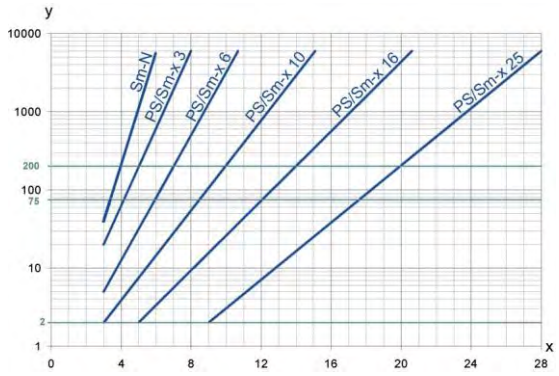
2. Flow rates/pressure drop curve (filter housing incl. element)



y = differential pressure Δp [bar]

x = flow rate V [l/min]

3. Separation grade characteristics



y = beta-value
x = particel size [µm]

determined by multipass tests (ISO 16889)
calibration according to ISO 11171 (NIST)

4. Filter performance data

tested according to ISO 16889 (multipass test)

PS elements with
max. Δ p 20 bar

Sm-N	2	$\beta_{4(C)}$	≥ 200
PS/Sm-x	3	$\beta_{5(C)}$	≥ 200
PS/Sm-x	6	$\beta_{7(C)}$	≥ 200
PS/Sm-x	10	$\beta_{10(C)}$	≥ 200
PS/Sm-x	25	$\beta_{20(C)}$	≥ 200

values guaranteed up to 10 bar differential pressure

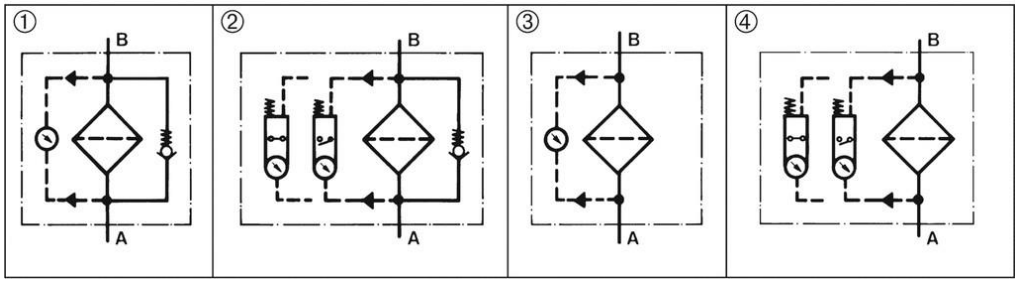
The filter element Sm-N 2 is an element with a very large dirt holding capacity, especially for bypass filtration

5. Quality assurance

Filtration Group filters and filter elements are produced according to the following international standards:

Norm	Designation
DIN ISO 2941	Hydraulic fluid power filter elements; verification of collapse/burst resistance
DIN ISO 2942	Hydraulic fluid power filter elements; verification of fabrication integrity
DIN ISO 2943	Hydraulic fluid power filter elements; verification of material compatibility with fluids
DIN ISO 3723	Hydraulic fluid power filter elements; method for end load test
DIN ISO 3724	Hydraulic fluid power elements; verification of flow fatigue characteristics
ISO 3968	Hydraulic fluid power filters; evaluation of pressure drop versus flow characteristics
ISO 10771.1	Fatigue pressure testing of metal containing envelopes in hydraulic fluid applications
ISO 16889	Hydraulic fluid power filters; multipass method for evaluation filtration performance of a filter element

6. Symbols



7. Order numbers

Example for ordering filters:

1. Filter housing	2. Filter element
Nominal size: 800, with bypass, electrical maintenance indicatior, inlet at the side for standard filter elements Type: Pi 23040/22-058 Order number: 76320972	PS 10 Type: Pi 852014 PS 10 Order number: 76321814

7.1 Housing design standard

Nominal size NG [l/min]	Order number inlet at the bottom	Type inlet at the bottom	Order number inlet at the side	Type inlet at the side	① with bypass valve and visual indicator	② with bypass valve and electrical indicator	③ with visual indicator	④ with electrical indicator
800	76334668	Pi 23040/12-057	76320931	Pi 23040/22-057	■			
	76320964	Pi 23040/12-058	76320972	Pi 23040/22-058		■		
	76321004	Pi 23040/12-068	76321012	Pi 23040/22-068			■	
	76321046	Pi 23040/12-069	76321053	Pi 23040/22-069				■
1400	76320949	Pi 23080/12-057	76320956	Pi 23080/22-057	■			
	76320980	Pi 23080/12-058	76320998	Pi 23080/22-058		■		
	76321020	Pi 23080/12-068	76321038	Pi 23080/22-068			■	
	76321061	Pi 23080/12-069	76321079	Pi 23080/22-069				■

When filter with non bypass configuration is selected, the collapse pressure of the element must not be exceeded.

7.2 Filter elements standard*

Nominal size NG [l/min]	Order number	Type	Filter material	max. Δ p [bar]	Filter surface [cm²]
800	76136220	852014 Sm-N 2	Sm-N 2	20	18533
	76321830	852014 PS 3	PS 3		24830
	76321822	852014 PS 6	PS 6		24830
	76321814	852014 PS 10	PS 10		24830
	76321806	852014 PS 25	PS 25		24830
1400	76136212	852015 Sm-N 2	Sm-N 2	20	42275
	76321897	852015 PS 3	PS 3		57200
	76321889	852015 PS 6	PS 6		57200
	76321871	852015 PS 10	PS 10		57200
	76321863	852015 PS 25	PS 25		57200

* a wider range of element types is available on request

7.3 Housing design CC

Nominal size NG [l/min]	Order number inlet at the bottom	Type inlet at the bottom	Order number inlet at the side	Type inlet at the side	① with bypass valve and visual indicator	② with bypass valve and electrical indicator	③ with visual indicator	④ with electrical indicator
800	79770074	Pi 23040/1C-057	79770116	Pi 23040/2C-057	■			
	76320642	Pi 23040/1C-058	76320659	Pi 23040/2C-058		■		
	76320683	Pi 23040/1C-068	76320691	Pi 23040/2C-068			■	
	76320725	Pi 23040/1C-069	76320733	Pi 23040/2C-069				■
1400	79768854	Pi 23080/1C-057	79768862	Pi 23080/2C-057	■			
	76320667	Pi 23080/1C-058	76320675	Pi 23080/2C-058		■		
	76320709	Pi 23080/1C-068	76320717	Pi 23080/2C-068			■	
	76320741	Pi 23080/1C-069	76320758	Pi 23080/2C-069				■

When filter with non bypass configurationis selected, the collapse pressure of the element must not be exceeded.

7.4 Filter elements CC*

Nominal size NG [l/min]	Order number	Type	Filter material	max. Δ p [bar]	Filter surface [cm²]
800	76135859	852014 CC Sm-x 3	Sm-x 3	5	23000
	76135867	852014 CC Sm-x 6	Sm-x 6		23000
	76135875	852014 CC Sm-x 10	Sm-x 10		23000
	76135883	852014 CC Sm-x 25	Sm-x 25		23000
1400	76322028	852015 CC Sm-x 3	Sm-x 3	5	60159
	76322010	852015 CC Sm-x 6	Sm-x 6		60159
	76322002	852015 CC Sm-x 10	Sm-x 10		60159
	76321996	852015 CC Sm-x 25	Sm-x 25		60159

* a wider range of element types is available on request

8. Technical specifications

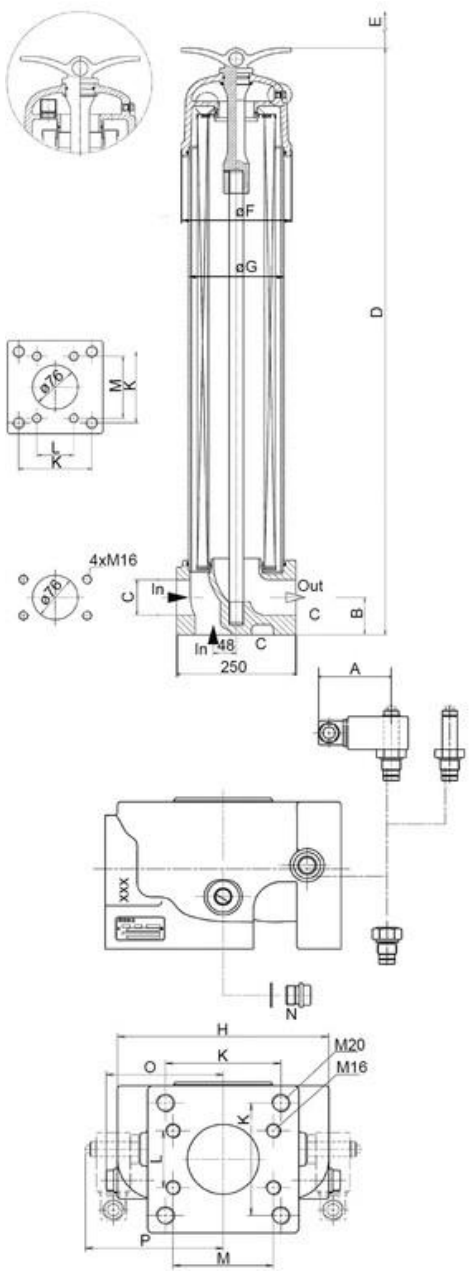
Nominal pressure (10^7 LW):	25 bar (360 psi)
Nominal pressure (static):	40 bar (570 psi)
Temperature range:	-10 °C to +120 °C
	(other temperature ranges on request)
Bypass setting:	Δ 3.5 bar ± 10 %
Filter head and cap material:	GAL
Filter housing material:	AL
Sealing material:	NBR
Maintenance indicator setting:	Δ p 2.2 bar ± 0.3 bar
Electrical data of maintenance indicator:	
Maximum voltage:	250 V AC/200 V DC
Maximum current :	1 A
Contact load:	70 W
Type of protection:	IP 65 in inserted and secured status
Contact:	normally open/closed
Cable connection:	M20x1.5

The switching function can be changed by turning the electric upper part by 180° (normally closed contact or normally open contact). The state on delivery is normally closed contact. By inductivity in the direct current circuit the use of suitable protection circuit should be considered. Further maintenance indicator details and designs are available in the maintenance indicator data sheet.

We draw attention to the fact that all values indicated are average values which do not always occur in specific cases of application. Our products are continually being further developed. Values, dimensions and weights can change as a result of this. Our specialized department will be pleased to offer you advice.

We recommend you to contact us concerning applications of our filters in areas governed by the EU Directive 94/4 EC (ATEX 95). The standard version can be used for liquids based on mineral oil (corresponding to fluids in Group2 of DirectiveDirective 97/23 EC Article 9). If you consider to use other fluds please contact us for additional support.

Subject to technical alteration without prior notice.



In = Inlet
Out = Outlet

9. Dimensions

All dimensions except "C" and "N" in mm.

Type	A	B	C	D	E	F	G	H	K	L	M	N	O	P	Weight [kg]
Pi 23040	78	80	SAE 3, 3000 psi	710	770	230	200	224	122,3	61,9	106,6	G½	124	146	29
Pi 23080	78	80	SAE 3, 3000 psi	1260	770	230	200	224	122,3	61,9	106,6	G½	124	146	30

NPT- and SAE-connections on request.

10. Installation, operating and maintenance instructions

10.1 Filter installation

When installing filter make sure that sufficient space is available to remove filter element and filter housing. Preferably the filter should be installed with the filter housing pointing upwards.
The maintenance indicator must be visible.

10.2 Connecting the electrical maintenance indicator

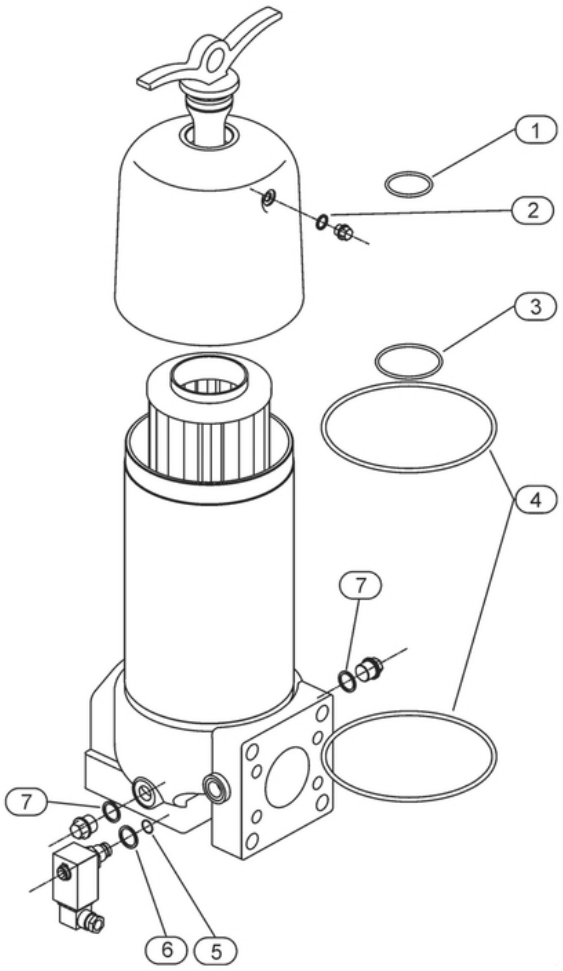
The electrical indicator is connected via a 2-pole appliance plug according to DIN EN 175301-803 with poles marked 1 and 2. The electrical section can be inverted to change from normally open to normally closed position or vice versa.

10.3 When should the filter element be replaced?

1. Filters equipped with visual and electrical maintenance indicator:
   During cold starts, the indicator may give a warning signal. Press the red button of the visual indicator once again and only after operating temperature has been reached. If the red button immediately pops up again and/or the electrical signal has not switched off after reaching operating temperature, the filter element must be replaced after the end of the shift.
2. Filters without maintenance indicator:
   The filter element should be replaced after the trial run or flushing of the system. Afterwards follow the instructions of the manufacturer.
3. Please always ensure that you have original Filtration Group spare elements in stock: Disposable elements (PS, Sm-x , Sm-N2) cannot be cleaned.

10.4. Element replacement

1. Stop system and relieve filter from pressure.
2. Loosen quick-action clamp, remove cover and open drain valve. Housing completely vented.
3. Remove filter element from filter housing.
4. Check seals for damages. Replace, if necessary.
5. Make sure that the order number on the spare element corresponds to the order number of the filter name-plate.
   To ensure no contamination occurs during the exchange of the element first open the plastic bag and push the element over the spigot in the filter head. Now remove plastic bag.
6. Close drain valve. Put the thumb screw together with the cover on the centre rod and tighten strong. Filter must be bleeded.



11. Spare parts list

Order numbers for spare parts		
Position	**Type**	**Order number**
①②③ ④⑦	Seal kit	
	NBR	76321244
	FPM	76321251
	EPDM	76321269
	Maintenance indicator	
	Visual PiS 3098/2.2	77669971
	Visual/electrical PiS 3097/2.2	77669948
	Electrical upper section only	77536550
⑤⑥	Seal kit for maintenance indicator	
	NBR	77760309
	FPM	77760317
	EPDM	77760325

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Filter elements and retrofit kits
Pi 230/Pi 2300

Overview of suitable filter elements and adapters

1. Features

- High performace filter elements for hydraulic oils and lubricants
- Guaranteed retention rates for the PS/Sm-x and Sm-N elements according to ISO 16889
- Defined cleanliness according to ISO 4402 by PS/Sm-x and Sm-N elements
- Long service intervalls because of high dirt holding capacity
- Optional design according to DIN 24550
- Optional metal-free incinerable CC design

2. Overview and order numbers

2.1 For Pi 23040../Pi 23100.. , required adapter to mount filter element					
Filter housing	**891 031 CC**	**852 014 CC**	**852 014**	**Pi 23100**	**P 8300 D 16**
Pi 23040/..C	70315692	-	-	70315674	70315676
Pi 23040/..0	-	70315617	-	70315674	70315676
Pi 23040/..1	70315692	70315617	-	70315674	-
Pi 23040/..2	70315692	70315617	-	70315674	70315676
Pi 23100/..2	70315692	70315617	-	-	70315676

2.2 For Pi 23080../Pi 23200, required adapter for mount filter element					
Filter housing	**891 030 CC**	**852 015 CC**	**852 015**	**Pi 23200**	**P 8300 D 39**
Pi 23080/..C	70315694	-	-	70315675	70315676
Pi 23080/..0	-	70315621	-	70315675	70315676
Pi 23080/..1	70315694	70315621	-	70315675	-
Pi 23080/..2	70315694	70315621	-	70315675	70315676
Pi 23200/..2	70315694	70315621	-	-	70315676

recommended filter element

Example: To fit filter element P 8300 D 39 into housing Pi 23080/..C, you require adapter kit 70315676 part no.. When ordering housing and elements separately, please ensure to order the suitable filter housing version.

Attention: Filter elements 891 030 CC/891 031 CC are not directly interchangeable to PALL! The original PALL coreless does not fit into our housing. To make our 891 030 CC/891031 CC elements fit into the PALL housing, special adapters are available.

3. Filter element data

Filter element	Filter surface [cm²]	Remarks
891 031 CC	18000	incinerable, metal-free, interchange for PALL HC 8304 xxx 16 x, mounting into PALL housing only with special adapter
852 014 CC	23000	incinerable, metal-free, extreme high dirt holding capacity
852 014	24830	extreme high dirt holding capacity
Pi 23100	18760	acc. DIN 24 550
P 8300 D 16	15400	interchange for PALL HC 8300 xxx 16 x
891 030 CC	48290	incinerable, metal-free, interchange for PALL HC 8304 xxx 39 x, mounting into PALL housing only with special adapter
852 015 CC	60159	incinerable, metal-free, extreme high dirt holding capacity
852 015	57200	extreme high dirt holding capacity
Pi 23200	2 x 18760	acc. DIN 24 550
P 8300 D 39	35420	interchange for PALL HC 8300 xxx 39 x

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Low Pressure Filter
Pi 260

Nominal pressure 25 bar (360 psi), nominal size up to 1100

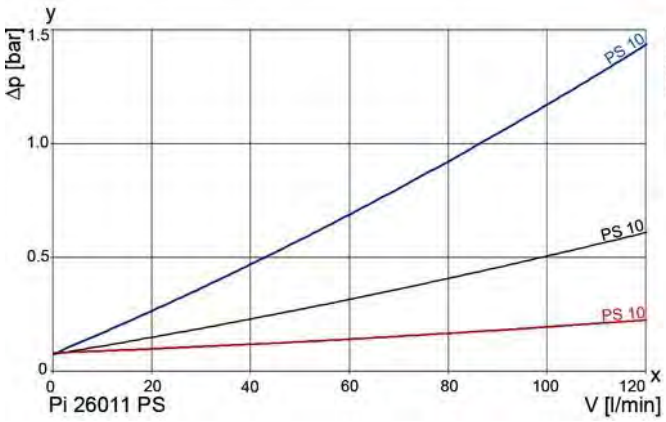
1. Features

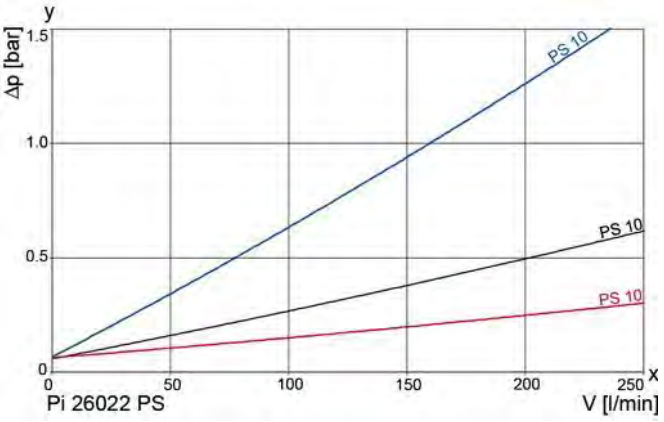
Compact, ready-to connect filter for gear boxes, lubrication and hydraulic systems

- Provided for pipe installation
- Modular system for optimal filter selection
- Low space requirements due to compact design
- Weight optimised design
- Minimal pressure drop due to the high efficiency and the volume flow optimised design of parts
- Visual/electrical maintenance indicators
- Drain outlet clean side
- Drain outlet dirt side
- Permanent venting
- Equipped with highly efficient Filtration Group Premium Select filter elements
- Guaranteed retention rates according to ISO 16889 multipass test
- Defined cleanliness classes according to ISO 4406
- High dirt holding capacity
- Easy to service
- Worldwide sales and service

2. Flow rate/pressure drop curve (filter housing incl. element)

500 mm²/s
190 mm²/s
33 mm²/s





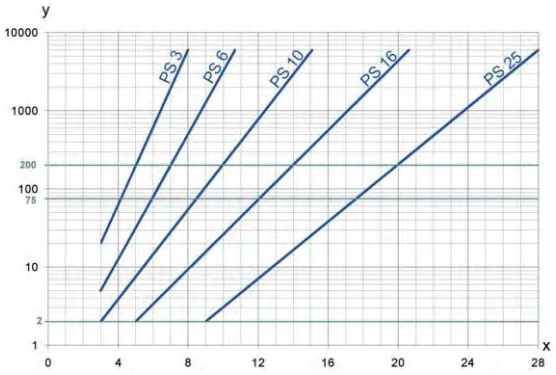
y = differential pressure Δp [bar]
x = flow rate V [l/min]

A wider range of grade of filtration on request.

3. Mode of operation

Due to the high filter surface, the filter is suitable for high viscous lubricating oils, used for example in gear boxes for wind mill generators and in paper machines. An additional feature is the individual fitting position. Connections (drain outlet dirt side, drain outlet clean side and indicator) are already provided at both sides of the filter head. Therefore the connections meet all customers requirements. The filter is fitted with a 2-step filter element with Filtration Group Premium Select (PS) filter media.
The first filtration stage consists a 10 µm fine filter and the second stage a 50 µm safety filter. Other degrees of filtration are available on request.
For monitoring the filter element, optional a differential pressure indicator is available. For customized requirements we offer a wide range of Filtration Group differential pressure indicators with 1 or 2 setting-points, LED indicators, various types of contacts, analog outputs, temperature suppression and connecting plugs.
The filter series is available for all mineral-oil-based gear box and lubrication oils.

4. Separation grade characteristics



y = beta-value
x = particle size [µm]

determined by multipass tests (ISO 16889)
calibration according to ISO 11171 (NIST)

5. Filter performance data

tested according to ISO 16889 (Multipass-Test)

PS elements with max. Δ p 10 bar

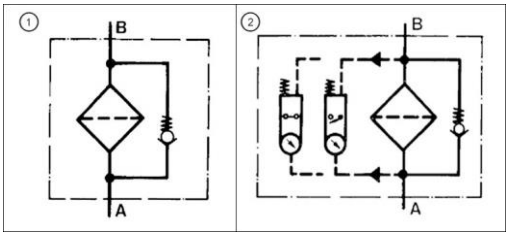
PS	3	$\beta_{5(C)} \geq 200$
PS	6	$\beta_{7(C)} \geq 200$
PS	10	$\beta_{10(C)} \geq 200$

6. Quality assurance

Filtration Group filters and filter elements are produced according to the following international standards:

Norm	Designation
DIN ISO 2941	Hydraulic fluid power filter elements; verification of collapse/burst resistance
DIN ISO 2942	Hydraulic fluid power filter elements; verification of fabrication integrity
DIN ISO 2943	Hydraulic fluid power filter elements; verification of material compatibility with fluids
DIN ISO 3723	Hydraulic fluid power filter elements; method for end load test
DIN ISO 3724	Hydraulic fluid power filter elements; verification of flow fatigue characteristics
ISO 3968	Hydraulic fluid power-filters-evaluation of pressure drop versus flow characteristics
ISO 10771.1	Fatigue pressure testing of metal containing envelopes in hydraulic fluid applications
ISO 16889	Hydraulic fluid power filters-multipass method for evaluation filtration performance of a filter element

7. Symbols



Bypass valve is integrated into the filter element.

8. Order numbers

Example for ordering filters:

1. Filter housing	2. Filter element
V = 650 l/min with visual/electrical maintenance indicator Type: Pi 260065-134 Order number: 70526941	PS 10 Type: 852 099 PS 10/Drg 50/V 5.0 Order number: 70514957

8.1 Housing design				
Nominal size NG [l/min]	Order number	Type	① no options	② with visual/ electrical indicator
650	70516485	Pi 260065-046		
	70526941	Pi 260065-134		
1100	70519705	Pi 260110-046		
	70526942	Pi 260110-134		

8.2 Filter elements (a wider range of element types is availble on request)						
Nominal size NG [l/min]	**Order number**	**Type**	**Filter material**	**max. Δ p [bar]**		**Filter surface [cm²]**
650	70535473	852 099 PS 3/V 5.0	PS 3	10	Fine filter	22100
	70535472	852 099 PS 6/V 5.0	PS 6	10	Fine filter	22100
	70535470	852 099 PS 10/V 5.0	PS 10	10	Fine filter	22100
	70534327	852 099 PS 6/Drg 50/V 5.0	PS 6	10	Fine filter	22100
			Drg 50		Safety filter	2525
	70514957	852 099 PS 10/Drg 50/V 5.0	PS 10	10	Fine filter	22100
			Drg 50		Safety filter	2525
1100	70535476	852 100 PS 3/V 5.0	PS 3	10	Fine filter	52000
	70535475	852 100 PS 6/V 5.0	PS 6	10	Fine filter	52000
	70535474	852 100 PS 10/V 5.0	PS 10	10	Fine filter	52000
	70535918	852 100 PS 6/Drg 50/V 5.0	PS 6	10	Fine filter	52000
			Drg 50		Safety filter	5200
	70514957	852 100 PS 10/Drg 50/V 5.0	PS 10	10	Fine filter	52000
			Drg 50		Safety filter	5200

9. Technical specifications

Type:	Pi 260065	Pi 260110
Nominal pressure:	25 bar/363 psi	25 bar/363 psi
Test pressure:	40 bar/581 psi	40 bar/581 psi
Oil temperature:	-40 to +100 °C	-40 to +100 °C
Temperature range:	+60 °C	+60 °C
Bypass setting:	5 bar/72 psi	5 bar/72 psi
Maintenance indicator setting:	3.5 bar/51 psi	3.5 bar/51 psi
Electrical data of maintenance indicator:		
Maximum voltage:	250 V AC/200 V DC	250 V AC/200 V DC
Maximum current:	1 A	1 A
Contact load:	70 W	70 W
Type of protection:	IP 65 in inserted and secured status	IP 65 in inserted and secured status
Contact:	normally open/closed	normally open/closed
Cable connection:	M20x1.5	M20x1.5
Connection suction side*:	G/SAE 2.5	G/SAE 2.5
Connection pressure side*:	G/SAE 2.5	G/SAE 2.5
Viscosity range:	10 – 10,000 mm²/s	10 – 10,000 mm²/s

* G/SAE 2 connections optional

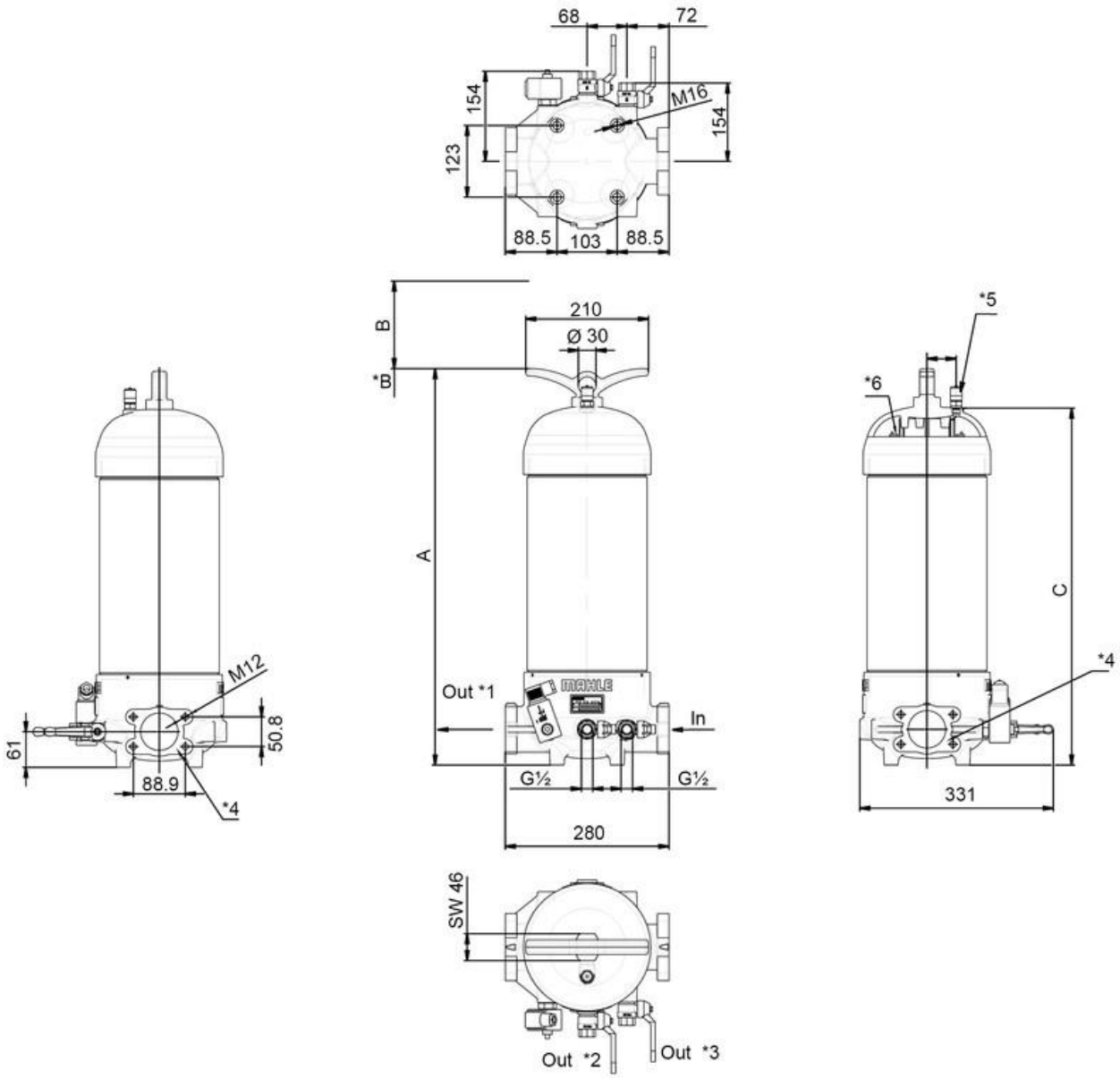
Subject to technical alteration without prior notice!

The switching function can be changed by turning the electric upper part by 180° (normally closed contact or normally open contact). The state on delivery is a normally closed contact. By inductivity in the direct current circuit the use of suitable protection circuit should be considered. Further maintenance indicator details and designs are available in the maintenance indicator data sheet.

We draw attention to the fact that all values indicated are average values and do not always occur in specific cases of application. Our products are continually being further developed. Values, dimensions and weights can change as a result of this. Our specialized department will be pleased to offer you advice.

We recommend you to contact us concerning applications of our filters in areas governed by the EU Directive 94/9 EC (ATEX 95). The standard version can be used for liquids based on mineral oil (corresponding to the fluids in Group 2 of Directive 97/23 EC Article 9). If you consider to use other fluids please contact us for additional support.

10. Dimensions



Out *1	Outlet	*5	Connection permanent venting
Out *2	Drain outlet clean side	*6	Element removal via bow
Out *3	Drain outlet dirt side	*B	Minimum clearance for filter element
*4	SAE flange ISO 6162-1 DN64	In	Inlet

All dimensions in mm.

Type	A	B	C
260065	667	440	611
260110	1197	970	1141

11. Installation, operating and maintenance instructions

11.1 Filter installation

When installing the filter make sure that sufficient space is available to remove filter element and filter housing. Preferably the filter should be installed with the filter housing pointing upwards.
Der The maintenance indicator must be visible.

11.2 Connecting the electrical maintenance indicator

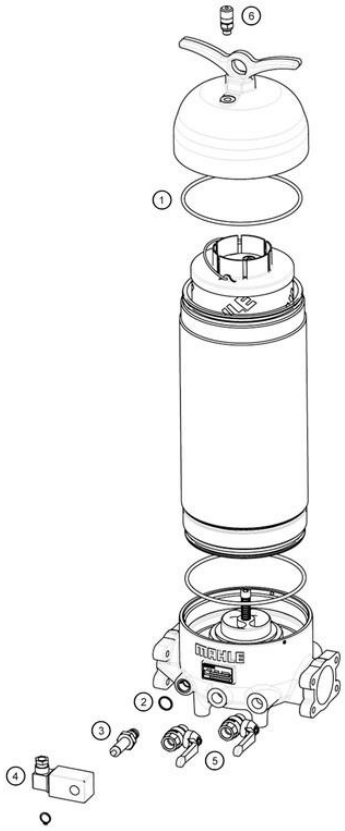
The electrical indicator is connected via a 2-pole appliance plug according to DIN EN 175301-803 with poles marked 1 and 2. The electrical section can be inverted to change from normally open position to normally closed position or vice versa.

11.3 When should the filter element be replaced?

1. Filters equipped with visual and electrical maintenance indicator:
   During cold starts, the indicator may give a warning signal. Press the red button of the visual indicator once again only after operating temperature has been reached. If the red button immediately pops up again and/or the electrical signal has not switched off after reaching operating temperature, the filter element must be replaced after the end of the shift.
2. Filters without maintenance indicator:
   The filter element should be replaced after the trial run or flushing of the system. Afterwards follow instructions of the manufacturer.
3. Please always ensure that you have original Filtration Group spare elements in stock: Disposable elements (PS) cannot be cleaned.

11.4 Element replacement

1. Stop system and relieve filter module from pressure.
2. Unscrew the cover with an open-end wrench and remove it.
3. Open the drain and discharge the housing completely.
4. Remove element out of the housing carefully.
5. Check seals on the filter housing for damage. Replace, if necessary.
6. Make sure that the order number on the spare element corresponds to the order number of the filter name-plate.
   To ensure no contamination occurs during the exchange of the element first open the plastic bag and push the element over the spigot in the filter head. Now remove plastic bag.
7. Close the drain.
8. Tighten the cover with an open-end wrench.
9. Vent the filter.



12. Spare parts list

Order numbers of spare parts and optional accessories		
Position	**Type**	**Order number**
① to ②	Seal kit complete	
	NBR	70523436
③ to ④	Maintenance indicator	
	Visual PiS 3098/3.5	77938582
	Electrical PiS 3097/3.5	78236648
	Electrical upper section only	77536550
⑤	Ball valve drain outlet dirt side/ outlet clean side	70518114
⑥	Ventilation system connection	70518145

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70531449.06/2019

FG Fluid Solutions
Filtration Group

MAHLE Industrialfiltration is now Filtration Group. For more information, visit www.fluid.filtrationgroup.com

Low Pressure Filter
Pi 1500

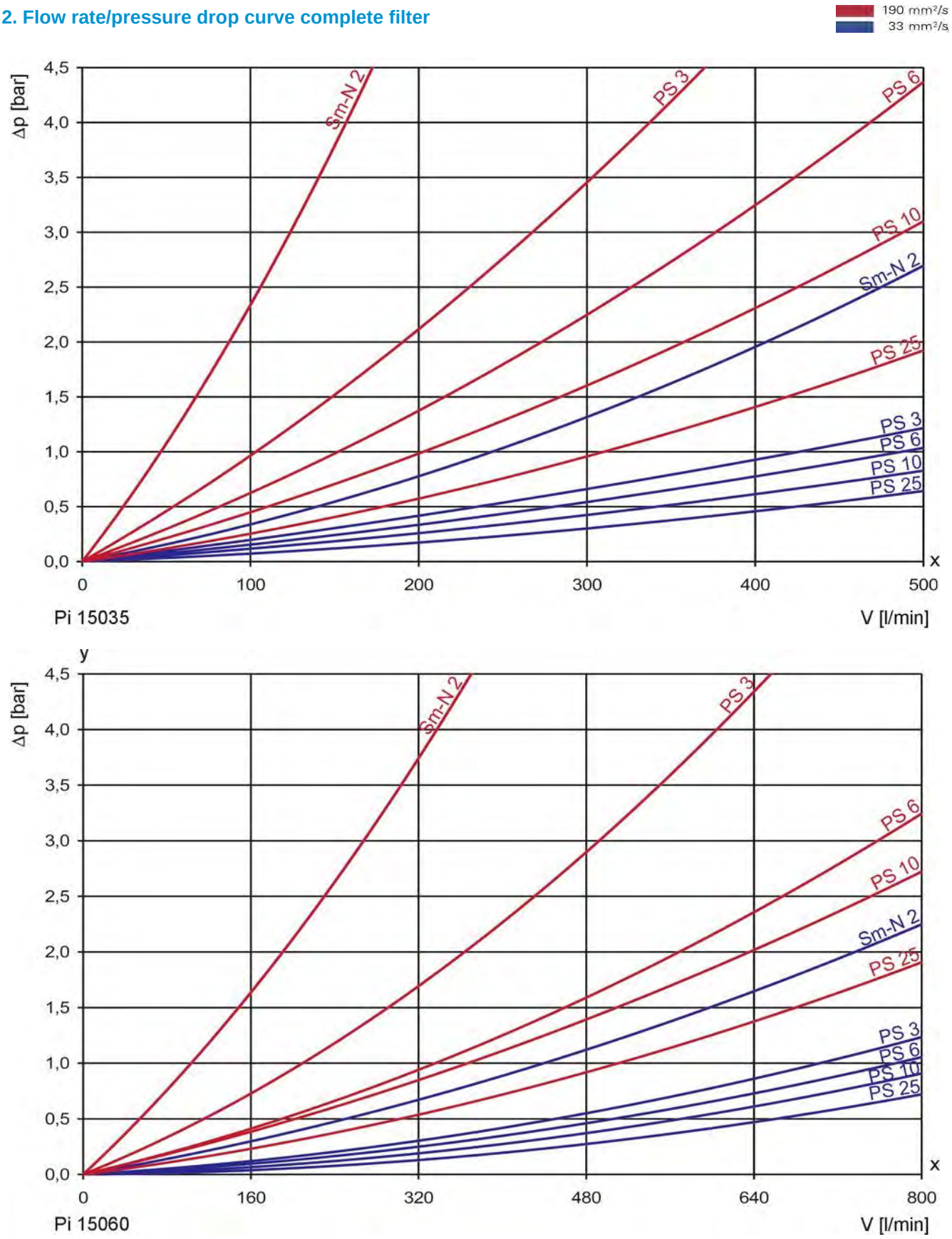
Nominal pressure 10/25 bar (140/360 psi), nominal size up to 600
Filter elements according to DIN 24550

1. Features

High performance filters for modern hydraulic systems

- Provided for pipe installation
- Modular system
- Compact design
- Minimal pressure drop through optimal flow design
- Visual/electrical/electronic maintenance indicator
- Threaded connections
- Quality filters, easy to service
- Equipped with highly efficient glass fibre PS filter elements
- Beta rated elements according to ISO 16889 multipass test
- Elements with high differential pressure stability and dirt holding capacity
- Worldwide distribution

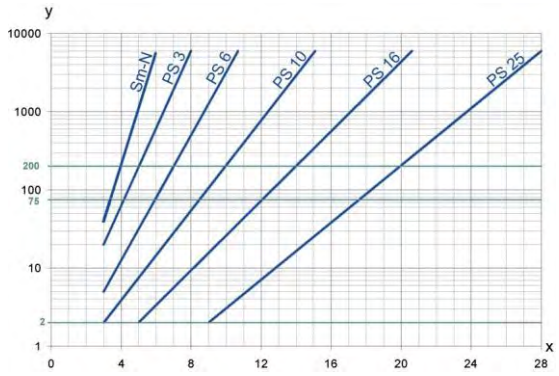
2. Flow rate/pressure drop curve complete filter



y = differential pressure Δp [bar]

x = flow rate V [l/min]

3. Separation characteristics



y = beta-value
x = particle size [µm]

determined by multipass tests (ISO 16889)
calibration according to ISO 11171 (NIST)

4. Filter performance data

tested according to ISO 16889 (multipass test)

PS/Sm-N 2 elements with
max. Δp 10 bar

Sm-N	2	$\beta_{4(C)} \geq 200$
PS	3	$\beta_{5(C)} \geq 200$
PS	6	$\beta_{7(C)} \geq 200$
PS	10	$\beta_{10(C)} \geq 200$
PS	16	$\beta_{15(C)} \geq 200$
PS	25	$\beta_{20(C)} \geq 200$

Values guaranteed up to 10 bar differential pressure.

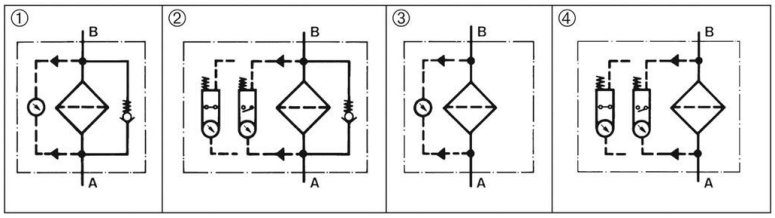
The filter element Sm-N 2 is an element with a very large dirt holding capacity, especially for bypass filtration.

5. Quality assurance

Filtration Group filters and filter elements are manufactured respectively, tested in accordance with the following international standards:

Norm	Designation
DIN ISO 2941	Hydraulic fluid power filter elements; verification of collapse/burst resistance
DIN ISO 2942	Hydraulic fluid power filter elements; verification of fabrication integrity
DIN ISO 2943	Hydraulic fluid power filter elements; verification of material compatibility with fluids
DIN ISO 3723	Hydraulic fluid power filter elements; method for end load test
DIN ISO 3724	Hydraulic fluid power filter elements; verification of flow fatigue characteristics
ISO 3968	Hydraulic fluid power-filters-evaluation of pressure drop versus flow characteristics
ISO 10771.1	Fatigue pressure testing of metal containing envelopes in hydraulic fluid applications
ISO 16889	Hydraulic fluid power filters-multipass method for evaluation filtration performance of a filter element

6. Symbols



7. Order numbers

Example for ordering filters:

1. Filter housing	2. Filter element
V = 350 l/min, bypass, electrical maintenance indicator, Nominal pressure: 10 bar Type: Pi 15035/10-058 Order number: 76101778	PS 10 Type: Pi 23063 RN PS 10 Order number: 77924202

7.1 Housing design

Nominal size NG [l/min]	Order number	Type	Nominal pressure [bar]	① with bypass valve and visual indicator	② with bypass valve and electrical indicator	③ with visual indicator	④ with electrical indicator
350	76101760	Pi 15035/10-057	10	■			
	76101778	Pi 15035/10-058			■		
	76101786	Pi 15035/10-068				■	
	76101794	Pi 15035/10-069					■
	76101851	Pi 15035/25-057	25	■			
	76101869	Pi 15035/25-058			■		
600	76101802	Pi 15060/10-057	10	■			
	76101810	Pi 15060/10-058			■		
	76101828	Pi 15060/10-068				■	
	76126353	Pi 15060/10-069					■
	76101877	Pi 15060/25-057	25	■			
	76101885	Pi 15060/25-058			■		

When filter with non bypass configuration is selected, the collapse pressure of the element must not be exceeded.

7.2 Filter elements*

Nominal size NG [l/min]	Order number	Type	Filter material	Number	max. Δ p [bar]	Filter surface [cm²]
350	76112650	Pi 2S063 RN Sm-N 2	Sm-N 2	1	10	8850
	77924194	Pi 21063 RN PS 3	PS 3	1		13515
	77964091	Pi 22063 RN PS 6	PS 6	1		13515
	77924202	Pi 23063 RN PS 10	PS 10	1		13515
	77963671	Pi 24063 RN PS 16	PS 16	1		13515
	77960263	Pi 25063 RN PS 25	PS 25	1		13515
600	76112650	Pi 2S063 RN Sm-N 2	Sm-N 2	2	10	2 x 8850
	77924194	Pi 21063 RN PS 3	PS 3	2		2 x 13515
	77964091	Pi 22063 RN PS 6	PS 6	2		2 x 13515
	77924202	Pi 23063 RN PS 10	PS 10	2		2 x 13515
	77963671	Pi 24063 RN PS 16	PS 16	2		2 x 13515
	77960263	Pi 25063 RN PS 25	PS 25	2		2 x 13515

*a wider range of element types is available on request

8. Technical specifications

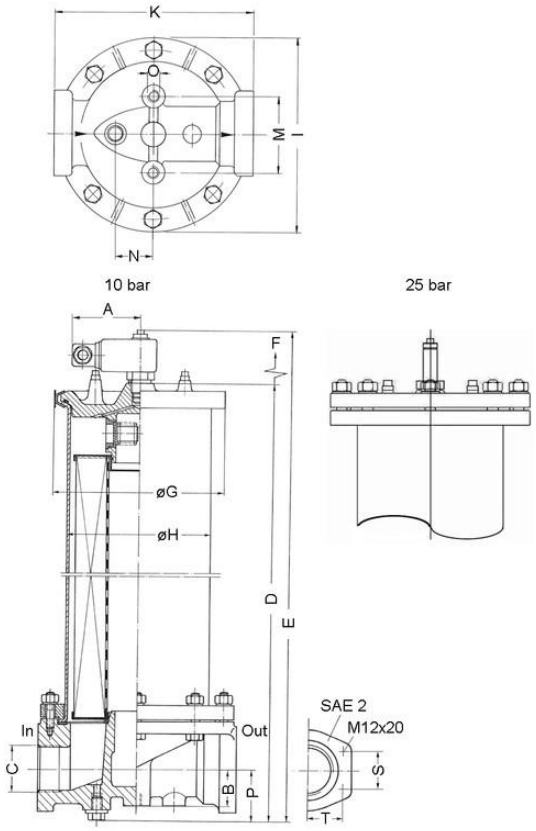
Nominal pressure:	10/25 bar (140/360 psi)
Temperature range:	- 10 °C to + 120 °C
	(other temperature ranges on request)
Bypass setting:	Δp 3.5 bar ± 10 %
Filter head material:	GAL
Filter housing material:	St
Sealing material:	NBR
Maintenance indicator setting:	Δp 2.2 bar ± 10 %
Electrical data of maintenance indicator:	
Maximum voltage:	250 V AC/200 V DC
Maximum current:	1 A
Contact load:	70 W
Type of protection:	IP 65 in inserted and secured status
Contact:	normally open/closed
Cable sleave:	M20x1.5

The switching function can be changed by turning the electric upper part by 180° (normally closed contact or normally open contact). The state on delivery is a normally closed contact. By inductivity in the direct current circuit the use of suitable protection circuit shoud be considered. Further maintenance indicators details and designs are available in the maintenance indicator data sheet.

We draw attention to the fact that all values indicated are average values which do not always occur in specific cases of application. Our products are continually being further developed. Values, dimensions and weights can change as a result of this. Our specialized department will be pleased to offer you advice.

We recommend to contact us concerning applications of our filters in areas governed by the EU Directive 94/9 EC (ATEX 95). The standard version can be used for liquids based on mineral oil (corresponding to the fluids in Group 2 of Directive 97/23 EC Article 9). If you consider to use other fluids please contact us for additional support.

Housing with nominal pressure 10 bar are fitted standard with an air bleeder valve.



Subject to technical alteration without prior notice.

9. Dimensions

All dimensions except "C" in mm.

Type	A	B	C	D	E	F	G 10 bar	G 25 bar	H	I	K	M	N	O	P	S	T	Weight [kg]
Pi 15035	78	42	G1½	643	680	425	190	225	165	225	230	90	44	M12x20	59	-	-	17.1
Pi 15060	78	42	SAE 2	1005	1045	850	190	225	165	225	230	90	44	M12x20	59	42.9	77.8	27.1

NPT- and SAE-connections on request.

* Standard pressure series hole pattern 3000 PSI

10. Installation, operating and maintenance instructions

10.1 Filter installation

When installing filter make sure that sufficient space is available to remove filter element and filter housing.

10.2 Connecting the electrical maintenance indicator

The electrical indicator is connected via a 2-pole appliance plug according to DIN EN 175301-803 with poles marked 1 and 2. The electric upper section can be inverted to change from normally open position to normally closed position or vice versa.

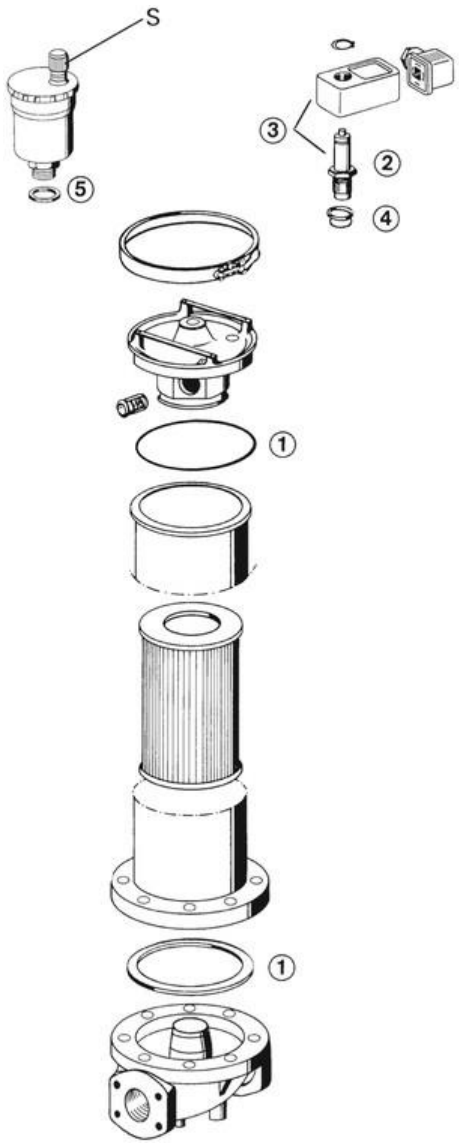
10.3 When should the filter element be replaced?

1. Filters equipped with visual and electrical maintenance indicator:
   During cold starts, the indicator may give a warning signal. Press the red button of the visual indicator once again only after operating temperature has been reached. If the red button immediately pops up again and/or the electrical signal has not switched off after reaching operating temperature, the filter element must be replaced after the end of the shift.
2. Filters without maintenance indicator:
   The filter element should be replaced after the trial run or flushing of the system. Afterwards follow instructions of the manufacturer.
3. Please always ensure that you have original Filtration Group spare elements in stock: Disposable elements (PS, Sm-N) cannot be cleaned.

10.4 Element replacement

1. Stop system and relieve filter from pressure.
2. Loosen quick-action clamp (10 bar version) or screws of flanged cover, remove cover, and open drain valve. Housing completely vented.
3. Remove filter element from filter housing. Remove spacer sleeve at Pi 15060. After proper cleaning please use again.
4. Check seals for damage. Replace, if necessary.
5. Make sure that the part number on the spare element corresponds with the part number on the filter label. It is necessary to replace always both elements of Pi 15060. Remove the plastic bag and push element over the spigot in the filter head. Attach sleeve on Pi 15060 and fit second element.
6. 10 bar version: Close drain valve, relocate cover, and close the quick-action clamp. Filters are automatically vented via the air bleeder valve, the protection cap has to be turned 2 times for being open.
7. 25 bar version: Close drain valve and put the cover plate on so that the stud bolts go into the holes of the cover plate. Make sure not to squeeze the O-ring on the bottom side of the cover plate. Hand-tighten the 8 mounting nuts with spring rings. Then draw up the nuts tight crosswise with a turn-screw SW 19 without canting the cover plate. Tightening torque for mountings nuts is 50 Nm. After bringing the hydraulic unit to service de-aerate the filter via vent-screw.

11. Spare parts list



Order numbers for spare parts		
Position	**Type**	**Order number**
①	Seal kit	
	NBR	77831407
	FPM	77831415
	EPDM	77831423
② + ③	Maintenance indicator	
	Visual PiS 3098/2.2	77669971
	Electrical PiS 3097/2.2	77669948
	Electrical upper section only	77536550
④	Seal kit for differential pressure indicator PiS 3098/2.2 + PiS 3097/2.2	
	NBR	77760309
	FPM	77760317
	EPDM	77760325
⑤	Air bleeder valve	70323353
	Adapter for filter elements (Pi 15060)	76102073

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Line filter
Pi 1907

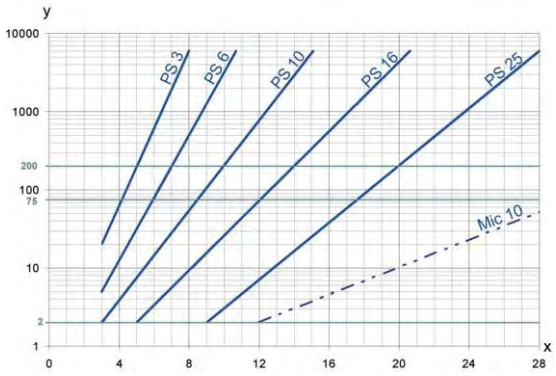
Nominal pressure 16 bar (230 psi), nominal size 400 up to 6000

1. Features

High performance filters for modern hydraulic systems

- Provided for pipe installation
- Modular design
- Compact design
- Minimal pressure drop through optimal flow design
- Visual/electrical/electronic maintenance indicator
- Flanged connections
- Quality filters, easy to service
- Equipped with highly efficient glass fibre PS/Sm-x filter elements
- Beta rated elements according to ISO 16889 multipass test
- Elements with high differential pressure stability and dirt holding capacity
- Worldwide distribution

2. Separation grade characteristics



y = beta-value
x = particle size [µm]

determined by multipass tests (ISO 16889)
calibration according to ISO 11171 (NIST)

3. Filter performance data

tested according to ISO 16889 (multipass test)

PS elements with max. Δ p 10 bar

PS	3	$\beta_{5(C)}$	≥	200
PS	6	$\beta_{7(C)}$	≥	200
PS	10	$\beta_{10(C)}$	≥	200
PS	16	$\beta_{15(C)}$	≥	200
PS	25	$\beta_{20(C)}$	≥	200

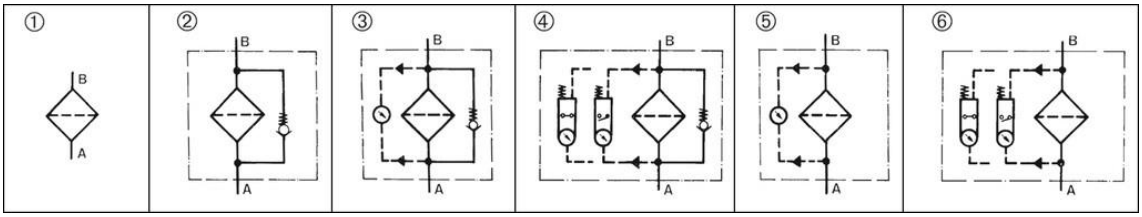
values guaranteed at 5 bar differential pressure

4. Quality assurance

Filtration Group filters and filter elements are produced according to the following international standards:

Norm	Designation
DIN ISO 2941	Hydraulic fluid power filter elements; verification of collapse/burst resistance
DIN ISO 2942	Hydraulic fluid power filter elements; verification of fabrication integrity
DIN ISO 2943	Hydraulic fluid power filter elements; verification of material compatibility with fluids
DIN ISO 3723	Hydraulic fluid power filter elements; method for end load test
DIN ISO 3724	Hydraulic fluid power filter elements; verification of flow fatigue characteristics
ISO 3968	Hydraulic fluid power-filters-evaluation of pressure drop versus flow characteristics
ISO 10771.1	Fatigue pressure testing of metal containing envelopes in hydraulic fluid applications
ISO 16889	Hydraulic fluid power filters; multipass method for evaluation filtration performance of a filter element

5. Symbols



6. Types (Example for ordering filters)

Pi 1907/ 3/ 16/ 150/ V/ E/ Mg/ Abh/ 852 888 PS 10

Pi 1907	**3**	**16**	**150**	**V**	**E**	**Mg**	**Abh**	**852888 PS 10**
1	2	3	4	5	6	7	8	9

1 Filter type
2 Number of elements (up to DN 125, 1; DIN 150 and 200 3 ea.)
3 Nominal pressure
4 Connection size
5 Bypass valve
6 Maintenance indicator E = electrical, M = visual
7 Magnets (available for flange size DN 100 up to DN 200)
8 Cover lifting device (available for flange size DN 150, DN 200)
9 Filter element

7. Technical specifications

Design:								line mounting filter
Fitting position:								preferable upright
Nominal pressure:								16 bar (NG 150 and 200 also available with operating pressure 10 bar)
Connections:	NG	400	630	800	1250	1800	3500	6000
	DN	50	65	80	100	125	150	200
								Flange connections according to DIN EN 1092-1
Temperature range:								- 10 °C to + 100 °C
								(other temperature ranges on request)
Filter housing material:								steel welded construction
Sealing material:								NBR (other material on request)
Bypass setting:								Δ p 3.5 bar $\pm$ 10 %
Maintenance indicator setting:								Δ p 2.2 bar $\pm$ 10 %
Electrical data of maintenance indicator:								
Maximum voltage:								230 V ~/=
Maximum current:								2.5 A
Contact load:								60 VA/40 W
Inrush current:								70 VA
Type of protection:								IP 65 in inserted and secured status
Contact:								normally open/closed
Cable sleave:								M20x1.5

The switching function can be changed by turning the electric upper part by 180° (normally closed contact or normally open contact). The state on delivery is a normally closed contact. By inductivity in the direct current circuit the use of suitable protection circuit should be considered. Further maintenance indicator details and designs are available in the maintenance indicator data sheet.

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8. Order numbers

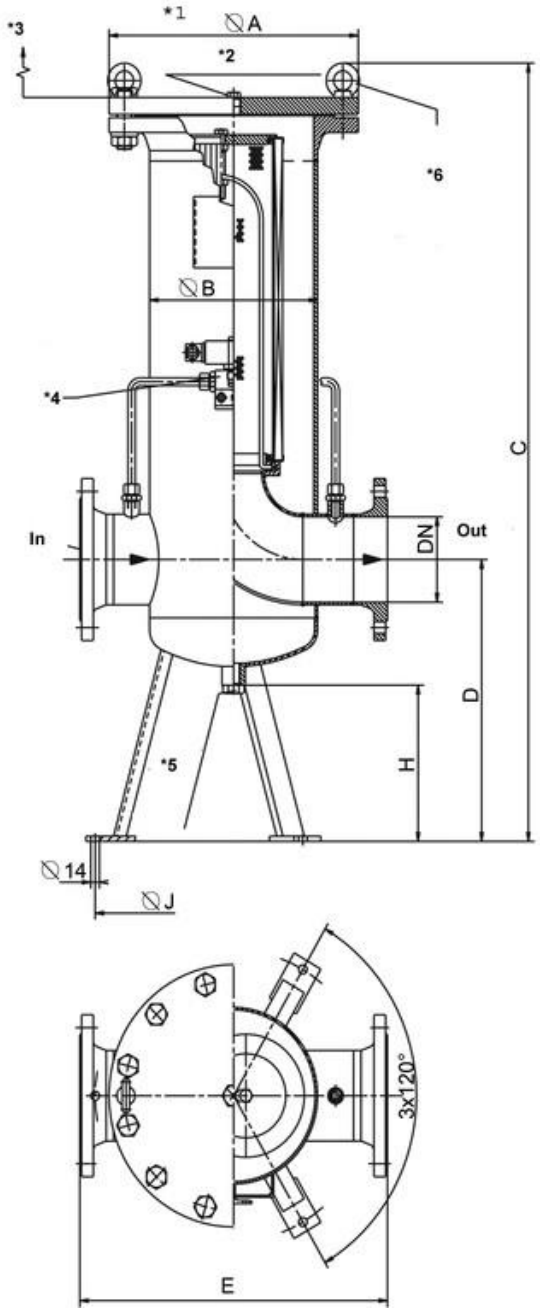
8.1 Filter elements					
Nominal size NG [l/min]	**Order number**	**Type**	**Filter material**	**max. Δ p [bar]**	**Filter surface [cm²]**
400 DN 50	77924178	Pi 21040 RN PS 3 NBR	PS 3	**10**	8310
	77964083	Pi 22040 RN PS 6 NBR	PS 6		8310
	77924186	Pi 23040 RN PS 10 NBR	PS 10		8310
	77963663	Pi 24040 RN PS 16 NBR	PS 16		8310
	77960255	Pi 25040 RN PS 25 NBR	PS 25		8310
	77925050	Pi 13040 RN Mic 10 NBR	Mic 10	**10**	9450
	77963713	Pi 35040 RN DRG 25 NBR	DRG 25	**10**	6370
	77999444	Pi 36040 RN DRG 40 NBR	DRG 40		6370
	77963762	Pi 37040 RN DRG 60 NBR	DRG 60		6370
	78267833	Pi 38040 RN DRG 100 NBR	DRG 100		6370
630 DN 65	77924194	Pi 21063 RN PS 3 NBR	PS 3	**10**	13580
	77964091	Pi 22063 RN PS 6 NBR	PS 6		13580
	77924202	Pi 23063 RN PS 10 NBR	PS 10		13580
	77963671	Pi 24063 RN PS 16 NBR	PS 16		13580
	77960263	Pi 25063 RN PS 25 NBR	PS 25		13580
	77925068	Pi 13063 RN Mic 10 NBR	Mic 10	**10**	15550
	77963721	Pi 35063 RN DRG 25 NBR	DRG 25	**10**	8777
	77999451	Pi 36063 RN DRG 40 NBR	DRG 40		10320
	77963770	Pi 37063 RN DRG 60 NBR	DRG 60		8777
	78264459	Pi 38063 RN DRG 100 NBR	DRG 100		10320
800 DN 80	77924194	Pi 21063 RN PS 3 NBR	PS 3	**10**	13580
	77964091	Pi 22063 RN PS 6 NBR	PS 6		13580
	77924202	Pi 23063 RN PS 10 NBR	PS 10		13580
	77963671	Pi 24063 RN PS 16 NBR	PS 16		13580
	77960263	Pi 25063 RN PS 25 NBR	PS 25		13580
	77925068	Pi 13063 RN Mic 10 NBR	Mic 10	**10**	15550
	77963721	Pi 35063 RN DRG 25 NBR	DRG 25	**10**	8777
	77999451	Pi 36063 RN DRG 40 NBR	DRG 40		10320
	77963770	Pi 37063 RN DRG 60 NBR	DRG 60		8777
	78264459	Pi 38063 RN DRG 100 NBR	DRG 100		10320
1250 DN 100	78263295	852 888 PS 3 NBR	PS 3	**10**	21850
	78354029	852 888 PS 6 NBR	PS 6		21850
	78226813	852 888 PS 10 NBR	PS 10		21850
	78226821	852 888 PS 25 NBR	PS 25		21850
	78207664	852 888 Mic 10 NBR	Mic 10	**10**	21850
	78228017	852 888 Drg 25 NBR	DRG 25	**10**	16500
	78228025	852 888 Drg 40 NBR	DRG 40		16500
	78303026	852 888 Drg 60 NBR	DRG 60		16500
	78228470	852 888 Drg 100 NBR	DRG 100		16500

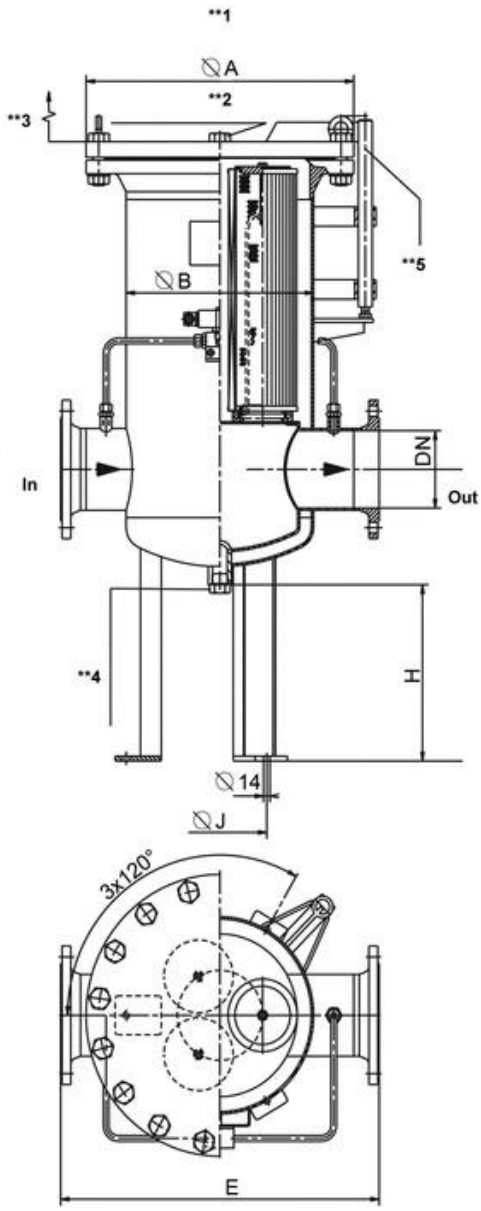
8.1 Filter elements					
Nominal size NG [l/min]	**Order number**	**Type**	**Filter material**	**max. Δ p [bar]**	**Filter surface [cm²]**
1800 DN 125	78227431	852 884 PS 3 NBR	PS 3	**10**	28500
	79337916	852 884 PS 6 NBR	PS 6		28500
	78226797	852 884 PS 10 NBR	PS 10		28500
	78226805	852 884 PS 25 NBR	PS 25		28500
	70366315	852 884 Mic 10 NBR	Mic 10	**10**	28500
	79337460	852 884 Drg 25 NBR	DRG 25	**10**	23450
	78261653	852 884 Drg 40 NBR	DRG 40		23450
	79700402	852 884 Drg 60 NBR	DRG 60		23450
	79327750	852 884 Drg 100 NBR	DRG 100		23450
3500 DN 150	78263295	3x 852 888 PS 3 NBR	PS 3	**10**	65550
	78354029	3x 852 888 PS 6 NBR	PS 6		65550
	78226813	3x 852 888 PS 10 NBR	PS 10		65550
	78226821	3x 852 888 PS 25 NBR	PS 25		65550
	78207664	3x 852 888 Mic 10 NBR	Mic 10	**10**	65550
	78228017	3x 852 888 DRG 25 NBR	DRG 25	**10**	49500
	78228025	3x 852 888 DRG 40 NBR	DRG 40		49500
	78303026	3x 852 888 DRG 60 NBR	DRG 60		49500
	78228470	3x 852 888 DRG 100 NBR	DRG 100		49500
6000 DN 200	78227431	3x 852 884 PS 3 NBR	PS 3	**10**	85506
	79337916	3x 852 884 PS 6 NBR	PS 6		85506
	78226797	3x 852 884 PS 10 NBR	PS 10		85506
	78226805	3x 852 884 PS 25 NBR	PS 25		85506
	70366315	3x 852 884 Mic 10 NBR	Mic 10	**10**	85500
	79337460	3x 852 884 DRG 25 NBR	DRG 25	**10**	70350
	78261653	3x 852 884 DRG 40 NBR	DRG 40		70350
	79700402	3x 852 884 DRG 60 NBR	DRG 60		70350
	79327750	3x 852 884 DRG 100 NBR	DRG 100		70350

9. Dimensions

All dimensions in mm.

Nominal size NG [l/min]	**Connection DN**	**Nominal pressure PN [bar]**	**A**	**B**	**C**	**D**	**E**	**G**	**H**	**J**	**K**
400	50	16	285	169	890	250	380	G½	110	300	200
630	65		285	169	890	250	380	G½	110	300	350
800	80		285	169	890	250	380	G½	110	300	350
1250	100		340	220	1200	365	450	G½	195	380	450
1800	125		405	273	1200	435	500	G½	240	450	450
3500	150		580	407	1530	600	690	G1	300	440	450
6000	200		715	508	1465	550	740	G1	170	500	450
3500	150	10	565	407	1530	600	690	G1	300	440	450
6000	200		670	508	1465	550	740	G1	170	500	450





*1 illustration shows execution up to flange size DN 125
*2 vent screw
*3 "K" height required for element removal
*4 maintenance indicator visual/electrical
*5 drain plug dirt side "G"
*6 Lifting eye; available for versions starting with size DN 100

**1 illustration shows execution starting with flange size DN 150
**2 vent screw
**3 "K" height required for element removal
**4 drain plug dirt side "G"
**5 cover lifting device

10. Commissioning

- Prior to commissioning the filter open the venting screw and wait until liquid emerges. Then tighten the venting screw.
- After that all sealing points must be optically inspected for leaks.
- If the maintenance indicator gives a signal when the operating temperature has been reached, the filter element must be exchanged after the end of the shift.
- For element exchange stop system and relieve filter from pressure. Empty filter over drain plug, remove hex nuts, remove container top, remove hex nut, remove valve plate, remove nut, remove filter element.
- Clean filter housing using a suitable medium.
- Clean contaminated filter elements or replace by new MAHLE filters (only Drg-elements are cleanable).
- Inspect all sealing points and seals and replace by new if required.
- Assembly is performed in reverse order.

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fm.de.sales@filtrationgroup.com, www.fluid.filtrationgroup.com, 79322728.06/2019

Low Pressure Filter
Pi 1975

Nominal pressure 6 bar (90 psi), nominal size 50

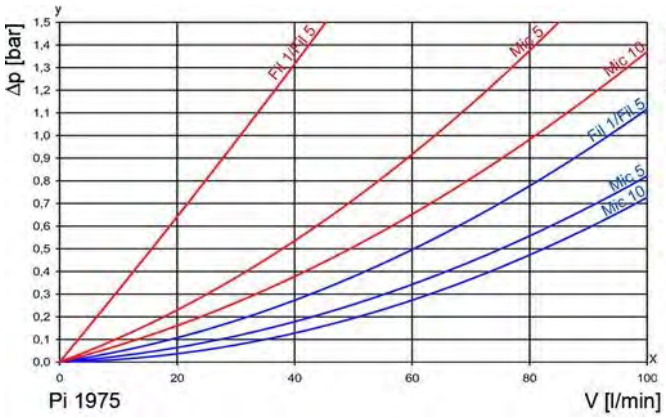
1. Features

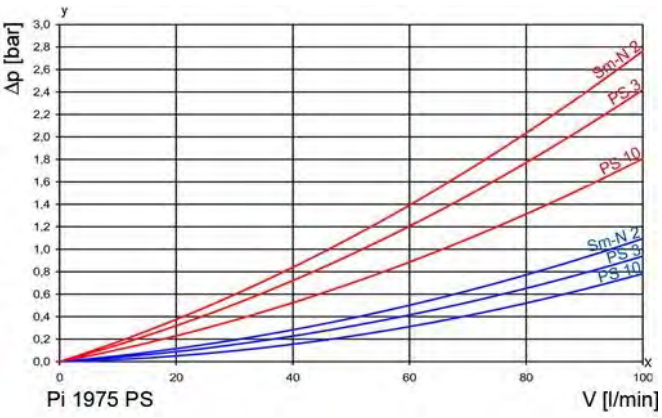
High performance filters for modern hydraulic systems

- Provided for pipe installation
- Modular system
- Compact design
- Minimal pressure drop through optimal flow design
- Visual/electrical/electronic maintenance indicator
- Threaded connections
- Quality filters, easy to service
- Equipped with highly efficient glass fibre PS filter elements
- Beta rated elements according to ISO 16889 multipass test
- Elements with high differential pressure stability and dirt holding capacity
- Worldwide distribution

2. Flow rate/pressure drop curve complete filter

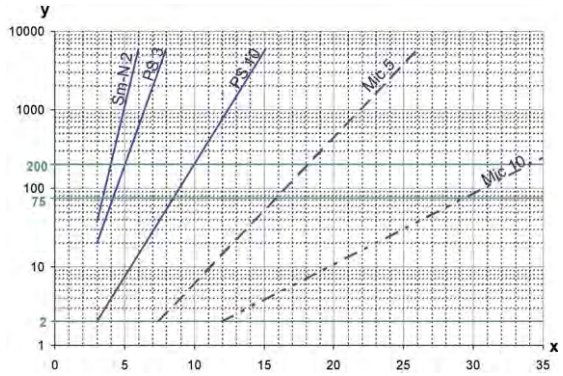
190 mm²/s
33 mm²/s





y = differential pressure Δp [bar]
x = flow rate V [l/min]

3. Separation grade characteristics



y = beta-value
x = particle size [µm]
determined by multipass tests (ISO 16889)
calibration according to ISO 11171 (NIST)

4. Filter performance data

tested according to ISO 16889 (multipass test)

PS/Sm-N 2 elements with
max. Δp 5 bar

Sm-N	2	$\beta_{4(C)} \geq 200$
PS	3	$\beta_{5(C)} \geq 200$
PS	10	$\beta_{10(C)} \geq 200$

Values guaranteed up to 5 bar differential pressure, Sm-N 2 elements up to 5 bar differential pressure.

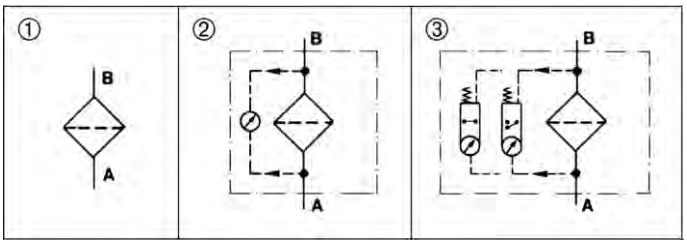
The filter element Sm-N 2 is an element with a very large dirt holding capacity, especially for bypass filtration.

5. Quality assurance

Filtration Group filters and filter elements are produced according to the following international standards:

Norm	Designation
DIN ISO 2941	Hydraulic fluid power filter element; verification of collapse/burst resistance
DIN ISO 2942	Hydraulic fluid power filter element, verification of fabrication integrity
DIN ISO 2943	Hydraulic fluid power filter element, verification of material compatibility with fluids
DIN ISO 3723	Hydraulic fluid power filter element, method for end load test
DIN ISO 3724	Hydraulic fluid power filter element, verification of flow fatigue characteristics
ISO 3968	Hydraulic fluid power filters; evaluation of pressure drop versus flow characteristics
ISO 10771.1	Fatigue pressure testing of metal containing envelopes in hydraulic fluid applications
ISO 16889	Hydraulic fluid power filters; multipass method for evaluation filtration performance of a filter element

6. Symbols



7. Order numbers

Example for ordering filters:

1. Housing design	2. Filter elements
with electrical indicator Type: Pi 1975-E Order number: 77664980	PS 10 Type: 852 275 PS 10 Order number: 77725583

7.1 Housing design

Nominal size NG [l/min]	Order number	Type	① with indicator	② with visual indicator	③ with electrical indicator
50	77664956	Pi 1975	■		
	77664964	Pi 1975-M		■	
	77664980	Pi 1975-E			■

The collapse pressure of the element must not be exceeded.

7.2 Filter elements*

Nominal size NG [l/min]	Order number	Type	Filter material	max. Δ p [bar]	Filter surface [cm²]
50	77698814	852 275 Mic 5	Mic 5	5	27000
	77675903	852 275 Mic 10	Mic 10		27000
	77678121	852 275 FIL 1	FIL 1	1.4	-
	77678113	852 275 FIL 5	FIL 5		-
	79309303	852 275 Sm-N 2	Sm-N 2	5	13150
	77956220	852 275 PS 3	PS 3		15500
	77725583	852 275 PS 10	PS 10		15500

* a wider range of element types is available on request

8. Technical specifications

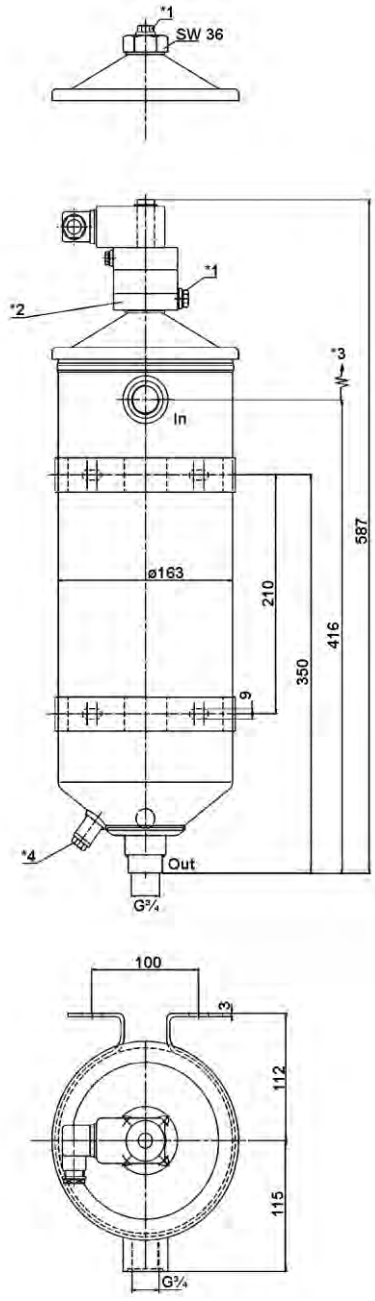
Design:	in-line filter
Nominal pressure:	6 bar (90 psi)
Test pressure:	8 bar (110 psi)
Temperature range:	- 10 °C to + 120 °C
	(other temperature ranges on request)
Filter head material:	St
Sealing material:	NBR/Cu
Maintenance indicator setting:	Δ p 1.2 bar $\pm$ 0.2 bar
Electrical data of maintenance indicator:	
Maximum voltage:	250 V AC/200 V DC
Maximum current:	1 A
Contact load:	70 W
Type of protection:	IP 65 in inserted and secured status
Contact:	normally open/closed
Cable sleave:	M20x1.5

The switching function can be changed by turning the electric upper part by 180° (normally closed contact or normally open contact). The state on delivery is a normally closed contact. By inductivity in the direct current circuit the use of suitable protection circuit should be considered. Further maintenance indicator details and designs are available in the maintenance indicator data sheet.

We draw attention to the fact that all values indicated are average values which do not always occur in specific cases of application. Our products are continually being further developed. Values, dimensions and weights can change as a result of this. Our specialized department will be pleased to offer you advice.

We recommend you to contact us concerning applications of our filters in areas governed by the EU Directive 94/9 EC (ATEX 95). The standard version can be used for liquids based on mineral oil (corresponding to the fluids in Group 2 of Directive 97/23 EC Article 9). If you consider to use other fluids please contact us for additional support.

Subject to technical alteration without prior notice.



Design without indicator- weight 8 kg

*1 vent screw G¼
*2 SW 36 for maintenance
*3 height required for element removal 400
*4 drain plug G¼ 90° ill. turned by 90°
In = inlet
Out = outlet

9. Installation, operating and maintenance instructions

9.1 Filter installation

When installing filter make sure that sufficient space is available to remove filter element and filter housing. Preferably the filter should be installed with the filter housing pointing downwards. The maintenance indicator must be visible.

9.2 Connecting the electrical maintenance indicator

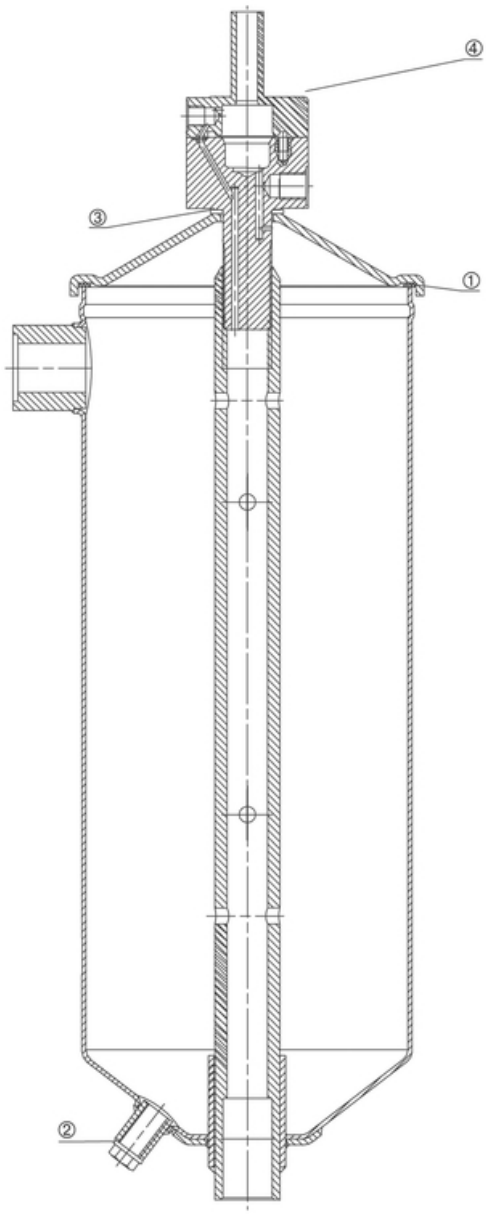
The electrical indicator is connected via a 2-pole appliance plug according to DIN EN 175301-803 with poles marked 1 and 2. The electrical section can be inverted to change from normally open to normally closed position or vice versa.

9.3 When should the filter be replaced?

1. Filters equipped with visual and electrical maintenance indicator:
   During cold starts, the indicator may give a warning signal. Press the red button of the visual indicator once again only after operating temperature has been reached. If the red button immediately pops up again and/or the electrical signal has not switched off after reaching operating temperature, the filter element must be replaced after the end of the shift.
2. Filters without maintenance indicator:
   The filter element should be replaced after the trial run or flushing of the system. Afterwards follow instructions of the manufacturer.
3. Please always make sure that you have original Filtration Group spare elements in stock: Disposable elements (Mic, FIL, Sm-N or PS) cannot be cleaned.

9.4 Element replacement

1. Stop system and relieve filter from pressure.
2. Remove cover screw, then lift off cover. On executions with indicator please unscrew maintenance indicator.
3. Remove filter element.
4. Check seals for damage. Replace if necessary.
5. Make sure that the order number on the spare element corresponds to the order number of the filter name-plate. Remove plastic bag and push element over the spigot in the filter housing.
6. Close drain screw, relocate cover and close it with cover screws and/or the indicator. Filters are automatically vented via the air bleeder valve. (Back off the screw 1-2 turns till medium escapes. Tight vent screw).



10. Spare parts list

Order number for spare parts		
Position	**Type**	**Order number**
① - ③	Seal kit for housing	
	NBR	77898836
④	Maintenance indicator	
	Visual PiS 3112/1.2	78287690
	Electrical PiS 3113/1.2	78287708
	Electrical upper section only	77536550
	Seal kit for maintenance indicator	
	NBR	78389280

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78357378.06/2019

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Low Pressure Filter
Pi 2000

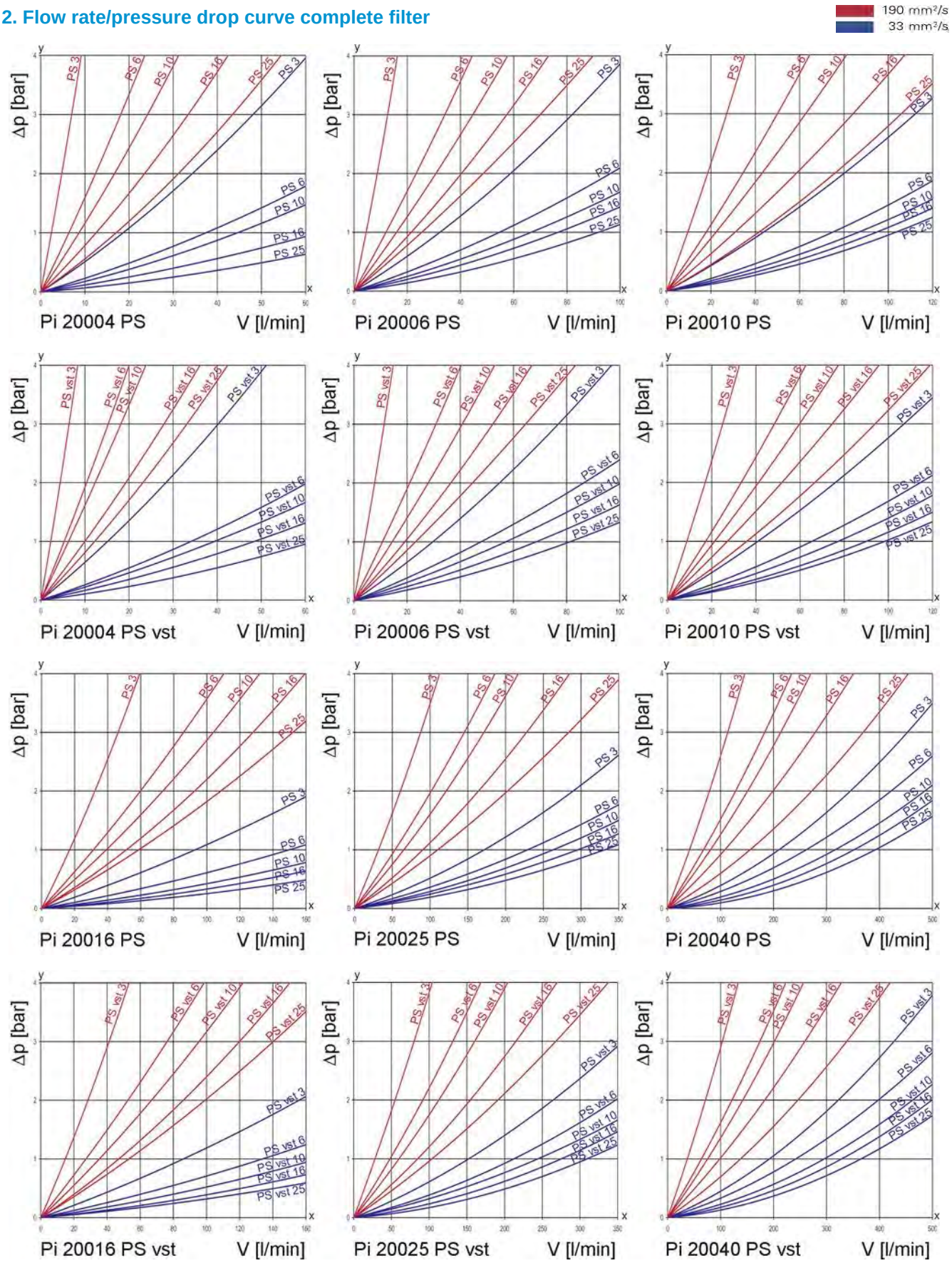
Nominal pressure 32/63 bar (460/900 psi), nominal size up to 400
according DIN 24550

1. Features

High performance filters for modern hydraulic systems

- Provided for pipe installation
- Modular system
- Compact design
- Minimal pressure drop through optimal flow design
- Visual/electrical/electronic maintenance indicator
- Threaded connections
- Quality filters, easy to service
- Equipped with higly efficient glass fibre PS filter elements
- Beta rated elements according to ISO 16889 multipass test
- Elements with high differential pressure stability and dirt holding capacity
- Other connections on request
- Worldwide distribution

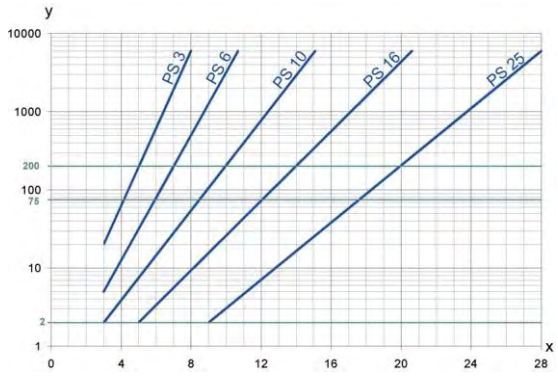
2. Flow rate/pressure drop curve complete filter



y = differential pressure Δp [bar]

x = flow rate V [l/min]

3. Separation grade characteristics



y = beta-value
x = particle size [µm]

determined by multipass tests (ISO 16889)
calibration according to ISO 11171 (NIST)

4. Filter performance data

tested according to ISO 16889 (multipass test)

PS elements with max. Δ p 20 bar

PS	3	$\beta_{5(C)}$	≥200
PS	6	$\beta_{7(C)}$	≥200
PS	10	$\beta_{10(C)}$	≥200
PS	16	$\beta_{15(C)}$	≥200
PS	25	$\beta_{20(C)}$	≥200

values guaranteed up to 10 bar differential pressure

PS vst elements with max. Δ p 210 bar

PS vst	3	$\beta_{5(C)}$	≥200
PS vst	6	$\beta_{7(C)}$	≥200
PS vst	10	$\beta_{10(C)}$	≥200
PS vst	16	$\beta_{15(C)}$	≥200
PS vst	25	$\beta_{20(C)}$	≥200

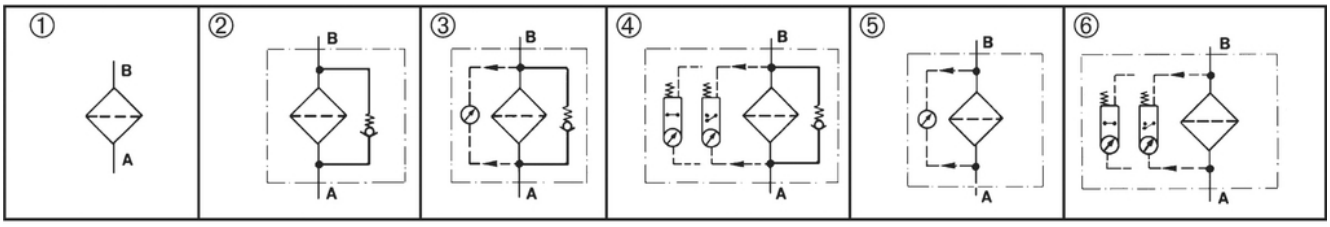
values guaranteed up to 20 bar differential pressure

5. Quality assurance

Filtration Group filters and filter elements are produced according to the following international standard:

Norm	Designation
DIN ISO 2941	Hydraulic fluid power filter elements; verification of collapse/burst resistance
DIN ISO 2942	Hydraulic fluid power filter elements; verification of fabrication integrity
DIN ISO 2943	Hydraulic fluid power filter elements; verification of material compatibility with fluids
DIN ISO 3723	Hydraulic fluid power filter elements; method for end load test
DIN ISO 3724	Hydraulic fluid power filter elements; verification of flow fatigue characteristics
ISO 3968	Hydraulic fluid power-filters-evaluation of pressure drop versus flow characteristics
ISO 10771.1	Fatigue pressure testing of metal containing envelopes in hydraulic fluid applications
ISO 16889	Hydraulic fluid power filters; multipass method for evaluation filtration performance of a filter element

6. Symbols



7. Order numbers

Example for ordering filters:

1. Housing design	2. Filter element
V = 100 l/min with visual/electrical maintenance indicator Type: Pi 20010-069 Order number: 78265035	PS vst 3 NBR Type: Pi 71010 DN PS vst 3 Order number: 78227480

7.1 Housing design

Nominal size NG [l/min]	Order number	Type	① no options	② with bypass	③ with bypass valve and visual indicator	④ with bypass valve and electrical indicator	⑤ with visual indicator	⑥ with electrical indicator
40	76116974	Pi 20004-060	■					
	76116982	Pi 20004-056		■				
	79328394	Pi 20004-057			■			
	79328402	Pi 20004-058				■		
	79328410	Pi 20004-068					■	
	79328428	Pi 20004-069						■
63	76116990	Pi 20006-060	■					
	76117006	Pi 20006-056		■				
	76117014	Pi 20006-057			■			
	76117022	Pi 20006-058				■		
	76117030	Pi 20006-068					■	
	76117048	Pi 20006-069						■
100	76117055	Pi 20010-060	■					
	76117063	Pi 20010-056		■				
	79328436	Pi 20010-057			■			
	77958705	Pi 20010-058				■		
	79328444	Pi 20010-068					■	
	78265035	Pi 20010-069						■
160	76117071	Pi 20016-060	■					
	76117089	Pi 20016-056		■				
	76117097	Pi 20016-057			■			
	79713520	Pi 20016-058				■		
	76114102	Pi 20016-068					■	
	76114110	Pi 20016-069						■
250	76114128	Pi 20025-060	■					
	76114136	Pi 20025-056		■				
	79328451	Pi 20025-057			■			
	77958879	Pi 20025-058				■		
	79328469	Pi 20025-068					■	
	79328477	Pi 20025-069						■
400	76114144	Pi 20040-060	■					
	76114151	Pi 20040-056		■				
	79714395	Pi 20040-057			■			
	76114169	Pi 20040-058				■		
	76114177	Pi 20040-068					■	
	76114185	Pi 20040-069						■

When filter with non bypass configuration is selected, the collapse pressure of the element must not be exceeded.

7.2 Filter elements*					
Nominal size NG [l/min]	**Order number**	**Type**	**Filter material**	**max. Δ p [bar]**	**Filter surface [cm²]**
40	78260929	Pi 21004 DN PS 3	PS 3	**20**	475
	77960859	Pi 22004 DN PS 6	PS 6		475
	77925571	Pi 23004 DN PS 10	PS 10		475
	78260937	Pi 24004 DN PS 16	PS 16		475
	78260945	Pi 25004 DN PS 25	PS 25		475
	78216079	Pi 71004 DN PS vst 3	PS vst 3	**210**	445
	77960156	Pi 72004 DN PS vst 6	PS vst 6		445
	77925654	Pi 73004 DN PS vst 10	PS vst 10		445
	78216087	Pi 74004 DN PS vst 16	PS vst 16		445
	78216095	Pi 75004 DN PS vst 25	PS vst 25		445
63	78260960	Pi 21006 DN PS 3	PS 3	**20**	835
	77960867	Pi 22006 DN PS 6	PS 6		835
	77925589	Pi 23006 DN PS 10	PS 10		835
	78260978	Pi 24006 DN PS 16	PS 16		835
	78260986	Pi 25006 DN PS 25	PS 25		835
	78216137	Pi 71006 DN PS vst 3	PS vst 3	**210**	780
	77960149	Pi 72006 DN PS vst 6	PS vst 6		780
	77925662	Pi 73006 DN PS vst 10	PS vst 10		780
	78216145	Pi 74006 DN PS vst 16	PS vst 16		780
	78216152	Pi 75006 DN PS vst 25	PS vst 25		780
100	78227472	Pi 21010 DN PS 3	PS 3	**20**	1375
	77960875	Pi 22010 DN PS 6	PS 6		1375
	77925597	Pi 23010 DN PS 10	PS 10		1375
	78261000	Pi 24010 DN PS 16	PS 16		1375
	78261018	Pi 25010 DN PS 25	PS 25		1375
	78227480	Pi 71010 DN PS vst 3	PS vst 3	**210**	1275
	77960131	Pi 72010 DN PS vst 6	PS vst 6		1275
	77925670	Pi 73010 DN PS vst 10	PS vst 10		1275
	78261281	Pi 74010 DN PS vst 16	PS vst 16		1275
	78216160	Pi 75010 DN PS vst 25	PS vst 25		1275

* a wider range of element types is available on request

7.2 Filter elements*					
Nominal size NG [l/min]	**Order number**	**Type**	**Filter material**	**max. Δ p [bar]**	**Filter surface [cm²]**
160	78261034	Pi 21016 DN PS 3	PS 3	**20**	2530
	77960826	Pi 22016 DN PS 6	PS 6		2530
	77925605	Pi 23016 DN PS 10	PS 10		2530
	78261042	Pi 24016 DN PS 16	PS 16		2530
	78261059	Pi 25016 DN PS 25	PS 25		2530
	77940638	Pi 71016 DN PS vst 3	PS vst 3	**210**	1885
	77960123	Pi 72016 DN PS vst 6	PS vst 6		1885
	77925688	Pi 73016 DN PS vst 10	PS vst 10		1885
	78269797	Pi 74016 DN PS vst 16	PS vst 16		1885
	78216178	Pi 75016 DN PS vst 25	PS vst 25		1885
250	78227514	Pi 21025 DN PS 3	PS 3	**20**	4020
	77960834	Pi 22025 DN PS 6	PS 6		4020
	77925613	Pi 23025 DN PS 10	PS 10		4020
	78261075	Pi 24025 DN PS 16	PS 16		4020
	78261083	Pi 25025 DN PS 25	PS 25		4020
	77940646	Pi 71025 DN PS vst 3	PS vst 3	**210**	3090
	77960115	Pi 72025 DN PS vst 6	PS vst 6		3090
	77925696	Pi 73025 DN PS vst 10	PS vst 10		3090
	78269813	Pi 74025 DN PS vst 16	PS vst 16		3090
	78216186	Pi 75025 DN PS vst 25	PS vst 25		3090
400	78227522	Pi 21 040 DN PS 3	PS 3	**20**	6770
	77960842	Pi 22 040 DN PS 6	PS 6		6770
	77925621	Pi 23 040 DN PS 10	PS 10		6770
	78261109	Pi 24 040 DN PS 16	PS 16		6770
	78261117	Pi 25 040 DN PS 25	PS 25		6770
	77940653	Pi 71 040 DN PS vst 3	PS vst 3	**210**	5240
	77960107	Pi 72 040 DN PS vst 6	PS vst 6		5240
	77930829	Pi 73 040 DN PS vst 10	PS vst 10		5240
	78269821	Pi 74 040 DN PS vst 16	PS vst 16		5240
	78260903	Pi 75 040 DN PS vst 25	PS vst 25		5240

* a wider range of element types is available on request

8. Technical specifications

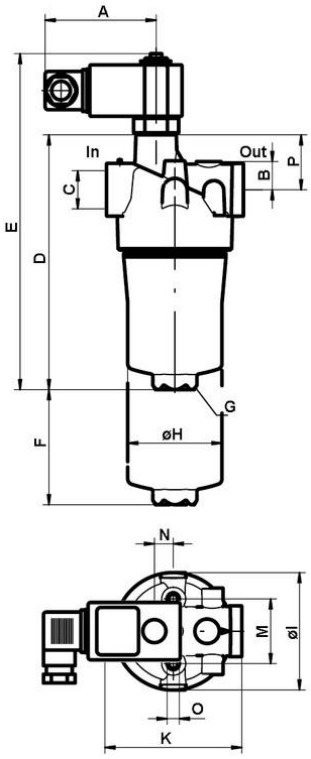
Design:	line mounting filter
Nominal pressure:	
Pi 20004-20010	10^7 load changes 63 bar (900 psi)
Pi 20016-20040	10^7 load changes 25 bar (360 psi) 2x 10^6 load changes 32 bar (460 psi)
Test pressure:	
Pi 20004-20010	95 bar (1370 psi)
Pi 20016-20040	48 bar (690 psi)
Temperature range:	- 30 °C to + 120 °C survival temperature - 40 °C (other temperature ranges on request)
Bypass setting:	Δ p 3.5 bar ± 10 %
Filter head material:	GDAL
Filter housing material:	AL/St.
Sealing material:	NBR/AL
Maintenance indicator setting:	Δ p 2.2 bar ± 10 %
Electrical data of maintenance indicator:	
Max. voltage:	250 V AC/200 V DC
Max. current:	1 A
Contact load:	70 W
Type of protection:	IP 65 in inserted and secured status
Contact:	normally open/closed
Cable sleave:	M20x1.5

The switching function can be changed by turning the electric upper part by 180° (normally closed contact or normally open contact). The state on delivery is a normally closed contact. By inductivity in the direct current circuit the use of suitable protection circuit should be considered. Further maintenance indicator details and designs are available in the maintenance indicator data sheet.

We draw attention to the fact that all values indicated are average values which do not always occur in specific cases of application. Our products are continually being further developed. Values, dimensions and weights can change as a result of this. Our specialized department will be pleased to offer you advice.

We recommend to contact us concerning applications of our filters in areas governed by the EU Directive 94/9 EC (ATEX 95). The standard version can be used for liquids based on mineral oil (corresponding to the fluids in Group 2 of Directive 97/23 EC Article 9). If you consider to use other fluids please contact us for additional support.

Subject to technical alteration without prior notice.



9. Dimensions

All dimensions except "C" in mm.

Type	A	B	C*	D	E	F	G SW	H	I	K	M	N	O	P	Weight [kg]
Pi 20004	78	19	G½	186	240	80	27	66	80	95	45	13	M8x10	37.5	0.9
Pi 20006	78	19	G¾	243	300	80	27	66	80	95	45	13	M8x10	37.5	1.0
Pi 20010	78	19	G¾	333	393	80	27	66	80	95	45	13	M8x10	37.5	1.1
Pi 20016	78	30	G1¼	268	326	110	32	109	128	150	60	24.5	M12x15	43.5	2.3
Pi 20025	78	30	G1¼	363	421	110	32	109	128	150	60	24.5	M12x15	43.5	2.5
Pi 20040	78	30	G1¼	509	566	110	24	109	128	150	60	24.5	M12x15	43.5	7.4

* NPT and SAE connections on request

10. Installation, operating and maintenance instructions

10.1 Filter installation

When installing the filter make sure that sufficient space is available to remove filter element and filter housing.
Preferably the filter should be installed with the filter housing pointing downwards.
The maintenance indicator must be visible.

10.2 Connecting the electrical maintenance indicator

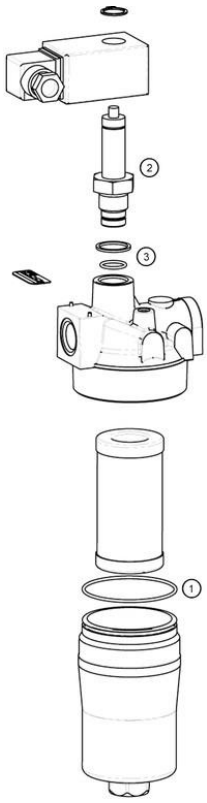
The electrical indicator is connected via a 2-pole appliance plug according to DIN EN 175301-803 with poles marked 1 and 2. The electrical section can be inverted to change from normally open position to normally closed position or vice versa. The state on delivery is a normally closed contact.

10.3 When should the filter element be replaced?

1. Filters equipped with visual and electrical maintenance indicator:
   During cold starts, the indicator may give a warning signal. Press the red button of the visual indicator once again only after operating temperature has been reached. If the red button immediately pops up again and/or the electrical signal has not switched off after reaching operating temperature, the filter element must be replaced after the end of the shift.
2. Filters without maintenance indicator:
   The filter element should be replaced after the trial run or flushing of the system. Afterwards follow instructions of the manufacturer.
3. Please always ensure that you have original Filtration Group spare elements in stock: Disposable elements cannot be cleaned.

10.4 Element replacement

1. Stop system and relieve filter from pressure.
2. Unscrew the filter housing by turning counter-clockwise. Clean the housing using a suitable cleaning solvent.
3. Remove element by pulling down carefully.
4. Check O-ring on the filter housing for damage. Replace, if necessary.
5. Make sure that the order number on the spare element corresponds to the order number of the filter name-plate.
   To ensure no contamination occurs during the exchange of the element first open the plastic bag and push the element over the spigot in the filter head. Now remove plastic bag.
6. Lightly lubricate the threads of the filter housing a little bit and screw into the filter head. Maximum tightening torque for NG 40 to 100 = 30 Nm, for NG 160 to 400 = 50 Nm.



11. Spare parts list

Order numbers for spare parts		
Position	**Type**	**Order number**
①	Seal kit for filter housing	
	Pi 20004 - Pi 20010	
	NBR	79328485
	FPM	79328493
	EPDM	79357609
	Pi 20016 - Pi 20040	
	NBR	79357617
	FPM	79357625
	EPDM	79357633
②	Maintenance indicator	
	Visual PiS 3098/2.2	77669971
	Electrical PiS 3097/2.2	77669948
	Electrical upper section only	77536550
③	Seal kit for maintenance indicator	
	NBR	77760309
	FPM	77760317
	EPDM	77760325

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Low Pressure Filter
Pi 2000/Pi 2200

Nominal pressure 25 bar (360 psi), nominal size 630 up to 2000
according to DIN 24550

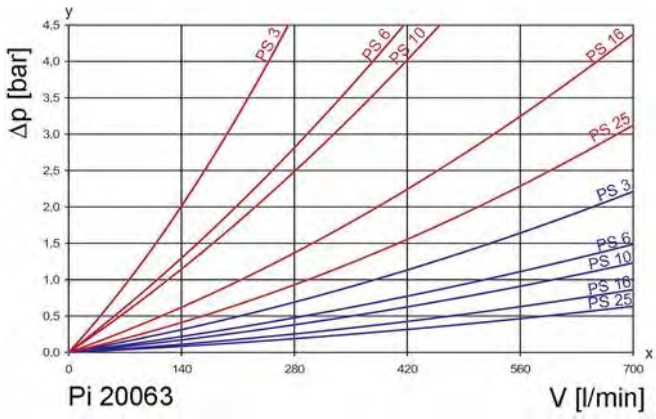
1. Features

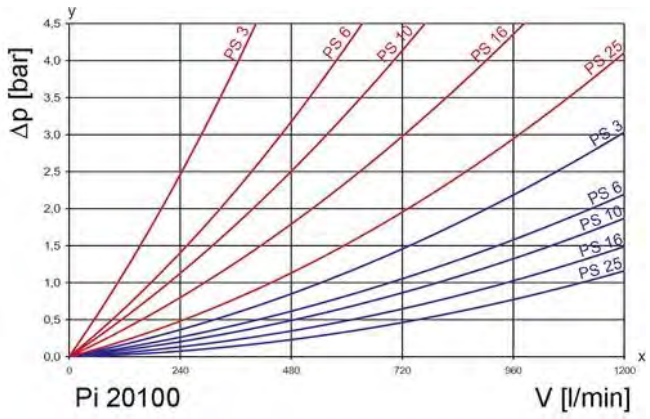
HIgh performance filters for modern hydraulic systems

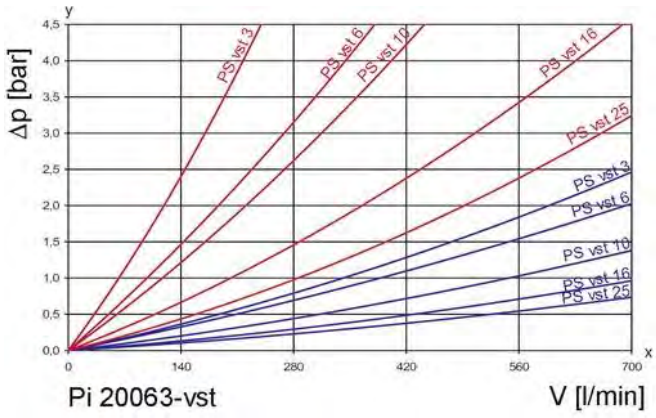
- Modular system
- Compact design
- Minimal pressure drop through optimal flow design
- Visual/electrical, electronic maintenance indicator
- Flanged connections
- Quality filters, easy to service
- Equipped with highly efficient glass fibre PS filter elements
- Beta rated elements according to ISO 16889 multipass test
- Elements with high differential pressure stability and dirt holding capacity
- Worldwide distribution

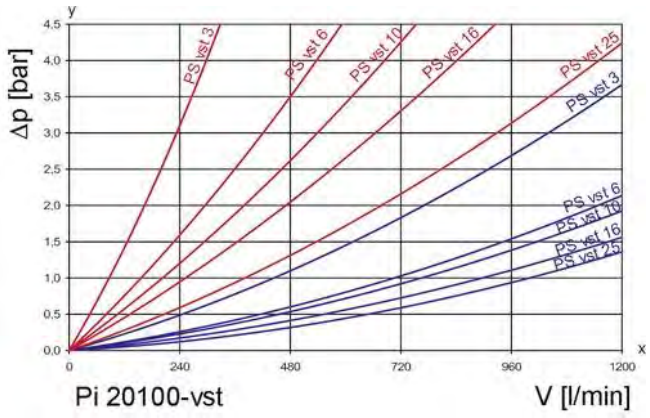
2. Flow rate/pressure drop curve complete filter

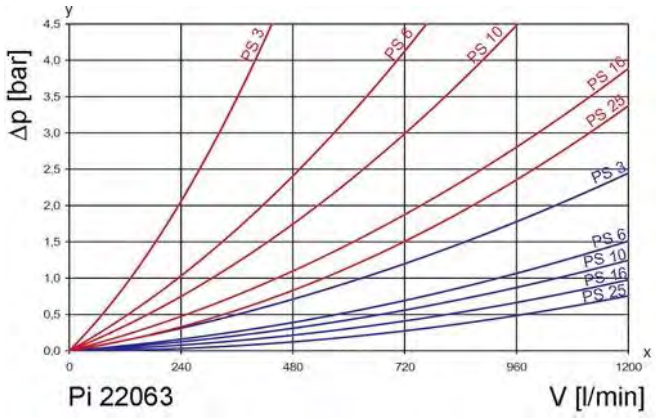
190 mm²/s
33 mm²/s

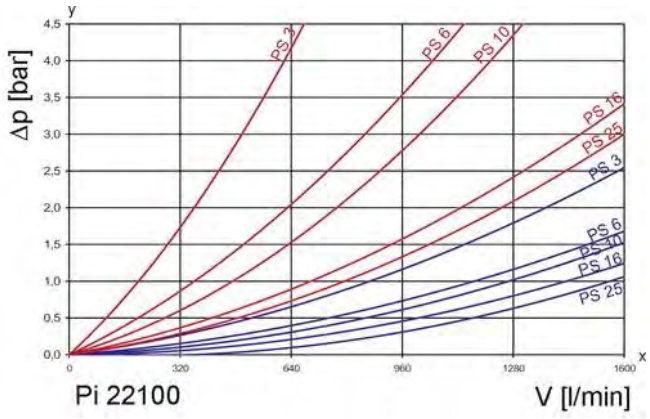


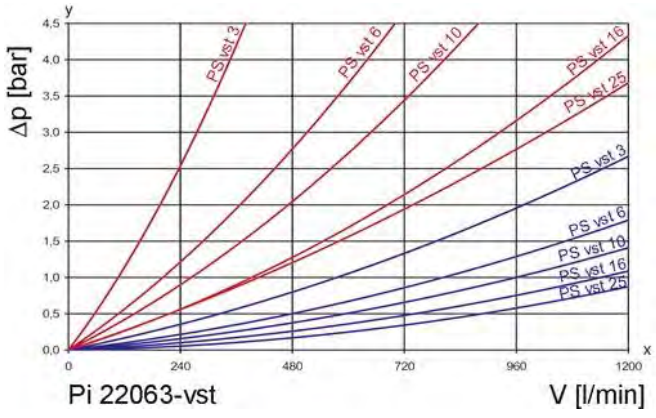


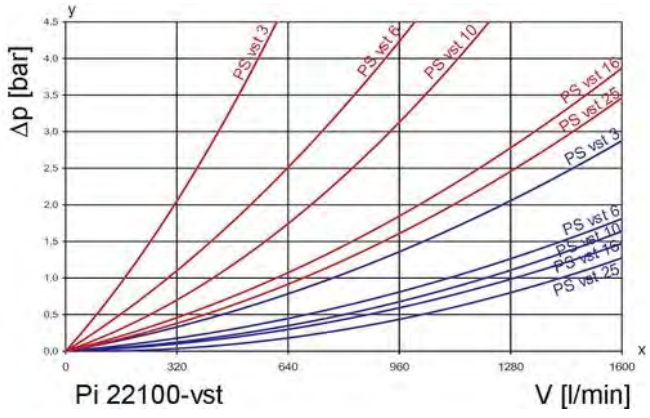








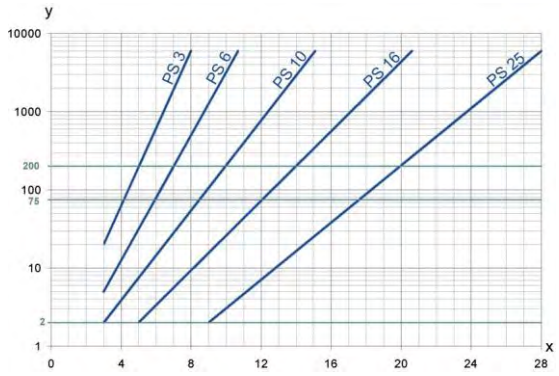




y = differential pressure Δ p [bar]

x = flow rate V [l/min]

3. Separation grade characteristics



y = beta-value
x = particle size [µm]

determined by multipass tests (ISO 16889)
calibration according to ISO 11171 (NIST)

4. Filter performance data

tested according to ISO 16889 (multipass test)

PS elements with
max. Δ p 20 bar

PS	3	$\beta_{5(C)}$	≥200
PS	6	$\beta_{7(C)}$	≥200
PS	10	$\beta_{10(C)}$	≥200
PS	16	$\beta_{15(C)}$	≥200
PS	25	$\beta_{20(C)}$	≥200

values guaranteed at
10 bar differential pressure

PS vst elements with
max. Δ p 210 bar

PS vst	3	$\beta_{5(C)}$	≥200
PS vst	6	$\beta_{7(C)}$	≥200
PS vst	10	$\beta_{10(C)}$	≥200
PS vst	16	$\beta_{15(C)}$	≥200
PS vst	25	$\beta_{20(C)}$	≥200

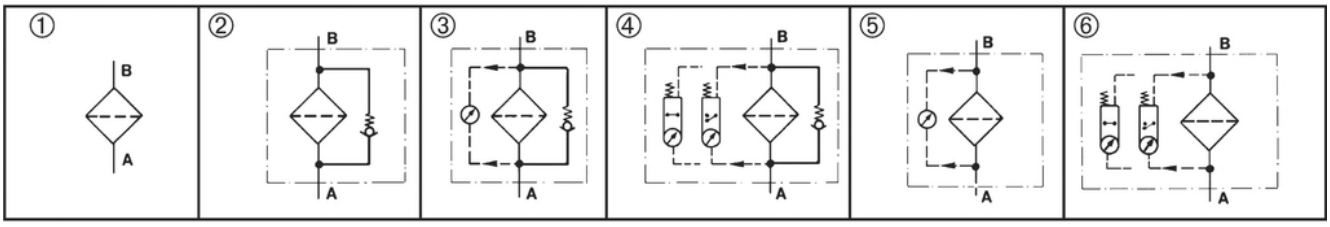
values guaranteed at
20 bar differential pressure

5. Quality assurance

Filtration Group filters and filter elements are produced according to the following international standards:

Norm	Designation
DIN ISO 2941	Hydraulic fluid power filter elements; verification of collapse/burst resistance
DIN ISO 2 942	Hydraulic fluid power filter elements; verification of fabrication integrity
DIN ISO 2 943	Hydraulic fluid power filter elements; verification of material compatibility
DIN ISO 3 723	Hydraulic fluid power filter elements; method for end load test
DIN ISO 3 724	Hydraulic fluid power filter elements; verification of flow fatigue characteristics
ISO 3 968	Hydraulic fluid power-filters-evaluation of pressure drop versus flow characteristics
ISO 10 771.1	Fatigue pressure testing of metal containing envelopes in hydraulic fluid applications
ISO 16 889	Hydraulic fluid power filters-multi-passmethod for evaluation filtration performance of a filter element

6. Symbols



7. Order numbers

Example for ordering filters:

1. Housing design	2. Filter element (2 elements required for parallel arrangement)
V = 630 l/min and electrical maintenance indicator Type: Pi 20063-69 Order number: 77965510	PS vst 25 Type: Pi 75063 DN PS vst 25 Order number: 77961568

7.1 Housing design

Design	Nominal size NG [l/min]	Order number	Type	① no options	② with bypass valve	③ with bypass valve and visual indicator	④ with bypass valve and electrical indicator	⑤ with visual indicator	⑥ with electrical indicator
Line filter single	630	77965478	Pi 20063-060	■					
		77965486	Pi 20063-056		■				
		77965494	Pi 20063-057			■			
		77964497	Pi 20063-058				■		
		77965502	Pi 20063-068					■	
		77965510	Pi 20063-069						■
	1000	77965577	Pi 20100-060	■					
		77965585	Pi 20100-056		■				
		77965593	Pi 20100-057			■			
		77974769	Pi 20100-058				■		
		77965601	Pi 20100-068					■	
		77965619	Pi 20100-069						■
Line filter parallel	1260	77965387	Pi 22063-060	■					
		77965676	Pi 22063-056		■				
		77965684	Pi 22063-057			■			
		77965692	Pi 22063-058				■		
		77965700	Pi 22063-068					■	
		77965718	Pi 22063-069						■
	2000	77965775	Pi 22100-060	■					
		77965783	Pi 22100-056		■				
		77965791	Pi 22100-057			■			
		77965809	Pi 22100-058				■		
		77965817	Pi 22100-068						
		77965825	Pi 22100-069						■

When filter with non bypass configuration is selected, the collapse pressure of the element must not be exceeded.

7.2 Filter elements*					
Nominal size NG [l/min]	**Order number**	**Type**	**Filter material**	**max. Δ p [bar]**	**Filter surface [cm²]**
630	77961519	Pi 21063 DN PS 3	PS 3	**20**	9300
	77943699	Pi 22063 DN PS 6	PS 6		9300
	77925639	Pi 23063 DN PS 10	PS 10		9300
	77961527	Pi 24063 DN PS 16	PS 16		9300
	77961535	Pi 25063 DN PS 25	PS 25		9300
	77961543	Pi 71063 DN PS vst 3	PS vst 3	**210**	7490
	77960099	Pi 72063 DN PS vst 6	PS vst 6		7490
	77925712	Pi 73063 DN PS vst 10	PS vst 10		7490
	77961550	Pi 74063 DN PS vst 16	PS vst 16		7490
	77961568	Pi 75063 DN PS vst 25	PS vst 25		7490
1000	77961618	Pi 21100 DN PS 3	PS 3	**20**	14690
	77943723	Pi 22100 DN PS 6	PS 6		14690
	77925647	Pi 23100 DN PS 10	PS 10		14690
	77961626	Pi 24100 DN PS 16	PS 16		14690
	77961634	Pi 25100 DN PS 25	PS 25		14690
	77961642	Pi 71100 DN PS vst 3	PS vst 3	**210**	11700
	77960081	Pi 72100 DN PS vst 6	PS vst 6		11700
	77925720	Pi 73100 DN PS vst 10	PS vst 10		11700
	77961659	Pi 74100 DN PS vst 16	PS vst 16		11700
	77961667	Pi 75100 DN PS vst 25	PS vst 25		11700
1260	77961519	Pi 21063 DN PS 3	PS 3	**20**	2x9300
	77943699	Pi 22063 DN PS 6	PS 6		2x9300
	77925639	Pi 23063 DN PS 10	PS 10		2x9300
	77961527	Pi 24063 DN PS 16	PS 16		2x9300
	77961535	Pi 25063 DN PS 25	PS 25		2x9300
	77961543	Pi 71063 DN PS vst 3	PS vst 3	**210**	2x7490
	77960099	Pi 71063 DN PS vst 6	PS vst 6		2x7490
	77925712	Pi 72063 DN PS vst 10	PS vst 10		2x7490
	77961550	Pi 73063 DN PS vst 16	PS vst 16		2x7490
	77961568	Pi 74063 DN PS vst 25	PS vst 25		2x7490
2000	77961618	Pi 21100 DN PS 3	PS 3	**20**	2x14690
	77943723	Pi 22100 DN PS 6	PS 6		2x14690
	77925647	Pi 23100 DN PS 10	PS 10		2x14690
	77961626	Pi 24100 DN PS 16	PS 16		2x14690
	77961634	Pi 25100 DN PS 25	PS 25		2x14690
	77961642	Pi 71100 DN PS vst 3	PS vst 3	**210**	2x11700
	77960081	Pi 72100 DN PS vst 6	PS vst 6		2x11700
	77925720	Pi 73100 DN PS vst 10	PS vst 10		2x11700
	77961659	Pi 74100 DN PS vst 16	PS vst 16		2x11700
	77961667	Pi 75100 DN PS vst 25	PS vst 25		2x11700

* a wider range of element types is available on request

8. Technical specifications

Design:	in-line filter
Nominal pressure:	25 bar (360 psi)
Test pressure:	32 bar (460 psi)
Temperature range:	-10 °C to +120 °C
	(other temperature ranges on request)
Bypass setting:	Δ p 3.5 bar $\pm$ 10 %
Filter head material:	GAL
Filter housing material:	AL
Sealing material:	NBR/AL
Maintenance indicator setting:	Δ p 2.2 bar $\pm$ 0.3 bar
Electrical data of maintenance indicator:	
Maximum voltage:	250 V AC/200 V DC
Maximum current:	1 A
Contact load:	70 W
Type of protection:	IP 65 in inserted and secured status
Contact:	normally open/closed
Cable sleave:	M20x1.5

The switching function can be changed by turning the electric upper part by 180° (normally closed contact or normally open contact). The state on delivery is a normally closed contact. By inductivity in the direct current circuit the use of suitable protection circuit should be considered. Further maintenance indicator details and designs are available in the maintenance indicator data sheet.

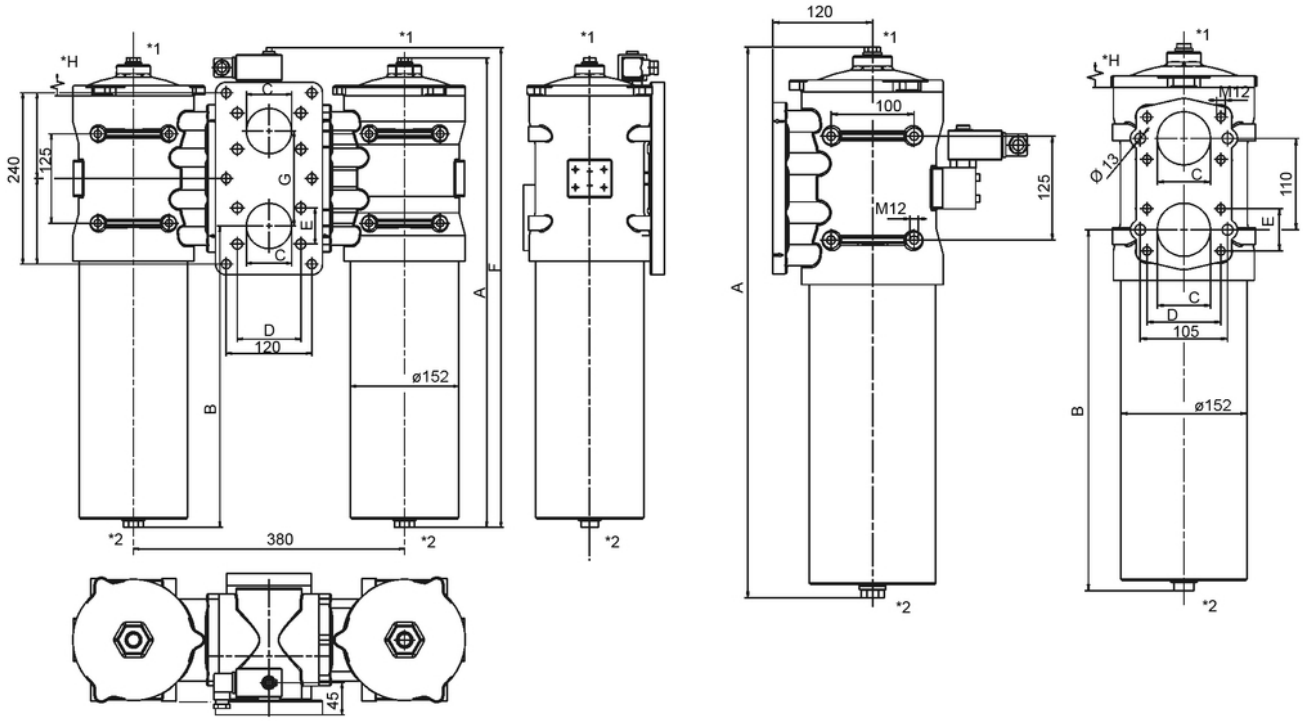
We draw attention to the fact that all values indicated are average values and do not always occur in specific cases of application. Our products are continually being further developed. Values, dimensions and weights can change as a result of this. Our specialized department will be pleased to offer you advice.

We recommend you to contact us concerning applications of our filters in areas governed by the EU Directive 94/9 EC (ATEX 95). The standard version can be used for liquids based on mineral oil (corresponding to the fluids in Group 2 of Directive 97/23 EC Article 9). If you consider to use other fluids please contact us for additional support.

Due to the modular system, filter can be easily converted from single type into parallel type.

Subject to technical alteration without prior notice.

9. Dimensions



*1 = Vent screw G3/8
*2 = Drain plug G¾ DIN 910
*H = Minimum clearance for filter element removal

All dimensions in mm.

Type	A	B	C	D	E	F	G	H	Weight [kg]
Pi 20063	659	434	DN64	89	50.8	-	110	400	12.5
Pi 20100	889	664	DN64	89	50.8	-	110	630	15.0
Pi 22063	659	434	DN76	106	61.9	674	133	400	30.0
Pi 22100	889	664	DN76	106	61.9	904	133	630	35.0

10. Installation, operating and maintenance instructions

10.1 Filter installation

When installing the filter make sure that sufficient space is available to remove filter element and filter housing.
Preferably the filter should be installed with the filter housing pointing downwards.
The maintenance indicator must be visible.

10.2 Connecting the electrical maintenance indicator

The electrical indicator is connected via a 2-pole appliance plug according to DIN 43650 with poles marked 1 and 2.
The electrical section can be inverted to change from normally open position to normally closed position or vice versa.

10.3 When should the filter element be replaced?

1. Filters equipped with visual and electrical maintenance indicator:
   During cold starts, the indicator may give a warning signal. Press the red button of the visual indicator once again only after operating temperature has been reached. If the red button immediately pops up again and/or the electrical signal has not switched off after reaching operating temperature, the filter element must be replaced after the end of the shift.
2. Filters without maintenance indicator:
   The filter element should be replaced after trial run or flushing of the system. Afterwards follow instructions of the manufacturer.
3. Please always ensure that you have original Filtration Group spare elements in stock: Disposable elements (PS) cannot be cleaned.

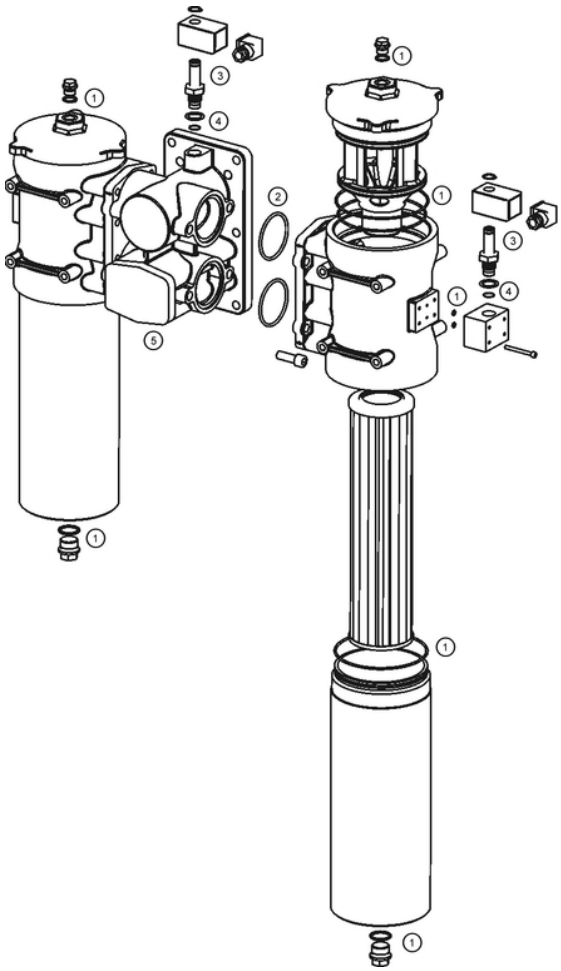
10.4 Element replacement

1. Stop system and relieve filter from pressure.
2. Open venting screw in filter cover (ascertain switching lever position with duplex filter and carefully check which filter housing is under pressure).
3. Remove drain plug in housing bottom and drain oil.
4. Unscrew filter cover (CCW).
5. Lift out filter element.
6. Check seal on filter cover. We recommend replacment in any case.
7. Make sure that the order number on the spare element corresponds to the order number of the filter name-plate. Remove packaging and place element closed end downward into filter housing.
8. Carefully insert element holding fixture of the filter cover into the open end of the element and tighten cover against stop.
9. Close drain plug on housing bottom.
10. Carefully vent filter prior operation. Then thighten venting screw.

Additional remark: For cleaning purposes the filter housing can be removed by unscrewing counter-clockwise.
Please change both elements at the parallel type.

11. Spare parts list

Order numbers for spare parts		
Position	**Type**	**Order number**
①	Seal kit for filter housing (duplex or parallel filter 2 sets required)	
	NBR	77967433
	FPM	77967441
	EPDM	77967458
②	Seal kit for parallel unit	
	NBR	79350984
	FPM	79350992
	EPDM	79351008
③	Maintenance indicator	
	Visual PiS 3098/2.2 bar	77669971
	Electrical PiS 3097/2.2 bar	77669948
	Electrical upper part only	77536550
④	Seal kit for maintenance indicator	
	NBR	77760309
	FPM	77760317
	EPDM	77760325
⑤	Parallel unit (for parallel filter modification)	77974876



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Low Pressure Filter
Pi 2300

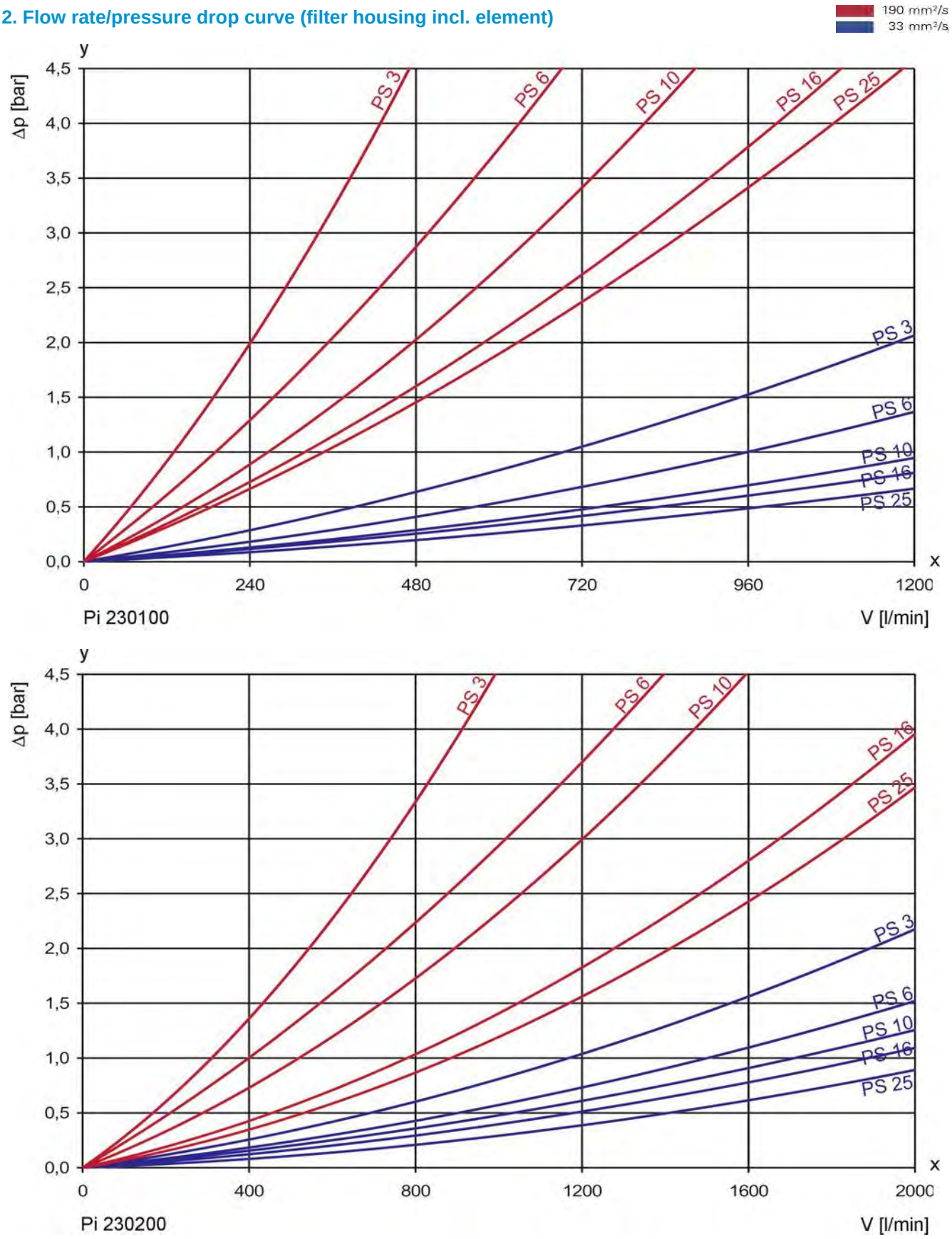
Nominal pressure 25/40 bar (360/570 psi), nominal size up to 1200
Filter elements according DIN 24550

1. Features

High performance filters for modern hydraulic systems

- Provided for pipe installation
- Modular system
- Compact design
- Minimal pressure drop through optimal flow design
- Visual/electrical,electronic maintenance indicator
- Quality filters, easy to service
- Equipped with highly efficient PS filter elements
- Beta rated elements according to ISO 16889
- Elements with high differential pressure stability and dirt holding capacity
- Worldwide distribution

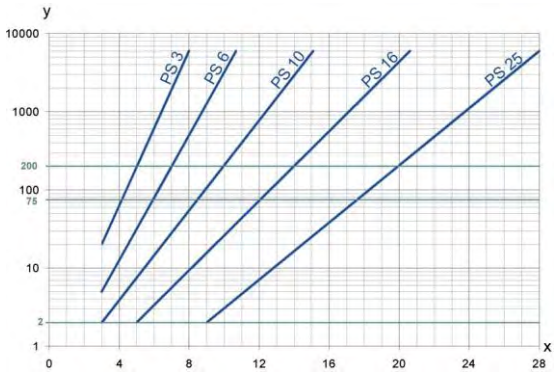
2. Flow rate/pressure drop curve (filter housing incl. element)



y = differential pressure Δp [bar]

x = flow rate V [l/min]

3. Separation grade characteristics



y = beta-value
x = particle size [µm]

determined by multipass tests (ISO 16889)
calibration according to ISO 11171 (NIST)

4. Filter performance data

tested according to ISO 16889 (multipass test)

PS elements with
max. Δ p 10 bar

PS	3	$\beta_{5(C)}$	≥	200
PS	6	$\beta_{7(C)}$	≥	200
PS	10	$\beta_{10(C)}$	≥	200
PS	16	$\beta_{15(C)}$	≥	200
PS	25	$\beta_{20(C)}$	≥	200

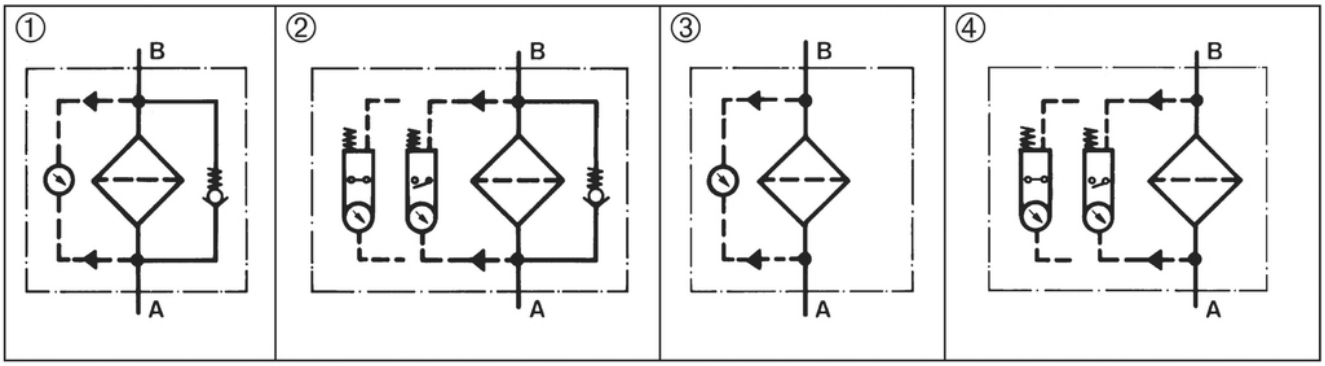
values guaranteed up to
10 bar differential pressure

5. Quality assurance

Filtration Group filters and filter elements are produced according to the following international standards:

Norm	Designation
DIN ISO 2941	Hydraulic fluid power filter elements; verification of collapse/burst resistance
DIN ISO 2942	Hydraulic fluid power filter elements; verification of fabrication integrity
DIN ISO 2943	Hydraulic fluid power filter elements; verification of material compatibility with fluids
DIN ISO 3723	Hydraulic fluid power filter elements; method for end load test
DIN ISO 3724	Hydraulic fluid power filter elements; verification of flow fatigue characteristics
ISO 3968	Hydraulic fluid power filters; evaluation of pressure drop versus flow characteristics
ISO 10771.1	Fatigue pressure testing of metal containing envelopes in hydraulic fluid applications
ISO 16889	Hydraulic fluid power filters; multipass method for evaluation filtration performance of a filter element

6. Symbols



7. Order numbers

Example for ordering filters:

1. Housing design	2. Filter elements
Nominal size 750, with bypass, electrical maintenance indicator, inlet at the bottom Type: Pi 230100/11-058 Order number: 76321129	PS 10 Type: 23100 RN PS 10 Order number: 77924228 Attention: At a nominal size of 1200, 2 filter elements per housing are required

7.1 Housing design

Nominal size NG [l/min]	Order number	Type	Inlet	① with bypass valve and visual indicator	② with bypass valve and electrical indicator	③ with visual indicator	④ with electrical indicator
750	76321087	Pi 230100/11-057	at the bottom	■			
	76321129	Pi 230100/11-058			■		
	76321160	Pi 230100/11-068				■	
	76321202	Pi 230100/11-069					■
750	76321095	Pi 230100/21-057	at the sight	■			
	76321137	Pi 230100/21-058			■		
	76321178	Pi 230100/21-068				■	
	76321210	Pi 230100/21-069					■
1200	76321103	Pi 230200/11-057	at the bottom	■			
	76321145	Pi 230200/11-058			■		
	76321186	Pi 230200/11-068				■	
	76321228	Pi 230200/11-069					■
1200	76321111	Pi 230200/21-057	at the sight	■			
	76321152	Pi 230200/21-058			■		
	76321194	Pi 230200/21-068				■	
	76321236	Pi 230200/21-069					■

When using filter with non bypass configuration is selected, the collapse pressure of the element must not be exceeded.

7.2 Filter elements*

Nominal size NG [l/min]	Order number	Type	Filter material	Collapse pressure [bar]	Filter surface [cm²]
750	77924210	Pi 21100 RN PS 3	PS 3	10	18760
	77964109	Pi 22100 RN PS 6	PS 6		18760
	77924228	Pi 23100 RN PS 10	PS 10		18760
	77963689	Pi 24100 RN PS 16	PS 16		18760
	77960271	Pi 25100 RN PS 25	PS 25		18760
1200	77924210	Pi 21100 RN PS 3	PS 3	10	2 x 18760
	77964109	Pi 22100 RN PS 6	PS 6		2 x 18760
	77924228	Pi 23100 RN PS 10	PS 10		2 x 18760
	77963689	Pi 24100 RN PS 16	PS 16		2 x 18760
	77960271	Pi 25100 RN PS 25	PS 25		2 x 18760

* a wider range of element types is available on request

8. Technical specifications

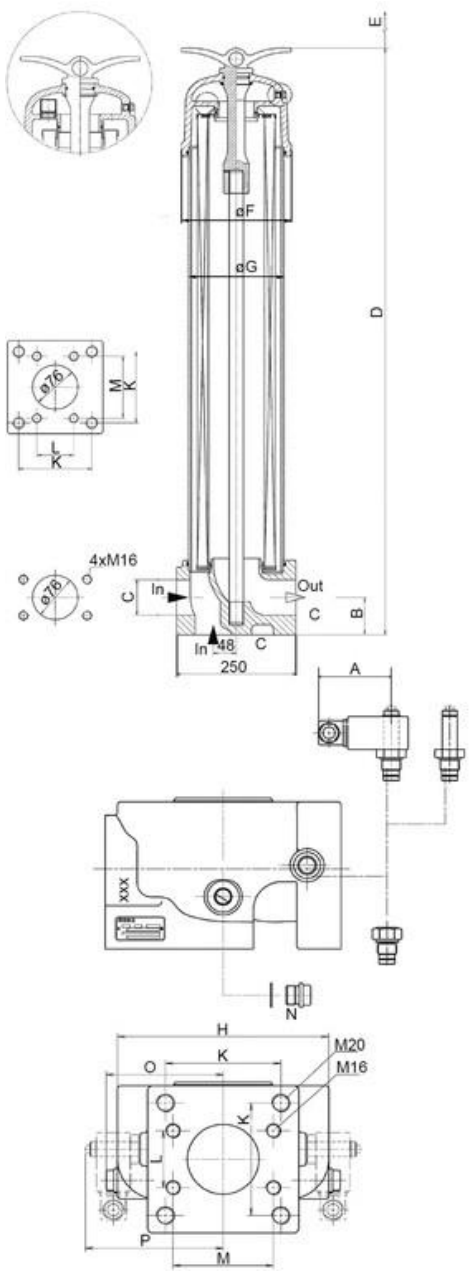
Nominal pressure (10 LW):	25 bar (360 psi)
Test pressure (statical):	40 bar (570 psi)
Temperature range:	-10 °C to +120 °C (other temperature ranges on request)
Bypass setting:	Δp 3.5 bar ± 10 %
Filter head material:	GAL
Filter housing material:	AL
Sealing material:	NBR
Maintenance indicator setting	Δp 2.2 bar ± 0.3 bar
Electrical data of maintenance indicator:	
Max. voltage:	250 V AC/200 V DC
Max. current:	1 A
Contact load:	70 W
Type of protection:	IP 65 in inserted and secured status
Contact:	normally open/closed
Cable sleave:	M20x1.5

The switching function can be changed by turning the electric upper part by 180° (normally closed contact or normally open contact). The state on delivery is a normally closed contact. By inductivity in the direct current circuit the use of suitable protection circuit should be considered. Further maintenance indicator details and designs are available in the maintenance indicator data sheet.

We draw attention to the fact that all values indicated are average values and do not always occur in specific cases of application. Our products are continually being further developed. Values, dimensions and weights can change as a result of this. Our specialized department will be pleased to offer you advice.

We recommend you to contact us concerning applications of our filters in areas governed by the EU Directive 94/9 EC (ATEX 95). The standard version can be used for liquids based on mineral oil (corresponding to the fluids in Group 2 of Directive 97/23 EC Article 9). If you consider to use other fluids please contact us for additional support.

Subject to technical alteration without prior notice.



In = Inlet
Out = Outlet

9. Dimensions

All dimensions except "C" und "N" in mm

Type	A	B	C	D	E	F	G	H	K	L	M	N	O	P	Weight [kg]
Pi 230100	78	80	SAE 3, 3000 psi	710	770	230	200	224	122.3	61.9	106.6	G½	124	146	29
Pi 230200	78	80	SAE 3, 3000 psi	1260	770	230	200	224	122.3	61.9	106.6	G½	124	146	30

NPT- and SAE-connections on request

10. Installation, operating and maintenance instructions

10.1 Filter installation

When installing filter make sure that sufficient space is available to remove filter element and filter housing. Preferably the filter should be installed with the filter housing pointing upwards. The maintenance indicator must be visible.

10.2 Connecting the electrical maintenance indicator

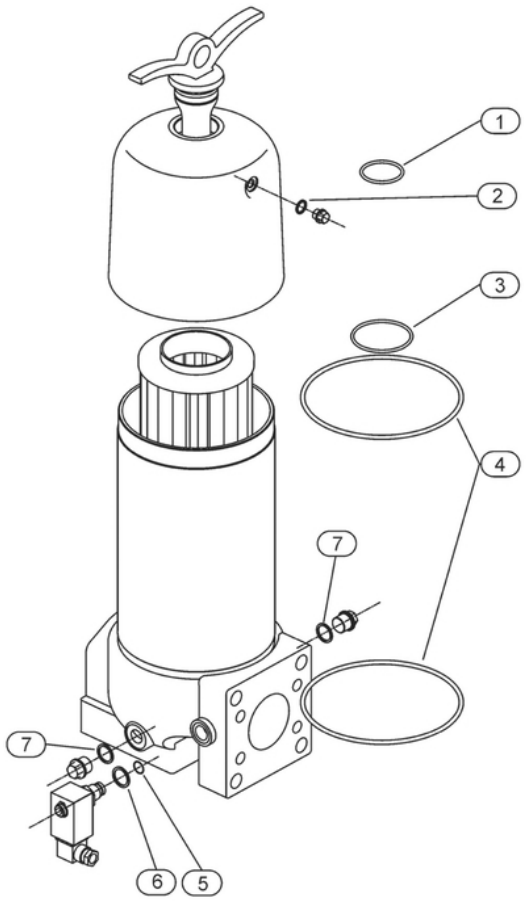
The electrical indicator is connected via a 2-pole appliance plug according to DIN EN 175301-803 with poles marked 1 and 2. The electrical section can be inverted to change from normally open to normally closed position or vice versa.

10.3 When should the filter element be replaced?

1. Filters equipped with visual and electrical maintenance indicator:
   During cold starts, the indicator may give a warning signal. Press the red button of the visual indicator once again only after operating temperature has been reached. If the red button immediately pops up again and/or the electrical signal has not switched off after reaching operating temperature. The filter element must be replaced after the end of the shift.
2. Filters without maintenance indicator:
   The filter element should be replaced after trial run or flushing of the system. Afterwards follow instructions of the manufacturer.
3. Please always ensure that you have original Filtration Group spare
   elements in stock: Disposable elements (PS) cannot be cleaned.

10.4 Element replacement

1. Stop system and relieve filter from pressure.
2. Loosen toggle, remove cover, and open drain valve. Housing completely vented.
3. Remove filter element from the filter bowl. With filter type Pi 230200 remove the spacer sleeve from the elements clean and reuse.
4. Check seals for damages. Replace, if necessary.
5. Make sure that the part number on the spare element corresponds with the part number on the filter name-plate. With the filter type Pi 230200 always change both elements. Remove the plastic bag and push element over spigot in the filter head. With filter type Pi 230200 put the sleeve on the element. On this, telescope the second element and locate it.
6. Close drain valve. Put the thumb screw together with the cover on the centre rod and tighten strong. Filter must be bleeded!



11. Spare parts list

Order numbers for spare parts		
Position	**Type**	**Order number**
①②③④⑦	Seal kit	
	NBR	76321244
	FPM	76321251
	EPDM	76321269
	Maintenance indicator	
	Visual PiS 3098/2.2	77669971
	Visual/electrical PiS 3097/2.2	77669948
	Electrical upper section only	77536550
⑤⑥	Seal kit for maintenance indicator PiS 3098/2.2 + PiS 3097/2.2	
	NBR	77760300
	FPM	77760317
	EPDM	77760325
not illustrated	Adapter for elements at Pi 230200	76937791

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Medium Pressure Filter
Pi 340

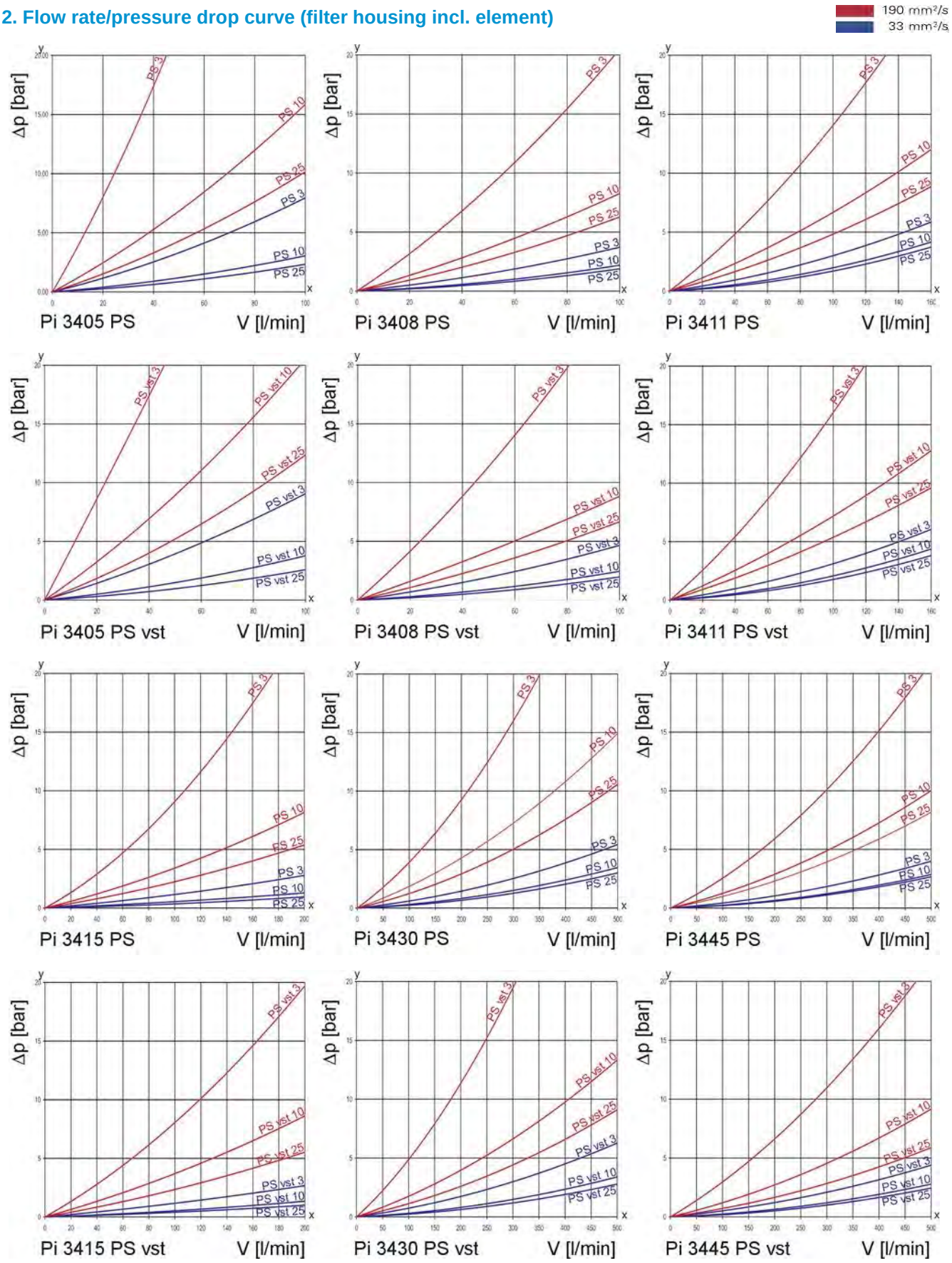
Nominal pressure 250/315/350 bar (3560/4480/4980 psi), nominal size up to 450
(also available with filter elements acc. to DIN 24550)

1. Features

High performance filters for modern hydraulic systems

- Designed for control block mounting
- Modular system
- Compact design
- Minimal pressure drop through optimal flow design
- Visual/electrical/electronic maintenance indicator
- Equipped with highly efficient glass fibre PS filter elements
- Beta rated elements according to ISO 16889 multipass test
- Elements with high differential pressure stability and dirt holding capacity
- Worldwide distribution

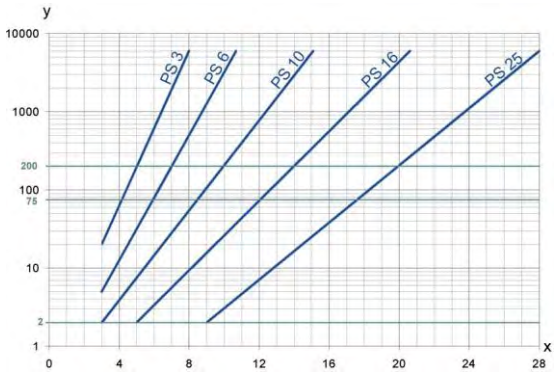
2. Flow rate/pressure drop curve (filter housing incl. element)



y = differential pressure Δp [bar]

x = flow rate V [l/min]

3. Separation grade characteristics



y = beta-value
x = particle size [µm]

determined by multipass tests (ISO 16889)
calibration according to ISO 11171 (NIST)

4. Filter performance data

tested according to ISO 16889 (multipass test)

PS elements with
max. Δ p 20 bar

PS	3	$\beta_{5(C)}$	≥200
PS	6	$\beta_{7(C)}$	≥200
PS	10	$\beta_{10(C)}$	≥200
PS	25	$\beta_{20(C)}$	≥200

values guaranteed up to
10 bar differential pressure

PS vst elements with
max. Δ p 210 bar

PS vst	3	$\beta_{5(C)}$	≥200
PS vst	6	$\beta_{7(C)}$	≥200
PS vst	10	$\beta_{10(C)}$	≥200
PS vst	25	$\beta_{20(C)}$	≥200

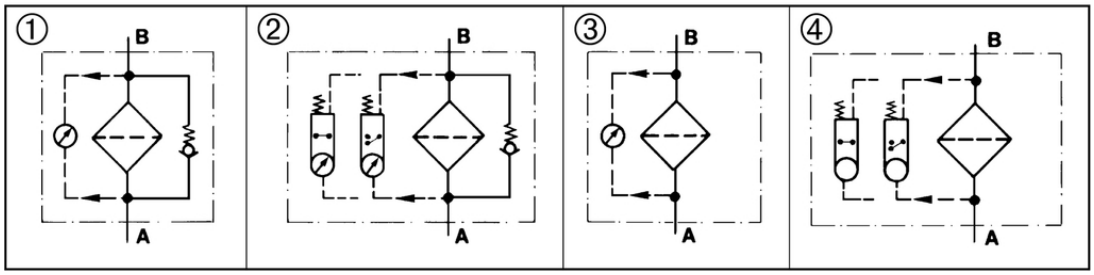
values guaranteed up to
20 bar differential pressure

5. Quality assurance

Filtration Group filters and filter elements are produced according to the following international standards:

Norm	Designation
DIN ISO 2941	Hydraulic fluid power filter elements; verification of collapse/burst resistance
DIN ISO 2942	Hydraulic fluid power filter elements; verification of fabrication integrity
DIN ISO 2943	Hydraulic fluid power filter elements; verification of material compatibility with fluids
DIN ISO 3723	Hydraulic fluid power filter elements; method for end load test
DIN ISO 3724	Hydraulic fluid power filter elements; verifiaction flow fatigue characteristics
ISO 3968	Hydraulic fluid power filters; evaluation of pressure drop versus flow characteristics
ISO 10771.1	Fatigue pressure testing of metal containing envelopes in hydraulic fluid applications
ISO 16889	Hydraulic fluid power filters; multipass method for evaluation filtration performance of a filter element

6. Symbols



7. Order numbers

Example for ordering filters:

1. Filtergehäuse	2. Filterelement
V = 80 l/min and electrical maintenance indicator Type: Pi 3408-015 Order number: 77874415	PS vst 3 Type: Pi 2208 PS vst 3 Order number: 77680200

7.1 Housing design						
Nominal size NG [l/min]	**Order number**	**Type**	① **with bypass valve and visual indicator**	② **with bypass valve and electrical indicator**	③ **with visual indicator**	④ **with electrical indicator**
50	77874324	Pi 3405-012	■			
	77874332	Pi 3405-013		■		
	77874340	Pi 3405-014			■	
	77874357	Pi 3405-015				■
80	77874381	Pi 3408-012	■			
	78274136	Pi 3408-013		■		
	77874407	Pi 3408-014			■	
	77874415	Pi 3408-015				■
110	77874449	Pi 3411-012	■			
	77874456	Pi 3411-013		■		
	77874464	Pi 3411-014			■	
	77874472	Pi 3411-015				■
150	77921919	Pi 3415-012	■			
	77921927	Pi 3415-013		■		
	77921935	Pi 3415-014			■	
	77921943	Pi 3415-015				■
300	77921968	Pi 3430-012	■			
	77921976	Pi 3430-013		■		
	77921984	Pi 3430-014			■	
	77921992	Pi 3430-015				■
450	77922008	Pi 3445-012	■			
	77922016	Pi 3445-013		■		
	77922024	Pi 3445-014			■	
	77922032	Pi 3445-015				■

When filter with non bypass configuration is selected, the collapse pressure of the element must not be exceeded.

7.2 Filter elements (a wider range of element types is availble on request)					
Nominal size NG [l/min]	**Order number**	**Type**	**Filter material**	**max. Δp [bar]**	**Filter surface [cm²]**
50	77680135	Pi 2105 PS 3	PS 3	**20**	590
	77943509	Pi 5105 PS 6	PS 6		590
	77680325	Pi 3105 PS 10	PS 10		590
	77680440	Pi 4105 PS 25	PS 25		590
	77680192	Pi 2205 PS vst 3	PS vst 3	**210**	425
	77943533	Pi 5205 PS vst 6	PS vst 6		425
	77680382	Pi 3205 PS vst 10	PS vst 10		425
	77680507	Pi 4205 PS vst 25	PS vst 25		425
80	77680143	Pi 2108 PS 3	PS 3	**20**	1150
	77943517	Pi 5108 PS 6	PS 6		1150
	77680341	Pi 3108 PS 10	PS 10		1150
	77680457	Pi 4108 PS 25	PS 25		1150
	77680200	Pi 2208 PS vst 3	PS vst 3	**210**	850
	77943541	Pi 5208 PS vst 6	PS vst 6		850
	77681190	Pi 3208 PS vst 10	PS vst 10		850
	77680515	Pi 4208 PS vst 25	PS vst 25		850
110	77680150	Pi 2111 PS 3	PS 3	**20**	1700
	77943525	Pi 5111 PS 6	PS 6		1700
	77680333	Pi 3111 PS 10	PS 10		1700
	77680465	Pi 4111 PS 25	PS 25		1700
	77680218	Pi 2211 PS vst 3	PS vst 3	**210**	1275
	77943558	Pi 5211 PS vst 6	PS vst 6		1275
	77680390	Pi 3211 PS vst 10	PS vst 10		1275
	77680523	Pi 4211 PS vst 25	PS vst 25		1275
150	77680168	Pi 2115 PS 3	PS 3	**20**	2425
	77955099	Pi 5115 PS 6	PS 6		2425
	77680358	Pi 3115 PS 10	PS 10		2425
	77680473	Pi 4115 PS 25	PS 25		2425
	77680226	Pi 2215 PS vst 3	PS vst 3	**210**	2010
	77955123	Pi 5215 PS vst 6	PS vst 6		2010
	77680408	Pi 3215 PS vst 10	PS vst 10		2010
	77680531	Pi 4215 PS vst 25	PS vst 25		2010
300	77680176	Pi 2130 PS 3	PS 3	**20**	4620
	77955107	Pi 5130 PS 6	PS 6		4620
	77680366	Pi 3130 PS 10	PS 10		4620
	77680481	Pi 4130 PS 25	PS 25		4620
	77680234	Pi 2230 PS vst 3	PS vst 3	**210**	3800
	77955131	Pi 5230 PS vst 6	PS vst 6		3800
	77680416	Pi 3230 PS vst 10	PS vst 10		3800
	77680549	Pi 4230 PS vst 25	PS vst 25		3800
450	77680184	Pi 2145 PS 3	PS 3	**20**	6865
	77955115	Pi 5145 PS 6	PS 6		6865
	77680374	Pi 3145 PS 10	PS 10		6865
	77680499	Pi 4145 PS 25	PS 25		6865
	77680242	Pi 2245 PS vst 3	PS vst 3	**210**	5600
	77955149	Pi 5245 PS vst 6	PS vst 6		5600
	77680424	Pi 3245 PS vst 10	PS vst 10		5600
	77680556	Pi 4245 PS vst 25	PS vst 25		5600

8. Technical specifications

Design:	flange filter
Nominal pressure: Pi 3405-3411	350 bar (4980 psi)
Pi 3415-3445 without bypass	315 bar (4480 psi)
Pi 3415-3445 with bypass	250 bar (3560 psi)
Test pressure: Pi 3405-3411	450 bar (6400 psi)
Pi 3415-3445 without bypass	410 bar (5830 psi)
Pi 3415-3445 with bypass	325 bar (4620 psi)
Temperature range:	-10 °C to +120 °C
	(other temperature ranges on request)
Bypass setting:	Δ p 7 bar $\pm$ 10 %
Filter head material:	GGG
Filter housing material:	St
Sealing material:	NBR/PTFE
Maintenance indicator setting:	Δ p 5 bar $\pm$ 10 %
Electrical data of maintenance indicator:	
Maximum voltage:	250 V AC/200 V DC
Maximum curent:	1 A
Contact load:	70 W
Type of protection:	IP 65 in inserted and secured status
Contact:	normally open/closed
Cable sleave:	M20x1.5

The switching function can be changed by turning the electric upper part by 180° (normally closed contact or normally open contact). The state on delivery is a normally closed contact. By the inductivity in the direct current circuit the use of suitable protection circuit should be considered. Further maintenance indicator details and designs are available in the maintenance data sheet.

We draw attention to the fact that all values indicated are average values and do not always occur in specific cases of application. Our products are continually being further developed. Values, dimensions and weights can change as a result of this. Our specialized department will be pleased to offer you advice.

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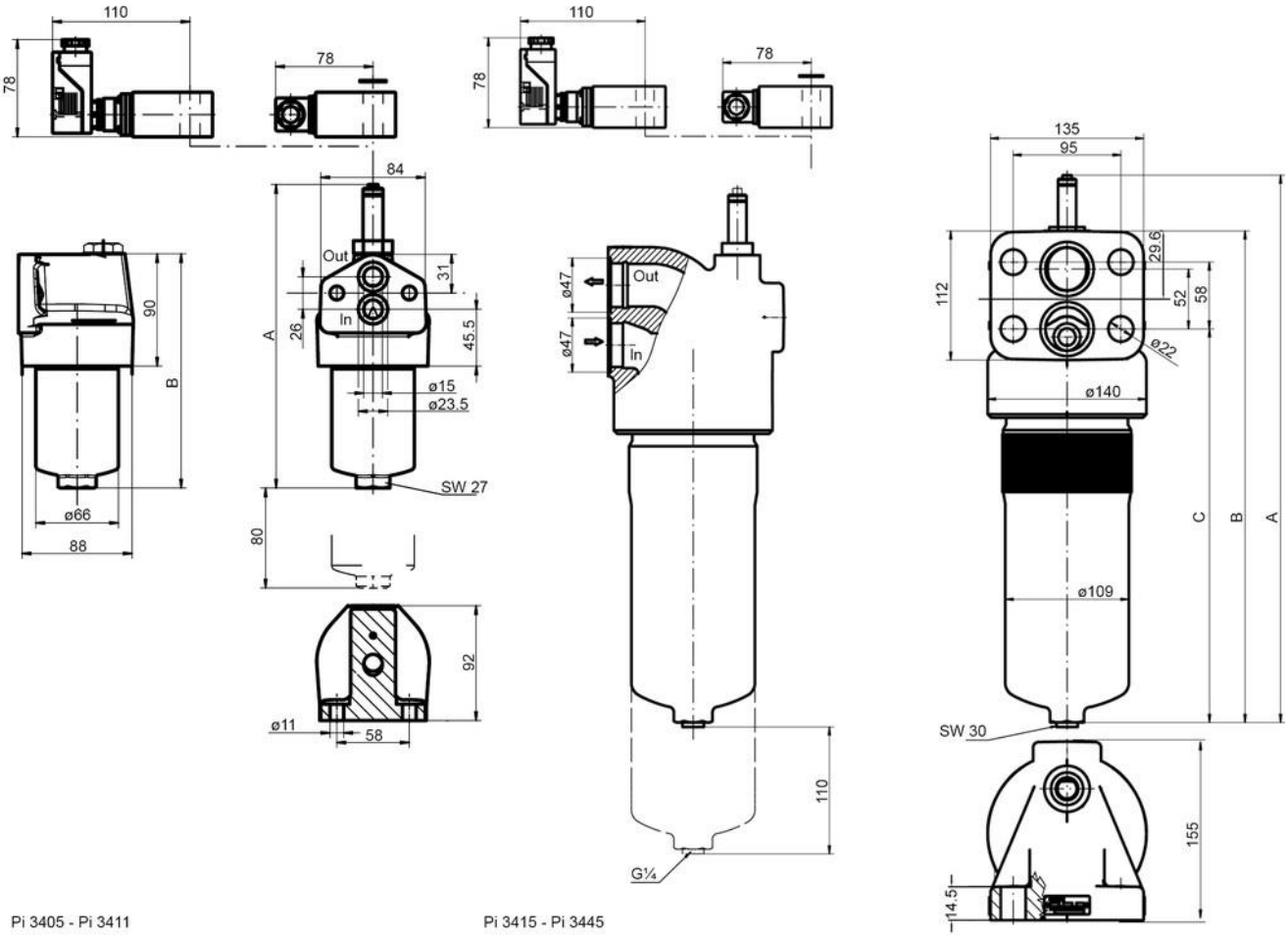
Subject to technical alteration without prior notice.

9. Dimensions



In = intlet
Out = outlet

Attachment screws (property class 12.9) are not included in the delivery.

All dimensions in mm.

Type	A	B	C	Weight [kg]
Pi 3405	241	188	-	3.7
Pi 3408	320	265	-	4.7
Pi 3411	395	342	-	5.5
Pi 3415	360	305	227	14.4
Pi 3430	474	419	341	17.3
Pi 3445	590	535	457	19.4

10. Installation, operating and maintenance instructions

10.1 Filter installation

When installing the filter make sure that sufficient space is available to remove filter element and filter housing. Preferably the filter should be installed with the filter housing pointing downwards. The maintenance indicator must be visible.

10.2 Connecting the electrical maintenance indicator

The electrical connection is connected via a 2-pole appliance plug according to DIN EN 175301-803 with poles marked 1 and 2.The electrical section can be inverted to change from normally open position to normally closed position or vice versa.

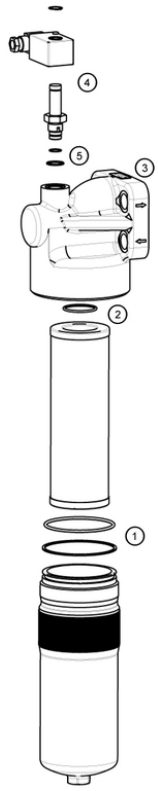
10.3 When should the filter element be replaced?

1. Filters equipped with visual and electrical maintenance indicator:
   During cold starts, the indicator may give a warning signal. Press the red button of the visual indicator once again only after operating temperature has been reached. If the red button immediately pops up again and/or the electrical signal has not switched off after reaching operating temperature, the filter element must be replaced after the end of the shift.
2. Filters without maintenance indicator:
   The filter element should be replaced after the trial run or flushing of the system. Afterwards follow instructions of the manufacturer.
3. Please always ensure that you have original Filtration Group spare elements in stock: Disposable elements (PS) cannot be cleaned.

10.4 Element replacement

1. Stop system and relieve filter from pressure.
2. Filter sizes 300 and 450: empty the filter housing by removing the drain plug.
3. Unscrew the filter housing by turning counter-clockwise. Clean the housing using a suitable cleaning solvent.
4. Remove element by pulling down carefully.
5. Check o-ring, spigot and o-ring in the element locator for damage. Replace, if necessary.
6. Make sure that the order number on the spare element corresponds to the order number of the filter name-plate.
   To ensure no contamination occurs during the exchange of the element first open the plastic bag and push the element over the spigot in the filter head. Now remove plastic bag.
7. Lightly lubricate the threads of the filter housing a little bit and screw into the filter head. Maximum tightening torque for NG 50 to 110 = 60 Nm, for NG 150 to 450 = 100 Nm.
8. Check seals of vent drain plug - if necessary, please replace. Torque drain plug 30 Nm.

11. Spare parts list



Order numbers for spare parts		
Position	**Type**	**Order number**
① bis ③	Seal kit for filter	
	Pi 3405 - Pi 3411	
	NBR	77850381
	FPM	77850399
	EPDM	77850407
	Pi 3415 - Pi 3445	
	NBR	77936206
	FPM	77936214
	EPDM	77936222
④	Maintenance indicator	
	Visual 5 bar PiS 3093/5	77669914
	Electrical 5 bar PiS 3092/5	77669864
	Electrical upper section only	77536550
⑤	Seal kit for maintenance indicator	
	NBR	77760275
	FPM	77760283
	EPDM	77760291

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Medium Pressure Filter
Pi 360

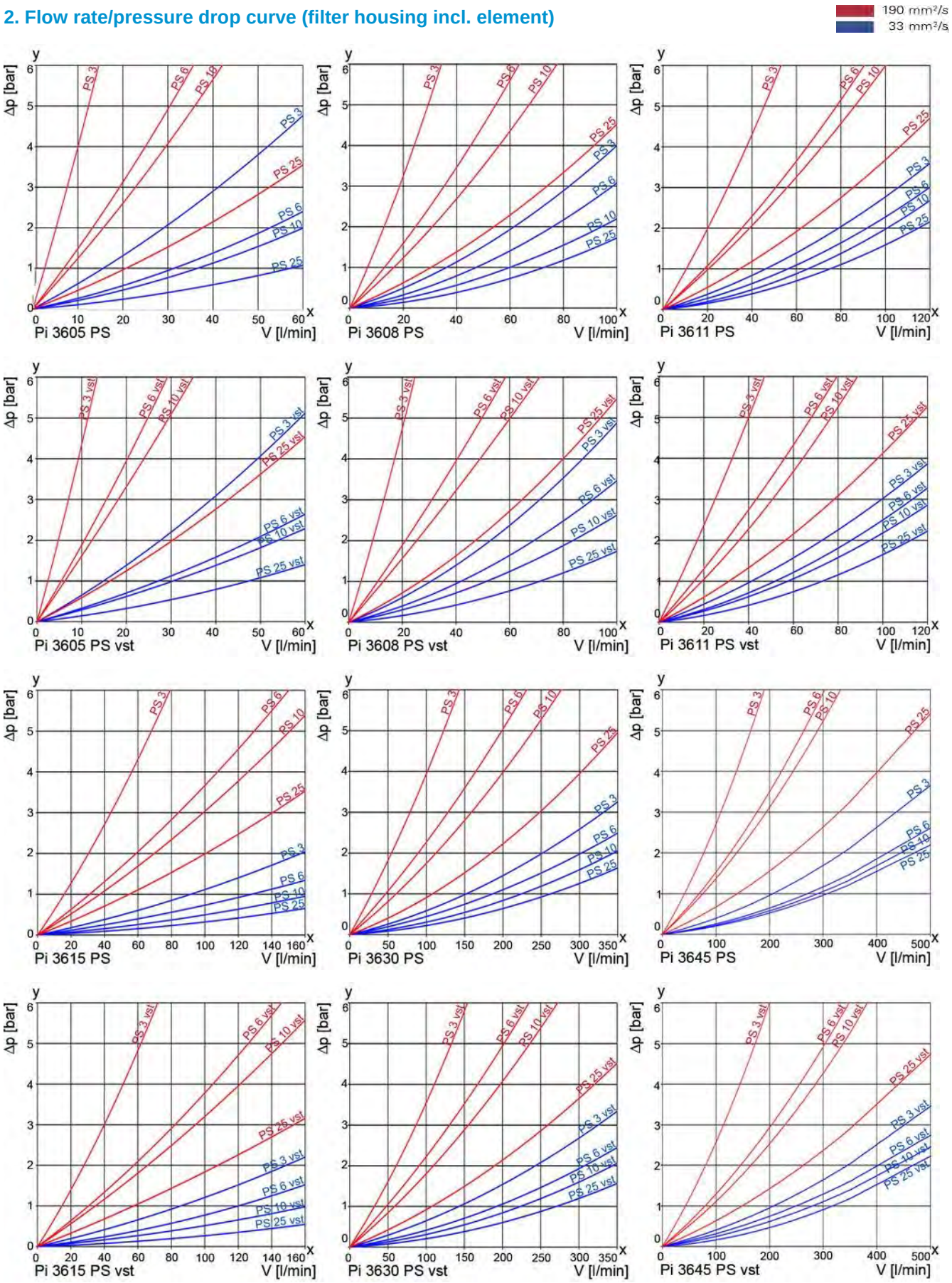
Nominal pressure 210/315 bar (2990/4480 psi), nominal size up to 450

1. Features

High performance filters for modern hydraulic systems

- Provided for pipe installation
- Modular system
- Compact design
- Minimal pressure drop through optimal flow design
- Visual/electrical/electronic maintenance control
- Threaded connections
- Change over valve on upstream side
- Ergonomic switch-over handle with safety lock and pressure compensation
- User-optimized one-hand-operation
- Equipped with highly efficient glass fibre PS filter elements
- Beta rated elements according to ISO 16889 multipass test
- Elements with high differential pressure stability and dirt holding capacity
- NPT- and SAE-connections on request
- Worldwide distribution

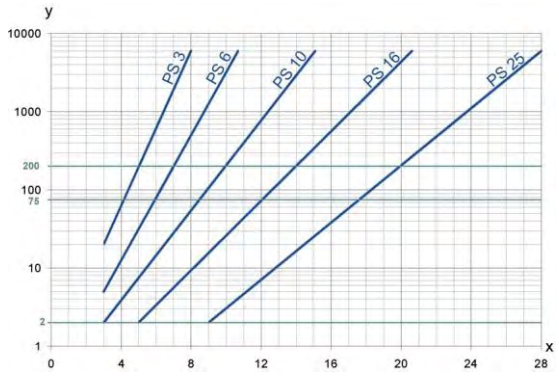
2. Flow rate/pressure drop curve (filter housing incl. element)



y = differential pressure Δp [bar]

x = flow rate V [l/min]

3. Separation grade characteristics



y = beta-value
x = particle size [µm]

determined by multipass tests (ISO 16889)
calibration according to ISO 1171 (NIST)

4. Filter performance data

tested according to ISO 16889 (multipass test)

PS elements with
max. Δ p 20 bar

PS	3	$\beta_{5(C)}$	≥200
PS	6	$\beta_{7(C)}$	≥200
PS	10	$\beta_{10(C)}$	≥200
PS	25	$\beta_{20(C)}$	≥200

values guaranteed up to
10 bar differential pressure

PS vst elements with
max. Δ p 210 bar

PS vst	3	$\beta_{5(C)}$	≥200
PS vst	6	$\beta_{7(C)}$	≥200
PS vst	10	$\beta_{10(C)}$	≥200
PS vst	25	$\beta_{20(C)}$	≥200

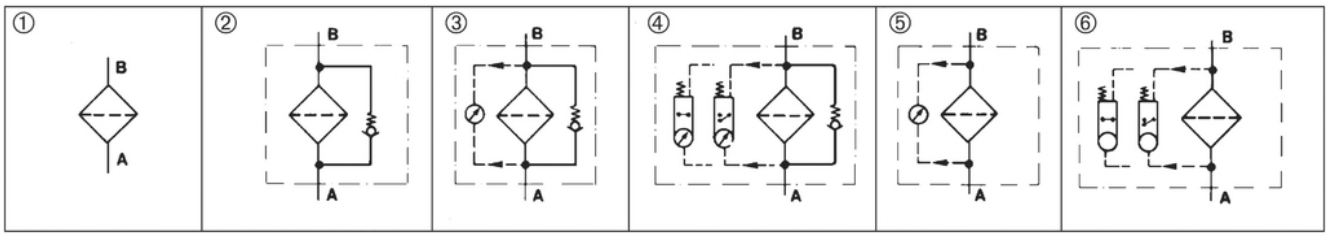
values guaranteed up to
20 bar differential pressure

5. Quality assurance

Filtration Group filters and filter elements are produced according to the following international standards:

Norm	Designation
DIN ISO 2941	Hydraulic fluid power filter elements; verification of collapse/burst resistance
DIN ISO 2942	Hydraulic fluid power filter elements; verification of fabrication integrity
DIN ISO 2943	Hydraulic fluid power filter elements; verification of material compatibility with fluids
DIN ISO 3723	Hydraulic fluid power filter elements; method for end load test
DIN ISO 3724	Hydraulic fluid power filter elements; verification of flow fatigue characteristics
ISO 3968	Hydraulic fluid power filters; evaluation of pressure drop versus flow characteristics
ISO 10771.1	Fatigue pressure testing of metal containing envelopes in hydraulic fluid applications
ISO 16889	Hydraulic fluid power filters; multipass method for evaluation filtration performance of a filter element

6. Symbols



7. Order numbers

Example for ordering filters:

1. Filter housing	2. Filter element
V = 80 l/min and electrical maintenance indicator Type: Pi 3608-15 Order number: 77666282	PS vst 3 Type: Pi 2208 PS vst 3 Order number: 77680200

7.1 Housing design

Nominal size NG [l/min]	Order number	Type	① no options	② with bypass and indicator cavity	③ with bypass and visual indicator	④ with bypass and electrical indicator	⑤ with visual indicator	⑥ with electrical indicator
50	77655996	Pi 3605-060	■					
	77666217	Pi 3605-011		■				
	77666225	Pi 3605-012			■			
	77656044	Pi 3605-013				■		
	77666233	Pi 3605-014					■	
	77666241	Pi 3605-015						■
80	77656002	Pi 3608-060	■					
	77666258	Pi 3608-011		■				
	77666266	Pi 3608-012			■			
	77656036	Pi 3608-013				■		
	77666274	Pi 3608-014					■	
	77666282	Pi 3608-015						■
110	77656010	Pi 3611-060	■					
	77666290	Pi 3611-011		■				
	77666308	Pi 3611-012			■			
	77656028	Pi 3611-013				■		
	77731821	Pi 3611-014					■	
	77666316	Pi 3611-015						■
150	77647845	Pi 3615-060	■					
	77731854	Pi 3615-011		■				
	77666324	Pi 3615-012			■			
	77655988	Pi 3615-013				■		
	77731862	Pi 3615-014					■	
	77731847	Pi 3615-015						■
300	77655970	Pi 3630-060	■					
	77731896	Pi 3630-011		■				
	77666332	Pi 3630-012			■			
	77647837	Pi 3630-013				■		
	77731904	Pi 3630-014					■	
	77731888	Pi 3630-015						■
450	70328126	Pi 3645-060	■					
	79343153	Pi 3645-011		■				
	79350810	Pi 3645-012			■			
	77883648	Pi 3645-013				■		
	79343161	Pi 3645-014					■	
	78299307	Pi 3645-015						■

When filter with non bypass configuration is selected, the collapse pressure of the element must not be exceeded.

7.2 Filter elements (a wider range of element types is available on request)					
Nominal size NG [l/min]	**Order number**	**Type**	**Filter material**	**max. Δ p [bar]**	**Filter surface [cm²]**
50	77680135	Pi 2105 PS 3	PS 3	**20**	590
	77943509	Pi 5105 PS 6	PS 6		590
	77680325	Pi 3105 PS 10	PS 10		590
	77680440	Pi 4105 PS 25	PS 25		590
	77680192	Pi 2205 PS vst 3	PS vst 3	**210**	425
	77943533	Pi 5205 PS vst 6	PS vst 6		425
	77680382	Pi 3205 PS vst 10	PS vst 10		425
	77680507	Pi 4205 PS vst 25	PS vst 25		425
80	77680143	Pi 2108 PS 3	PS 3	**20**	1150
	77943517	Pi 5108 PS 6	PS 6		1150
	77680341	Pi 3108 PS 10	PS 10		1150
	77680457	Pi 4108 PS 25	PS 25		1150
	77680200	Pi 2208 PS vst 3	PS vst 3	**210**	850
	77943541	Pi 5208 PS vst 6	PS vst 6		850
	77681190	Pi 3208 PS vst 10	PS vst 10		850
	77680515	Pi 4208 PS vst 25	PS vst 25		850
110	77680150	Pi 2111 PS 3	PS 3	**20**	1700
	77943525	Pi 5111 PS 6	PS 6		1700
	77680333	Pi 3111 PS 10	PS 10		1700
	77680465	Pi 4111 PS 25	PS 25		1700
	77680218	Pi 2211 PS vst 3	PS vst 3	**210**	1275
	77943558	Pi 5211 PS vst 6	PS vst 6		1275
	77680390	Pi 3211 PS vst 10	PS vst 10		1275
	77680523	Pi 4211 PS vst 25	PS vst 25		1275
150	77680168	Pi 2115 PS 3	PS 3	**20**	2425
	77955099	Pi 5115 PS 6	PS 6		2425
	77680358	Pi 3115 PS 10	PS 10		2425
	77680473	Pi 4115 PS 25	PS 25		2425
	77680226	Pi 2215 PS vst 3	PS vst 3	**210**	2010
	77955123	Pi 5215 PS vst 6	PS vst 6		2010
	77680408	Pi 3215 PS vst 10	PS vst 10		2010
	77680531	Pi 4215 PS vst 25	PS vst 25		2010
300	77680176	Pi 2130 PS 3	PS 3	**20**	4620
	77955107	Pi 5130 PS 6	PS 6		4620
	77680366	Pi 3130 PS 10	PS 10		4620
	77680481	Pi 4130 PS 25	PS 25		4620
	77680234	Pi 2230 PS vst 3	PS vst 3	**210**	3800
	77955131	Pi 5230 PS vst 6	PS vst 6		3800
	77680416	Pi 3230 PS vst 10	PS vst 10		3800
	77680549	Pi 4230 PS vst 25	PS vst 25		3800
450	77680184	Pi 2145 PS 3	PS 3	**20**	6865
	77955115	Pi 5145 PS 6	PS 6		6865
	77680374	Pi 3145 PS 10	PS 10		6865
	77680499	Pi 4145 PS 25	PS 25		6865
	77680242	Pi 2245 PS vst 3	PS vst 3	**210**	5600
	77955149	Pi 5245 PS vst 6	PS vst 6		5600
	77680424	Pi 3245 PS vst 10	PS vst 10		5600
	77680556	Pi 4245 PS vst 25	PS vst 25		5600

8. Technical specifications

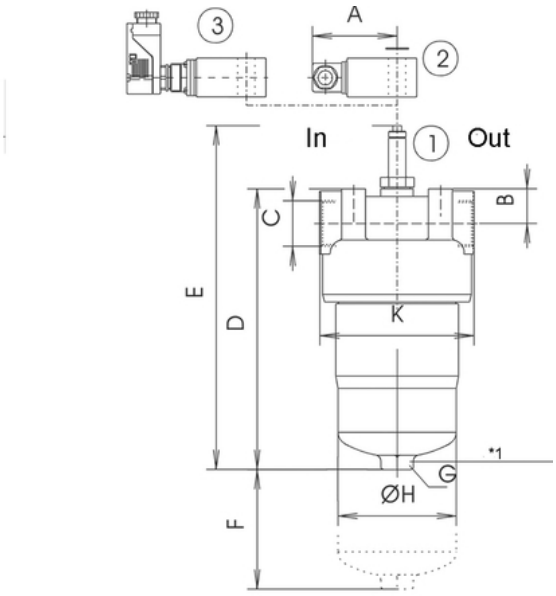
Design:	line mounting filter
Nominal pressure: Pi 3615-3645	210 bar (2990 psi)
Pi 3605, 3608, 3611	315 bar (4480 psi)
Test pressure: Pi 3615-3645	275 bar (3910 psi)
Pi 3605, 3608, 3611	410 bar (5830 psi)
Temperature range:	-10 °C to +120 °C
	(other temperature ranges on request)
Bypass setting:	Δ p 7 bar ± 10 %
Filter head material:	GGG
Filter housing material:	St
Sealing material:	NBR/PTFE
Maintenance indicator setting:	Δ p 5 bar ± 10 %
Electrical data of maintenance indicator:	
Max. voltage:	250 V AC/200 V DC
Max. current:	1 A
Contact load:	70 W
Type of protection:	IP 65 in inserted and secured status
Contact:	normally open/closed
Cable sleave:	M20x1.5

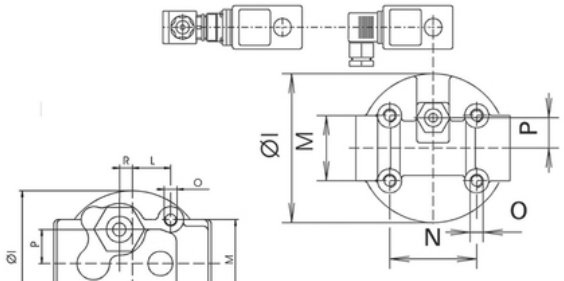
The switching function can be changed by turning the electric upper part by 180° (normally closed contact or normally open contact). The state on delivery is a normally closed contact. By inductivity in the direct current circuit the use of suitable protection ciruit should be considered. Further maintenance indicator details and designs are available in the maintenance indicator data sheet.

We draw attention to the fact that all values indicated are average values which do not always occur in specific cases of application. Our products are continually being further developed. Values, dimensions and weights can change as a result of this. Our specialized department will be pleased to offer you advice.

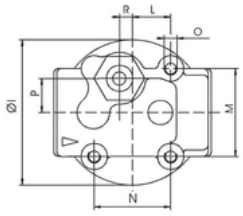
We recommend to contact us concerning applications of filters in areas governed by the EU Directive 94/9 EC (ATEX 95). The standard version can be used for liquids based on mineral oil (corresponding to the fluids in Group 2 of Directive 97/23 EC Article 9). If you consider to use other fluids please contact us for additional support.

Subject to technical alteration without prior notice.





Pi 3615 - Pi 3645



Pi 3605 - Pi 3611

In = inlet
Out = outlet
Pos 1 - Visual maintenance indicator
Pos 2 - Electrical upper section connector according DIN EN 175301-803
Executions: Pis 3092, 3105, 3115
Pos 3 - Electrical upper section connector according DIN EN 175201-804
Executions: Pis 3102, 3122, 3110, 3132

*1 NG 300 and NG 450 with drain screw G¼

9. Dimensions

All dimensions except "C" in mm.

Type	A	B	C*	D	E	F	G SW	H	I	K	L	M	N	O	P	R	Weight [kg]
Pi 3605	78	31	G½	189	247	80	27	66	90	92	23.5	54	47	M8x16	21	8	4.1
Pi 3608	78	31	G¾	267	325	80	27	66	90	92	23.5	54	47	M8x16	21	8	5.0
Pi 3611	78	31	G¾	343	401	80	27	66	90	92	23.5	54	47	M8x16	21	8	5.9
Pi 3615	78	32	G1¼	257	312	110	30	109	137	142	-	60	80	M12x16	30	-	9.8
Pi 3630	78	32	G1¼	371	426	110	30	109	137	142	-	60	80	M12x16	30	-	12.5
Pi 3645	78	32	G1¼	487	542	110	30	109	137	142	-	60	80	M12x16	30	-	14.0

* NPT- and SAE- port connections on request

10. Installation, operating and maintenance instructions

10.1 Filter installation

When installing the filter make sure that sufficient space is available to remove filter element and filter housing. Preferably the filter should be installed with the filter housing pointing downwards.
The maintenance indicator must be visible.

10.2 Connecting the electrical maintenance indicator

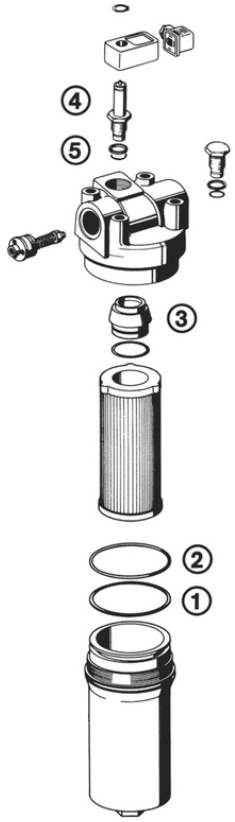
The electrical indicator is connected via a 2-pole appliance plug according to DIN EN 175301-803 with poles marked 1 and 2. The electrical section can be inverted to change from normally open to normally closed position or vice versa.

10.3 When should the filter be replaced?

1. Filters equipped with visual and electrical maintenance indicator:
   During cold starts, the indicator may give a warning signal. Press the red button of the visual indicator once again only after operating temperature has been reached. If the red button immediately pops up again and/or the electrical signal has not switched off after reaching operating temperature. The filter element must be replaced after the end of the shift.
2. Filters without maintenance indicator: The filter element should be replaced after trial run or flushing of the system. Afterwards follow instructions of the manufacturer.
3. Please always ensure that you have original Filtration Group spare elements in stock: Disposable elements (PS) cannot be cleaned.

10.4 Element replacement

1. Stop system and relieve filter from pressure.
2. Filter sizes 300 and 450: empty the filter housing by removing the drain plug.
3. Unscrew the filter housing by turning counter-clockwise. Clean the housing using a suitable cleaning solvent.
4. Remove element by pulling down carefully.
5. Check o-ring, spigot and o-ring in the element locator for damage. Replace, if necessary.
6. Make sure that the order number on the spare element corresponds to the order number of the filter name-plate. To ensure no contamination occurs during the exchange of the element first open the plastic bag and push the element over the spigot in the filter head. Now remove plastic bag.
7. Lightly lubricate the threads of the filter housing a little bit and screw into the filter head. Maximum tightening torque for NG 50 to 110 = 60 Nm, for NG 150 to 450 = 100 Nm.
8. Check seals of vent drain plug - if necessary, please replace.
   Torque drain plug 30 Nm.



11. Spare parts list

Order numbers for spare parts		
Position	**Type**	**Order number**
① - ③	Seal kit	
	Pi 3605 - Pi 3611	
	NBR	77637150
	FPM	77637168
	EPDM	77637176
	Pi 3615 - Pi 3645	
	NBR	77637184
	FPM	77637192
	EPDM	77637200
④	Maintenance indicator	
	Visual PiS 3093/5	77669914
	Visual/electrical PiS 3092/5	77669864
	Electrical upper section only	77536550
⑤	Seal kit for maintenance indicator	
	NBR	77760275
	FPM	77760283
	EPDM	77760291

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78356834.06/2019

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Medium Pressure Filter
Pi 3000

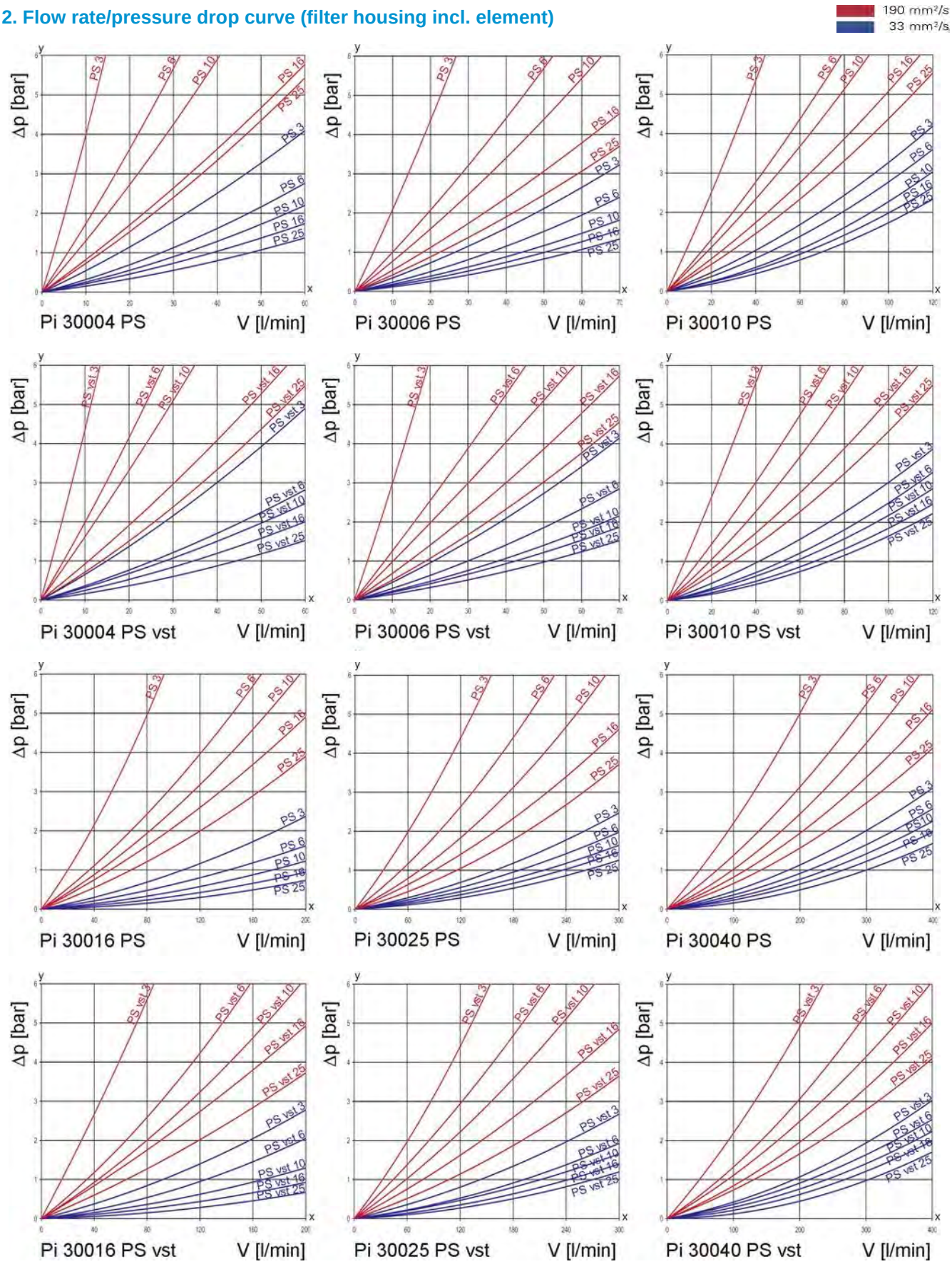
Nominal pressure 200/315 bar (2900/4570 psi), nominal size up to 400
according to DIN 24550

1. Features

High performance filters for modern hydraulic systems

- Provided for pipe installation
- Modular system
- Compact design
- Minimal pressure drop through optimal flow design
- Visual/electrical/electronic maintenance indicator
- Threaded connections
- Quality filters, easy to service
- Equipped with highly efficient glass fibre PS filter elements
- Beta rated elements according to ISO 16889
- Elements with high differential pressure stability and dirt holding capacity
- NPT- and SAE-connections on request
- Worldwide distribution

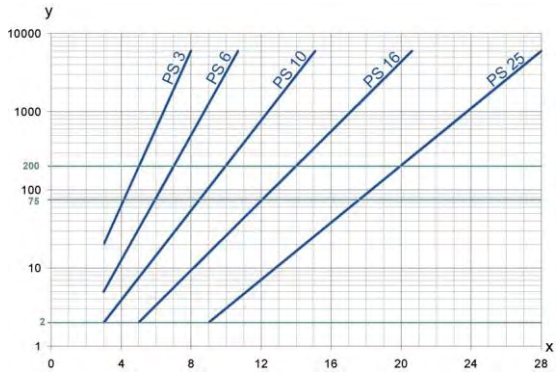
2. Flow rate/pressure drop curve (filter housing incl. element)



y = differential pressure Δ p [bar]

x = flow rate V [l/min]

3. Separation grade characteristics



y = beta-value
x = particle size [µm]

determined by multipass tests (ISO 16889)
calibration according to ISO 11171 (NIST)

4. Filter performance data

tested according to ISO 16889 (multipass test)

PS elements with
max. Δ p 20 bar

PS	3	$\beta_{5(C)}$	≥200
PS	6	$\beta_{7(C)}$	≥200
PS	10	$\beta_{10(C)}$	≥200
PS	16	$\beta_{15(C)}$	≥200
PS	25	$\beta_{20(C)}$	≥200

values guaranteed up to
10 bar differential pressure

PS vst elements with
max. Δ p 210 bar

PS vst	3	$\beta_{5(C)}$	≥200
PS vst	6	$\beta_{7(C)}$	≥200
PS vst	10	$\beta_{10(C)}$	≥200
PS vst	16	$\beta_{15(C)}$	≥200
PS vst	25	$\beta_{20(C)}$	≥200

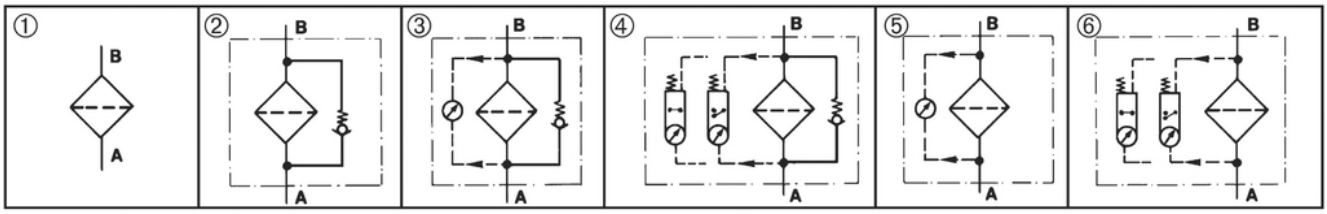
values guaranteed up to
20 bar differential pressure

5. Quality assurance

Filtration Group filters and filter elements are produced according to the following international standards:

Norm	Designation
DIN ISO 2941	Hydraulic fluid power filter elements; verification of collapse/burst resistance
DIN ISO 2942	Hydraulic fluid power filter elements; verification of fabrication integrity
DIN ISO 2943	Hydraulic fluid power filter elements; verification of material compatibility with fluids
DIN ISO 3723	Hydraulic fluid power filter elements; method for end load test
DIN ISO 3724	Hydraulic fluid power filter elements; verification of flow fatigue characteristics
ISO 3968	Hydraulic fluid power filters; evaluation of pressure drop versus flow characteristics
ISO 10771.1	Fatigue pressure testing of metal containing envelopes in hydraulic fluid applications
ISO 16889	Hydraulic fluid power filters; multipass method for evaluation filtration performance of a filter element

6. Symbols



7. Order numbers

Example for ordering filters:

1. Filter housing	2. Filter element
V = 100l/min and electrical maintenance indicator Type: Pi 30010-015 Order number: 78208084	PS vst 3 Type: Pi 71010 DN PS vst 3 Order number: 78227480

Nominal size NG [l/min]	Order number	Type	① with indicator cavity	② with bypass valve and indicator cavity	③ with bypass valve and visual indicator	④ with bypass valve and electrical indicator	⑤ with visual indicator	⑥ with electrical indicator
40	78207896	Pi 30004-010	■					
	78207904	Pi 30004-011		■				
	78337388	Pi 30004-012			■			
	78304206	Pi 30004-013				■		
	78207938	Pi 30004-014					■	
	78207946	Pi 30004-015						■
63	78207961	Pi 30006-010	■					
	78207979	Pi 30006-011		■				
	78207987	Pi 30006-012			■			
	78304214	Pi 30006-013				■		
	78208001	Pi 30006-014					■	
	78208019	Pi 30006-015						■
100	78208035	Pi 30010-010	■					
	78208043	Pi 30010-011		■				
	78208050	Pi 30010-012			■			
	78304222	Pi 30010-013				■		
	78208076	Pi 30010-014					■	
	78208084	Pi 30010-015						■
160	78208100	Pi 30016-010	■					
	78208118	Pi 30016-011		■				
	78208126	Pi 30016-012			■			
	78259970	Pi 30016-013				■		
	78208142	Pi 30016-014					■	
	78208159	Pi 30016-015						■
250	78208167	Pi 30025-010	■					
	78208175	Pi 30025-011		■				
	78208183	Pi 30025-012			■			
	78259988	Pi 30025-013				■		
	78208209	Pi 30025-014					■	
	78208217	Pi 30025-015						■
400	78208225	Pi 30040-010	■					
	78208233	Pi 30040-011		■				
	78208241	Pi 30040-012			■			
	78259996	Pi 30040-013				■		
	78208266	Pi 30040-014					■	
	78208274	Pi 30040-015						■

When filter with non bypass configuration is selected, the collapse pressure of the element must not be exceeded.

7.2 Filter elements*					
Nominal size NG [l/min]	**Order number**	**Type**	**Filter material**	**max. Δ p [bar]**	**Filter surface [cm²]**
40	78260929	Pi 21004 DN PS 3 NBR	PS 3	**20**	475
	77960859	Pi 22004 DN PS 6 NBR	PS 6		475
	77925571	Pi 23004 DN PS 10 NBR	PS 10		475
	78260937	Pi 24004 DN PS 16 NBR	PS 16		475
	78260945	Pi 25004 DN PS 25 NBR	PS 25		475
	78216079	Pi 71004 DN PS vst 3 NBR	PS vst 3	**210**	445
	77960156	Pi 72004 DN PS vst 6 NBR	PS vst 6		445
	77925654	Pi 73004 DN PS vst 10 NBR	PS vst 10		445
	78216087	Pi 74004 DN PS vst 16 NBR	PS vst 16		445
	78216095	Pi 75004 DN PS vst 25 NBR	PS vst 25		445
63	78260960	Pi 21006 DN PS 3 NBR	PS 3	**20**	835
	77960867	Pi 22006 DN PS 6 NBR	PS 6		835
	77925589	Pi 23006 DN PS 10 NBR	PS 10		835
	78260978	Pi 24006 DN PS 16 NBR	PS 16		835
	78260986	Pi 25006 DN PS 25 NBR	PS 25		835
	78216137	Pi 71006 DN PS vst 3 NBR	PS vst 3	**210**	780
	77960149	Pi 72006 DN PS vst 6 NBR	PS vst 6		780
	77925662	Pi 73006 DN PS vst 10 NBR	PS vst 10		780
	78216145	Pi 74006 DN PS vst 16 NBR	PS vst 16		780
	78216152	Pi 75006 DN PS vst 25 NBR	PS vst 25		780
100	78227472	Pi 21010 DN PS 3 NBR	PS 3	**20**	1375
	77960875	Pi 22010 DN PS 6 NBR	PS 6		1375
	77925597	Pi 23010 DN PS 10 NBR	PS 10		1375
	78261000	Pi 24010 DN PS 16 NBR	PS 16		1375
	78261018	Pi 25010 DN PS 25 NBR	PS 25		1375
	78227480	Pi 71010 DN PS vst 3 NBR	PS vst 3	**210**	1275
	77960131	Pi 72010 DN PS vst 6 NBR	PS vst 6		1275
	77925670	Pi 73010 DN PS vst 10 NBR	PS vst 10		1275
	78261281	Pi 74010 DN PS vst 16 NBR	PS vst 16		1275
	78216160	Pi 75010 DN PS vst 25 NBR	PS vst 25		1275

* a wider range of element types is available on request

7.2 Filter elements*					
Nominal size NG [l/min]	**Order number**	**Type**	**Filter material**	**max. Δ p [bar]**	**Filter surface [cm²]**
160	78261034	Pi 21016 DN PS 3 NBR	PS 3	**20**	2530
	77960826	Pi 22016 DN PS 6 NBR	PS 6		2530
	77925605	Pi 23016 DN PS 10 NBR	PS 10		2530
	78261042	Pi 24016 DN PS 16 NBR	PS 16		2530
	78261059	Pi 25016 DN PS 25 NBR	PS 25		2530
	77940638	Pi 71016 DN PS vst 3 NBR	PS vst 3	**210**	1885
	77960123	Pi 72016 DN PS vst 6 NBR	PS vst 6		1885
	77925688	Pi 73016 DN PS vst 10 NBR	PS vst 10		1885
	78269797	Pi 74016 DN PS vst 16 NBR	PS vst 16		1885
	78216178	Pi 75016 DN PS vst 25 NBR	PS vst 25		1885
250	78227514	Pi 21025 DN PS 3 NBR	PS 3	**20**	4020
	77960834	Pi 22025 DN PS 6 NBR	PS 6		4020
	77925613	Pi 23025 DN PS 10 NBR	PS 10		4020
	78261075	Pi 24025 DN PS 16 NBR	PS 16		4020
	78261083	Pi 25025 DN PS 25 NBR	PS 25		4020
	77940646	Pi 71025 DN PS vst 3 NBR	PS vst 3	**210**	3090
	77960115	Pi 72025 DN PS vst 6 NBR	PS vst 6		3090
	77925696	Pi 73025 DN PS vst 10 NBR	PS vst 10		3090
	78269813	Pi 74025 DN PS vst 16 NBR	PS vst 16		3090
	78216186	Pi 75025 DN PS vst 25 NBR	PS vst 25		3090
400	78227522	Pi 21040 DN PS 3 NBR	PS 3	**20**	6770
	77960842	Pi 22040 DN PS 6 NBR	PS 6		6770
	77925621	Pi 23040 DN PS 10 NBR	PS 10		6770
	78261109	Pi 24040 DN PS 16 NBR	PS 16		6770
	78261117	Pi 25040 DN PS 25 NBR	PS 25		6770
	77940653	Pi 71040 DN PS vst 3 NBR	PS vst 3	**210**	5240
	77960107	Pi 72040 DN PS vst 6 NBR	PS vst 6		5240
	77930829	Pi 73040 DN PS vst 10 NBR	PS vst 10		5240
	78269821	Pi 74040 DN PS vst 16 NBR	PS vst 16		5240
	78260903	Pi 75040 DN PS vst 25 NBR	PS vst 25		5240

* a wider range of element types is available on request

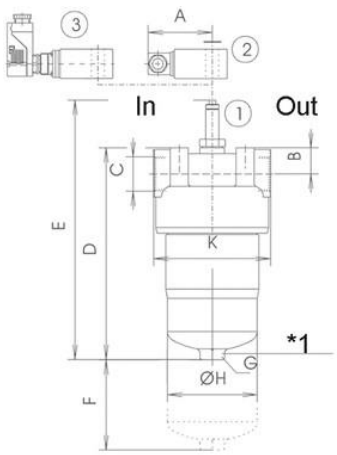
8. Technical specifications

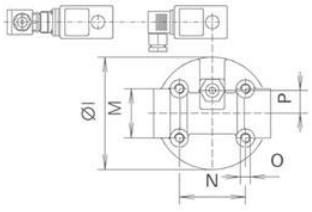
Design:	in-line filter
Nominal pressure:	
Pi 30004 - 30010	315 bar (4570 psi)
Pi 30016 - 30040	200 bar (2900 psi)
Test pressure:	
Pi 30004 - 30010	410 bar (5940 psi)
Pi 30016 - 30040	260 bar (3770 psi)
Temperature range:	-10 °C to +120 °C
	(other temperature ranges on request)
Bypass setting:	Δp 7 bar ± 10 %
Filter head material:	GGG
Filter housing material:	St
Sealing material:	NBR/PTFE
Maintenance indicator setting:	Δp 5 bar ± 10 %
Electrical data of maintenance indicator:	
Maximum voltage:	250 V AC/200 V DC
Maximum current:	1 A
Contact load:	70 W
Type of protection:	IP 65 in inserted and secured status
Contact:	normally open/closed
Cable sleave:	M20x1.5

The switching function can be changed by turning the electric upper part by 180° (normally closed contact or normally open contact). The state on delivery is a normally closed contact. By inductivity in the direct current circuit the use of suitable protection circuit should be considered. Further maintenance indicator details and designs are available in the maintenance indicator data sheet.

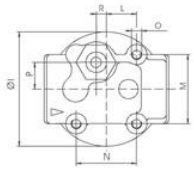
We draw attention to the fact that all values indicated are average values which do not always occur in specific cases of application. Our products are continually being further developed. Values, dimensions and weights can change as a result of this. Our specialized department will be pleased to offer you advice.

We recommend you to contact us concerning applications of our filters in areas governed by the EU Directive 94/9 EC (ATEX 95). The standard version can be used for liquids based on mineral oil (corresponding to the fluids in Group 2 of Directive 97/23 EC Article 9). If you consider to use other fluids please contact us for additional support.





NG 160 - 400



NG 40 - 100

In = inlet
Out = outlet
*1 NG 250, 400 with drain screw G ¼ DIN 910
Pos. 1 Visual maintenance indicator
Pos. 2 Electrical upper section
connector according DIN EN 175301-803
Version: PiS 3092, 3105, 3115
Pos. 3 Electrical upper section
connector according DIN EN 175301-804
Version: PiS 3102, 3122, 3132

Subject to technical alteration without prior notice.

9. Dimensions

All dimensions except "C" in mm.

Type	A	B	C*	D	E	F	G SW	H	I	K	L	M	N	O	P	R	Weight [kg]
Pi 30004	78	31	G½	181	238	80	27	66	90	92	23.5	54	47	M8x16	21	8	4.2
Pi 30006	78	31	G¾	241	298	80	27	66	90	92	23.5	54	47	M8x16	21	8	4.9
Pi 30010	78	31	G1	331	389	80	27	66	90	92	23.5	54	47	M8x16	21	8	5.8
Pi 30016	78	32	G1¼	267	324	110	30	109	137	142	-	60	80	M12x16	28	-	10.0
Pi 30025	78	32	G1¼	357	414	110	30	109	137	142	-	60	80	M12x16	28	-	12.0
Pi 30040	78	32	G1¼	507	564	110	30	109	137	142	-	60	80	M12x16	28	-	15.6

* NPT- and SAE- port connections on request

10. Installation, operating and maintenance instructions

10.1 Filter installation

When installing the filter make sure that sufficient space is available to remove filter element and filter housingl. Preferably the filter should be installed with the filter housing pointing downwards.
The maintenance indicator must be visible.

10.2 Connecting the electrical maintenance indicator

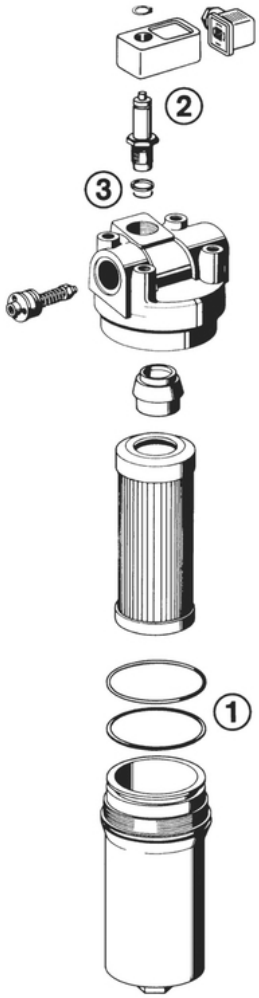
The electrical indicator is connected via a 2-pole appliance plug according to DIN EN 175301-803 with poles marked 1 and 2.
The electrical section can be inverted to change from normally open position to normally closed position or vice versa.

10.3 When should the filter element be replaced?

1. Filters equipped with visual and electrical maintenance indicator:
   During cold starts, the indicator may give a warning signal. Press the red button of the visual indicator once again only after operating temperature has been reached. If the red button immediately pops up again and/or the electrical signal has not switched off after reaching operating temperature, the filter element must be replaced after the end of the shift.
2. Filters without maintenance indicator:
   The filter element should be replaced after the trial run or flushing of the system. Afterwards follow instructions of the manufacturer.
3. Please always ensure that you have Original Filtration Group spare elements in stock: Disposable elements (PS) cannot be cleaned.

10.4 Element replacement

1. Stop system and relieve filter from pressure.
2. Filter sizes 250 and 400: empty the filter housing by removing the drain plug.
3. Unscrew the filter housing by turning counter-clockwise. Clean the housing using a suitable cleaning solvent.
4. Remove element by pulling down carefully.
5. Check o-ring and spigot for damage. Replace, if necessary.
6. Make sure that the order number on the spare element corresponds to the order number of the filter name-plate. To ensure no contamination occurs during the exchange of the element first open the plastic bag and push the element over the spigot in the filter head. Now remove plastic bag.
7. Lightly lubricate threads of the filter housing a little bit and screw into the filter head. Maximum tightening torque for NG 40 to 100 = 60 Nm, for NG 160 to 400 = 100 Nm.
8. Check seals of vent drain plug - if necessary, please replace. Torque drain plug 30 Nm.



11. Spare parts list

Order numbers for spare parts		
Position	**Type**	**Order number**
①	Seal kit for filter	
	Pi 30004 - Pi 30010	
	NBR	78383747
	FPM	78383754
	EPDM	78383762
	Pi 30016 - Pi 30040	
	NBR	78383770
	FPM	78383788
	EPDM	78383796
②	Maintenance indicator	
	Visual PiS 3093/5	77669914
	Electrical PiS 3092/5	77669864
	Electrical upper section only	77536550
③	Seal kit for maintenance indicator	
	NBR	77760275
	FPM	77760283
	EPDM	77760291

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High Pressure Filter
Pi 410

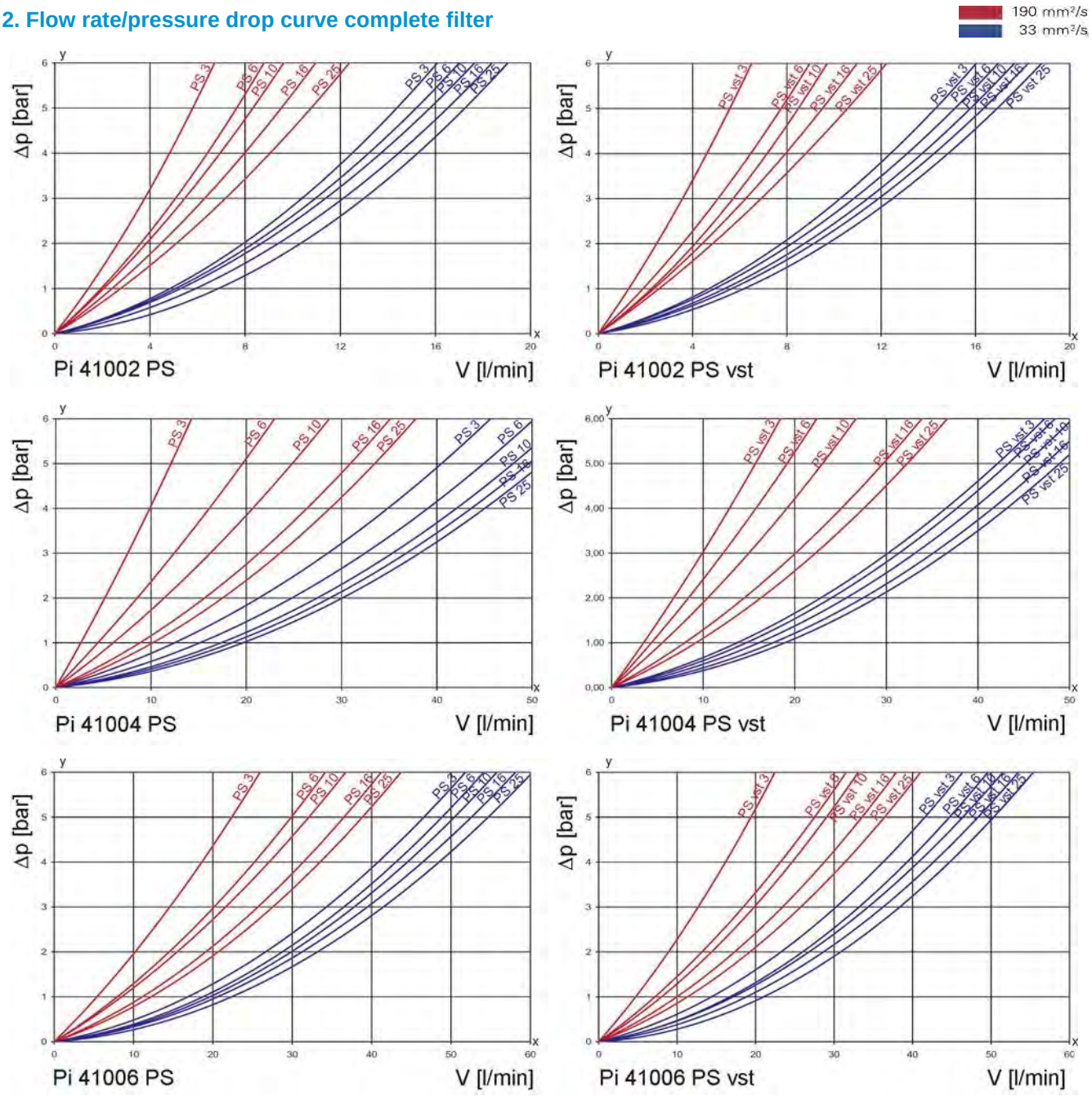
Nominal pressure 315 bar (4480 psi), nominal size 20-63

1. Features

High performance filters for modern hydraulic systems

- Provided for valve block installation
- Modular system
- Compact design
- Minimal pressure drop through optimal flow design
- Visual/electrical/electronic maintenance indicator
- Connections according DIN 24340
- Quality filters, easy to service
- Equipped with highly efficient glass fibre PS filter elements
- Nominal sizes 40 and 63 equipped with filter elements according to DIN 24550
- Beta rated elements according to ISO 16889 multipass test
- Elements with high differential pressure stability and dirt holding capacity
- Worldwide distribution

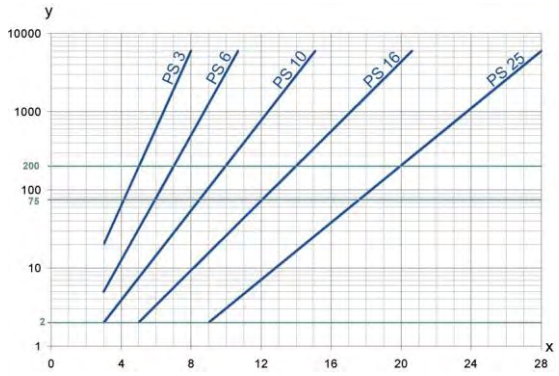
2. Flow rate/pressure drop curve complete filter



y = differential pressure Δp [bar]

x = flow rate V [l/min]

3. Separation grade characteristics



y = beta -value
x = particle size [µm]

determined by multipass tests (ISO 16889)
calibration according to ISO 11171 (NIST)

4. Filter performance data

tested according to ISO 16889 (multipass test)

PS elements with
max. Δ p 20 bar

PS	3	$\beta_{5(C)}$	≥200
PS	6	$\beta_{7(C)}$	≥200
PS	10	$\beta_{10(C)}$	≥200
PS	16	$\beta_{15(C)}$	≥200
PS	25	$\beta_{20(C)}$	≥200

values guaranteed up to
10 bar differential pressure

PS vst elements with
max. Δ p 210 bar

PS vst	3	$\beta_{5(C)}$	≥200
PS vst	6	$\beta_{7(C)}$	≥200
PS vst	10	$\beta_{10(C)}$	≥200
PS vst	16	$\beta_{15(C)}$	≥200
PS vst	25	$\beta_{20(C)}$	≥200

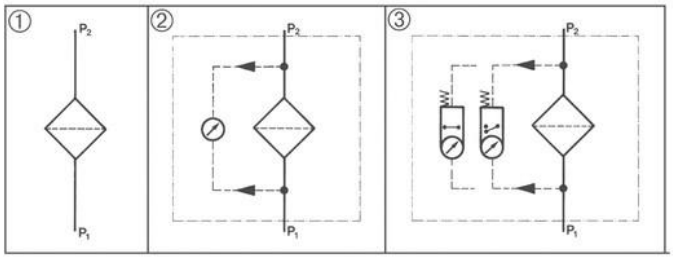
values guaranteed up to
20 bar differential pressure

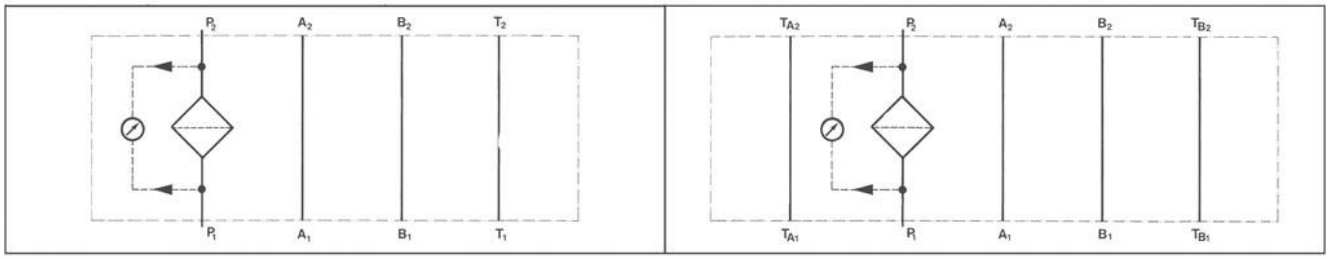
5. Quality assurance

Filtration Group filters and filter elements are produced according to the following international standards:

Norm	Designation
DIN ISO 2941	Hydraulic fluid power filter elements; verification of collapse/burst resistance
DIN ISO 2942	Hydraulic fluid power filter elements; verification of fabrication integrity
DIN ISO 2943	Hydraulic fluid power filter elements; verification of material compatibility with fluids
DIN ISO 3723	Hydraulic fluid power filter elements; method for end load test
DIN ISO 3724	Hydraulic fluid power filter elements; verification of flow fatigue characteristics
ISO 3968	Hydraulic fluid power filters; evaluation of pressure drop versus flow characteristics
ISO 10771.1	Fatigue pressure testing of metal containing envelopes in hydraulic fluid applications
ISO 16889	Hydraulic fluid power filters; multipass method for evaluation filtration performance of a filter element

6. Symbols





NG 20

NG 40-63

7. Order numbers

Example for ordering filters:

1. Filter housing	2. Filter element
V = 40 l/min, visual/electrical indicator Type: Pi 41004-015/Order number: 77937600	PS 3 Type: Pi 21004 DN PS 3/Order number: 78260929

7.1 Housing design

NG [l/min]	Order number	Type	with indicator cavity	with visual indicator	with electrical indicator
20	77937543	Pi 41002-046	■		
	77937550	Pi 41002-014		■	
	77937568	Pi 41002-015			■
40	77937618	Pi 41004-046	■		
	77937592	Pi 41004-014		■	
	77937600	Pi 41004-015			■
63	77937642	Pi 41006-046	■		
	77937626	Pi 41006-014		■	
	77937634	Pi 41006-015			■

The collapse pressure of the element must not be exceeded.

7.2 Filter elements (a wider range of element types is available on request)

NG [l/min]	Order number	Type	Filter material	max. Δp [bar]	Filter surface [cm²]
20	77685407	852 243 PS 3	PS 3	20	305
	78216038	852 243 PS 6	PS 6		305
	77740327	852 243 PS 10	PS 10		305
	78216053	852 243 PS 16	PS 16		305
	77685415	852 243 PS 25	PS 25		305
	77685423	852 243 PS vst 3	PS vst 3	160	275
	78216046	852 243 PS vst 6	PS vst 6		275
	77685431	852 243 PS vst 10	PS vst 10		275
	78216061	852 243 PS vst 16	PS vst 16		275
	77685449	852 243 PS vst 25	PS vst 25		275
40	78260929	Pi 21004 DN PS 3	PS 3	20	475
	77960859	Pi 22004 DN PS 6	PS 6		475
	77925571	Pi 23004 DN PS 10	PS 10		475
	78260937	Pi 24004 DN PS 16	PS 16		475
	78260945	Pi 25004 DN PS 25	PS 25		475
	78216079	Pi 71004 DN PS vst 3	PS vst 3	210	445
	77960156	Pi 72004 DN PS vst 6	PS vst 6		445
	77925654	Pi 73004 DN PS vst 10	PS vst 10		445
	78216087	Pi 74004 DN PS vst 16	PS vst 16		445
	78216095	Pi 75004 DN PS vst 25	PS vst 25		445
63	78260960	Pi 21006 DN PS 3	PS 3	20	835
	77960867	Pi 22006 DN PS 6	PS 6		835
	77925589	Pi 23006 DN PS 10	PS 10		835
	78260978	Pi 24006 DN PS 16	PS 16		835
	78260986	Pi 25006 DN PS 25	PS 25		835
	78216137	Pi 71006 DN PS vst 3	PS vst 3	210	780
	77960149	Pi 72006 DN PS vst 6	PS vst 6		780
	77925662	Pi 73006 DN PS vst 10	PS vst 10		780
	78216145	Pi 74006 DN PS vst 16	PS vst 16		780
	78216152	Pi 75006 DN PS vst 25	PS vst 25		780

8. Technical specifications

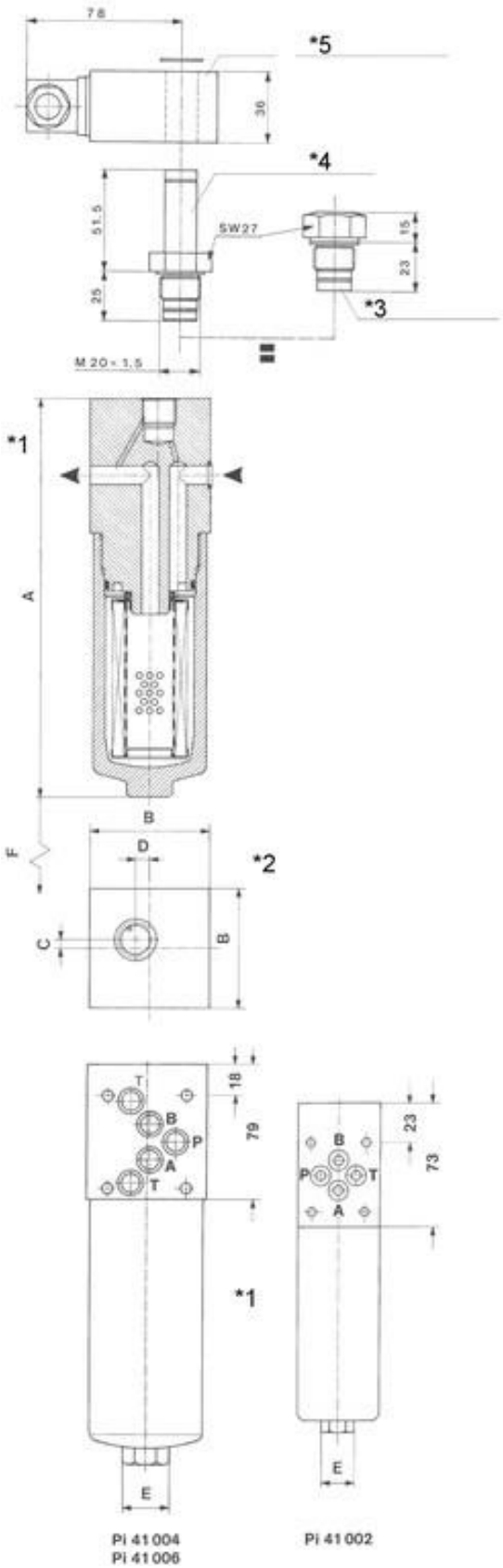
Design:	installation in vertical interlink
Nominal pressure:	315 bar (4480 psi)
Test pressure:	410 bar (5830 psi)
Temperature range:	-10 °C to +120 °C (other temperature ranges on request)
Filter head material:	steel
Filter housing material:	steel
Sealing material:	NBR/PTFE
Maintenance indicator setting:	Δ p 5 bar $\pm$ 0.5 bar
Electrical data of maintenance indicator:	
Maximum voltage:	250 V AC/200 V DC
Maximum current on contact:	1 A
Inrush current:	70 W
Type of protection:	IP 65 in inserted and secured status
Contact:	normally open/closed
Cable sleave:	M20x1.5

The switching function can be changed by turning the electric upper part by 180° (normally closed contact or normally open contact). The state on delivery is a normally closed contact. By inductivity in the direct current circuit the use of suitable protection circuit should be considered. Further maintenance indicator details and designs are available in the maintenance indicator data sheet.

We draw attention to the fact that all values indicated are average values which do not always occur in specific cases of application. Our products are continually being further developed. Values, dimensions and weights can change as a result of this. Our specialized department will be pleased to offer you advice.

We recommend to contact us concerning applications of our filters in areas governed by the EU Directive 94/9 EG (ATEX 95). The standard version can be used for liquids based on mineral oil (corresponding to the fluids in Group 2 of Directive 97/23 EG Article 9). If you consider to use other fluids please contact us for additional support.

Subject to technical alteration without prior notice.



*1 View A
*2 View B
*3 Screw plug
*4 Visual maintenance indicator
*5 Electrical upper section for maintenance indicator

9. Dimensions

Dimension	Pi 41002	Pi 41004	Pi 41006
A	241	235	295
B	48	70	70
C	3	5	5
D	2	8	8
E	SW 17	SW 27	SW 27
F	50	50	50
Master gauge for holes DIN 24340	A6	A10	A10
O-ring for connecting plate Ø	9.25x1.78	12x2	12x2
Weight [kg]	2.65	5.00	5.70

10. Installation, operating and maintenance instructions

10.1 Filter installation

When installing the filter make sure that sufficient space is available to remove filter element and filter bowl. Preferably the filter should be installed with the filter housing pointing downwards.
The maintenance indicator must be visible.

10.2 Connecting the electrical maintenance indicator

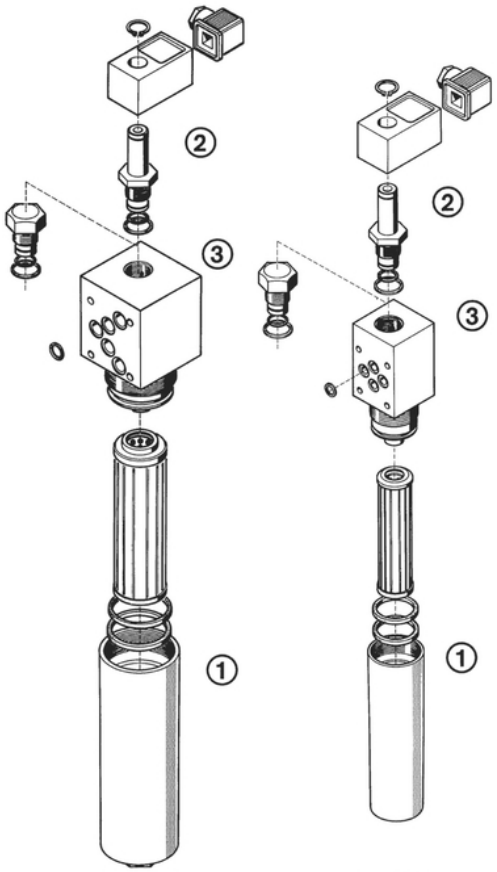
The electrical indicator is connected via a 2-pole appliance plug according to DIN EN 175301-803 with poles marked 1 and 2.
The electrical section can be inverted to change from normally open position to normally closed position or vice versa.

10.3 When should the filter element be replaced?

1. Filters equipped with visual and electrical maintenance indicator:
   During cold starts, the indicator may give a warning signal. Press the red button of the visual indicator once again only after operating temperature has been reached. If the red button immediately pops up again and/or the electrical signal has not switched off after reaching operating temperature, the filter element must be replaced after the end of the shift.
2. Filters without maintenance indicator:
   The filter element should be replaced after the trial run or flushing of the system. Afterwards follow instructions of the manufacturer.
3. Please always ensure that you have original Filtration Group spare elements in stock: Disposable elements (PS) cannot be cleaned.

10.4 Element replacement

1. Stop system and relieve filter from pressure.
2. Unscrew the filter housing by turning counter-clockwise. Clean the housing using a suitable cleaning solvent.
3. Remove the filter element by pulling down carefully.
4. Check O-ring and spigot for damage. Replace, if necessary.
5. Make sure that the order number on the spare element corresponds to the order number of the filter name-plate. To ensure no contamination occurs during the exchange of the element first open the plastic bag and push the element over the spigot in the filter head. Now remove plastic bag.
6. Lightly lubricate the threads of the filter housing a little bit and screw into the filter head. Maximum tightening torque for NG 50 to 110 = 60 Nm, for NG 150 to 450 = 100 Nm.



11. Spare parts list

Order numbers for spare parts		
Position	**Type**	**Order number**
①	Seal kit	
	Pi 41002	
	NBR	77996861
	FPM	77996879
	EPDM	77996887
	Pi 41004 - Pi 41006	
	NBR	77996895
	FPM	77996903
	EPDM	77996911
②	Maintenance indicator	
	Visual PiS 3093/5	77669914
	Electrical PiS 3092/5	77669864
	Electrical upper section only	77536550
③	Seal kit for maintenance indicator	
	NBR	77760275
	FPM	77760283
	EPDM	77760291

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High Pressure Filter
Pi 420

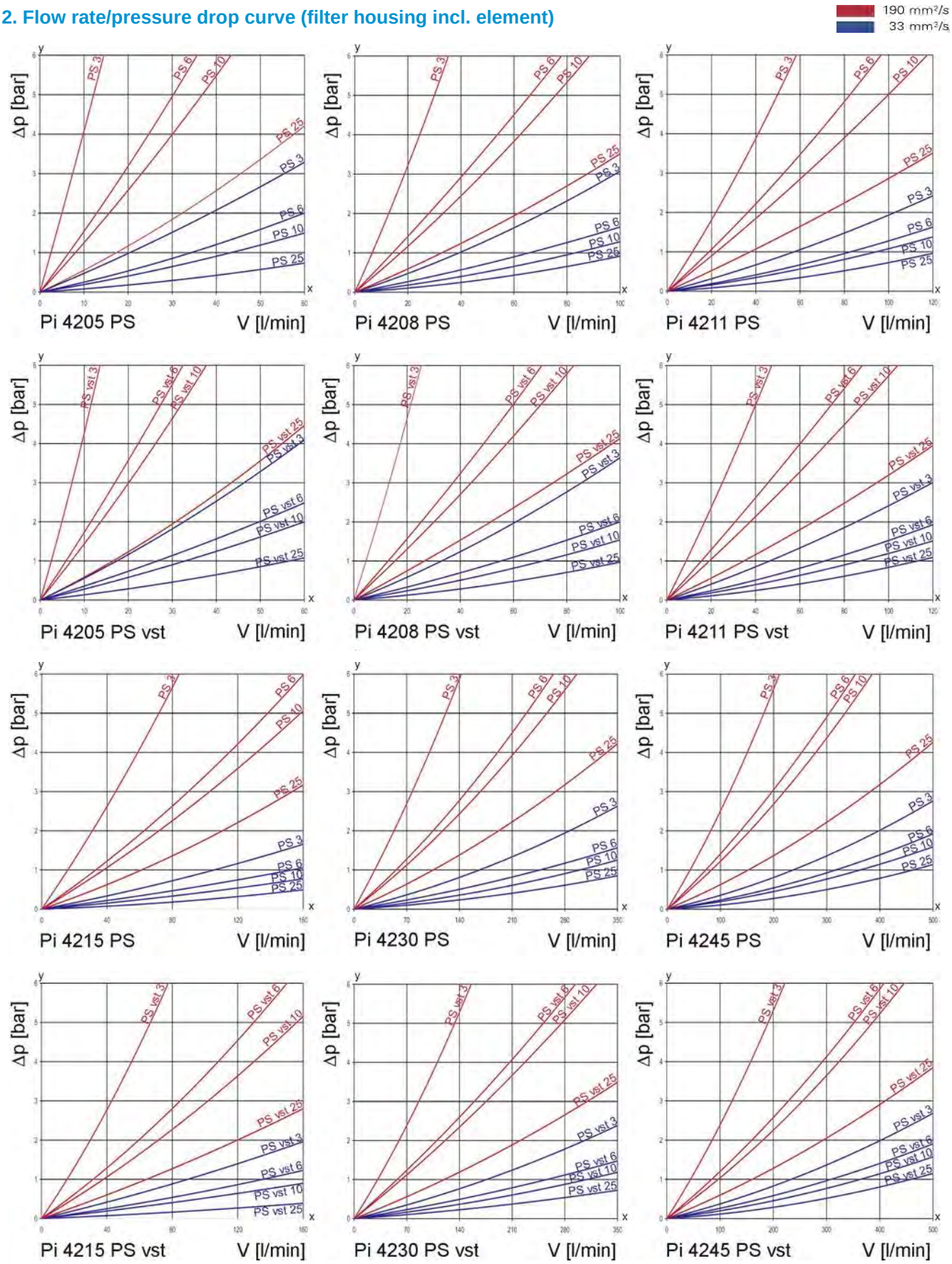
Nominal pressure 400 bar (5690 psi), nominal size up to 450
optional with reverse flow valve

1. Features

High performance filters for modern hydraulic systems

- Modular system
- Compact design
- Minimal pressure drop through optimal flow design
- Visual/electrical/electronic maintenance indicator
- Threaded or flanged connections
- Equipped with highly efficient glass fibre PS filter elements
- Beta rated elements according to ISO 16889 multipass test
- Elements with high differential pressure stability and dirt holding capacity
- NPT- and SAE-connections on request
- Worldwide distribution

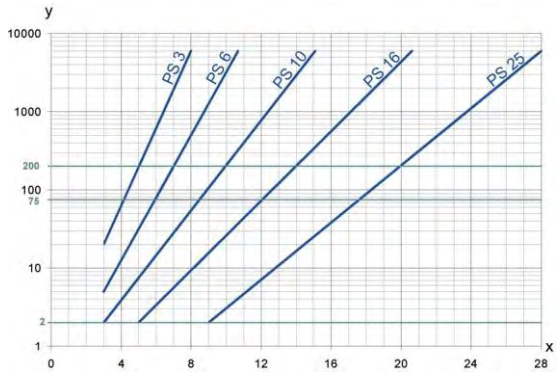
2. Flow rate/pressure drop curve (filter housing incl. element)



y = differential pressure Δp [bar]

x = flow rate V [l/min]

3. Separation grade characteristics



y = beta-value
x = particle-size [µm]

determined by multipass tests (ISO 16889)
calibration according to ISO 11171 (NIST)

4. Filter performance data

tested according to ISO 16889 (multipass test)

PS elements with
max. Δ p 20 bar

PS	3	$\beta_{5(C)}$	≥200
PS	6	$\beta_{7(C)}$	≥200
PS	10	$\beta_{10(C)}$	≥200
PS	25	$\beta_{20(C)}$	≥200

values guaranteed up to
10 bar differential pressure

PS vst elements with
max. Δ p 210 bar

PS vst	3	$\beta_{5(C)}$	≥200
PS vst	6	$\beta_{7(C)}$	≥200
PS vst	10	$\beta_{10(C)}$	≥200
PS vst	25	$\beta_{20(C)}$	≥200

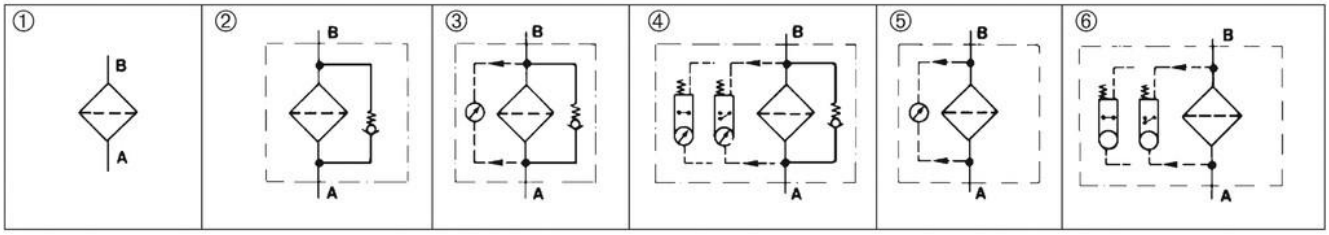
values guaranteed up to
20 bar differential pressure

5. Quality assurance

FGC filters and filter elements are produced according to the following international standards:

Norm	Designation
DIN ISO 2941	Hydraulic fluid power filter elements; verification of collapse/burst resistance
DIN ISO 2942	Hydraulic fluid power filter elements; verification of fabrication integrity
DIN ISO 2943	Hydraulic fluid power filter elements; verification of material compatibility with fluids
DIN ISO 3723	Hydraulic fluid power filter elements; method for end load test
DIN ISO 3724	Hydraulic fluid power filter elements; verification of flow fatigue characteristics
ISO 3968	Hydraulic fluid power-filters-evaluation of pressure drop versus flow characteristics
ISO 10771.1	Fatigue pressure testing of metal containing envelopes in hydraulic fluid applications
ISO 16889	Hydraulic fluid power filters-multipass method for evaluation filtration performance of a filter element

6. Symbols



7. Order numbers

Example for ordering filters:

1. Housing design	2. Filter elements
Housing design V = 80 l/min, electrical maintenance indicator Type: Pi 4208-015 Order number: 77666472	PS vst 3 Type: Pi 2208 PS vst 3 Order number: 77680200

7.1 Housing design

Nominal size NG [l/min]	Order number thread version	Type thread version	Order number flange version	Type flange version	① with indicator cavity	② with bypass valve and indicator cavity	③ with bypass valve and visual indicator	④ with bypass valve and electrical indicator	⑤ with visual indicator	⑥ with electrical indicator
50	77666357	Pi 4205-010	77967714	Pi 4205-010 FL	■					
	77666365	Pi 4205-011	77967722	Pi 4205-011 FL		■				
	77666373	Pi 4205-012	77967730	Pi 4205-012 FL			■			
	77666381	Pi 4205-013	77967748	Pi 4205-013 FL				■		
	77666399	Pi 4205-014	77967755	Pi 4205-014 FL					■	
	77666415	Pi 4205-015	77967763	Pi 4205-015 FL						■
80	77666423	Pi 4208-010	77967771	Pi 4208-010 FL	■					
	77666431	Pi 4208-011	77967789	Pi 4208-011 FL		■				
	77666449	Pi 4208-012	77967797	Pi 4208-012 FL			■			
	77666456	Pi 4208-013	77967805	Pi 4208-013 FL				■		
	77666464	Pi 4208-014	77967813	Pi 4208-014 FL					■	
	77666472	Pi 4208-015	77967821	Pi 4208-015 FL						■
110	77666480	Pi 4211-010	77967839	Pi 4211-010 FL	■					
	77666498	Pi 4211-011	77967847	Pi 4211-011 FL		■				
	77666506	Pi 4211-012	77967854	Pi 4211-012 FL			■			
	77666514	Pi 4211-013	77967862	Pi 4211-013 FL				■		
	77666522	Pi 4211-014	77967870	Pi 4211-014 FL					■	
	77666530	Pi 4211-015	77967888	Pi 4211-015 FL						■
150	77666548	Pi 4215-010	77978596	Pi 4215-010 FL	■					
	77666555	Pi 4215-011	77978604	Pi 4215-011 FL		■				
	77666563	Pi 4215-012	77978612	Pi 4215-012 FL			■			
	77666571	Pi 4215-013	77978620	Pi 4215-013 FL				■		
	77666589	Pi 4215-014	77978638	Pi 4215-014 FL					■	
	77666597	Pi 4215-015	77978646	Pi 4215-015 FL						■
300	77666613	Pi 4230-010	77978653	Pi 4230-010 FL	■					
	77666621	Pi 4230-011	77978661	Pi 4230-011 FL		■				
	77666639	Pi 4230-012	77978679	Pi 4230-012 FL			■			
	77666647	Pi 4230-013	77978687	Pi 4230-013 FL				■		
	77666654	Pi 4230-014	77978695	Pi 4230-014 FL					■	
	77666662	Pi 4230-015	77964505	Pi 4230-015 FL						■
450	77666688	Pi 4245-010	77978703	Pi 4245-010 FL	■					
	77666696	Pi 4245-011	77978711	Pi 4245-011 FL		■				
	77666704	Pi 4245-012	77978729	Pi 4245-012 FL			■			
	77666712	Pi 4245-013	77978737	Pi 4245-013 FL				■		
	77666720	Pi 4245-014	77978745	Pi 4245-014 FL					■	
	77666746	Pi 4245-015	77978752	Pi 4245-015 FL						■

When filter with non bypass configuration is selected, the collapse pressure of the element must not be exceeded.

7.2 Filter elements (a wider range of element types is available on request)					
Nominal size NG [l/min]	**Order number**	**Type**	**Filter material**	**max. Δp [bar]**	**Filter surface [cm²]**
50	77680135	Pi 2105 PS 3	PS 3	**20**	590
	77943509	Pi 5105 PS 6	PS 6		590
	77680325	Pi 3105 PS 10	PS 10		590
	77680440	Pi 4105 PS 25	PS 25		590
	77680192	Pi 2205 PS vst 3	PS vst 3	**210**	425
	77943533	Pi 5205 PS vst 6	PS vst 6		425
	77680382	Pi 3205 PS vst 10	PS vst 10		425
	77680507	Pi 4205 PS vst 25	PS vst 25		425
80	77680143	Pi 2108 PS 3	PS 3	**20**	1150
	77943517	Pi 5108 PS 6	PS 6		1150
	77680341	Pi 3108 PS 10	PS 10		1150
	77680457	Pi 4108 PS 25	PS 25		1150
	77680200	Pi 2208 PS vst 3	PS vst 3	**210**	850
	77943541	Pi 5208 PS vst 6	PS vst 6		850
	77681190	Pi 3208 PS vst 10	PS vst 10		850
	77680515	Pi 4208 PS vst 25	PS vst 25		850
110	77680150	Pi 2111 PS 3	PS 3	**20**	1700
	77943525	Pi 5111 PS 6	PS 6		1700
	77680333	Pi 3111 PS 10	PS 10		1700
	77680465	Pi 4111 PS 25	PS 25		1700
	77680218	Pi 2211 PS vst 3	PS vst 3	**210**	1275
	77943558	Pi 5211 PS vst 6	PS vst 6		1275
	77680390	Pi 3211 PS vst 10	PS vst 10		1275
	77680523	Pi 4211 PS vst 25	PS vst 25		1275
150	77680168	Pi 2115 PS 3	PS 3	**20**	2425
	77955099	Pi 5115 PS 6	PS 6		2425
	77680358	Pi 3115 PS 10	PS 10		2425
	77680473	Pi 4115 PS 25	PS 25		2425
	77680226	Pi 2215 PS vst 3	PS vst 3	**210**	2010
	77955123	Pi 5215 PS vst 6	PS vst 6		2010
	77680408	Pi 3215 PS vst 10	PS vst 10		2010
	77680531	Pi 4215 PS vst 25	PS vst 25		2010
300	77680176	Pi 2130 PS 3	PS 3	**20**	4620
	77955107	Pi 5130 PS 6	PS 6		4620
	77680366	Pi 3130 PS 10	PS 10		4620
	77680481	Pi 4130 PS 25	PS 25		4620
	77680234	Pi 2230 PS vst 3	PS vst 3	**210**	3800
	77955131	Pi 5230 PS vst 6	PS vst 6		3800
	77680416	Pi 3230 PS vst 10	PS vst 10		3800
	77680549	Pi 4230 PS vst 25	PS vst 25		3800
450	77680184	Pi 2145 PS 3	PS 3	**20**	6865
	77955115	Pi 5145 PS 6	PS 6		6865
	77680374	Pi 3145 PS 10	PS 10		6865
	77680499	Pi 4145 PS 25	PS 25		6865
	77680242	Pi 2245 PS vst 3	PS vst 3	**210**	5600
	77955149	Pi 5245 PS vst 6	PS vst 6		5600
	77680424	Pi 3245 PS vst 10	PS vst 10		5600
	77680556	Pi 4245 PS vst 25	PS vst 25		5600

8. Technical specifications

Design:	line mounting filter
Nominal pressure:	400 bar (5690 psi)
Test pressure:	520 bar (7400 psi)
Temperature range:	-10 °C to +120 °C
	(other temperature ranges on request)
Bypass setting:	Δ p 7 bar ± 10 %
Filter head material:	GGG
Filter housing material:	St
Sealing material:	NBR/PTFE
Maintenance indicator setting:	Δ p 5 bar ± 10 %
Electrical data of maintenance indicator:	
Maximum voltage:	250 V AC/200 V DC
Maximum current:	1 A
Contact load:	70 W
Type of protection:	IP 65 in inserted and secured status
Contact:	normally open/closed
Cable connection:	M20x1.5

The switching function can be changed by turning the electric upper part by 180° (normally closed contact or normally open contact). The state on delivery is a normally closed contact. By inductivity in the direct current circuit the use of suitable protection circuit should be considered. Further maintenance indicator details and designs are available in the maintenance indicator data sheet.

We draw attention to the fact that all values indicated are average values which do not always occur in specific cases of application. Our products are continually being further developed. Values, dimensions and weights can change as a result of this. Our specialized department will be pleased to offer you advice.

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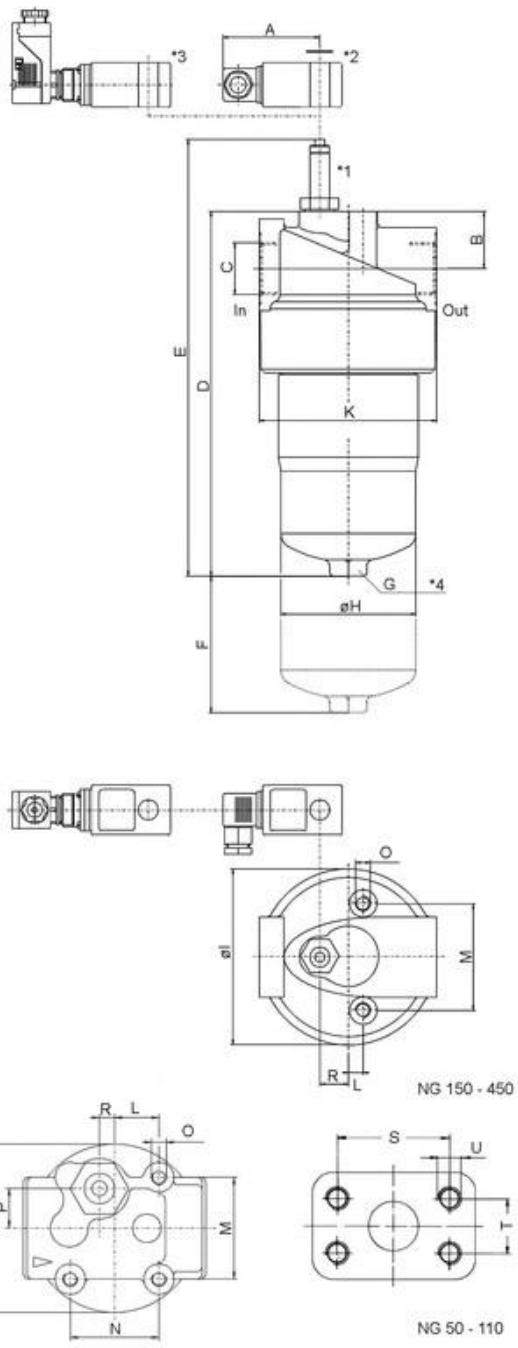
Subject to technical alteration.



In = Inlet
Out = Outlet
*1 = Visual maintenance indicator
*2 = Electrical upper section connector according DIN EN 175301-803, version: PiS 3092, 3105, 3115
*3 = Electrical upper section connector according DIN EN 175301-804, version: PiS3102, 3122, 3110
*4 = NG 300, 450 with drain screw G¼ DIN 910

DN25 according to SAE1" 6000 psi
DN38 according to SAE1½" 6000 psi
Flange, screw, o-ring not included in delivery.

9. Dimensions

All dimensions except "C" in mm.

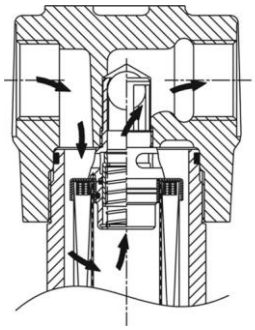
Type	A	B	C*	D	E	F	G SW	H	I	K
Pi 4205	78	31	G½	189	247	80	27	66	90	92.0
Pi 4205 FL		28	DN25	204	262				85	95.0
Pi 4208	78	31	G1	267	325	80	27	66	90	92.0
Pi 4208 FL		28	DN25	282	340				85	95.0
Pi 4211	78	31	G1	343	401	80	27	66	90	92.0
Pi 4211 FL		28	DN25	358	416				85	95.0
Pi 4215	78	46	G1¼	284	342	110	30	109	142	143.5
Pi 4215 FL			DN38							
Pi 4230	78	46	G1¼	409	467	110	30	109	142	143.5
Pi 4230 FL			DN38							
Pi 4245	78	46	G1½	525	583	110	30	109	142	143.5
Pi 4245 FL			DN38							

* NPT- und SAE-connections on request

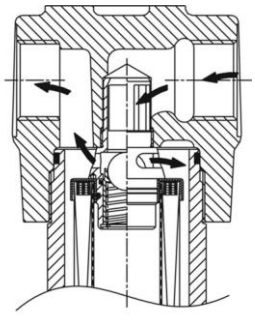
Type	L	M	N	O	P	R	S	T	U	Weight [kg]
Pi 4205	23.5	54	47	M8x14	21	8	57.1	27.8	M12x20	4.1
Pi 4205 FL	10.5		-			12				4.6
Pi 4208	23.5	54	47	M8x14	21	8	57.1	27.8	M12x20	4.9
Pi 4208 FL	10.5		-			12				5.3
Pi 4211	23.5	54	47	M8x14	21	8	57.1	27.8	M12x20	5.8
Pi 4211 FL	10.5		-			12				6.2
Pi 4215	12.0	86	-	M12x15	-	23	79.4	36.5	M16x20	12.3
Pi 4215 FL										13.3
Pi 4230	12.0	86	-	M12x15	-	23	79.4	36.5	M16x20	14.8
Pi 4230 FL										15.9
Pi 4245	12.0	86	-	M12x15	-	23	79.4	36.5	M16x20	17.1
Pi 4245 FL										18.6

10. Execution with reverse flow valve

Filters are normally designed for single- direction flow only. Reverse flows result in destruction of the cartridge. Some applications can require the medium to flow through the filter in both directions, however. The Pi 420 with a reverse flow valve can be used here. It allows medium flows in both directions, although it only filters in one. The liquid is not filtered in reverse mode. The reverse flow valve can be supplied with or without a bypass function.



Filtration mode



Reverse mode

11. Installation, operating and maintenance instructions

11.1 Filter installation

When installing the filter make sure that sufficient space is available to remove filter element and filter housing. Preferably the filter should be installed with the filter housing pointing downwards.
The maintenance indicator must be visible.

11.2 Connecting the electrical maintenance indicator

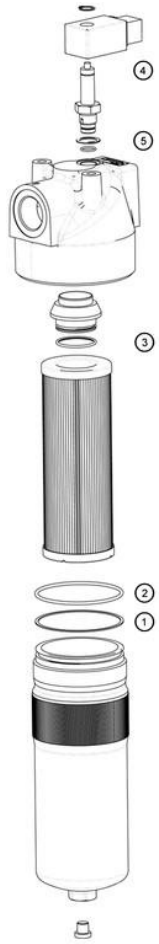
The electrical indicator is connected via a 2-pole appliance plug according to DIN EN 175301-803 with poles marked 1 and 2.
The electrical section can be inverted to change from normally open position to normally closed position or vice versa.

11.3 When should the filter element be replaced?

1. Filters equipped with visual and electrical maintenance indicator:
   During cold starts, the indicator may give a warning signal. Press the red button of the visual indicator once again only after operating temperature has been reached. If the red button immediately pops up again and/or the electrical signal has not switched off after reaching operating temperature, the filter element must be replaced after the end of the shift.
2. Filters without maintenance indicator:
   The filter element should be replaced after the trial run or flushing of the system. Afterwards follow instructions of the manufacturer.
3. Please always ensure that you have original FGC spare elements in stock: Disposable elements (PS) cannot be cleaned.

11.4 Element replacement

1. Stop system and relieve filter from pressure.
2. Filter sizes 300 and 450: empty the filter housing by removing the drain plug.
3. Unscrew the filter housing by turning counter-clockwise. Clean the housing using a suitable cleaning solvent.
4. Remove element by pulling down carefully.
5. Check o-ring, spigot and o-ring in the element locator for damage. Replace, if necessary.
6. Make sure that the order number on the spare element corresponds to the order number of the filter name-plate. To ensure no contamination occurs during the exchange of the element first open the plastic bag and push the element over the spigot in the filter head. Now remove plastic bag.
7. Oil the threads of the filter housing a little bit and screw into the filter head. Maximum tightening torque for NG 50 to 110 = 60 Nm, for NG 150 to 450 = 100 Nm.
8. Check seals of vent drain plug - if necessary, please replace.
   Torque drain plug 30 Nm.



12. Spare parts list

Order numbers for spare parts		
Position	**Type**	**Order number**
① to ③	Seal kit	
	Pi 4205 - Pi 4211	
	NBR	77544851
	FPM	77544869
	EPDM	77544877
	Pi 4215 - Pi 4245	
	NBR	77544885
	FPM	77544893
	EPDM	77544901
④	Maintenance indicator	
	Visual PiS 3093/5	77669914
	Electrical PiS 3092/5	77669864
	Electrical upper section only	77536550
⑤	Seal kit for maintenance indicator	
	NBR	77760275
	FPM	77760283
	EPDM	77760291

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78356990.06/2019

MAHLE Industrialfiltration is now Filtration Group. For more information, visit www.fluid.filtrationgroup.com

High Pressure Filter
Pi 420 KV/Pi 4000 KV

Nominal pressure 400 bar (5690 psi), NG 50, 80, 110/NG 40, 63, 100
according to DIN 24 550

1. Features

High pressure filter with differential pressure controlled cold-start valve

The filterhead contains a cold-start valve which guarantees under all operating conditions that the hydraulic system is provided only with filtered fluid.
When the differential pressure rises above the opening pressure of the cold-start valve (e.g. due to high cold-start viscosity or due to a not serviced filter element), a partial flow is returned to the tank via the filter heads` tank connection.

- The system is provided only with filter fluids
- A reduction of the flow rate indicates an outstanding filter element change
- Performance curves as per leaflet Pi 420 respectively Pi 4000
- Worldwide distribution

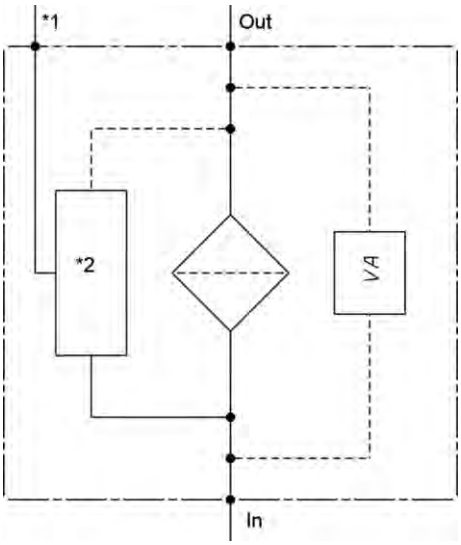
2. Technical specifications

Design:	line mounting filter
Nominal pressure:	400 bar (5690 psi)
Test pressure:	520 bar (7400 psi)
Temperature range:	-10 °C to +120 °C
	(other temperature ranges on request)
Bypass setting:	Δ p 8 bar
Filter head material:	GGG
Filter housing material:	St
Sealing material:	NBR
Maintenance indicator setting:	Δ p 5 bar
Electrical data of maintenance indicator	
Max. voltage:	250 V AC/200 V DC
Max. current:	1 A
Contact load:	70 W
Type of protection:	IP 65 when inserted and secured
Contact:	normally open/normally closed
Cable connection:	M20x1.5

The switching function can be changed by turning the electric upper part by 180° (normally closed contact or normally open contact). The state on delivery is a normally closed contact. By inductivity in the direct current circuit the use of suitable protection circuit should be considered. Further maintenance indicator details and designs are available in the maintenance indicator data sheet.

We draw attention to the fact that all values indicated are average values which do not always occur in specific cases of application. Our products are continually being further developed. Values, dimensions and weights can change as a result of this. Our specialized department will be pleased to offer you advice.

3. Symbols



*1 Tank G½
*2 Cold start valve
VA = Maintenance indicator
In = G1
Out =G1

We recommend to contact us concerning applications of our filters in areas governed by the Eu Directive 94/9 EC (ATEX). The standard version can be used for liquids based on mineral oil (corresponding to the fluids in Group 2 of Directive 97/23 EC Article 9). If you consider to use other fluids please contact us for additional support.

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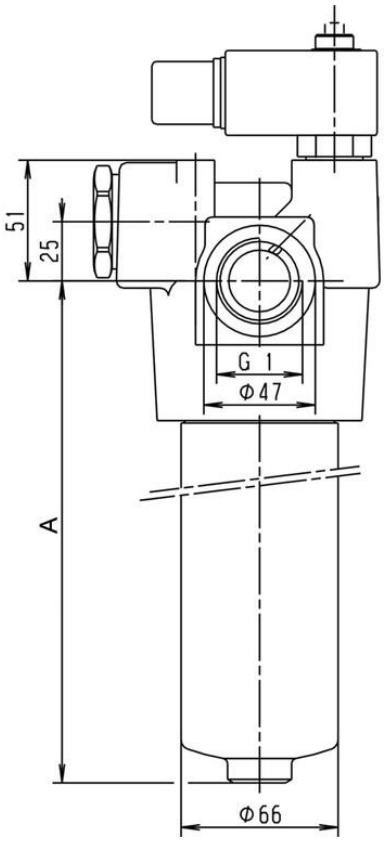

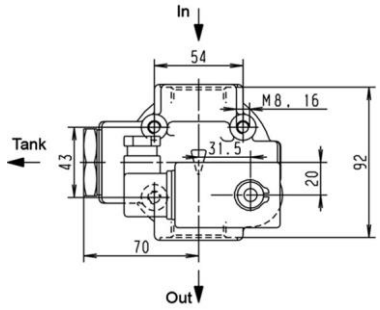

4. Dimensions

Pi 420 KV	A	Pi 4000 KV	A
NG 50	158	NG 40	158
NG 80	236	NG 63	236
NG 110	312	NG 100	312

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70328627.06/2019

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Filtration Group

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High Pressure Filter
Pi 422

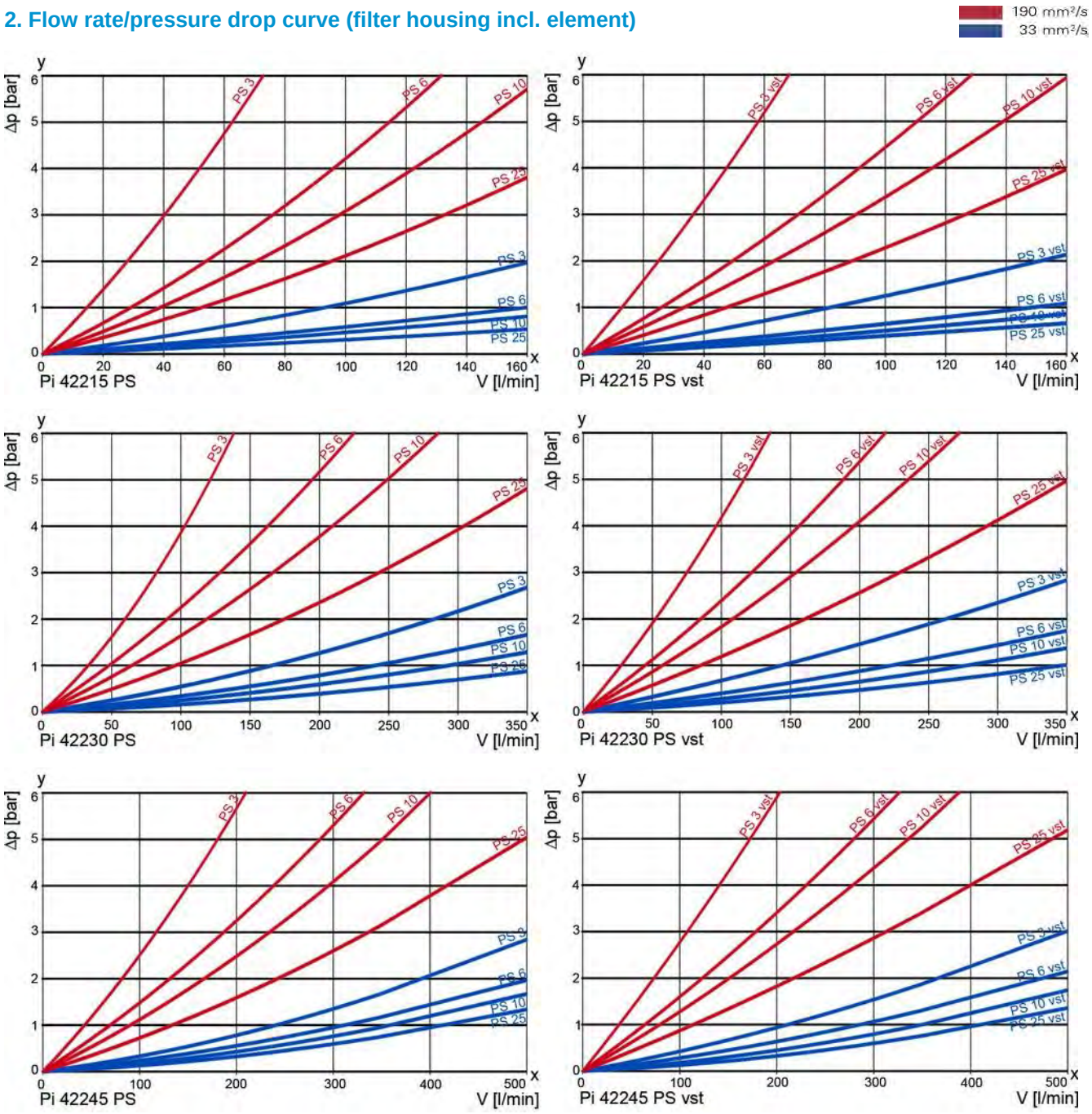
Nominal pressure 400 bar (5690 psi), nominal size up to 450
optional with reverse flow valve

1. Features

High performance filters for modern hydraulic systems

- Modular system
- Compact design
- Minimal pressure drop through optimal flow design
- Visual/electrical/electronic maintenance indicator
- Threaded or flanged connections
- Quality filters, easy to service
- Inlet sideways, outlet sideways or at the top
- Equipped with highly efficient glass fibre PS filter elements
- Beta rated elements according to ISO 16889 multipass test
- Elements with high differential pressure stability and dirt holding capacity
- NPT- and SAE-connections on request
- Worldwide distribution

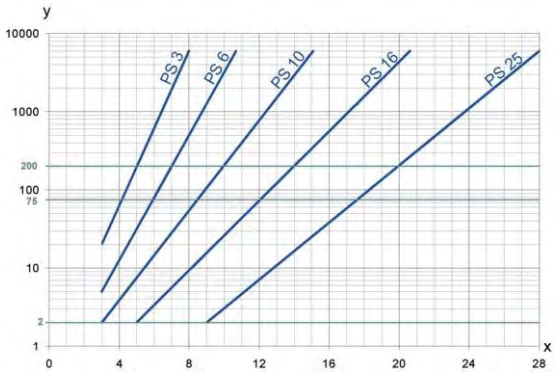
2. Flow rate/pressure drop curve (filter housing incl. element)



y = differential pressure Δp [bar]

x = flow rate V [l/min]

3. Separation grade characteristics



y = beta-value
x = particle-size [µm]

determined by multipass tests (ISO 16889)
calibration according to ISO 11171 (NIST)

4. Filter performance data

tested according to ISO 16889 (multipass test)

PS elements with
max. Δ p 20 bar

PS	3	$\beta_{5(C)}$	≥200
PS	6	$\beta_{7(C)}$	≥200
PS	10	$\beta_{10(C)}$	≥200
PS	25	$\beta_{20(C)}$	≥200

values guaranteed up to
10 bar differential pressure

PS vst elements with
max. Δ p 210 bar

PS vst	3	$\beta_{5(C)}$	≥200
PS vst	6	$\beta_{7(C)}$	≥200
PS vst	10	$\beta_{10(C)}$	≥200
PS vst	25	$\beta_{20(C)}$	≥200

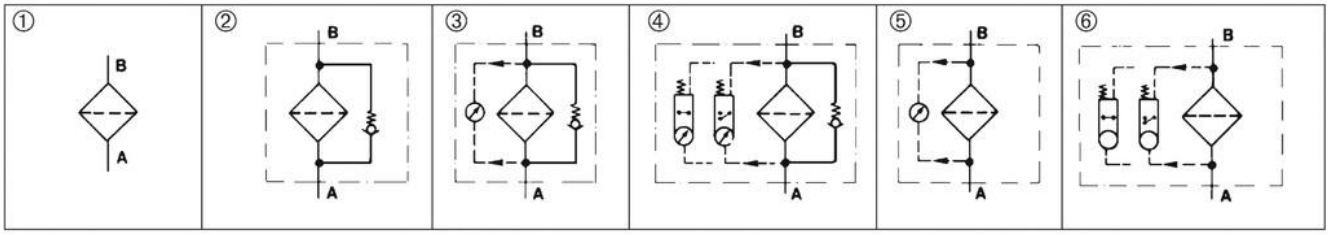
values guaranteed up to
20 bar differential pressure

5. Quality assurance

Filtration Group filters and filter elements are produced according to the following international standards:

Norm	Designation
DIN ISO 2941	Hydraulic fluid power filter elements; verification of collapse/burst resistance
DIN ISO 2942	Hydraulic fluid power filter elements; verification of fabrication integrity
DIN ISO 2943	Hydraulic fluid power filter elements; verification of material compatibility with fluids
DIN ISO 3723	Hydraulic fluid power filter elements; method for end load test
DIN ISO 3724	Hydraulic fluid power filter elements; verification of flow fatigue characteristics
ISO 3968	Hydraulic fluid power-filters-evaluation of pressure drop versus flow characteristics
ISO 10771.1	Fatigue pressure testing of metal containing envelopes in hydraulic fluid applications
ISO 16889	Hydraulic fluid power filters-multipass method for evaluation filtration performance of a filter element

6. Symbols



7. Type number key, housing design, order numbers

7.1 Type number key

Type					
Pi 422	High pressure filter series				
	NG				
	15	nominal size 150			
	30	nominal size 300			
	45	nominal size 450			
		Connection variant 1st position			
		/1	inlet and outlet sideways		
		/2	inlet sideways, outlet at the top		
			Connection variant 2nd position		
			1	G1½	
			2	flange SAE 1¼	
			3	flange SAE 1½	
			4	G1¼	
				Housing design	
				-010	with hole for maintenance indicator
				-011	with bypass valve and Bohrung für Wartungsanzeige
				-012	with bypass valve and visual maintenance indicator
				-013	with bypass valve and electrical maintenance indicator
				-014	with visual maintenance indicator
				-015	with electrical maintenance indicator
Pi 422	**30**	**/1**	**2**	**-011**	**ordering example**

7.2 Housing design

Nominal size NG [l/min]	Type inlet sideways outlet sideways	Type inlet sideways outlet at the top	① with hole for indicator	② with bypass and hole for indicator	③ with bypass and visual indicator	④ with bypass and electrical indicator	⑤ with visual indicator	⑥ with electrical indicator
150	Pi 42215/1*-010	Pi 42215/2*-010	■					
	Pi 42215/1*-011	Pi 42215/2*-011		■				
	Pi 42215/1*-012	Pi 42215/2*-012			■			
	Pi 42215/1*-013	Pi 42215/2*-013				■		
	Pi 42215/1*-014	Pi 42215/2*-014					■	
	Pi 42215/1*-015	Pi 42215/2*-015						■
300	Pi 42230/1*-010	Pi 42230/2*-010	■					
	Pi 42230/1*-011	Pi 42230/2*-011		■				
	Pi 42230/1*-012	Pi 42230/2*-012			■			
	Pi 42230/1*-013	Pi 42230/2*-013				■		
	Pi 42230/1*-014	Pi 42230/2*-014					■	
	Pi 42230/1*-015	Pi 42230/2*-015						■
450	Pi 42245/1*-010	Pi 42245/2*-010	■					
	Pi 42245/1*-011	Pi 42245/2*-011		■				
	Pi 42245/1*-012	Pi 42245/2*-012			■			
	Pi 42245/1*-013	Pi 42245/2*-013				■		
	Pi 42245/1*-014	Pi 42245/2*-014					■	
	Pi 42245/1*-015	Pi 42245/2*-015						■

* Connection variants see type number key 2nd position

When filter with non bypass configuration is selected, the collapse pressure of the element must not be exceeded.

7.3 Filter elements (other elements on request)					
Nominal size NG [l/min]	**Order number**	**Type designation**	**Filter material**	**Max. Δp [bar]**	**Filter surface [cm²]**
150	77680168	Pi 2115 PS 3	PS 3	**20**	2425
	77955099	Pi 5115 PS 6	PS 6		2425
	77680358	Pi 3115 PS 10	PS 10		2425
	77680473	Pi 4115 PS 25	PS 25		2425
	77680226	Pi 2215 PS vst 3	PS vst 3	**210**	2010
	77955123	Pi 5215 PS vst 6	PS vst 6		2010
	77680408	Pi 3215 PS vst 10	PS vst 10		2010
	77680531	Pi 4215 PS vst 25	PS vst 25		2010
300	77680176	Pi 2130 PS 3	PS 3	**20**	4620
	77955107	Pi 5130 PS 6	PS 6		4620
	77680366	Pi 3130 PS 10	PS 10		4620
	77680481	Pi 4130 PS 25	PS 25		4620
	77680234	Pi 2230 PS vst 3	PS vst 3	**210**	3800
	77955131	Pi 5230 PS vst 6	PS vst 6		3800
	77680416	Pi 3230 PS vst 10	PS vst 10		3800
	77680549	Pi 4230 PS vst 25	PS vst 25		3800
450	77680184	Pi 2145 PS 3	PS 3	**20**	6865
	77955115	Pi 5145 PS 6	PS 6		6865
	77680374	Pi 3145 PS 10	PS 10		6865
	77680499	Pi 4145 PS 25	PS 25		6865
	77680242	Pi 2245 PS vst 3	PS vst 3	**210**	5600
	77955149	Pi 5245 PS vst 6	PS vst 6		5600
	77680424	Pi 3245 PS vst 10	PS vst 10		5600
	77680556	Pi 4245 PS vst 25	PS vst 25		5600

8. Technical specifications

Design:	in-line filter inlet sideways; outlet optional sideways or on the top
Nominal pressure:	400 bar (5690 psi)
Test pressure:	520 bar (7400 psi)
Temperature range:	-10 °C to +120 °C (other temperature ranges on request)
Bypass setting:	Δ p 7 bar ± 10 %
Filter head material:	GGG
Filter housing material:	St
Sealing material:	NBR/PTFE
Maintenance indicator setting:	Δ p 5 bar ± 10 %
Electrical data of maintenance indicator:	
Maximum voltage:	250 V AC/200 V DC
Maximum current:	1 A
Contact load:	70 W
Type of protection:	IP 65 in inserted and secured status
Contact:	normally open/closed
Cable sleave:	M20x1.5

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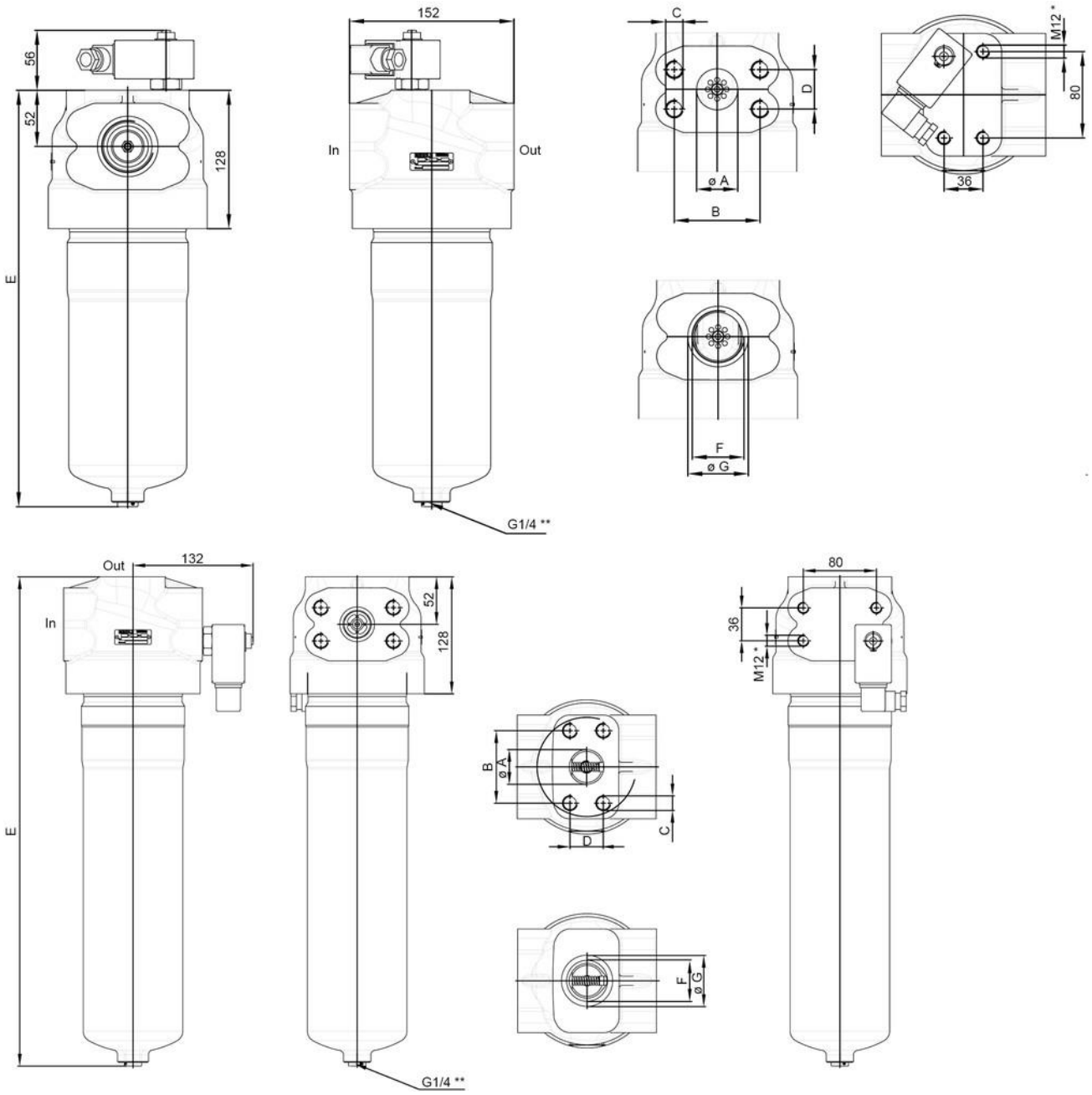
9. Dimensions



In = Inlet
Out = Outlet
* Thread depth 17 mm
** NG 150 without drain screw

All dimensions except "NG" in mm.

Type	NG	E
Pi 42215/...	150	281
Pi 42230/...	300	399
Pi 42245/...	450	515

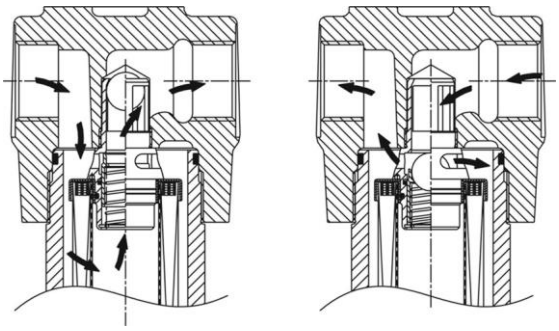
All dimensions except "F" in mm.

Con-nection	ø A	B	C	D	F	ø G
G1¼ *	-	-	-	-	1¼"	56
G1½	-	-	-	-	1½"	56
SAE1¼ *	32	66.6	M12	31.8	-	-
SAE1½	38	79.3	M16	36.5	-	-

* only for inlet sideways/outlet at the top version

10. Execution with reverse flow valve

Filters are normally designed for single- direction flow only. Reverse flows result in destruction of the cartridge. Some applications can require the medium to flow through the filter in both directions, however. The Pi 422 with a reverse flow valve can be used here. It allows medium flows in both directions, although it only filters in one. The liquid is not filtered in reverse mode. The reverse flow valve can be supplied with or without a bypass function.



Filtration mode | Reverse mode

11. Installation, operating and maintenance instructions

11.1 Filter installation

When installing the filter make sure that sufficient space is available to remove filter element and filter housing. Preferably the filter should be installed with the filter housing pointing downwards.
The maintenance indicator must be visible.

11.2 Connecting the electrical maintenance indicator

The electrical indicator is connected via a 2-pole appliance plug according to DIN EN 175301-803 with poles marked 1 and 2. The electrical section can be inverted to change from normally open position to normally closed position or vice versa.

11.3 When should the filter element be replaced?

1. Filters equipped with visual and electrical maintenance indicator: During cold starts, the indicator may give a warning signal. Press the red button of the visual indicator once again only after operating temperature has been reached. If the red button immediately pops up again and/or the electrical signal has not switched off after reaching operating temperature, the filter element must be replaced after the end of the shift.
2. Filters without maintenance indicator: The filter element should be replaced after the trial run or flushing of the system. Afterwards follow instructions of the manufacturer.
3. Please always ensure that you have original Filtration Group spare elements in stock: Disposable elements (PS) cannot be cleaned.

11.4 Element replacement

1. Stop system and relieve filter from pressure.
2. Filter sizes 300 and 450: empty the filter housing by removing the drain plug.
3. Unscrew the filter housing by turning counter-clockwise. Clean the housing using a suitable cleaning solvent.
4. Remove element by pulling down carefully.
5. Check o-ring, spigot and o-ring in the element locator for damage. Replace, if necessary.
6. Make sure that the order number on the spare element corresponds to the order number of the filter name-plate. To ensure no contamination occurs during the exchange of the element first open the plastic bag and push the element over the spigot in the filter head. Now remove plastic bag.
7. Oil the threads of the filter housing a little bit and screw into the filter head. Maximum tightening torque for NG 150 to 450 = 100 Nm.
8. Check seals of vent drain plug - if necessary, please replace. Torque drain plug 30 Nm.

12. Spare parts list

Order numbers for spare parts		
Position	**Type**	**Order number**
① - ③	Seal kit	
	NBR	77544885
	FPM	77544893
	EPDM	77544901
④	Maintenance indicator	
	Visual PiS 3093/5	77669914
	Electrical PiS 3092/5	77669864
	Electrical upper section only	77536550
⑤	Seal kit for maintenance indicator	
	NBR	77760275
	FPM	77760283
	EPDM	77760291

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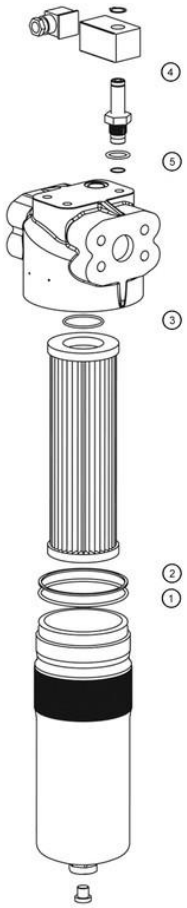

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70528748.06/2019

Stainless steel-high pressure filter
Pi 480

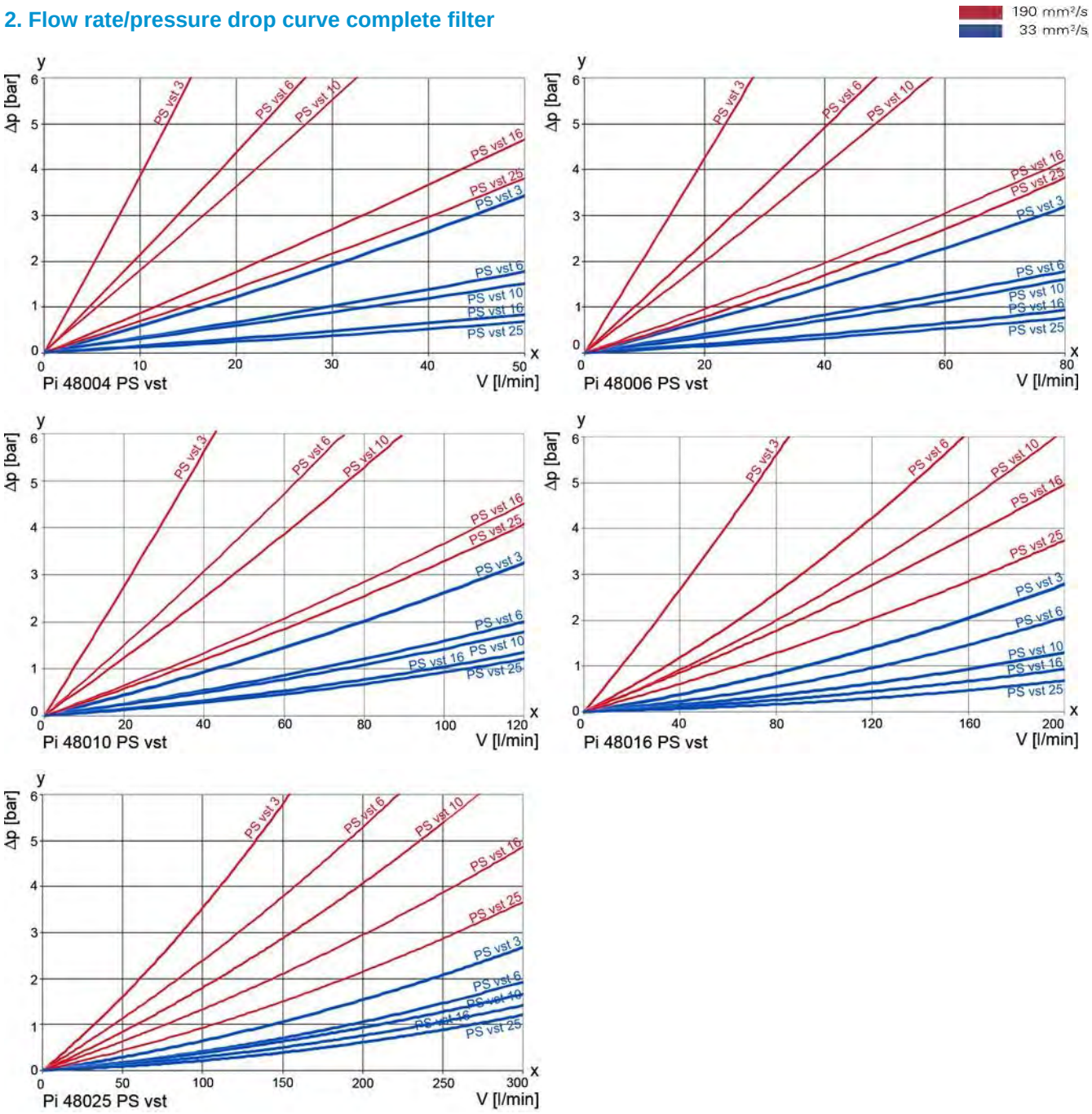
Nominal pressure 450/250 bar (6425/3570 psi), nominal size 40 up to 250

1. Features

High performance filters for modern hydraulic systems

- Modular system
- Compact design
- Minimal pressure drop through optimal flow design
- Visual/electrical/electronic maintenance indicator
- Threaded connections
- Quality filters, easy to service
- Equipped with highly efficient glass fibre PS filter elements according to DIN 24550
- Beta rated elements according to ISO 16889 multipass test
- Elements with high differential pressure stability and dirt holding capacity
- NPT- and SAE-connections on request
- Worldwide distribution

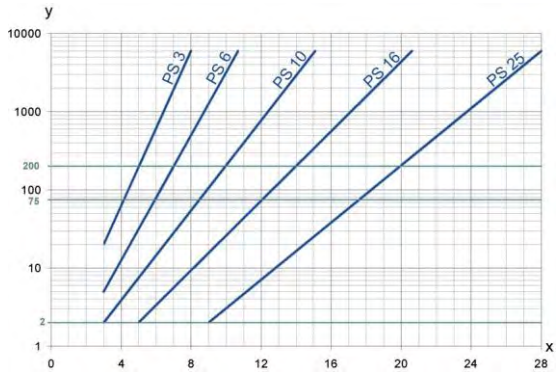
2. Flow rate/pressure drop curve complete filter



y = differential pressure Δ p [bar]

x = flow rate V [l/min]

3. Separation grade characteristics



y = beta-value
x = particle size [µm]

determined by multipass tests (ISO 16889)
calibration according to ISO 11171 (NIST)

4. Filter performance data

tested according to ISO 16889 (multipass test)

PS vst elements with
max. Δ p 210 bar

PS vst	3	$\beta_{5(C)}$	≥200
PS vst	6	$\beta_{7(C)}$	≥200
PS vst	10	$\beta_{10(C)}$	≥200
PS vst	16	$\beta_{15(C)}$	≥200
PS vst	25	$\beta_{20(C)}$	≥200

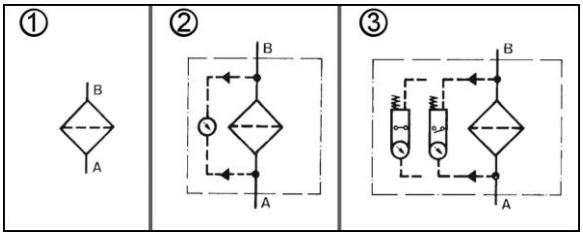
values guaranteed up to 20 bar differential pressure

5. Quality assurance

Filtration Group filters and filter elements are produced according to the following international standards:

Norm	Designation
DIN ISO 2941	Hydraulic fluid power filter elements; verification of collapse/burst resistance
DIN ISO 2942	Hydraulic fluid power filter elements; verification of fabrication integrity
DIN ISO 2943	Hydraulic fluid power filter elements; verification of material compatibility with fluids
DIN ISO 3723	Hydraulic fluid power filter elements; method for end load test
DIN ISO 3724	Hydraulic fluid power filter elements; verification of flow fatigue characteristics
ISO 3968	Hydraulic fluid power-filters-evaluation of pressure drop versus flow characteristics
ISO 10771.1	Fatigue pressure testing of metal containing envelopes in hydraulic fluid applications
ISO 16889	Hydraulic fluid power filters-multi-passmethod for evaluation filtration performance of a filter element

6. Symbols



7. Order numbers

Example for ordering filters:

1. Filter housing	2. Filter element
V = 100 l/min and electrical maintenance indicator Type: Pi 48010-015 Order number: 79324583	PS vst 6 Type: Pi 71010 DN PS vst 6 Order number: 77960131

7.1 Housing design					
Nominal size NG [l/min]	**Order number**	**Type**	**① no options**	**② with visual indicator**	**③ with electrical indicator**
40	78397556	Pi 48004-060	■		
	78306607	Pi 48004-014		■	
	79343351	Pi 48004-015			■
63	79762295	Pi 48006-060	■		
	79702325	Pi 48006-014		■	
	70368277	Pi 48006-015			■
100	78308660	Pi 48010-060	■		
	79353236	Pi 48010-014		■	
	79324553	Pi 48010-015			■
160	70368297	Pi 48016-060	■		
	70368298	Pi 48016-014		■	
	79353160	Pi 48016-015			■
250	70368299	Pi 48025-060	■		
	70368302	Pi 48025-014		■	
	76109284	Pi 48025-015			■

7.2 Filter elements*					
Nominal size NG [l/min]	**Order number**	**Type**	**Filter material**	**max. Δ p [bar]**	**Filter surface [cm²]**
40	78216079	Pi 71004 DN PS vst 3	PS vst 3	**210**	445
	77960156	Pi 72004 DN PS vst 6	PS vst 6		445
	77925654	Pi 73004 DN PS vst 10	PS vst 10		445
	78216087	Pi 74004 DN PS vst 16	PS vst 16		445
	78216095	Pi 75004 DN PS vst 25	PS vst 25		445
63	78216137	Pi 71006 DN PS vst 3	PS vst 3	**210**	780
	77960149	Pi 72006 DN PS vst 6	PS vst 6		780
	77925662	Pi 73006 DN PS vst 10	PS vst 10		780
	78216145	Pi 74006 DN PS vst 16	PS vst 16		780
	78216152	Pi 75006 DN PS vst 25	PS vst 25		780
100	78227480	Pi 71010 DN PS vst 3	PS vst 3	**210**	1275
	77960131	Pi 72010 DN PS vst 6	PS vst 6		1275
	77925670	Pi 73010 DN PS vst 10	PS vst 10		1275
	78261281	Pi 74010 DN PS vst 16	PS vst 16		1275
	78216160	Pi 75010 DN PS vst 25	PS vst 25		1275
160	77940638	Pi 71016 DN PS vst 3	PS vst 3	**210**	1885
	77960123	Pi 72016 DN PS vst 6	PS vst 6		1885
	77925688	Pi 73016 DN PS vst 10	PS vst 10		1885
	78269797	Pi 74016 DN PS vst 16	PS vst 16		1885
	78216178	Pi 75016 DN PS vst 25	PS vst 25		1885
250	77940646	Pi 71025 DN PS vst 3	PS vst 3	**210**	3090
	77960115	Pi 72025 DN PS vst 6	PS vst 6		3090
	77925696	Pi 73025 DN PS vst 10	PS vst 10		3090
	78269813	Pi 74025 DN PS vst 16	PS vst 16		3090
	78216186	Pi 75025 DN PS vst 25	PS vst 25		3090

*a wider range of element types is available on request

8. Technical specifications

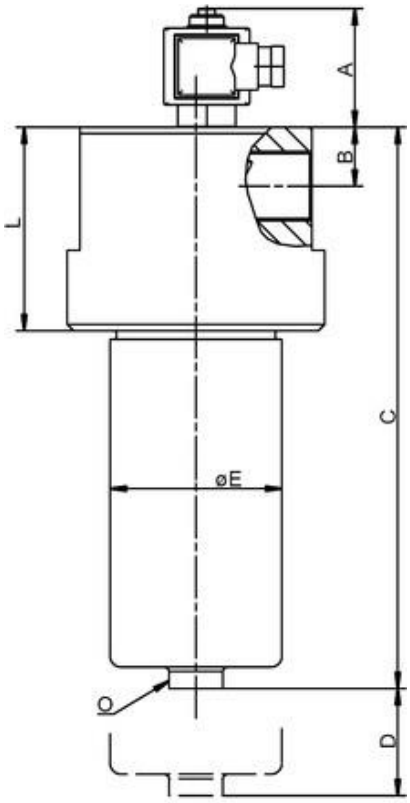
Design:	in-line filter
Nominal pressure:	
	2x 10^6 load changes 450 bar
NG 40 up to 100	(6425 psi)
NG 160 and 250	250 bar (3570 psi)
Test pressure:	
NG 40 up to 100	700 bar (10000 psi)
NG 160 and 250	325 bar (4640 psi)
Connections:	
NG 40 up to 100	G1
NG 160 and 250	G1½
Temperature range:	-10 °C to +120 °C
	(other temperature ranges on request)
	TP 316/TP 316 L
Filter head and housing material:	(1.4401/1.4404)
	(other materials on request)
Sealing material:	NBR/PTFE
Maintenance indicator setting:	Δ p 5 bar ± 10 %
Electrical data of maintenance indicator:	
Maximum voltage:	250 V AC/200 V DC
Maximum current:	1 A
Contact load:	70 W
	IP 65 in inserted
Type of protection:	and secured status
Contact:	normally open/closed
Cable sleave:	M20x1.5

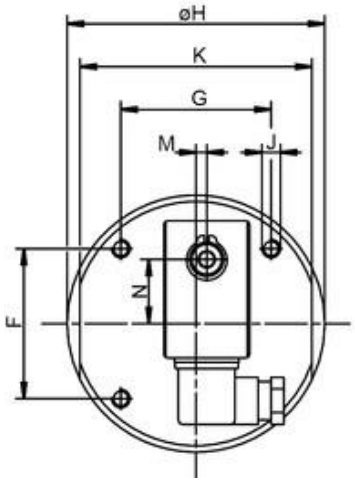
The switching function can be changed by turning the electric upper part by 180° (normally closed contact or normally open contact). The state on delivery is a normally closed contact. By inductivity in the direct current circuit the use of suitable protection circuit should be considered. Further maintenance indicator details and designs are available in the maintenance indicator data sheet.

We draw attention to the fact that all values indicated are average values and not not always occur in specific cases of application. Our products are continually being further developed. Values, dimensions and weights can change as a result of this. Our specialized department will be pleased to offer you advice.

We recommend to contact us concerning applications of our filters in areas governed by the EU Directive 94/9 EG (ATEX 95). The standard version can be used for liquids based on mineral oil (corresponding to the fluids in Group 2 of Directive 97/23 EG Article 9). If you consider to use other fluids please contact us for additional support.

Subject to technical alteration without prior notice.





9. Dimensions

All dimensions in mm.

Type	A	B	C ± 5	D	E	F	G	H	J	K	L	M	N	O (SW)
Pi 48004	60	27.5	202	100	80	70	70	120	M8	108	95	5	30.0	30
Pi 48006	60	27.5	262	100	80	70	70	120	M8	108	95	5	30.0	30
Pi 48010	60	27.5	352	100	80	70	70	120	M8	108	95	5	30.0	30
Pi 48016	60	42.0	310	130	120	78	78	150	M10	135	145	-	35.5	36
Pi 48025	60	42.0	400	130	120	78	78	150	M10	135	145	-	35.5	36

10. Installation, operating and maintenance instructions

10.1 Filter installation

When installing the filter make sure that sufficient space is available to remove filter element and filter housingl. Preferably the filter should be installed with the filter housing pointing downwards.
The maintenance indicator must be visible.

10.2 Connecting the electrical maintenance indicator

The electrical indicator is connected via a 2-pole appliance plug according to DIN EN 175301-803 with poles marked 1 and 2.
The electrical section can be inverted to change from normally open position to normally closed position or vice versa.

10.3 When should the filter element be replaced?

1. Filters equipped with visual and electrical maintenance indicator:
   During cold starts, the indicator may give a warning signal. Press the red button of the visual indicator once again only after operating temperature has been reached. If the red button immediately pops up again and/or the electrical signal has not switched off after reaching operating temperature, the filter element must be replaced after the end of the shift.
2. Filters without maintenance indicator:
   The filter element should be replaced after the trial run or flushing of the system. Afterwards follow instructions of the manufacturer.
3. Please always ensure that you have original Filtration Group spare elements in stock: Disposable elements (PS) cannot be cleaned.

10.4 Element replacement

1. Stop system and relieve filter from pressure.
2. Unscrew the filter housing by turning counter-clockwise. Clean the housing using a suitable cleaning solvent.
3. Remove element by pulling down carefully.
4. Check o-ring and spigot for damage. Replace, if necessary.
5. Make sure that the order number on the spare element corresponds to the order number of the filter name-plate. To ensure no contamination occurs during the exchange of the element first open the plastic bag and push the element over the spigot in the filter head. Now remove plastic bag.
6. Lightly lubricate the threads of the filter housing a little bit and screw into the filter head. Maximum tightening torque for NG 50 to 110 = 60 Nm, for NG 150 to 450 = 100 Nm.

11. Spare parts list

Order numbers for spare parts		
Position	**Type**	**Order number**
①	Seal kit	
	Pi 48004 - 48010	
	NBR	79767443
	FPM	70315096
	EPDM	70303334
	Pi 48016 - 48025	
	NBR	70315097
	FPM	70315098
	EPDM	70368303
②	Maintenance indicator	
	Visual PiS 3193	78308538
	Electrical PiS 3192	78308546
	Electrical upper section only	77536550
③	Seal kit for maintenance indicator	
	NBR	77760275
	FPM	77760283
	EPDM	77760291

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High Pressure Filter
Pi 4000

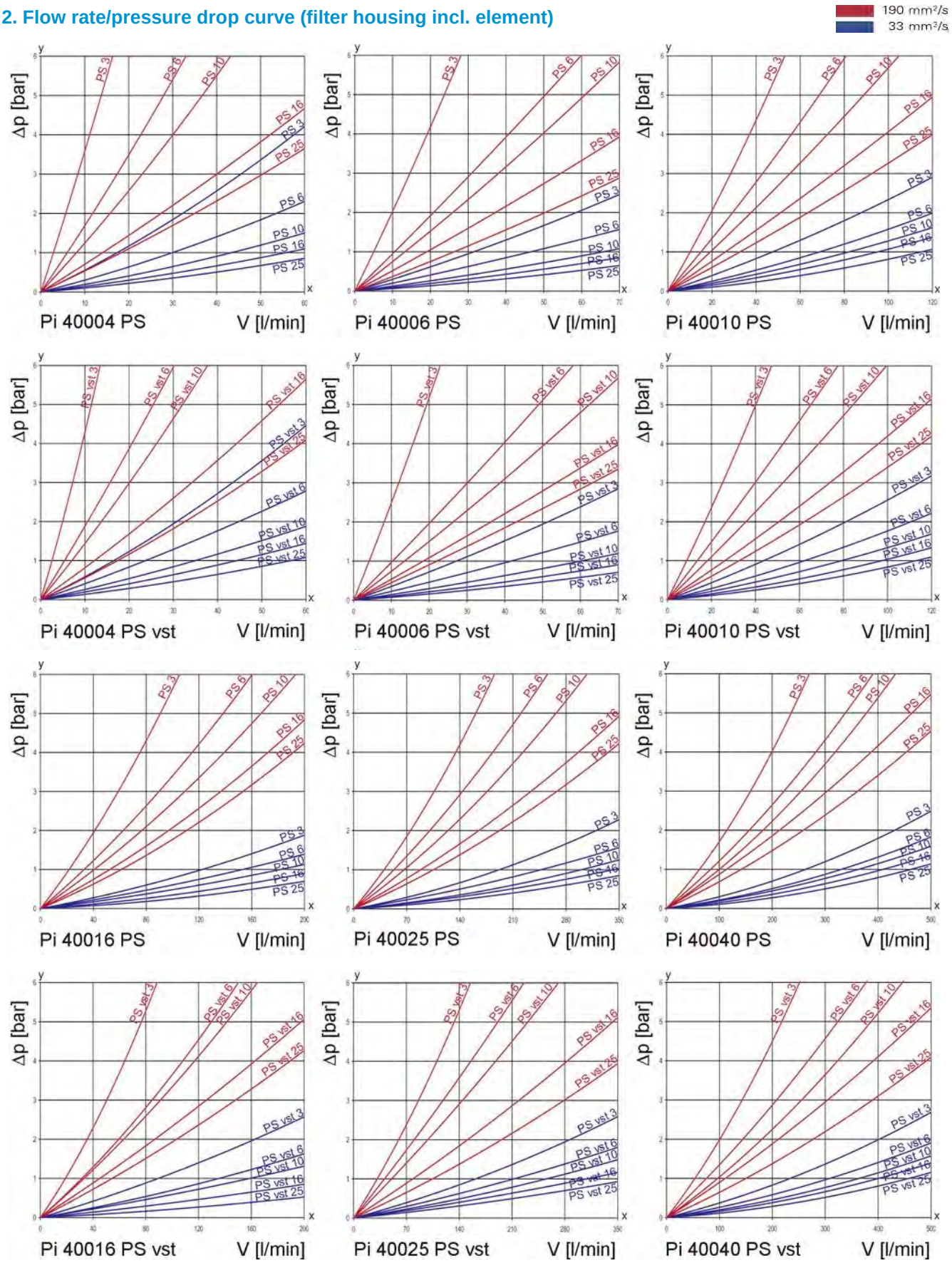
Nominal pressure 400 bar (5690 psi), nominal size up to 400
according DIN 24550

1. Features

High performance filters for modern hydraulic systems

- Modular system
- Compact design
- Minimal pressure drop through optimal flow design
- Visual/electrical/electronic maintenance indicator
- Quality filters, easy to service
- Equipped with highly efficient glass fibre PS filter elements
- Beta reated elements according to ISO 16889 multipass test
- Elements with high differential pressure stability and dirt holding capacity
- NPT- and SAE-connections on request
- Worldwide distribution

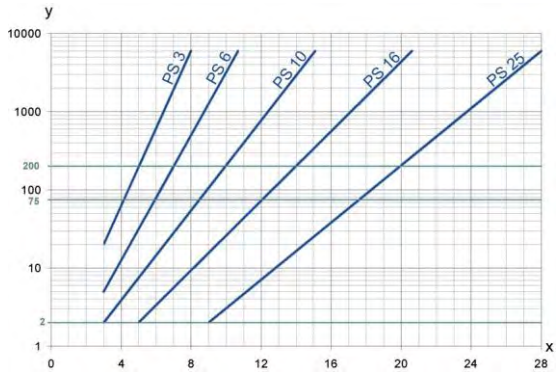
2. Flow rate/pressure drop curve (filter housing incl. element)



y = differential pressure Δp [bar]

x = flow rate V [l/min]

3. Separation grade characteristics



y = beta-value
x = particle size [µm]

determined by multipass tests (ISO 16889)
calibration according to ISO 11171 (NIST)

4. Filter performance data

tested according to ISO 16889 (multipass test)

PS elements with
max. Δ p 20 bar

PS	3	$\beta_{5(C)}$	≥200
PS	6	$\beta_{7(C)}$	≥200
PS	10	$\beta_{10(C)}$	≥200
PS	16	$\beta_{15(C)}$	≥200
PS	25	$\beta_{20(C)}$	≥200

values guaranteed up to
10 bar differential pressure

PS vst elements with
max. Δ p 210 bar

PS vst	3	$\beta_{5(C)}$	≥200
PS vst	6	$\beta_{7(C)}$	≥200
PS vst	10	$\beta_{10(C)}$	≥200
PS vst	16	$\beta_{15(C)}$	≥200
PS vst	25	$\beta_{20(C)}$	≥200

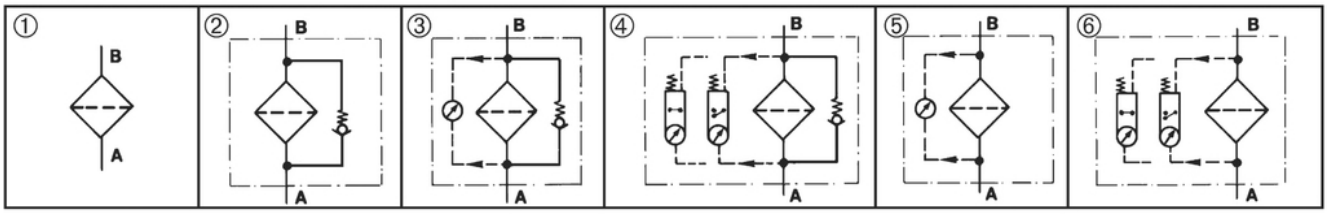
values guaranteed up to
20 bar differential pressure

5. Quality assurance

Filtration Group filters and filter elements are produced according to the following international standards:

Norm	Designation
DIN ISO 2941	Hydraulic fluid power filter elements; verification of collapse/burst resistance
DIN ISO 2942	Hydraulic fluid power filter elements; verification of fabrication integrity
DIN ISO 2943	Hydraulic fluid power filter elements; verification of material compatibility with fluids
DIN ISO 3723	Hydraulic fluid power filter elements; method for end load test
DIN ISO 3724	Hydraulic fluid power filter elements; verification of flow fatigue characteristics
ISO 3968	Hydraulic fluid power filters; evaluation of pressure drop versus flow characteristics
ISO 10771.1	Fatigue pressure testing of metal containing envelopes in hydraulic fluid applications
ISO 16889	Hydraulic fluid power filters; multipass method for evaluation filtration performance of a filter element

6. Symbols



7. Order numbers

Example for ordering filters:

1. Filter housing	2. Filter element
V = 100 l/min and electrical maintenance indicator Type: Pi 40010-015, Order number: 77978448	PS vst 3 Type: Pi 71010 DN PS vst 3, Order number: 78227480

7.1 Housing design

Nominal size NG [l/min]	Order number	Type	① with indicator cavity	② with bypass valve and indicator cavity	③ with bypass valve and visual indicator	④ with bypass valve and electrical indicator	⑤ with visual indicator	⑥ with electrical indicator
40	78207201	Pi 40004-010	■					
	78207219	Pi 40004-011		■				
	78207227	Pi 40004-012			■			
	78304156	Pi 40004-013				■		
	78207243	Pi 40004-014					■	
	77978463	Pi 40004-015						■
63	78207268	Pi 40006-010	■					
	78207276	Pi 40006-011		■				
	78207284	Pi 40006-012			■			
	78304164	Pi 40006-013				■		
	78207300	Pi 40006-014					■	
	77978455	Pi 40006-015						■
100	78207326	Pi 40010-010	■					
	78207334	Pi 40010-011		■				
	78207342	Pi 40010-012			■			
	78304172	Pi 40010-013				■		
	78207367	Pi 40010-014					■	
	77978448	Pi 40010-015						■
160	78207383	Pi 40016-010	■					
	78207391	Pi 40016-011		■				
	78207409	Pi 40016-012			■			
	78304107	Pi 40016-013				■		
	78207425	Pi 40016-014					■	
	78207433	Pi 40016-015						■
250	78207458	Pi 40025-010	■					
	78207466	Pi 40025-011		■				
	78207474	Pi 40025-012			■			
	78304115	Pi 40025-013				■		
	78207490	Pi 40025-014					■	
	78207813	Pi 40025-015						■
400	78207821	Pi 40040-010 FL	■					
	78207839	Pi 40040-011 FL		■				
	78207847	Pi 40040-012 FL			■			
	78304123	Pi 40040-013 FL				■		
	78207862	Pi 40040-014 FL					■	
	78207870	Pi 40040-015 FL						■

When filter with non bypass configuration is selected, the collapse pressure of the element must not be exceeded.

7.2 Filter elements*					
Nominal size NG [l/min]	**Order number**	**Type**	**Filter material**	**max. Δ p [bar]**	**Filter surface [cm²]**
40	78260929	Pi 21004 DN PS 3	PS 3	**20**	475
	77960859	Pi 22004 DN PS 6	PS 6		475
	77925571	Pi 23004 DN PS 10	PS 10		475
	78260937	Pi 24004 DN PS 16	PS 16		475
	78260945	Pi 25004 DN PS 25	PS 25		475
	78216079	Pi 71004 DN PS vst 3	PS vst 3	**210**	445
	77960156	Pi 72004 DN PS vst 6	PS vst 6		445
	77925654	Pi 73004 DN PS vst 10	PS vst 10		445
	78216087	Pi 74004 DN PS vst 16	PS vst 16		445
	78216095	Pi 75004 DN PS vst 25	PS vst 25		445
63	78260960	Pi 21006 DN PS 3	PS 3	**20**	835
	77960867	Pi 22006 DN PS 6	PS 6		835
	77925589	Pi 23006 DN PS 10	PS 10		835
	78260978	Pi 24006 DN PS 16	PS 16		835
	78260986	Pi 25006 DN PS 25	PS 25		835
	78216137	Pi 71006 DN PS vst 3	PS vst 3	**210**	780
	77960149	Pi 72006 DN PS vst 6	PS vst 6		780
	77925662	Pi 73006 DN PS vst 10	PSvst 10		780
	78216145	Pi 74006 DN PS vst 16	PS vst 16		780
	78216152	Pi 75006 DN PS vst 25	PS vst 25		780
100	78227472	Pi 21010 DN PS 3	PS 3	**20**	1375
	77960875	Pi 22010 DN PS 6	PS 6		1375
	77925597	Pi 23010 DN PS 10	PS 10		1375
	78261000	Pi 24010 DN PS 16	PS 16		1375
	78261018	Pi 25010 DN PS 25	PS 25		1375
	78227480	Pi 71010 DN PS vst 3	PS vst 3	**210**	1275
	77960131	Pi 72010 DN PS vst 6	PS vst 6		1275
	77925670	Pi 73010 DN PS vst 10	PS vst 10		1275
	78261281	Pi 74010 DN PS vst 16	PS vst 16		1275
	78216160	Pi 75010 DN PS vst 25	PS vst 25		1275

* a wider range of element types is available on request

7.2 Filter elements*					
Nominal size NG [l/min]	**Order number**	**Type**	**Filter material**	**max. Δ p [bar]**	**Filter surface [cm²]**
160	78261034	Pi 21016 DN PS 3	PS 3	**20**	2530
	77960826	Pi 22016 DN PS 6	PS 6		2530
	77925605	Pi 23016 DN PS 10	PS 10		2530
	78261042	Pi 24016 DN PS 16	PS 16		2530
	78261059	Pi 25016 DN PS 25	PS 25		2530
	77940638	Pi 71016 DN PS vst 3	PS vst 3	**210**	1885
	77960123	Pi 72016 DN PS vst 6	PS vst 6		1885
	77925688	Pi 73016 DN PS vst 10	PS vst 10		1885
	78269797	Pi 74016 DN PS vst 16	PS vst 16		1885
	78216178	Pi 75016 DN PS vst 25	PS vst 25		1885
250	78227514	Pi 21025 DN PS 3	PS 3	**20**	4020
	77960834	Pi 22025 DN PS 6	PS 6		4020
	77925613	Pi 23025 DN PS 10	PS 10		4020
	78261075	Pi 24025 DN PS 16	PS 16		4020
	78261083	Pi 25025 DN PS 25	PS 25		4020
	77940646	Pi 71025 DN PS vst 3	PS vst 3	**210**	3090
	77960115	Pi 72025 DN PS vst 6	PS vst 6		3090
	77925696	Pi 73025 DN PS vst 10	PS vst 10		3090
	78269813	Pi 74025 DN PS vst 16	PS vst 16		3090
	78216186	Pi 75025 DN PS vst 25	PS vst 25		3090
400	78227522	Pi 21040 DN PS 3	PS 3	**20**	6770
	77960842	Pi 22040 DN PS 6	PS 6		6770
	77925621	Pi 23040 DN PS 10	PS 10		6770
	78261109	Pi 24040 DN PS 16	PS 16		6770
	78261117	Pi 25040 DN PS 25	PS 25		6770
	77940653	Pi 71040 DN PS vst 3	PS vst 3	**210**	5240
	77960107	Pi 72040 DN PS vst 6	PS vst 6		5240
	77930829	Pi 73040 DN PS vst 10	PS vst 10		5240
	78269821	Pi 74040 DN PS vst 16	PS vst 16		5240
	78260903	Pi 75040 DN PS vst 25	PS vst 25		5240

* a wider range of element types is available on request

8. Technical specifications

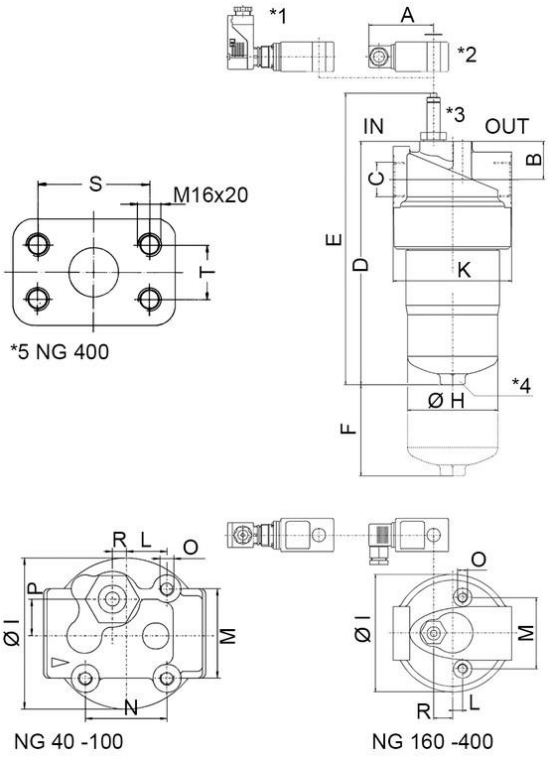
Design:	in-line filter
Nominal pressure:	400 bar (5690 psi)
Test pressure:	520 bar (7400 psi)
Temperature range:	-10 °C to +120 °C
	(other temperature ranges on request)
Bypass setting:	Δ p 7 bar ± 10 %
Filter head material:	GGG
Filter housing material:	St
Sealing material:	NBR/PTFE
Maintenance indicator setting:	Δ p 5 bar ± 10 %
Electrical data of maintenance indicator:	
Maximum voltage:	250 V AC/200 V DC
Maximum current:	1 A
Contact load:	70 W
Type of protection:	IP 65 in inserted and secured status
Contact:	normally open/closed
Cable sleave:	M20x1.5

The switching function can be changed by turning the electric upper part by 180° (normally closed contact or normally open contact). The state on delivery is a normally closed contact. By inductivity in the direct current circuit the use of suitable protection circuit should be considered. Further maintenance indicator details and designs are available in the maintenance indicator data sheet.

We draw attention to the fact that all values indicated are average values and not not always occur in specific cases of application. Our products are continually being further developed. Values, dimensions and weights can change as a result of this. Our specialized department will be pleased to offer you advice.

We recommend to contact us concerning applications of our filters in areas governed by the EU Directive 94/9 EG (ATEX 95). The standard version can be used for liquids based on mineral oil (corresponding to the fluids in Group 2 of Directive 97/23 EG Article 9). If you consider to use other fluids please contact us for additional support.

Subject to technical alteration without prior notice.



IN Inlet
OUT Outlet
*1 Electrical upper section connector acc. DIN EN 175301-804, Versions: PiS 3102, 3122, 3110
*2 Electrical upper section connector acc. DIN EN 175301-803, Versions: PiS 3092, 3105, 3115
*3 Visual maintenance indicator
*4 NG 250, 400 with drain screw G ¼ DIN 910
*5 DN 38 according to SAE 1½" 6000 psi. Flanges, bolts, o-rings are not included in delivery.

9. Dimensions

All dimensions except "C" in mm.

Type	A	B	C*	D	E	F	G SW	H	I	K	L	M	N	O	P	R	S	T	Weight [kg]
Pi 40004	78	31.5	G½	180	238	80	27	66	90	92	23.5	54	47	M8x16	21	8	-	-	4.2
Pi 40006	78	31.5	G¾	240	298	80	27	66	90	92	23.5	54	47	M8x16	21	8	-	-	4.9
Pi 40010	78	31.5	G1	330	388	80	27	66	90	92	23.5	54	47	M8x16	21	8	-	-	5.8
Pi 40016	78	46	G1¼	293	350	110	30	109	142	143.5	12	86	-	M12x15	-	23	-	-	12.6
Pi 40025	78	46	G1½	383	440	110	30	109	142	143.5	12	86	-	M12x15	-	23	-	-	14.2
Pi 40040 FL	78	46	DN 38	533	590	110	30	109	142	143.5	12	86	-	M12x15	-	23	79.4	36.5	18.4

* NPT- and SAE-connections on request

10. Installation, operating and maintenance instructions

10.1 Filter installation

When installing the filter make sure that sufficient space is available to remove filter element and filter housing. Preferably the filter should be installed with the filter housing pointing downwards.
The maintenance indicator must be visible.

10.2 Connecting the electrical maintenance indicator

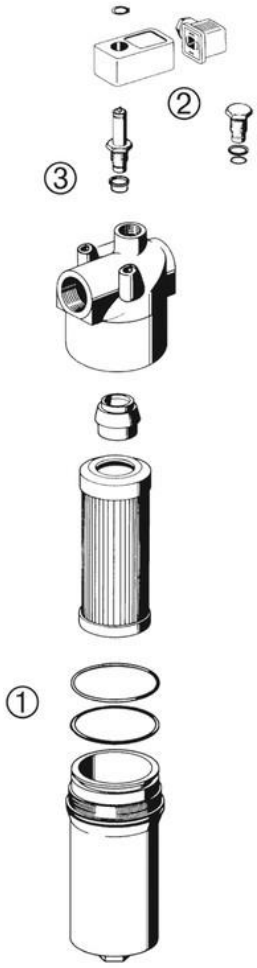
The electrical indicator is connected via a 2-pole appliance plug according to DIN EN 175301-803 with poles marked 1 and 2.
The electrical section can be inverted to change from normally open position to normally closed position or vice versa.

10.3 When should the filter element be replaced?

1. Filters equipped with visual and electrical maintenance indicator:
   During cold starts, the indicator may give a warning signal. Press the red button of the visual indicator once again only after operating temperature has been reached. If the red button immediately pops up again and/or the electrical signal has not switched off after reaching operating temperature, the filter element must be replaced after the end of the shift.
2. Filters without maintenance indicator:
   The filter element should be replaced after the trial run or flushing of the system. Afterwards follow instructions of the manufacturer.
3. Please always ensure that you have original FGC spare elements in stock: Disposable elements (PS) cannot be cleaned.

10.4 Element replacement

1. Stop system and relieve filter from pressure.
2. Filter sizes 250 and 400: empty the filter housing by removing the drain plug.
3. Unscrew the filter housing by turning counter-clockwise. Clean the housing using a suitable cleaning solvent.
4. Remove element by pulling down carefully.
5. Check o-ring and spigot for damage. Replace, if necessary.
6. Make sure that the order number on the spare element corresponds to the order number of the filter name-plate. To ensure no contamination occurs during the exchange of the element first open the plastic bag and push the element over the spigot in the filter head. Now remove plastic bag.
7. Oil the threads of the filter housing a little bit and screw into the filter head. Maximum tightening torque for NG 40 to 100 = 60 Nm, for NG 160 to 400 = 100 Nm.
8. Check seals of vent drain plug - if necessary, please replace.
   Torque drain plug 30 Nm.



11. Spare parts list

Order numbers for spare parts		
Position	**Type**	**Order number**
①	Seal kit	
	Pi 40004 - Pi 40010	
	NBR	78383804
	FPM	78383812
	EPDM	78383820
	Pi 40016 - Pi 40040	
	NBR	78383838
	FPM	78383846
	EPDM	78383853
②	Maintenance indicator	
	Visual PiS 3093/5	77669914
	Electrical PiS 3092/5	77669864
	Electrical upper section only	77536550
③	Seal kit for maintenance indicator	
	NBR	77760275
	FPM	77760283
	EPDM	77760291

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Filtration Group

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High Pressure Filter
Pi 4220

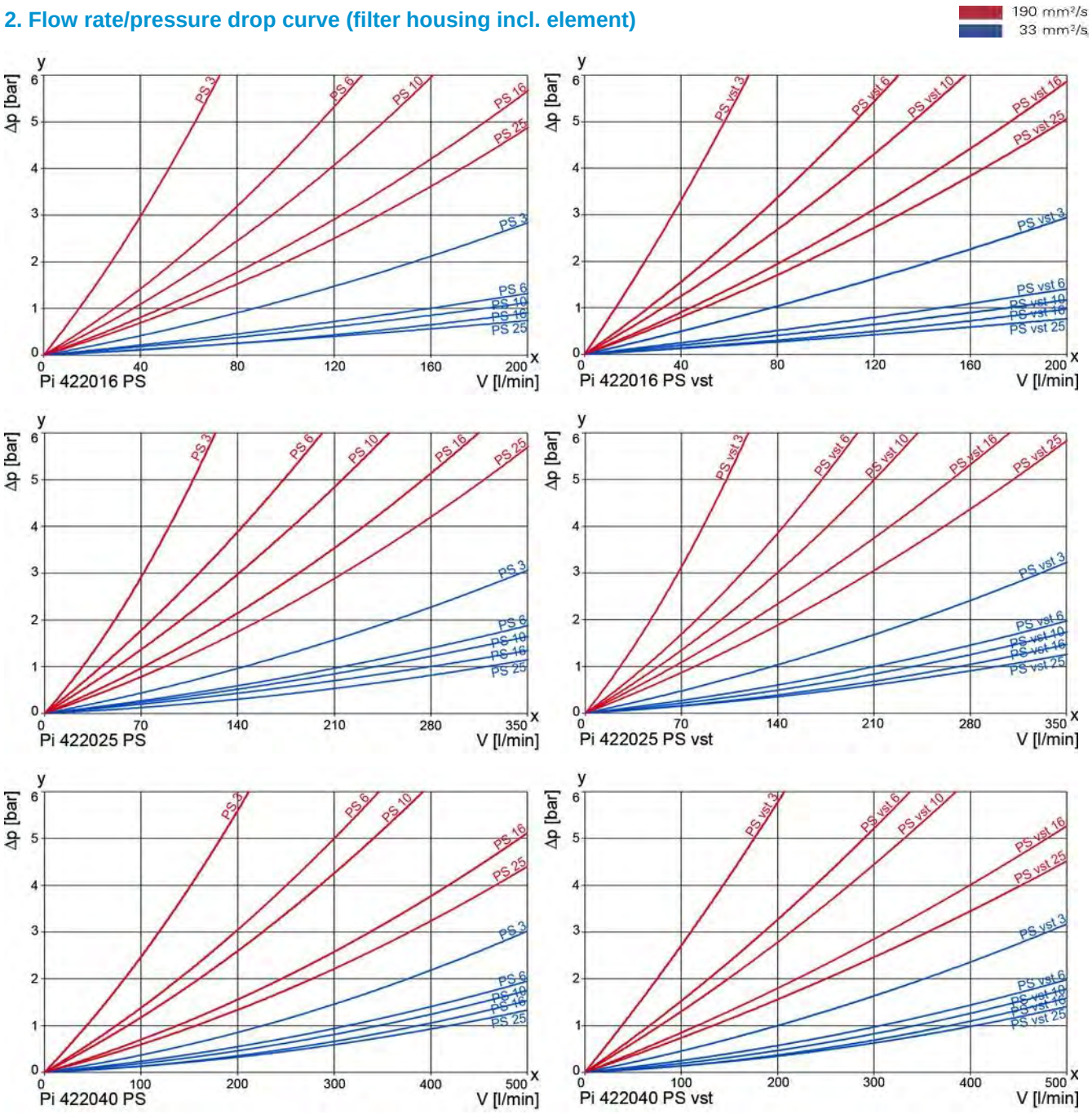
Nominal pressure 400 bar (5690 psi), nominal size up to 400
optional with reverse flow valve

1. Features

High performance filters for modern hydraulic systems

- Modular system
- Compact design
- Minimal pressure drop through optimal flow design
- Visual/electrical/electronic maintenance indicator
- Threaded or flanged connections
- Quality filters, easy to service
- Inlet sideways, outlet sideways or at the top
- Equipped with highly efficient glass fibre PS filter elements
- Beta rated elements according to ISO 16889 multipass test
- Elements with high differential pressure stability and dirt holding capacity
- NPT- and SAE-connections on request
- Worldwide distribution

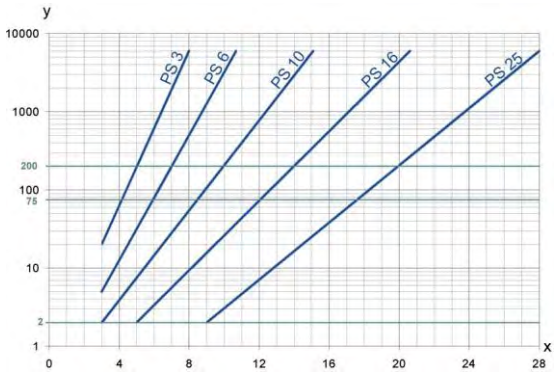
2. Flow rate/pressure drop curve (filter housing incl. element)



y = differential pressure Δp [bar]

x = flow rate V [l/min]

3. Separation grade characteristics



y = beta-value
x = particle-size [µm]

determined by multipass tests (ISO 16889)
calibration according to ISO 11171 (NIST)

4. Filter performance data

tested according to ISO 16889 (multipass test)

PS elements with
max. Δ p 20 bar

PS	3	$\beta_{5(C)}$	≥200
PS	6	$\beta_{7(C)}$	≥200
PS	10	$\beta_{10(C)}$	≥200
PS	16	$\beta_{15(C)}$	≥200
PS	25	$\beta_{20(C)}$	≥200

values guaranteed up to
10 bar differential pressure

PS vst elements with
max. Δ p 210 bar

PS vst	3	$\beta_{5(C)}$	≥200
PS vst	6	$\beta_{7(C)}$	≥200
PS vst	10	$\beta_{10(C)}$	≥200
PS vst	16	$\beta_{15(C)}$	≥200
PS vst	25	$\beta_{20(C)}$	≥200

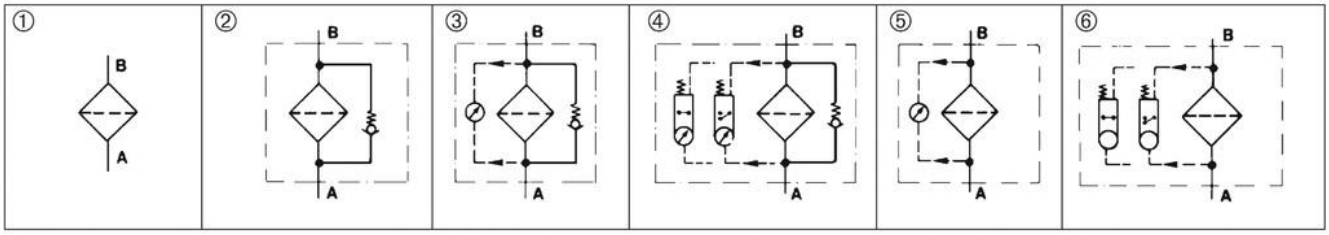
values guaranteed up to
20 bar differential pressure

5. Quality assurance

Filtration Group filters and filter elements are produced according to the following international standards:

Norm	Designation
DIN ISO 2941	Hydraulic fluid power filter elements; verification of collapse/burst resistance
DIN ISO 2942	Hydraulic fluid power filter elements; verification of fabrication integrity
DIN ISO 2943	Hydraulic fluid power filter elements; verification of material compatibility with fluids
DIN ISO 3723	Hydraulic fluid power filter elements; method for end load test
DIN ISO 3724	Hydraulic fluid power filter elements; verification of flow fatigue characteristics
ISO 3968	Hydraulic fluid power-filters-evaluation of pressure drop versus flow characteristics
ISO 10771.1	Fatigue pressure testing of metal containing envelopes in hydraulic fluid applications
ISO 16889	Hydraulic fluid power filters-multipass method for evaluation filtration performance of a filter element

6. Symbols



7. Type number key, housing design, order numbers

7.1 Type number key

Type					
Pi 4220	High pressure filter series				
	NG				
	16	nominal size 160			
	25	nominal size 250			
		Connection variant 1st position			
		/1	inlet and outlet sideways		
		/2	inlet sideways, outlet at the top		
			Connection variant 2nd position		
			1	G1½	
			2	flange SAE 1¼ (only for inlet sideways/outlet at the top version)	
			3	flange SAE 1½	
			4	G1¼ (only for inlet sideways/outlet at the top version)	
				Housing design	
				-010	with hole for maintenance indicator
				-011	with bypass valve and Bohrung für Wartungsanzeige
				-012	with bypass valve and visual maintenance indicator
				-013	with bypass valve and electrical maintenance indicator
				-014	with visual maintenance indicator
				-015	with electrical maintenance indicator
Pi 4220	**25**	**/1**	**1**	**-011**	**ordering example**

7.2 Housing design

Nominal size NG [l/min]	Type inlet sideways outlet sideways	Type inlet sideways outlet at the top	① with hole for indicator	② with bypass and hole for indicator	③ with bypass and visual indicator	④ with bypass and electrical indicator	⑤ with visual indicator	⑥ with electrical indicator
160	Pi 422016/1*-010	Pi 422016/2*-010	■					
	Pi 422016/1*-011	Pi 422016/2*-011		■				
	Pi 422016/1*-012	Pi 422016/2*-012			■			
	Pi 422016/1*-013	Pi 422016/2*-013				■		
	Pi 422016/1*-014	Pi 422016/2*-014					■	
	Pi 422016/1*-015	Pi 422016/2*-015						■
250	Pi 422025/1*-010	Pi 422025/2*-010	■					
	Pi 422025/1*-011	Pi 422025/2*-011		■				
	Pi 422025/1*-012	Pi 422025/2*-012			■			
	Pi 422025/1*-013	Pi 422025/2*-013				■		
	Pi 422025/1*-014	Pi 422025/2*-014					■	
	Pi 422025/1*-015	Pi 422025/2*-015						■
400	Pi 422040/1*-010	Pi 422040/2*-010	■					
	Pi 422040/1*-011	Pi 422040/2*-011		■				
	Pi 422040/1*-012	Pi 422040/2*-012			■			
	Pi 422040/1*-013	Pi 422040/2*-013				■		
	Pi 422040/1*-014	Pi 422040/2*-014					■	
	Pi 422040/1*-015	Pi 422040/2*-015						**LEER**

* Connection variants see type number key 2nd position

When filter with non bypass configuration is selected, the collapse pressure of the element must not be exceeded.

7.3 Filter elements					
Nominal size NG [l/min]	**Order number**	**Typen designation**	**Filter material**	**max. Δ p [bar]**	**Filter surface [cm²]**
160	78261034	Pi 21016 DN PS 3	PS 3	**20**	2530
	77960826	Pi 22016 DN PS 6	PS 6		2530
	77925605	Pi 23016 DN PS 10	PS 10		2530
	78261042	Pi 24016 DN PS 16	PS 16		2530
	78261059	Pi 25016 DN PS 25	PS 25		2530
	77940638	Pi 71016 DN PS vst 3	PS vst 3	**210**	1885
	77960123	Pi 72016 DN PS vst 6	PS vst 6		1885
	77925688	Pi 73016 DN PS vst 10	PS vst 10		1885
	78269797	Pi 74016 DN PS vst 16	PS vst 16		1885
	78216178	Pi 75016 DN PS vst 25	PS vst 25		1885
250	78227514	Pi 21025 DN PS 3	PS 3	**20**	4020
	77960834	Pi 22025 DN PS 6	PS 6		4020
	77925613	Pi 23025 DN PS 10	PS 10		4020
	78261075	Pi 24025 DN PS 16	PS 16		4020
	78261083	Pi 25025 DN PS 25	PS 25		4020
	77940646	Pi 71025 DN PS vst 3	PS vst 3	**210**	3090
	77960115	Pi 72025 DN PS vst 6	PS vst 6		3090
	77925696	Pi 73025 DN PS vst 10	PS vst 10		3090
	78269813	Pi 74025 DN PS vst 16	PS vst 16		3090
	78216186	Pi 75025 DN PS vst 25	PS vst 25		3090
400	78227522	Pi 21040 DN PS 3	PS 3	**20**	6770
	77960842	Pi 22040 DN PS 6	PS 6		6770
	77925621	Pi 23040 DN PS 10	PS 10		6770
	78261109	Pi 24040 DN PS 16	PS 16		6770
	78261117	Pi 25040 DN PS 25	PS 25		6770
	77940653	Pi 71040 DN PS vst 3	PSvst 3	**210**	5240
	77960107	Pi 72040 DN PS vst 6	PS vst 6		5240
	77930829	Pi 73040 DN PS vst 10	PS vst 10		5240
	78269821	Pi 74040 DN PS vst 16	PS vst 16		5240
	78260903	Pi 75040 DN PS vst 25	PS vst 25		5240

8. Technical specifications

Design:	in-line filter inlet sideways; outlet optional sideways or on top
Nominal pressure:	400 bar (5690 psi)
Test pressure:	520 bar (7400 psi)
Temperature range:	-10 °C to +120 °C (other temperature ranges on request)
Bypass setting:	Δ p 7 bar ± 10 %
Filter head material:	GGG
Filter housing material:	St
Sealing material:	NBR/PTFE
Maintenance indicator setting:	Δ p 5 bar ± 10 %
Electrical data of maintenance indicator:	
Maximum voltage:	250 V AC/200 V DC
Maximum current:	1 A
Contact load:	70 W
Type of protection:	IP 65 in inserted and secured status
Contact:	normally open/closed
Cable sleave:	M20x1.5

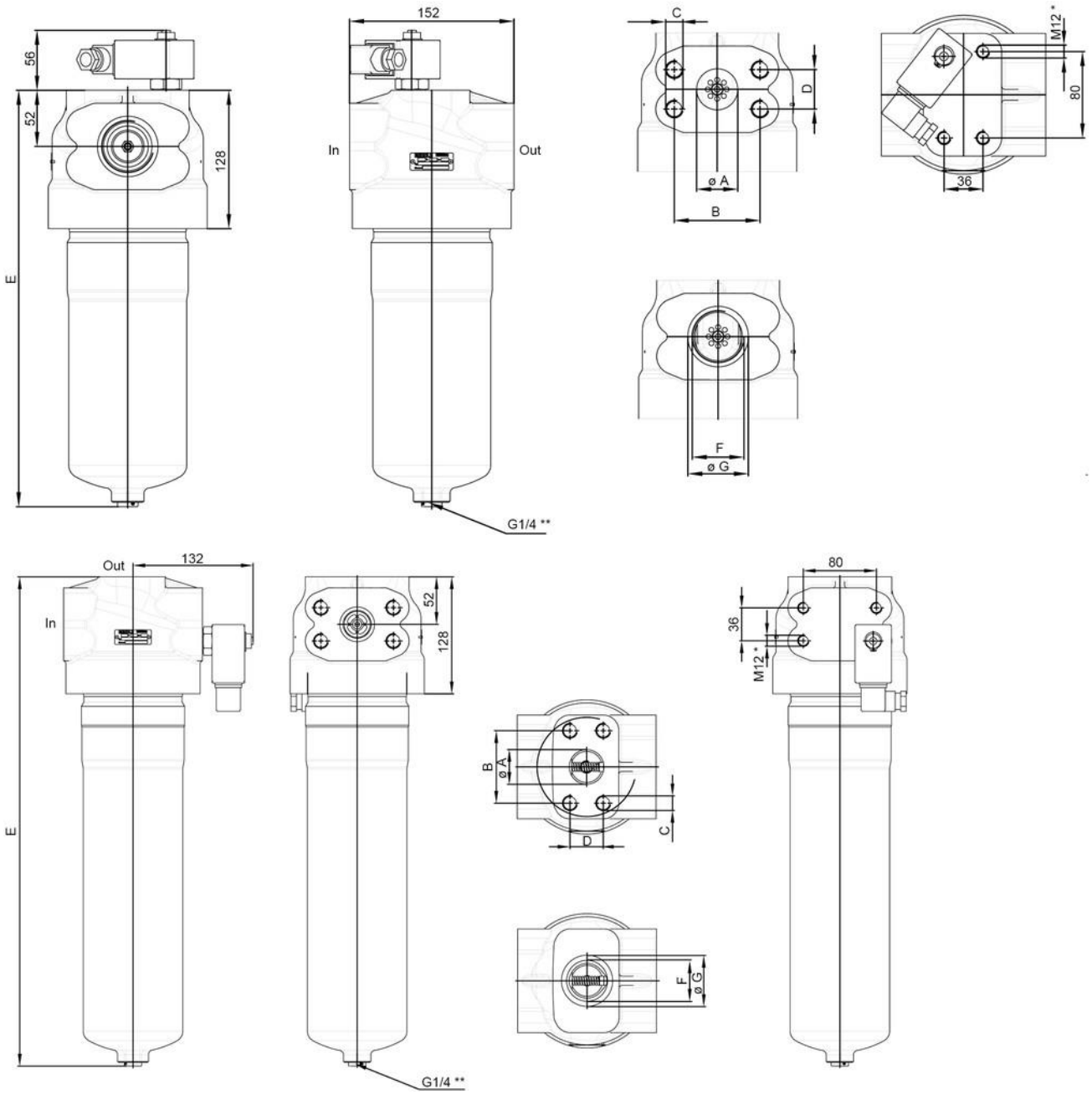
The switching function can be changed by turning the electric upper part by 180° (normally closed contact or normally open contact). The state on delivery is a normally closed contact. By inductivity in the direct current circuit the use of suitable protection circuit should be considered. Further maintenance indicator details and designs are available in the maintenance indicator data sheet.

We draw attention to the fact that all values indicated are average values and not not always occur in specific cases of application. Our products are continually being further developed. Values, dimensions and weights can change as a result of this. Our specialized department will be pleased to offer you advice.

We recommend to contact us concerning applications of our filters in areas governed by the EU Directive 94/9 EG (ATEX 95). The standard version can be used for liquids based on mineral oil (corresponding to the fluids in Group 2 of Directive 97/23 EG Article 9). If you consider to use other fluids please contact us for additional support.

Subject to technical alteration without prior notice.

9. Dimensions



In = Inlet
Out = Outlet
* Thread depth 17 mm
** NG 160 without drain screw

All dimensions except "NG" in mm.

Type	NG	E
Pi 422016/...	150	292
Pi 422025/...	300	385
Pi 422040/...	450	535

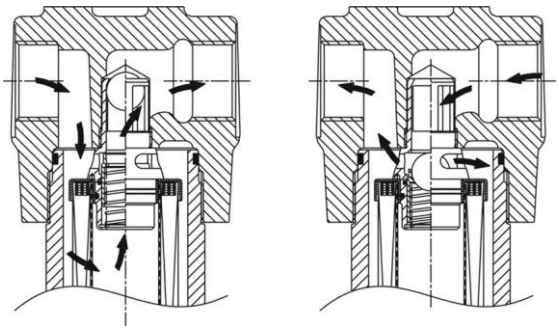
All dimensions except "F" in mm.

Con-nection	ø A	B	C	D	F	ø G
G1¼ *	-	-	-	-	1¼"	56
G1½	-	-	-	-	1½"	56
SAE1¼ *	32	66,6	M12	31,8	-	-
SAE1½	38	79,3	M16	36,8	-	-

* only for inlet sideways/outlet at the top version

10. Execution with reverse flow valve

Filters are normally designed for single- direction flow only. Reverse flows result in destruction of the cartridge. Some applications can require the medium to flow through the filter in both directions, however. The Pi 4220 with a reverse flow valve can be used here. It allows medium flows in both directions, although it only filters in one. The liquid is not filtered in reverse mode. The reverse flow valve can be supplied with or without a bypass function.



Filtration mode | Reverse mode

11. Installation, operating and maintenance instructions

11.1 Filter installation

When installing the filter make sure that sufficient space is available to remove filter element and filter housing. Preferably the filter should be installed with the filter housing pointing downwards.
The maintenance indicator must be visible.

11.2 Connecting the electrical maintenance indicator

The electrical indicator is connected via a 2-pole appliance plug according to DIN EN 175301-803 with poles marked 1 and 2. The electrical section can be inverted to change from normally open position to normally closed position or vice versa.

11.3 When should the filter element be replaced?

1. Filters equipped with visual and electrical maintenance indicator: During cold starts, the indicator may give a warning signal. Press the red button of the visual indicator once again only after operating temperature has been reached. If the red button immediately pops up again and/or the electrical signal has not switched off after reaching operating temperature, the filter element must be replaced after the end of the shift.
2. Filters without maintenance indicator: The filter element should be replaced after the trial run or flushing of the system. Afterwards follow instructions of the manufacturer.
3. Please always ensure that you have original Filtration Group spare elements in stock: Disposable elements (PS) cannot be cleaned.

11.4 Element replacement

1. Stop system and relieve filter from pressure.
2. Filter sizes 250 and 400: empty the filter housing by removing the drain plug.
3. Unscrew the filter housing by turning counter-clockwise. Clean the housing using a suitable cleaning solvent.
4. Remove element by pulling down carefully.
5. Check o-ring and spigot for damage. Replace, if necessary.
6. Make sure that the order number on the spare element corresponds to the order number of the filter name-plate. To ensure no contamination occurs during the exchange of the element first open the plastic bag and push the element over the spigot in the filter head. Now remove plastic bag.
7. Oil the threads of the filter housing a little bit and screw into the filter head. Maximum tightening torque for NG 160 to 400 = 100 Nm.
8. Check seals of vent drain plug - if necessary, please replace. Torque drain plug 30 Nm.

12. Spare parts list

Order numbers for spare parts		
Position	**Type**	**Order number**
① - ②	Seal kit	
	NBR	78383838
	FPM	78383846
	EPDM	78383853
③	Maintenance indicator	
	Visual PiS 3093/5	77669914
	Electrical PiS 3092/5	77669864
	Electrical upper section only	77536550
④	Seal kit for maintenance indicator	
	NBR	77760275
	FPM	77760283
	EPDM	77760291

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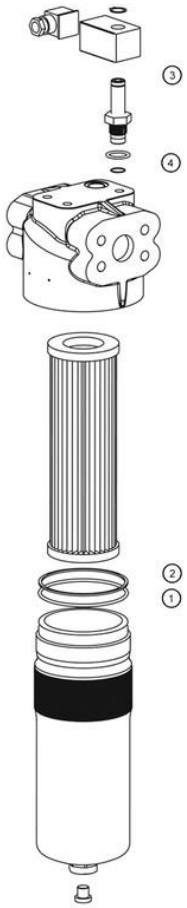

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High Pressure Filter
Pi 4230

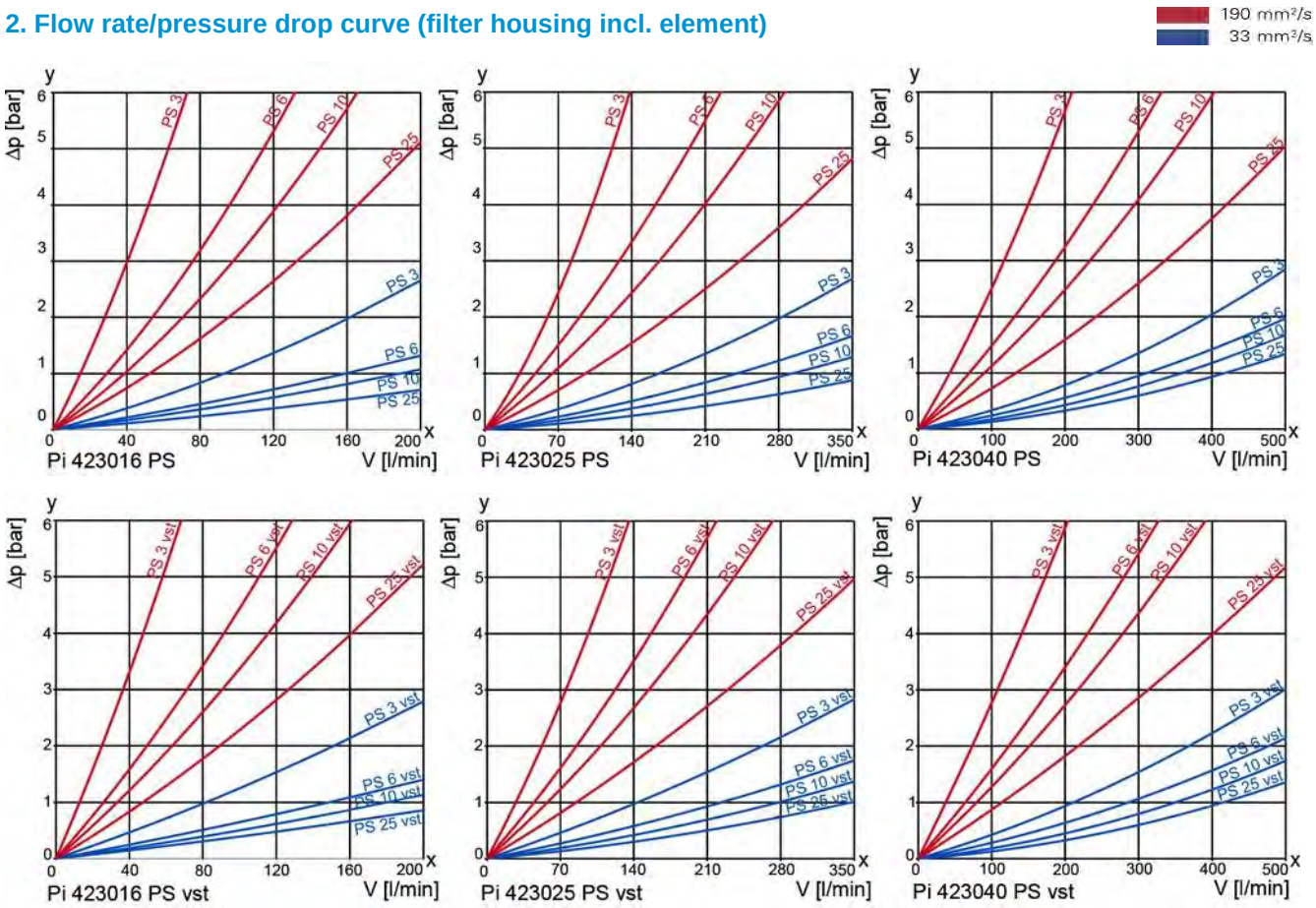
Nominal pressure 315 bar (4570 psi), nominal size 160 to 400
according DIN 24550

1. Features

High performance filters for modern hydraulic systems

- Modular system
- Compact design
- Minimal pressure drop through optimal flow design
- Visual/electrical/electronic maintenance indicator
- Quality filters, easy to service
- Filter element removal upwards
- Equipped with highly efficient glass fibre PS filter elements
- Beta rated elements according to ISO 16889 multipass test
- Elements with high differential pressure stability and dirt holding capacity
- Worldwide distribution

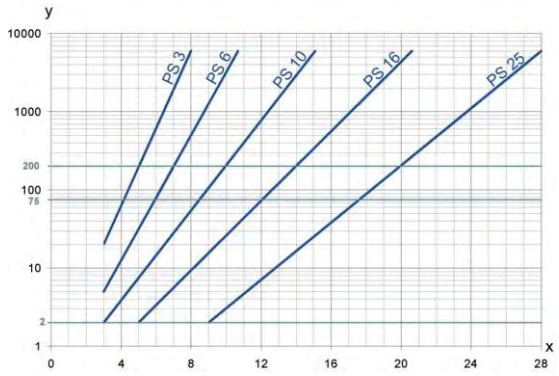
2. Flow rate/pressure drop curve (filter housing incl. element)



y = differential pressure Δp [bar]

x = flow rate V [l/min]

3. Separation grade characteristics



y = beta-value
x = particle size [µm]

determined by multipass tests (ISO 16889)
calibration according to ISO 11171 (NIST)

4. Filter performance data

tested according to ISO 16889 (multipass test)

PS elements with
max. Δ p 20 bar

PS	3	$\beta_{5(C)}$	≥200
PS	6	$\beta_{7(C)}$	≥200
PS	10	$\beta_{10(C)}$	≥200
PS	25	$\beta_{20(C)}$	≥200

values guaranteed up to
10 bar differential pressure

PS vst elements with
max. Δ p 210 bar

PS vst	3	$\beta_{5(C)}$	≥200
PS vst	6	$\beta_{7(C)}$	≥200
PS vst	10	$\beta_{10(C)}$	≥200
PS vst	25	$\beta_{20(C)}$	≥200

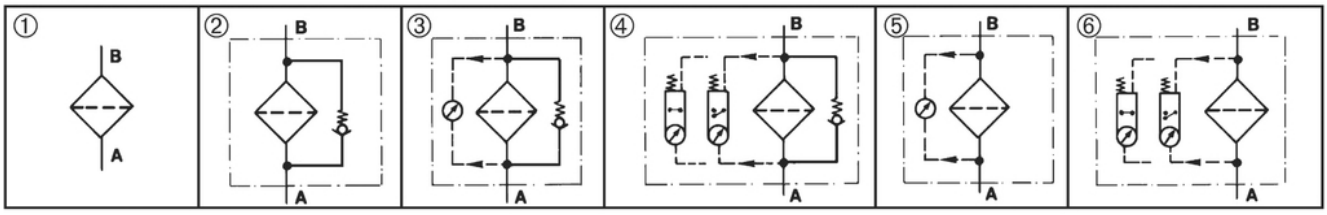
values guaranteed up to
20 bar differential pressure

5. Quality assurance

Filtration Group filters and filter elements are produced according to the following international standards:

Norm	Designation
DIN ISO 2941	Hydraulic fluid power filter elements; verification of collapse/burst resistance
DIN ISO 2942	Hydraulic fluid power filter elements; verification of fabrication integrity
DIN ISO 2943	Hydraulic fluid power filter elements; verification of material compatibility with fluids
DIN ISO 3723	Hydraulic fluid power filter elements; method for end load test
DIN ISO 3724	Hydraulic fluid power filter elements; verification of flow fatigue characteristics
ISO 3968	Hydraulic fluid power filters; evaluation of pressure drop versus flow characteristics
ISO 10771.1	Fatigue pressure testing of metal containing envelopes in hydraulic fluid applications
ISO 16889	Hydraulic fluid power filters; multipass method for evaluation filtration performance of a filter element

6. Symbols



7. Order numbers

Example for ordering filters:

1. Housing design	2. Filter elements
V = 250 l/min, electrical maintenance indicator Type: Pi 423025-015 Order number: 70382542	PS vst 3 Type: Pi 71025 DN PS vst 3 Order number: 77940646

7.1 Housing design

Nominal size NG [l/min]	Order number thread version	Type thread version	Order number flange version	Type flange version	① with indicator cavity	② with bypass valve and indicator cavity	③ with bypass valve and visual indicator	④ with bypass valve and visual/electrical indicator	⑤ with visual indicator	⑥ with visual/electrical indicator
160	70382531	Pi 423016-010	70382566	Pi 423016-010 FL	■					
	70382532	Pi 423016-011	70382567	Pi 423016-011 FL		■				
	70382533	Pi 423016-012	70382568	Pi 423016-012 FL			■			
	70382534	Pi 423016-013	70382569	Pi 423016-013 FL				■		
	70382535	Pi 423016-014	70382570	Pi 423016-014 FL					■	
	70382536	Pi 423016-015	70382571	Pi 423016-015 FL						■
250	70382537	Pi 423025-010	70382572	Pi 423025-010 FL	■					
	70382538	Pi 423025-011	70382573	Pi 423025-011 FL		■				
	70382539	Pi 423025-012	70382574	Pi 423025-012 FL			■			
	70382540	Pi 423025-013	70382575	Pi 423025-013 FL				■		
	70382541	Pi 423025-014	70382576	Pi 423025-014 FL					■	
	70382542	Pi 423025-015	70382577	Pi 423025-015 FL						■
400	70382543	Pi 423040-010	70382578	Pi 423040-010 FL	■					
	70382544	Pi 423040-011	70382579	Pi 423040-011 FL		■				
	70382545	Pi 423040-012	70382580	Pi 423040-012 FL			■			
	70382546	Pi 423040-013	70382581	Pi 423040-013 FL				■		
	70382547	Pi 423040-014	70382582	Pi 423040-014 FL					■	
	70382548	Pi 423040-015	70382583	Pi 423040-015 FL						■

When filter with non bypass configuration is selected, the collapse pressure of the element must not be exceeded.

7.2 Filter elements*					
Nominal size NG [l/min]	**Order number**	**Type**	**Filter material**	**max. Δ p [bar]**	**Filter surface [cm²]**
160	78261034	Pi 21016 DN PS 3	PS 3	**20**	2530
	77960826	Pi 22016 DN PS 6	PS 6		2530
	77925605	Pi 23016 DN PS 10	PS 10		2530
	78261042	Pi 24016 DN PS 16	PS 16		2530
	78261059	Pi 25016 DN PS 25	PS 25		2530
	77940638	Pi 71016 DN PS vst 3	PS vst 3	**210**	1885
	77960123	Pi 72016 DN PS vst 6	PS vst 6		1885
	77925688	Pi 73016 DN PS vst 10	PS vst 10		1885
	78269797	Pi 74016 DN PS vst 16	PS vst 16		1885
	78216178	Pi 75016 DN PS vst 25	PS vst 25		1885
250	78227514	Pi 21025 DN PS 3	PS 3	**20**	4020
	77960834	Pi 22025 DN PS 6	PS 6		4020
	77925613	Pi 23025 DN PS 10	PS 10		4020
	78261075	Pi 24025 DN PS 16	PS 16		4020
	78261083	Pi 25025 DN PS 25	PS 25		4020
	77940646	Pi 71025 DN PS vst 3	PS vst 3	**210**	3090
	77960115	Pi 72025 DN PS vst 6	PS vst 6		3090
	77925696	Pi 73025 DN PS vst 10	PS vst 10		3090
	78269813	Pi 74025 DN PS vst 16	PS vst 16		3090
	78216186	Pi 75025 DN PS vst 25	PS vst 25		3090
400	78227522	Pi 21040 DN PS 3	PS 3	**20**	6770
	77960842	Pi 22040 DN PS 6	PS 6		6770
	77925621	Pi 23040 DN PS 10	PS 10		6770
	78261109	Pi 24040 DN PS 16	PS 16		6770
	78261117	Pi 25040 DN PS 25	PS 25		6770
	77940653	Pi 71040 DN PS vst 3	PS vst 3	**210**	5240
	77960107	Pi 72040 DN PS vst 6	PS vst 6		5240
	77930829	Pi 73040 DN PS vst 10	PS vst 10		5240
	78269821	Pi 74040 DN PS vst 16	PS vst 16		5240
	78260903	Pi 75040 DN PS vst 25	PS vst 25		5240

* a wider range of element types is available on request

8. Technical specifications

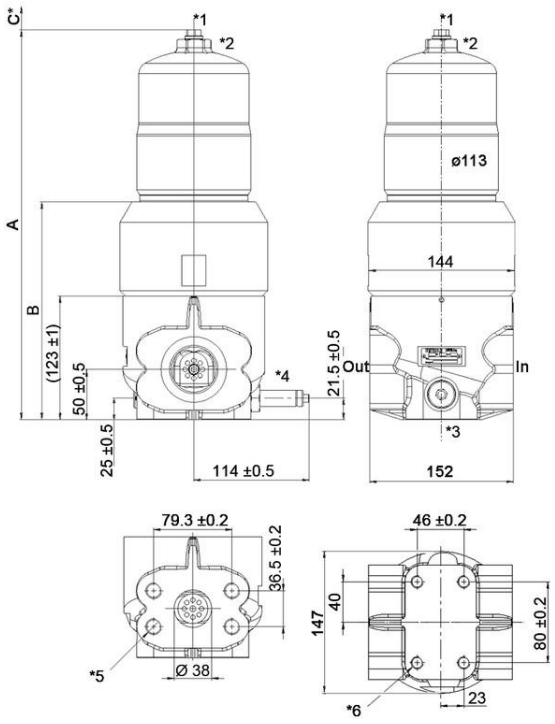
Design:	in-line filter
Nominal pressure:	315 bar (4570 psi)
Test pressure:	410 bar (5940 psi)
Temperature range:	-10 °C to +120 °C
	(other temperature ranges on request)
Bypass setting:	Δ p 7 bar ± 10 %
Filter head material:	GGG
Filter housing material:	St
Sealing material:	NBR/PTFE/Cu
Maintenance indicator setting:	Δ p 5 bar ± 10 %
Electrical data of maintenance indicator:	
Maximum voltage:	250 V AC/200 V DC
Maximum current:	1 A
Contact load:	70 W
Type of protection:	IP 65 in inserted and secured status
Contact:	normally open/closed
Cable sleave:	M20x1.5

The switching function can be changed by turning the electric upper part by 180° (normally closed contact or normally open contact). The state on delivery is a normally closed contact. By inductivity in the direct current circuit the use of suitable protection circuit should be considered. Further maintenance indicator details and designs are available in the maintenance indicator data sheet.

We draw attention to the fact that all values indicated are average values and not not always occur in specific cases of application. Our products are continually being further developed. Values, dimensions and weights can change as a result of this. Our specialized department will be pleased to offer you advice.

We recommend to contact us concerning applications of our filters in areas governed by the EU Directive 94/9 EG (ATEX 95). The standard version can be used for liquids based on mineral oil (corresponding to the fluids in Group 2 of Directive 97/23 EG Article 9). If you consider to use other fluids please contact us for additional support.

Subject to technical alteration without prior notice.



DN 38 according to SAE 1½" 6000 psi
Flanges, bolts, o-rings not included in delivery!

C* = Minimum clearence
In = Inlet
Out = Outlet
*1 = Venting G¼
*2 = SW 30
*3 = Drain G½
*4 = Visual maintenance indicator
*5 = Mounting holes SAE flange 4x M16, 20 mm depth
*6 = Mounting holes 4x M12, 17 mm depth

9. Dimensions

All dimensions except connection "G..." in mm.

Typ	Connection	A ±5	B ±2	C
Pi 423016	G1½	299	-	180
Pi 423016 FL	DN 38			
Pi 423025	G1½	386	224	180
Pi 423025 FL	DN 38			
Pi 423040	G1½	538	376	300
Pi 423040 FL	DN 38			

10. Installation, operating and maintenance instructions

10.1 Filter installation

When installing the filter make sure that sufficient space is available to remove filter element and filter housingl. Preferably the filter should be installed with the filter housing pointing upwards. The maintenance indicator must be visible.

10.2 Connecting the electrical maintenance indicator

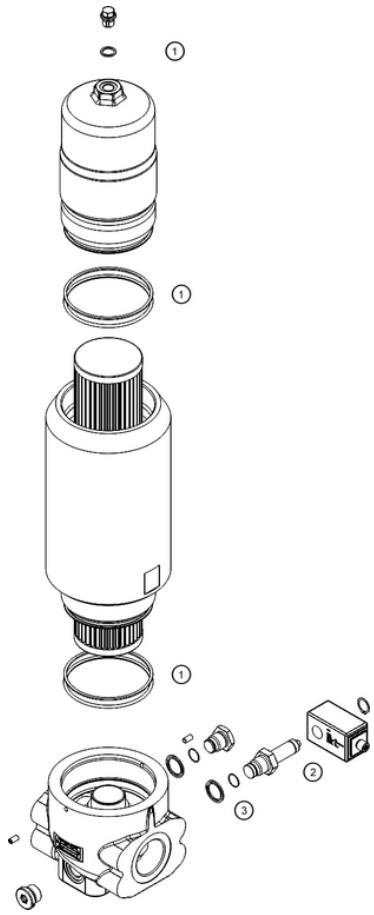
The electrical indicator is connected via a 2-pole appliance plug according to DIN EN 175301-803 with poles marked 1 and 2.
The electrical section can be inverted to change from normally open position to normally closed position or vice versa.

10.3 When should the filter element be replaced?

1. Filters equipped with visual and electrical maintenance indicator:
   During cold starts, the indicator may give a warning signal. Press the red button of the visual indicator once again only after operating temperature has been reached. If the red button immediately pops up again and/or the electrical signal has not switched off after reaching operating temperature, the filter element must be replaced after the end of the shift.
2. Filters without maintenance indicator:
   The filter element should be replaced after the trial run or flushing of the system. Afterwards follow instructions of the manufacturer.
3. Please always ensure that you have original Filtration Group spare
   elements in stock: Disposable elements (PS) cannot be cleaned.

10.4 Element replacement

1. Stop system and relieve filter from pressure.
2. Remove vent and drain plug and empty the filter housing.
3. Unscrew the filter housing by turning counter-clockwise. Clean the housing using a suitable cleaning solvent.
4. Remove element by pulling up carefully.
5. Check o-ring and spigot for damage. Replace, if necessary.
6. Make sure that the order number on the spare element corresponds to the order number of the filter name-plate. To ensure no contamination occurs during the exchange of the element first open the plastic bag and push the element over the spigot in the filter head. Now remove plastic bag.
7. Oil the threads of the filter housing a little bit and screw into the filter head. Maximum tightening torque for NG 50 to 110 = 60 Nm, for NG 150 to 450 = 100 Nm.
8. Check seals of vent and drain plug - if necessary, please replace. Vent the filter housing in pressureless status.
   Torque vent plug 30 Nm.
   Torque drain plug 110 Nm.



11. Spare parts list

Order numbers for spare parts		
Position	**Type**	**Order number**
①	Seal kit	
	NBR	70382630
	FPM	70382632
	EPDM	70382634
②	Maintenance indicator	
	Visual PiS 3093/5	77669914
	Electrical PiS 3092/5	77669864
	Electrical upper section only	77536550
③	Seal kit for maintenance indicator	
	NBR	77760275
	FPM	77760283
	EPDM	77760291

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Duplex Filter
Pi 210

Nominal pressure 32/63 bar (460/900 psi), nominal size up to 600

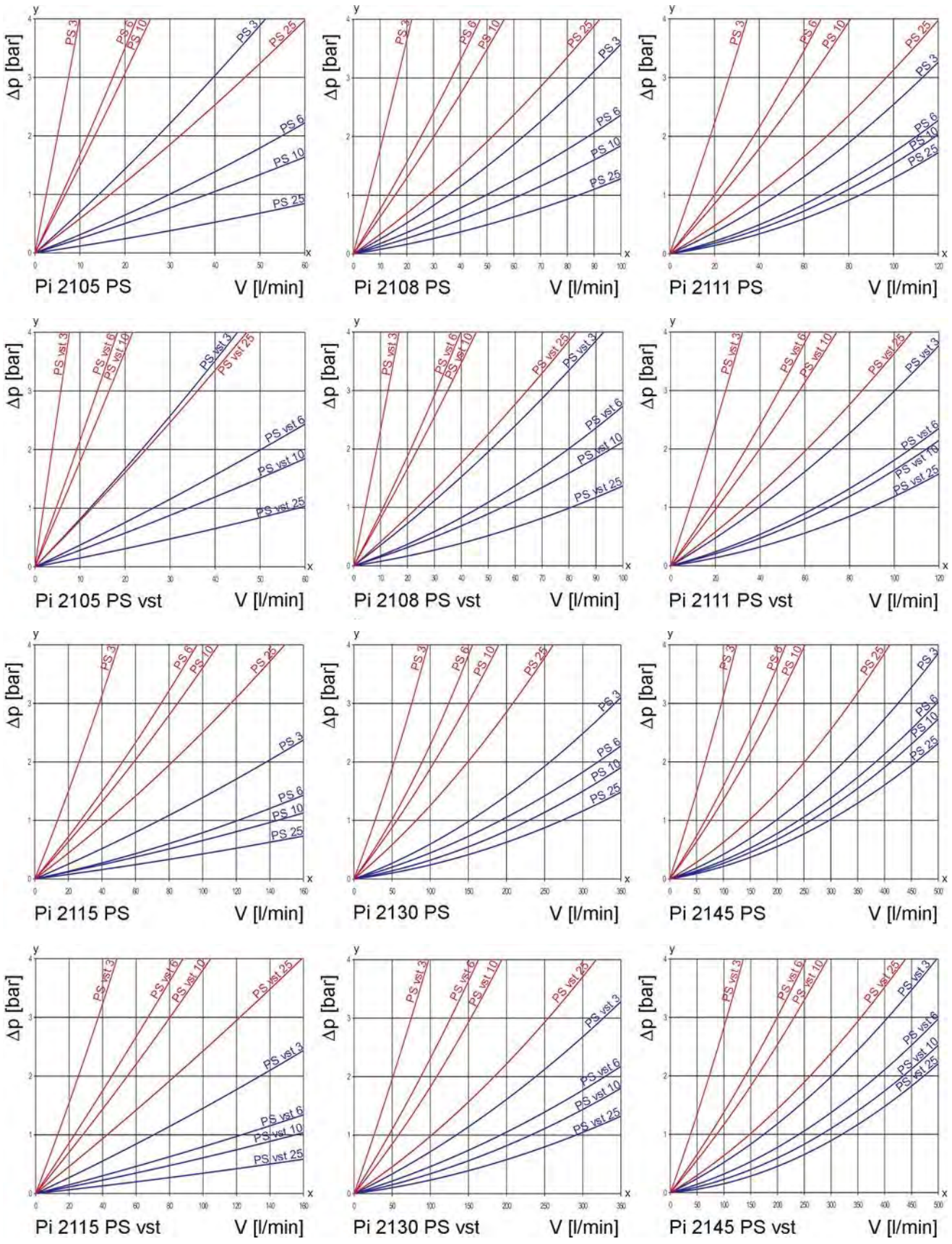
1. Features

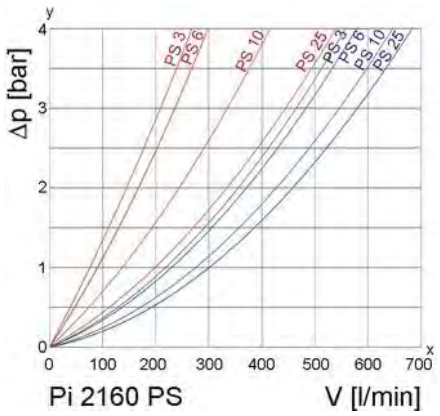
High performance filters for modern hydraulic systems

- Modular system
- Compact design
- Minimal pressure drop through optimal flow design
- Visual/electrical/electronic maintenance indicator
- Threaded connections
- Change over valve on upstream side
- Ergonomic switch-over handle with safety lock and pressure compensation
- User-optimized one-hand-operation
- Equipped with highly efficient glass fibre PS filter elements
- Beta rated elements according to ISO 16889 multipass test
- Elements with high differential pressure stability and dirt holding capacity
- Other connections on request
- Worldwide distribution

2. Flow rate/pressure drop curve complete filter

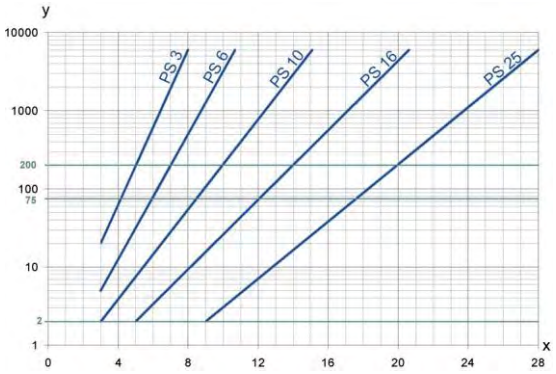
190 mm²/s
33 mm²/s





y = differential pressure Δ p [bar]
x = flow rate V [l/min]

3. Separation grade characteristics



y = beta-value
x = particle size [µm]

determined by multipass tests (ISO 16889)
calibration according to (NIST)

4. Filter performance data

tested according to ISO 16889 (multipass test)

PS elements with
max. Δ p 20 bar

PS	3	$\beta_{5(C)}$	≥	200
PS	6	$\beta_{7(C)}$	≥	200
PS	10	$\beta_{10(C)}$	≥	200
PS	25	$\beta_{20(C)}$	≥	200

values guaranteed up to
10 bar differential pressure

PS vst elements with
max. Δ p 210 bar

PS vst	3	$\beta_{5(C)}$	≥	200
PS vst	6	$\beta_{7(C)}$	≥	200
PS vst	10	$\beta_{10(C)}$	≥	200
PS vst	25	$\beta_{20(C)}$	≥	200

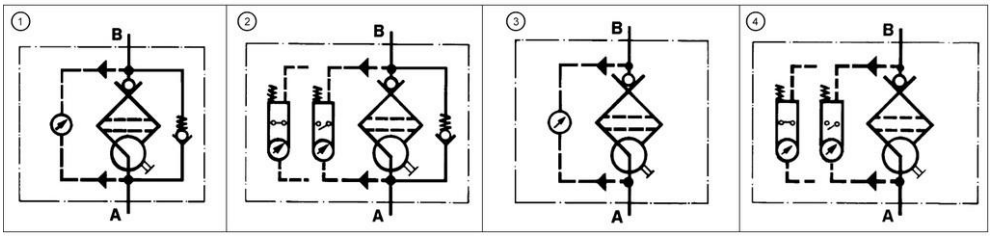
values guaranteed up to
20 bar differential pressure

5. Quality assurance

Filtration Group filters and filter elements are produced according to the following international standards:

Norm	Designation
DIN ISO 2941	Hydraulic fluid power filter elements; verification of collapse/burst resistance
DIN ISO 2942	Hydraulic fluid power filter elements; verification of fabrication integrity
DIN ISO 2943	Hydraulic fluid power filter elements; verification of material compatibility with fluids
DIN ISO 3723	Hydraulic fluid power filter elements; method for end load test
DIN ISO 3724	Hydraulic fluid power filter elements; verification of flow fatigue characteristics
ISO 3968	Hydraulic fluid power-filters-evaluation of pressure drop versus flow characteristics
ISO 10771.1	Fatigue pressure testing of metal containing envelopes in hydraulic fluid applications
ISO 16889	Hydraulic fluid power filters-multipass method for evaluation filtration performance of a filter element

6. Symbols



7. Order numbers

Example for ordering filters:

1. Housing design	2. Filter element
V = 80 l/min and visual/electrical indicator Type: Pi 2108-069 Order number: 77810286	PS vst 3 Type: Pi 2208 PS vst 3 Order number: 77680200

7.1 Housing design

Nominal size NG [l/min]	Order number	Type	① with bypass valve and visual indicator	② with bypass valve and electrical indicator	③ with visual indicator	④ with electrical indicator
50	77810211	Pi 2105-057	■			
	77810229	Pi 2105-058		■		
	77810237	Pi 2105-068			■	
	77810245	Pi 2105-069				■
80	77810252	Pi 2108-057	■			
	77810260	Pi 2108-058		■		
	77810278	Pi 2108-068			■	
	77810286	Pi 2108-069				■
110	78204083	Pi 2111-057	■			
	78204091	Pi 2111-058		■		
	78204109	Pi 2111-068			■	
	78204117	Pi 2111-069				■
150	77774573	Pi 2115-057	■			
	77774565	Pi 2115-058		■		
	77774557	Pi 2115-068			■	
	77774540	Pi 2115-069				■
300	77774532	Pi 2130-057	■			
	77774524	Pi 2130-058		■		
	77774516	Pi 2130-068			■	
	77774508	Pi 2130-069				■
450	77774490	Pi 2145-057	■			
	77774482	Pi 2145-058		■		
	77774474	Pi 2145-068			■	
	77774466	Pi 2145-069				■
600	70574769	Pi 2160-057	■			
	70574768	Pi 2160-058		■		
	70574767	Pi 2160-068			■	
	70574766	Pi 2160-069				■

When filter with non bypass configuration is selected, the collapse pressure of the element must not be exceeded.

7.2 Filter elements*					
Nominal size NG [l/min]	Order number	Type	Filter material	max. Δp [bar]	Filter surface [cm²]
50	77680135	Pi 2105 PS 3	PS 3	20	590
	77943509	Pi 5105 PS 6	PS 6		590
	77680325	Pi 3105 PS 10	PS 10		590
	77680440	Pi 4105 PS 25	PS 25		590
	77680192	Pi 2205 PS vst 3	PS vst 3	210	425
	77943533	Pi 5205 PS vst 6	PS vst 6		425
	77680382	Pi 3205 PS vst 10	PS vst 10		425
	77680507	Pi 4205 PS vst 25	PS vst 25		425
80	77680143	Pi 2108 PS 3	PS 3	20	1150
	77943517	Pi 5108 PS 6	PS 6		1150
	77680341	Pi 3108 PS 10	PS 10		1150
	77680457	Pi 4108 PS 25	PS 25		1150
	77680200	Pi 2208 PS vst 3	PS vst 3	210	850
	77943541	Pi 5208 PS vst 6	PS vst 6		850
	77681190	Pi 3208 PS vst 10	PS vst 10		850
	77680515	Pi 4208 PS vst 25	PS vst 25		850
110	77680150	Pi 2111 PS 3	PS 3	20	1700
	77943525	Pi 5111 PS 6	PS 6		1700
	77680333	Pi 3111 PS 10	PS 10		1700
	77680465	Pi 4111 PS 25	PS 25		1700
	77680218	Pi 2211 PS vst 3	PS vst 3	210	1275
	77943558	Pi 5211 PS vst 6	PS vst 6		1275
	77680390	Pi 3211 PS vst 10	PS vst 10		1275
	77680523	Pi 4211 PS vst 25	PS vst 25		1275
150	77680168	Pi 2115 PS 3	PS 3	20	2425
	77955099	Pi 5115 PS 6	PS 6		2425
	77680358	Pi 3115 PS 10	PS 10		2425
	77680473	Pi 4115 PS 25	PS 25		2425
	77680226	Pi 2215 PS vst 3	PS vst 3	210	2010
	77955123	Pi 5215 PS vst 6	PS vst 6		2010
	77680408	Pi 3215 PS vst 10	PS vst 10		2010
	77680531	Pi 4215 PS vst 25	PS vst 25		2010
300	77680176	Pi 2130 PS 3	PS 3	20	4620
	77955107	Pi 5130 PS 6	PS 6		4620
	77680366	Pi 3130 PS 10	PS 10		4620
	77680481	Pi 4130 PS 25	PS 25		4620
	77680234	Pi 2230 PS vst 3	PS vst 3	210	3800
	77955131	Pi 5230 PS vst 6	PS vst 6		3800
	77680416	Pi 3230 PS vst 10	PS vst 10		3800
	77680549	Pi 4230 PS vst 25	PS vst 25		3800
450	77680184	Pi 2145 PS 3	PS 3	20	6865
	77955115	Pi 5145 PS 6	PS 6		6865
	77680374	Pi 3145 PS 10	PS 10		6865
	77680499	Pi 4145 PS 25	PS 25		6865
	77680242	Pi 2245 PS vst 3	PS vst 3	210	5600
	77955149	Pi 5245 PS vst 6	PS vst 6		5600
	77680424	Pi 3245 PS vst 10	PS vst 10		5600
	77680556	Pi 4245 PS vst 25	PS vst 25		5600

*a wider range of element types is availble on request

7.2 Filter elements*					
Nominal size NG [l/min]	**Order number**	**Type**	**Filter material**	**max. Δp [bar]**	**Filter surface [cm²]**
600	70346506	Pi 2160 PS 3	PS 3	**20**	9398
	76114318	Pi 5160 PS 6	PS 6		9398
	79393380	Pi 3160 PS 10	PS 10		9398
	79748047	Pi 4160 PS 25	PS 25		9398

*a wider range of element types is availble on request

8. Technical specifications

Design:	line mounting filter
Nominal pressure:	
Pi 2105 - Pi 2111	10^7 load changes 63 bar (900 psi)
Pi 2115 - Pi 2160	10^7 load changes 25 bar (360 psi) 2x 10^6 load changes 32 bar (460 psi)
Test pressure:	
Pi 2105 - Pi 2111	95 bar (1370 psi)
Pi 2115 - Pi 2160	48 bar (690 psi)
Temperature range:	-10 °C to +120 °C survival temperature -40 C (other temperature ranges on request)
Bypass setting:	Δ p 3.5 bar ± 10
Filter head material:	GAL
Filter housing material:	AL/St
Sealing material:	NBR/AL
Maintenance indicator setting:	Δ p 2.2 bar ± 10 %
Electrical data of maintenance indicator:	
Max. voltage:	250 V AC/200 V DC
Max. current:	1 A
Contact load:	70 W
Type of protection:	IP 65 in inserted and secured status
Contact:	normally open/closed
Cable connection:	M20x1.5

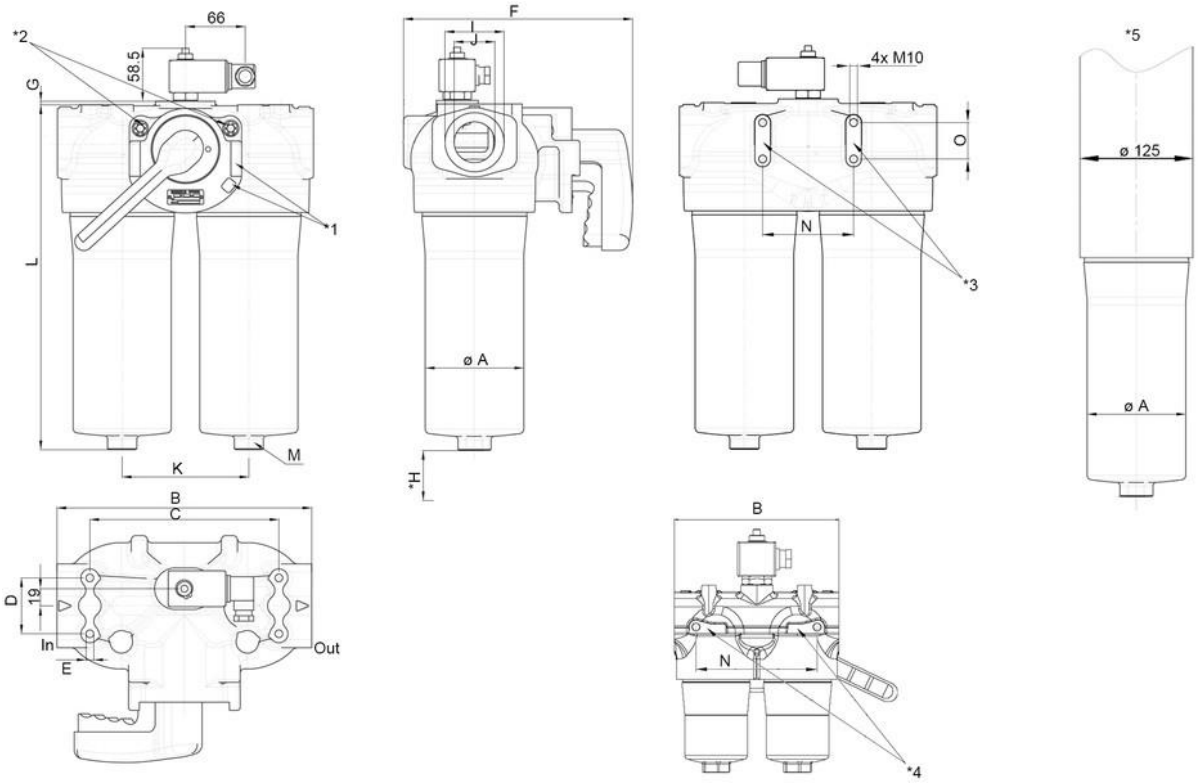
The switching function can be changed by turning the electric upper part by 180° (normally closed contact or normally open contact). The state on delivery is a normally closed contact. By inductivity in the direct current circuit the use of suitable protection circuit should be considered. Further maintenance indicator details and designs are available in the maintenance indicator data sheet.

We draw attention to the fact that all values indicated are average values which do not always occur in specific cases of application. Our products are continually being further developed. Values, dimensions and weights can change as a result of this. Our specialized department will be pleased to offer you advice.

We recommend to contact us concerning applications of our filters in areas governed by the EU Directive 94/9 EC (ATEX 95). The standard version can be used for liquids based on mineral oil (corresponding to the fluids in Goup 2 of Directive 97/23 EC Article 9). If you consider to use other fluids please contact us for additional support.

Subject to technical alteration without prior notice.

9. Dimensions



In Inlet
Out Outlet
*H Minimum clearance required for element change
*1 Lever locking and arresting
*2 Venting screws
*3 Optional fixing for NG 150 to 600 (WB version)
*4 Optional fixing for NG 50 to 110 (WB version)
*5 Housing version NG 600

All dimensions except "J" in mm

Type	øA	B	C	D	E	F	G	H
Pi 2105	66	172	100	52	M8x16	189	-	80
Pi 2108	66	172	100	52	M8x16	189	-	80
Pi 2111	66	172	100	52	M8x16	189	-	80
Pi 2115	109	283	210	62	M10x20	252	4	110
Pi 2130	109	283	210	62	M10x20	252	4	110
Pi 2145	109	283	210	62	M10x20	252	4	110
Pi 2160	109	283	210	62	M10x20	252	4	110

Type	øI	J*	K	L**	M SW	N	O	Wt. [kg]
Pi 2105	47	G1	85	195.5	27	128	-	2.60
Pi 2108	47	G1	85	272.5	27	128	-	2.90
Pi 2111	47	G1	85	352.0	27	128	-	3.30
Pi 2115	65	G1½	140	264.0	32	100	40	8.50
Pi 2130	65	G1½	140	381.0	32	100	40	950
Pi 2145	65	G1½	140	501.0	32	100	40	17.25
Pi 2160	65	G1½	140	637.0	32	100	40	15.50

* SAE flange connections (3000 psi), NPT and SAE connections on request
** Not shown drain screw at NG 450 and NG 600 is part of dimension "L"

10. Installation, operating and maintenance instructions

10.1 Filter installation

When installing the filter make sure that sufficient space is available to remove filter element and filter housing. Preferably the filter should be installed with the filter housing pointing downwards. The maintenance indicator must be visible.

10.2 Connecting the electrical maintenance indicator

The electrical indicator is connected via a 2-pole appliance plug according to DIN EN 175301-803 with poles marked 1 and 2.
The electrical section can be inverted to change from normally open position to normally closed position or vice versa.
The state on delivery is a normally closed contact
.

10.3 When should the filter element be replaced?

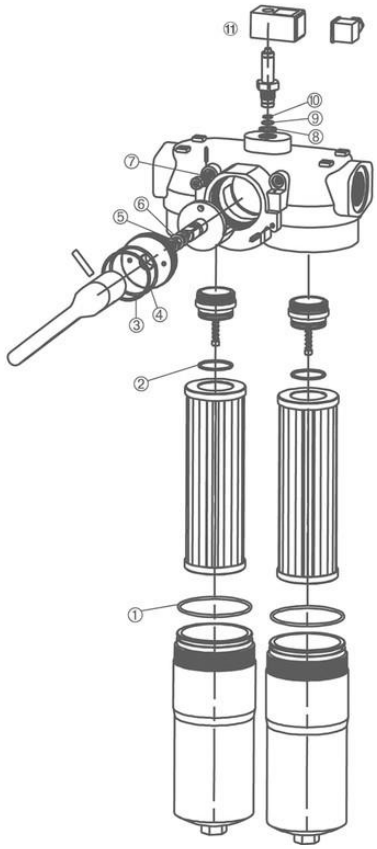
1 . Filters equipped with visual and electrical maintenance indicator:
   During cold starts, the indicator may give a warning signal. Press the red button of the visual indicator once again only after operating temperature has been reached. If the red button immediately pops up again and/or the electrical signal has not switched off after reaching operating temperature, the filter element must be replaced after the end of the shift.
2 . Please always ensure that you have original Filtration Group spare elements in stock: Disposable elements cannot be cleaned.

10.4 Element replacement

Note: Elements may only be replaced by people who are familiar with the function of the filter. When replacing elements, appropriate safety clothing (protective goggles, gloves, safety shoes) must be worn.
Note: The maintenance indicator monitors the filter side in operation, which is identified by the position of the switching lever catch. The change-over transfer valve must be switched prior filter servicing. Now the signal of the maintenance indicators cancelled and the red button can be repressed again.

1 . Operate and hold pressure equalizing lever located behind switching lever. Pull catch knob and swivel switching lever. Engage the catch on the clear filter side. Place through or drip pan underneath to collect leaving oil.
2 . Loosen vent screw of the filter side not in use by 2-3 turns; max. until contact is made with the safety stop.
3 . Unscrew filter housing by rotating same counter-clockwise and clean with a suitable medium.
   Warning: The shift lever may not, from now until the screwing back in of the filter housing (7.), be activated under any circumstances!
4 . Remove filter element with a side-to-side motion.
5 . Check O-ring on the filter house for damage. Replace, if necessary.
6 . Make sure that the order number on the spare element corresponds to the oder number of the filter name-plate.
7 . Lightly lubricate the threads of the filter housing and screw into the filter head. Maximum tightening torque for NG 50 to 110 = 30 Nm, for NG 150 to 600 = 50 Nm.
8 . To refill the filter chamber, operate only the pressure equalizing lever (leave the switching lever arrested in its catch) long enough for the medium to emerge bubble- free from the vent bore.
9 . Tighten vent screw. Check filter for leaks by operating the pressure equalizing lever once again.

11. Spare parts list



Order number for spare parts		
Position	**Type**	**Order number**
① - ⑦	Seal kit for housing	
	Pi 2105 - Pi 2111	
	NBR	79761271
	FPM	79761289
	EPDM	79761297
	Pi 2115 - Pi 2160	
	NBR	79761230
	FPM	79761248
	EPDM	79761255
⑧ - ⑩	Seal kit for maintenance indicator	
	NBR	77760309
	FPM	77760317
	EPDM	77760325
⑪	Maintenance indicator	
	Visual PiS 3098/2.2	77669971
	Electrical PiS 3097/2.2	77669948
	Electrical upper section only	77536550

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78356552.06/2019

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Duplex Filter
Pi 211

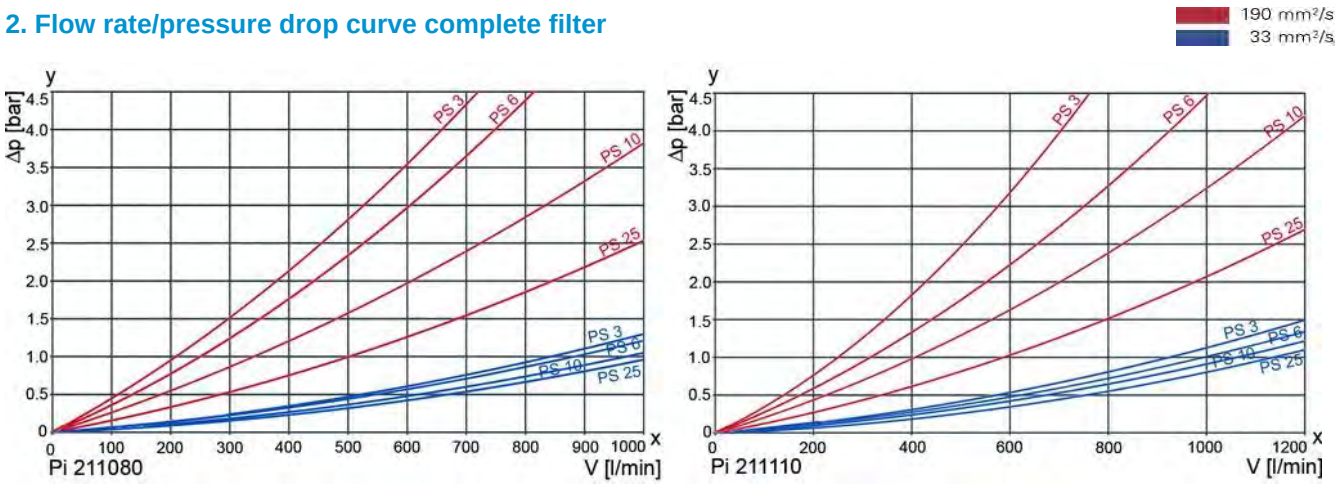
Nominal pressure 40 bar (570 psi), nominal size 800 and 1100

1. Features

High performance filters for modern hydraulic systems

- Modular system
- Compact design
- Minimal pressure drop through optimal flow design
- Visual/electrical/electronic maintenance indicator
- Flanged connections
- Quality filters, easy to service
- Equipped with highly efficient glass fibre PS filter elements
- Beta rated elements according to ISO 16889 multipass test
- Elements with high differential pressure stability and dirt holding capacity
- Worldwide distribution

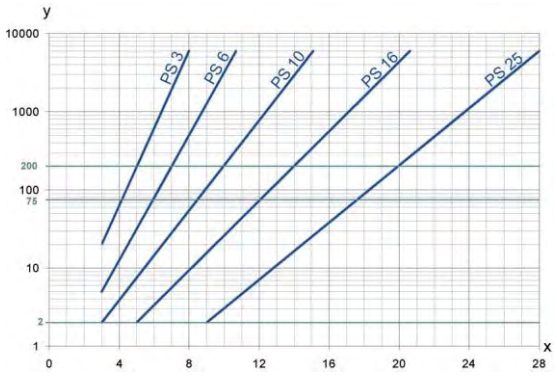
2. Flow rate/pressure drop curve complete filter



y = differential pressure Δp [bar]

x = flow rate V [l/min]

3. Separation grade characteristics



y = beta-value
x = partcle size [µm]

determined by multipass tests (ISO 16889)
calibration according to ISO 11171 (NIST)

4. Filter performance data

tested according to ISO 16889 (multipass test)

PS elements with
max. Δ p 20 bar

PS	3	$\beta_{5(C)}$	≥ 200
PS	6	$\beta_{7(C)}$	≥ 200
PS	10	$\beta_{10(C)}$	≥ 200
PS	25	$\beta_{20(C)}$	≥ 200

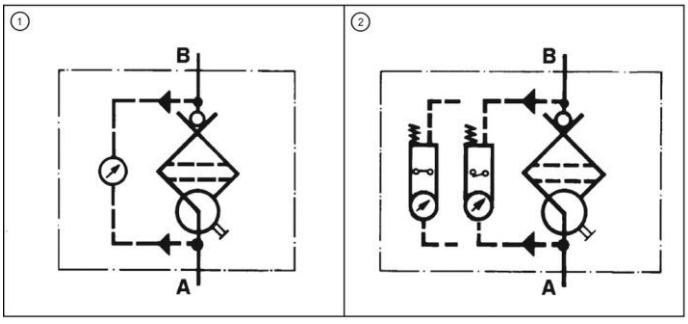
values guaranteed up to
10 bar differential pressure

5. Quality assurance

Filtration Group filters and filter elements are produced according to the following international standards:

Norm	Designation
DIN ISO 2941	Hydraulic fluid power filter elements; verification of collapse/burst resistance
DIN ISO 2942	Hydraulic fluid power filter elements, verification of fabrication integrity
DIN ISO 2943	Hydraulic fluid power filter elements, verification of material compatibility with fluids
DIN ISO 3723	Hydraulic fluid power filter elements, methods for end load test
DIN ISO 3724	Hydraulic fluid power filter elements, verification of flow fatigue charactersitics
ISO 3968	Hydraulic fluid power filters; evaluation of pressure drop versus flow characteristics
ISO 10771.1	Fatigue pressure testing of metal containing envelopes in hydraulic fluid applications
ISO 16889	Hydraulic fluid power filters; multipass method for evaluation filtration performance of a filter element

6. Symbols



7. Order numbers

Example for ordering filters:

1. Housing design	2. 2x Filter element with bypass
V = 800 l/min and visual/electrical maintenance indicator Type: Pi 211080-069 Order number: 70514415	PS 25 Type: 852 094 PS 25/V3.5 Order number: 70514489

7.1 Housing design

Nominal size NG	Order number	Type	③ with visual indicator	④ with electrical indicator
800	70514414	Pi 211080-068		
	70514415	Pi 211080-069		
1100	70514410	Pi 211110-068		
	70514411	Pi 211110-069		

If bypass is requested, it can be realized with appropriate filter element.

7.2 Filter elements*

Nominal size NG [l/min]	Order number	Type	Filter material	max. Δp [bar]	Filterfläche [cm²]
800 without bypass	70527011	852 094 PS 3	PS 3	20	31200
	70527014	852 094 PS 6	PS 6		
	70527016	852 094 PS 10	PS 10		
	70527019	852 094 PS 25	PS 25		
800 with bypass	70514474	852 094 PS 3/V3.5	PS 3		
	70514480	852 094 PS 6/V3.5	PS 6		
	70514484	852 094 PS 10/V3.5	PS 10		
	70514489	852 094 PS 25/V3.5	PS 25		
1100 without bypass	70527061	852 095 PS 3	PS 3	20	39690
	70527064	852 095 PS 6	PS 6		
	70527082	852 095 PS 10	PS 10		
	70527085	852 095 PS 25	PS 25		
1100 with bypass	70514577	852 095 PS 3/V3.5	PS 3		
	70514580	852 095 PS 6/V3.5	PS 6		
	70514582	852 095 PS 10/V3.5	PS 10		
	70514586	852 095 PS 25/V3.5	PS 25		

* A wider range of element types is available on request.

8. Technical specifications

Design:	line mounting filter
Nominal pressure:	10^7 load changes 40 bar (570 psi)
Test pressure:	60 bar (850 psi)
Temperature range:	-10 °C to +120 °C (other temperature ranges on request)
	Minimum viscosity of the fluid: 10 mm²/s (if viscosity of the fluid < 10 mm²/s on request)
Bypass Setting (in the element):	Δ p 3.5 bar ± 10 %
Filter head material:	GGG
Filter housing material:	St
Filter cover material:	GGG
Sealing material:	NBR
Maintenance indicator setting:	Δ p 2.2 bar ± 0.3 bar
Electrical data of maintenance indicator:	
Max. voltage:	250 V AC/200 V DC
Max. current:	1 A
Contact load:	70 W
Type of protection:	IP 65 in inserted and secured status
Contact:	normally open/closed
Cable sleave:	M20x1.5

The switching function can be changed by turning the electric upper part by 180° (normally closed contact or normally open contact). The state on delivery is a normally closed contact. By inductivity in the direct current circuit the use of suitable protection circuit should be considered. Further maintenance indicator details and designs are available in the maintenance indicator data sheet.

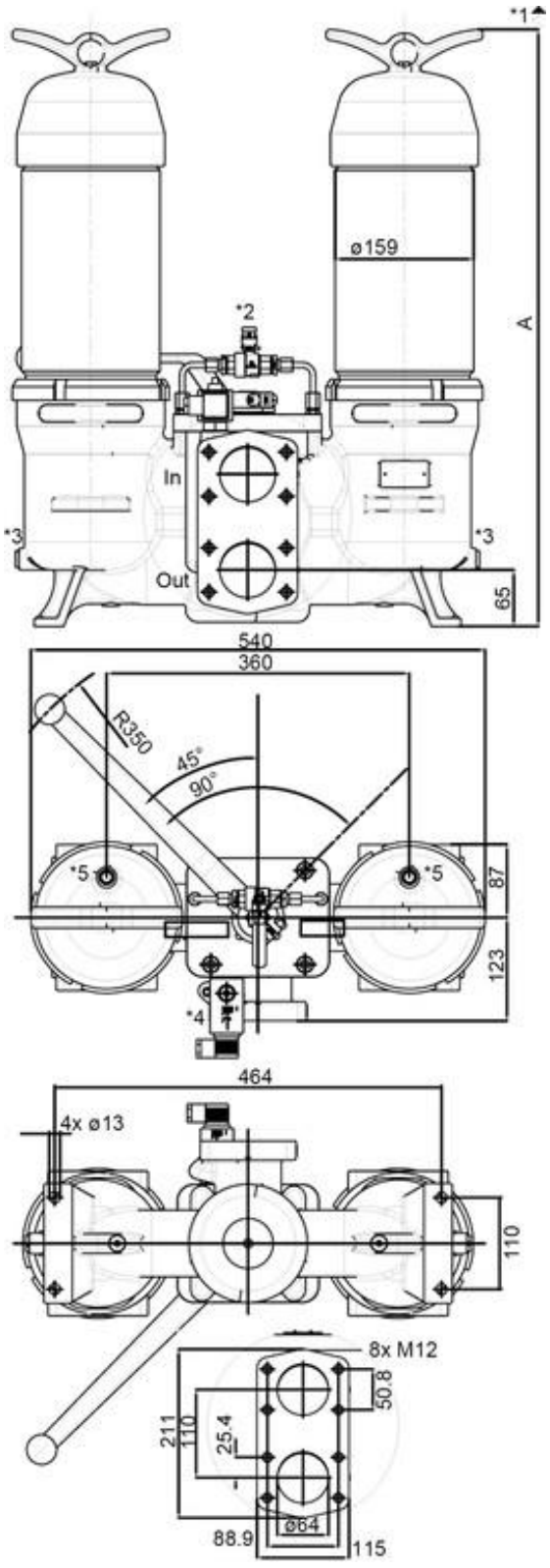
We draw attention to the fact that all values indicated are average values which do not always occur in specific cases of application. Our products are continually being further developed. Values, dimensions and weights can change as a result of this. Our specialized department will be pleased to offer you advice.

We recommend you to contact us concerning applications of our filters in areas governed by the EU Directive 94/9 EC (ATEX 95). The standard version can be used for liquids based on mineral oil (corresponding to the fluids in Group 2 of Directive 97/23 EC Article 9). If you consider to use other fluids please contact us for additional support.

Subject to technical alteration without prior notice.

In = Inlet
Out = Outlet
*1 Clearance B
*2 Pressure equalization valve
*3 Drain screw G¼
*4 Maintenance indicator
*5 Vent screw

DN64 according to SAE2½" 3000 psi



9. Dimensions

All dimensions in mm.

Type	Connection	A	B	Weight [kg]
Pi 211080	DN 64	1200	785	150
Pi 211110	DN 64	1465	1085	180

10. Installation, operating and maintenance instructions

10.1 Filter installation

When installing the filter make sure that sufficient space is available to remove filter element.

The maintenance indicator (*4) must be visible.

10.2 Connecting the electrical maintenance indicator

The electrical indicator is connected via a 2-pole appliance plug according to DIN EN 175301-803 with poles marked 1 and 2. The electrical section can be inverted to change from normally open to normally closed position or vice versa.

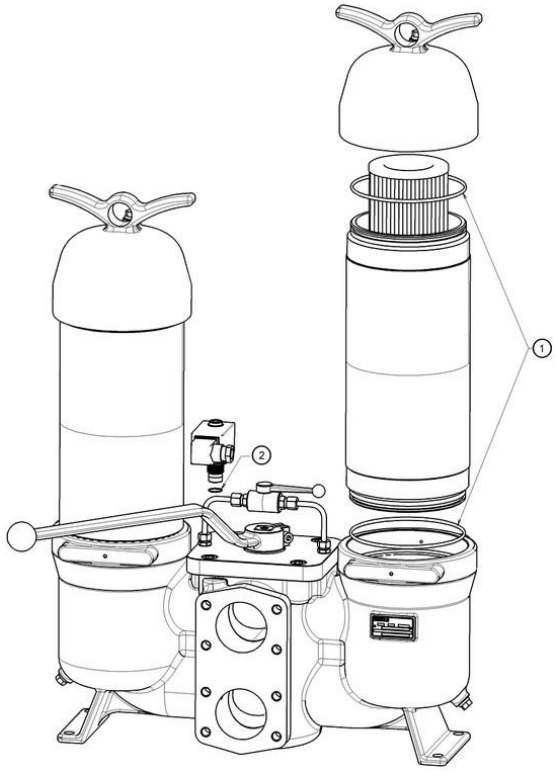
10.3 When should the filter element be replaced?

1 . Filters equipped with visual and electrical maintenance indicator (*4) :
   During cold starts, the indicator may give a warning signal. Press the red button of the visual indicator once again only after operating temperature has been reached. If the red button immediately pops up again and/or the electrical signal has not switched off after reaching operating temperature the filter element must be replaced after the end of the shift.
2 . Filters without maintenance indicator:
   The filter element should be replaced after the trial run or flushing of the system. Afterwards follow instructions of the manufacturer.
3 . Please always ensure that you have original Filtration Group spare elements in stock: disposable elements (PS) cannot be cleaned.

10.4 Element replacement

Note: The maintenance indicator (*4) monitors the filter side in operation, which is identified by the position of the switching lever catch. The change-over transfer valve must be switched prior filter servicing. Now the signal of the maintenance indicators cancelled and the red button can be repressed again.

1 . Operate and hold pressure equalizing lever (*2) located behind switching lever. Pull catch knob and swivel switching lever. Place through or drip pan underneath to collect leaving oil. Close pressure equalization valve.
2 . Loosen vent screw (*5) of the filter side not in use by 2-3 turns; max. until contact is made with the safety stop.
3 . Remove drain plug (*3) in housing bottom and drain oil.
4 . Unscrew filter cover counter-clockwise.
5 . Lift out filter element.
6 . Check seal on filter cover. We recommend replacement in any case.
7 . Make sure that the order number on the spare element corresponds to the order number of the filter name-plate. To ensure no contamination occurs during the exchange of the element first open the plastic bag and push the element over the spigot in the filter head. Now remove plastic bag.
8 . Push the element carefully over the spigot and tight cover until full stop. Back off the cover 1/8 turn.
9 . Tighten drain plug (*3) housing bottom.
10 . To refill the filter chamber, operate only the pressure equalizing Lever (*2), until fluid emerges bubble-free from the drain cavity.
11 . Tight vent screw (*5). Check vent screw (*5) for leckage by actuating the equalizing Lever (*2) again.



11. Spare parts list

Order numbers for spare parts		
Position	**Type**	**Order number**
①	Seal kit for housing	
	NBR	70318468
	FPM	70318469
	EPDM	70318471
	Maintenance indicator	
	Visual PiS 3098/2,2	77669971
	Visual/electrical PiS 3097/2,2	77669948
	Electrical upper section only	77536550
②	Seal kit for maintenance indicator	
	NBR	77760309
	FPM	77760317
	EPDM	77760325

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70514619.06/2019

Duplex Filter
Pi 21430

Nominal pressure 100 bar (1452 psi)/160 bar (2320 psi), nominal size 300

1. Features

High performance filters for modern lubrication and hydraulic systems

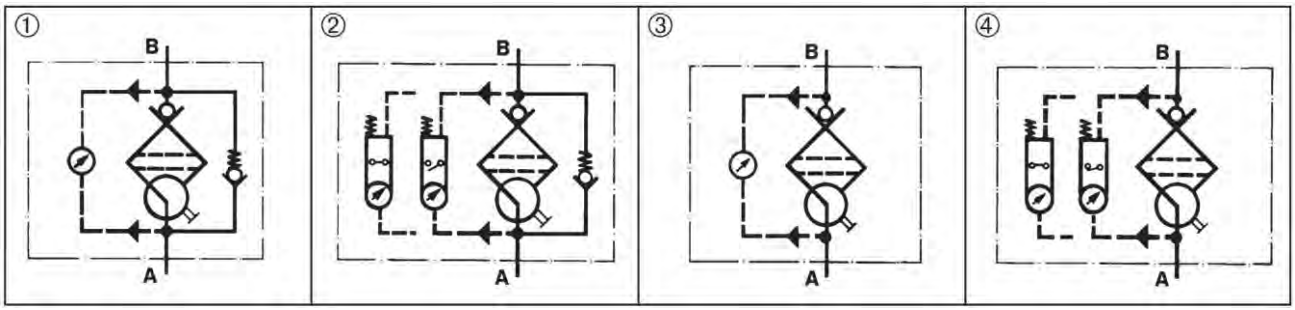
- Modular system
- Compact design
- Minimal pressure drop through optimal flow design
- Visual/electrical/electronic maintenance indicator
- Threaded and SAE-flange connections
- Change over valve on upstream side
- Ergonomic switch-over handle with saftey lock and pressure compensation
- User-optimized one-hand-operation
- Equipped with highly efficient Drg filter elements
- Beta rated elements according to ISO 16889 multipass test
- Elements with high differential pressure stability and dirt holding capacity
- NPT- and SAE-connections on request
- Worldwide distribution

2. Quality assurance

Filtration Group filters and filter elements are produced according to the following international standards:

Norm	Designation
DIN ISO 2941	Hydraulic fluid power filter elements; verification of collapse/burst pressure
DIN ISO 2942	Hydraulic fluid power filter elements; verification of fabrication integrity
DIN ISO 2943	Hydraulic fluid power filter elements; verification of material compatibility with fluids
DIN ISO 3723	Hydraulic fluid power filter elements; method for end load test
DIN ISO 3724	Hydraulic fluid power filter elements; verification of flow fatigue characteristics
ISO 3968	Hydraulic fluid power-filters-evaluation of pressure drop versus flow characteristics
ISO 10771.1	Fatigue pressure testing of metal containing envelopes in hydraulic fluid applications
ISO 16889	Hydraulic fluid power filters; multipass method for evaluation filtration performance of a filter element

3. Symbols



4. Order numbers

Example for ordering filters:

1. Filter housing	2. 2x Filter element
V = 300 l/min and electrical maintenance indicator Type: Pi 21430-069 Order number: 72464324	Drg 40 Type: Pi 8330 Drg 40 Order number: 77718802

4.1 Housing design

Nominal size NG [l/min]	Order number	Type	① with bypass valve and visual indicator	② with bypass valve and electrical indicator	③ with visual indicator	④ with electrical indicator
300	72464319	Pi 21430-057	■			
	72464320	Pi 21430-058		■		
	72464321	Pi 21430-068			■	
	72464324	Pi 21430-069				■
	72464325	Pi 21430-057 FKM	■			
	72464326	Pi 21430-058 FKM		■		
	72464327	Pi 21430-068 FKM			■	
	72464329	Pi 21430-069 FKM				■
	72464332	Pi 21430-057 FL	■			
	72464333	Pi 21430-058 FL		■		
	72464334	Pi 21430-068 FL			■	
	72464335	Pi 21430-069 FL				■
	72464336	Pi 21430-057 FL FKM	■			
	72464337	Pi 21430-058 FL FKM		■		
	72464338	Pi 21430-068 FL FKM			■	
	72464339	Pi 21430-069 FL FKM				■

When filter with non bypass configuration is selected, the collapse pressure of the element must not be exceeded.

4.2 Filter elements*					
Nominal size NG [l/min]	**Order number**	**Type**	**Filter material**	**max. Δp [bar]**	**Filter surface [cm²]**
300	77718810	Pi 8130 Drg 10	Drg 10	**20**	4280
	77680952	Pi 8230 Drg 25	Drg 25		4280
	77718802	Pi 8330 Drg 40	Drg 40		4280
	77681042	Pi 8430 Drg 60	Drg 60		2975
	77689078	Pi 8530 Drg 100	Drg 100		4280
	77669510	Pi 8630 Drg 200	Drg 200		2975
	77718786	Pi 8730 Drg 300	Drg 300		2975
	77718794	Pi 8830 Drg 500	Drg 500		4280

*other element types on request

5. Technical specifications

Design:	in-line filter
Operating pressure:	2x 10^6 load changes 100 bar (1452 psi)
	1x 10^6 load changes 160 bar (2320 psi)
Test pressure::	143 bar (2075 psi)
Temperature range:	-10 °C to +120 °C
	(other temperature ranges on request)
Bypass opening pressure:	Δp 3.5 bar ± 10 %
Filter head material:	GGG
Filter bowl material:	St
Sealing material:	NBR/FKM/EPDM
Activating pressure of visual/electrical differential maintenance indicator:	Δp 2.2 bar ± 10 %
Electrical data of maintenance indicator:	
Maximum voltage:	250 V AC/200 V DC
Maximum current on contact:	1 A
Inrush current:	70 W
Type of protection:	IP 65 when inserted and secured
Contact:	bistable
Cable connection:	M20x1.5

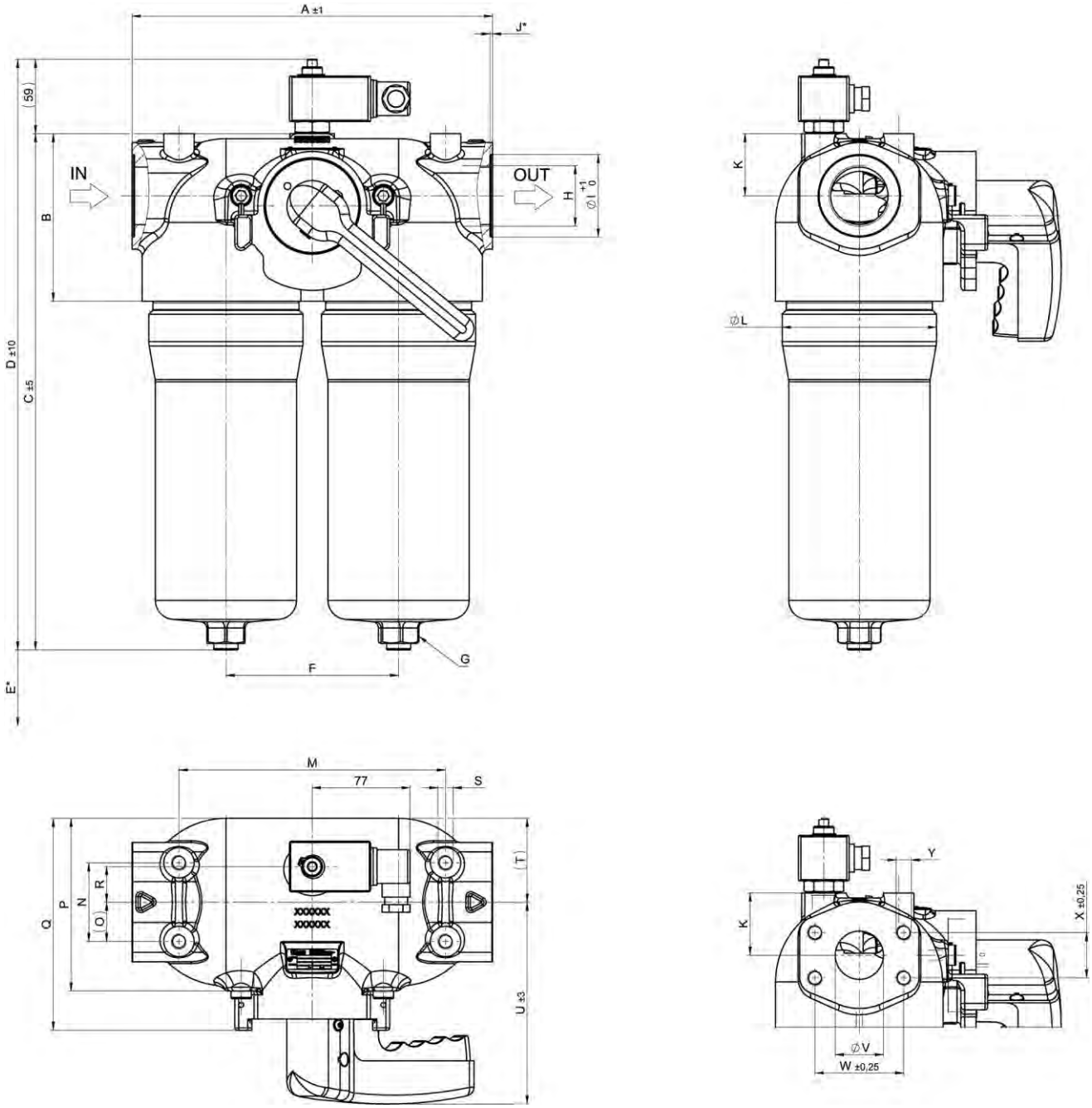
The switching function can be changed by turning the electric upper part by 180° (normally closed contact or normally open contact). The state on delivery is a normally closed contact. The use of quenching circuits must be checked in the case of inductivity in the DC current circuit. The maintenance indicator data sheet contains further information and additional maintenance indicator versions.

We draw attention to the fact that all values indicated are average values which do not always occur in specific cases of application. Our products are continually being further developed. Values, dimensions and weights can change as a result of this. Our specialized department will be pleased to offer you advice.

We recommend you to contact us concerning applications of our filters in areas governed by the EU 2014/34/EU (ATEX 95). The standard version can be used for liquids based on mineral oil (corresponding to the fluids in Group 2 of Directive 2014/68 EU Article 13). If you consider to use other fluids please contact us for additional support.

Subject to technical alteration without prior notice.

6. Dimensions



In	Inlet	E*	Minimum clearance required for element change
Out	Outlet	J*	Only with threaded version

All dimensions except "H" in mm.

Type	A ±1	B	C ±5	D	E*	F	G	H	øI +1	J*	K	øL	M
Pi 21430	284	132	407	465	110	136	SW 30	G1 1/2	65	2	49	121,5	210
Pi 21430 FL	284	132	407	465	110	136	SW 30	-	-	-	49	121,5	210

Type	N	O	P	Q	R	S	T	U ±3	øV	W ±0,25	X ±0,25	Y
Pi 21430	62	31	136	167	28	M12x18	66	159	-	-	-	-
Pi 21430 FL	62	31	136	167	28	M12x18	66	159	38	69,9	35,7	M12x21

7. Installation, operating and maintenance instructions

7.1 Filter installation
When installing filter make sure that sufficient space is available to remove filter element and filter housing. Preferably the filter should be installed with the filter housing pointing downwards. The maintenance indicator must be visible.

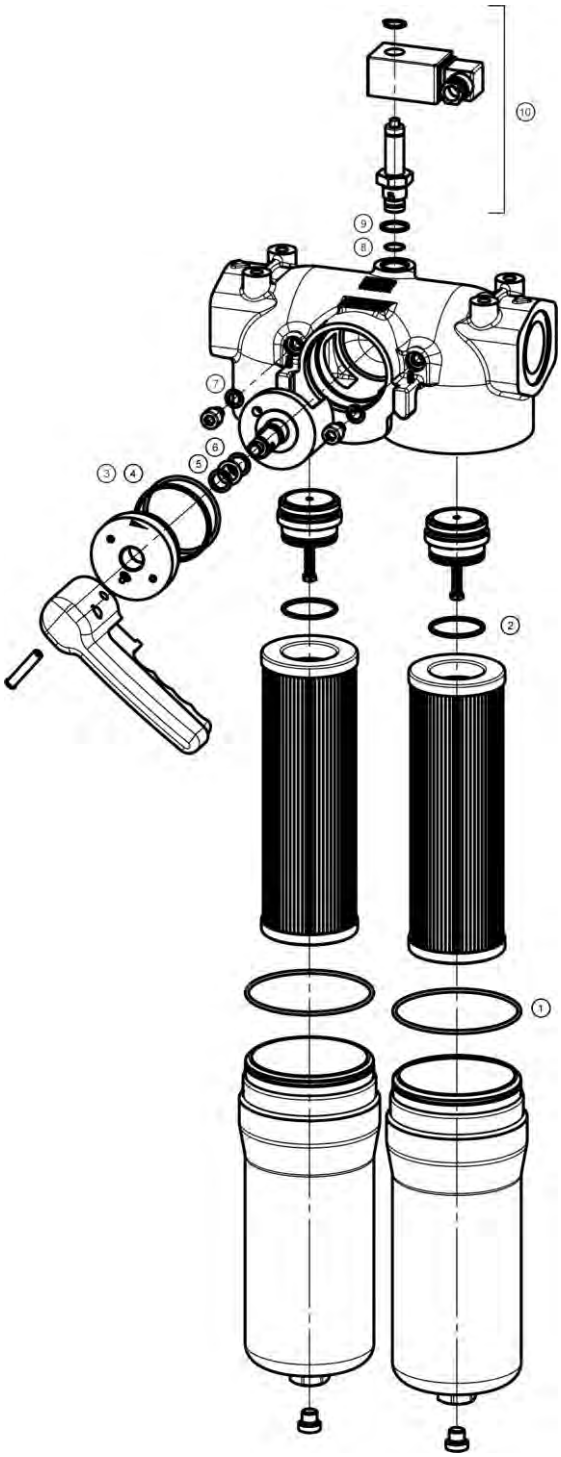
7.2 Connecting the electrical maintenance indicator
The electrical indicator is connected via a 2-pole appliance plug according to DIN EN 175301-803 with poles marked 1 and 2. The elec- trical section can be inverted to change from normally open to nor- mally closed position or vice versa. The state on delivery is a normally closed contact.

7.3 When should the filter element be replaced?
1. Filters equipped with visual and electrical maintenance indicator:
   During cold starts, the indicator may give a warning signal. Press the red button of the visual indicator once again only after operating temperature has been reached. If the red button im- mediately pops up again and/or the electrical signal has not switched off after reaching operating temperature the filter ele- ment must be replaced after the end of the shift.

2. Please always ensure that you have original Filtration Group spare elements in stock: Disposable elements (PS) cannot be cleaned.

7.4 Element replacement
Note: Elements may only be replaced by people who are familiar with the function of the filter. When replacing elements, appropriate safety clothing (protective goggles, gloves, safety shoes) must be worn.
Note: The maintenance indicator monitors the filter side in operation, which is identified by the position of the switching lever catch. The change-over transfer valve must be switched prior filter servicing. Now the signal of the maintenance indicators cancelled and the red button can be repressed again.
1. Operate and hold pressure equalizing lever located behind switching lever. Pull catch knob and swivel switching lever. Engage the catch on the clear filter side. Place through or drip pan underneath to collect leaving oil.
2. Loosen vent screw of the filter side not in use by 2-3 turns; max. until contact is made with the safety stop.
3. Unscrew filter housing by rotating same counter-clockwise and clean with a suitable medium.
   Warning: The shift lever may not, from now until the screw- ing back in of the filter housing (7.), be activated under any circumstances!
4. Remove filter element with a side-to-side motion.
5. Check O-ring on the filter house for damage. Replace, if necessary.
6. Make sure that the order number on the spare element corresponds to the oder number of the filter name-plate.
7. Lightly lubricate the threads of the filter housing and screw into the filter head. Maximum tightening torque for NG 300 = 100 Nm.
8. To refill the filter chamber, operate only the pressure equalizing lever (leave the switching lever arrested in its catch) long enough for the medium to emerge bubble- free from the vent bore.
9. Tighten vent screw. Check filter for leaks by operating the pres-
10. sure equalizing lever once again.

8. Spare parts list



Order numbers for spare parts		
Position	**Type**	**Order number**
① - ⑦	Seal kit for housing	
	NBR	72464282
	FPM	72464283
	EPDM	72464284
⑧ - ⑨	Seal kit for maintenance indicator	
	NBR	77760309
	FPM	77760317
	EPDM	77760325
⑩	Maintenance indicator	
	Visual PiS 3098/2.2	77669971
	Electrical PiS 3097/2.2	77669948
	Electrical upper section only	77536550

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04/2019

Duplex Filter
Pi 232

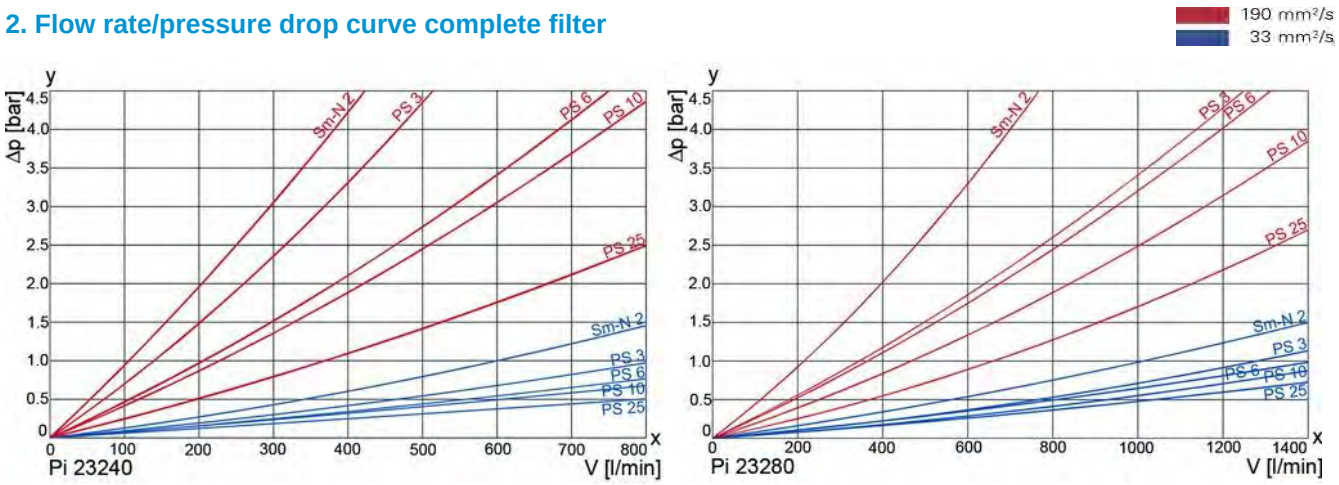
Nominal pressure 25 bar (360 psi), nominal size 800 and 1400

1. Features

Duplex filter for gear boxes, lubrication and hydraulic systems

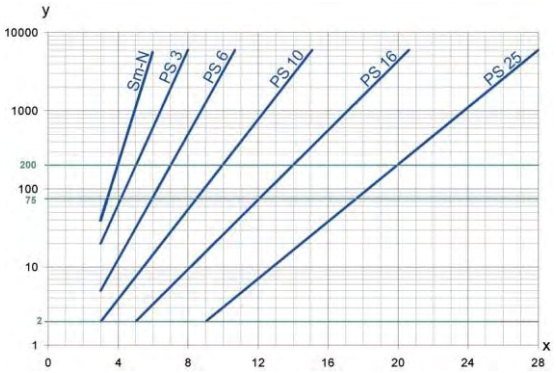
- Modular system
- Compact design
- Weight optimized design
- Minimal pressure drop through optimal flow design
- Flange connections, DIN DN 80, SAE 3“
- Visual/electrical maintenance indicator
- Drain on dirt and clean side
- Beta rated elements according to ISO 16889 multipass test
- Defined cleanliness classes according to ISO 4406/1999
- Elements with high differential pressure stability and dirt holding capacity
- Version according to DIN 24550 also deliverable
- Quality filters, easy to service
- Worldwide sales and service

2. Flow rate/pressure drop curve complete filter



y = differential pressure Δp [bar]
x = flow rate V [l/min]

3. Separation grade characteristics



y = beta-value
x = partcle size [µm]

determined by multipass tests (ISO 16889)
calibration according to ISO 11171 (NIST)

4. Filter performance data

tested according to ISO 16889 (multipass test)

PS elements with
max. Δ p 20 bar

PS	3	$\beta_{5(C)}$	≥	200
PS	6	$\beta_{7(C)}$	≥	200
PS	10	$\beta_{10(C)}$	≥	200
PS	25	$\beta_{20(C)}$	≥	200

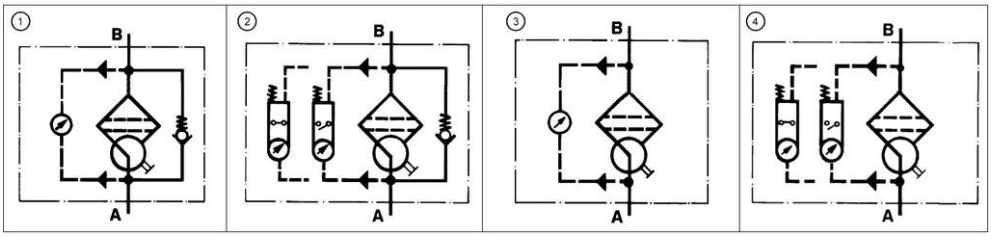
values guaranteed up to
10 bar differential pressure

5. Quality assurance

Filtration Group filters and filter elements are produced according to the following international standards:

Norm	Designation
DIN ISO 2941	Hydraulic fluid power filter elements; verification of collapse/burst resistance
DIN ISO 2942	Hydraulic fluid power filter elements, verification of fabrication integrity
DIN ISO 2943	Hydraulic fluid power filter elements, verification of material compatibility with fluids
DIN ISO 3723	Hydraulic fluid power filter elements, methods for end load test
DIN ISO 3724	Hydraulic fluid power filter elements, verification of flow fatigue charactersitics
ISO 3968	Hydraulic fluid power filters; evaluation of pressure drop versus flow characteristics
ISO 10771.1	Fatigue pressure testing of metal containing envelopes in hydraulic fluid applications
ISO 16889	Hydraulic fluid power filters; multipass method for evaluation filtration performance of a filter element

6. Symbols



7. Order numbers

Example for ordering filters:

1. Housing design	2. 2x Filter element
V = 800 l/min and visual/electrical maintenance indicator Type: Pi 23240-069 Order number: 70554948	PS 25 Type: 852014 PS 25 Order number: 76321663

7.1 Housing design

Nominal size NG [l/min]	Order number	Type	① with bypass valve and visual indicator	② with bypass valve and electrical indicator	③ with visual indicator	④ with electrical indicator
800	70554951	Pi 23240-057	■			
	70554950	Pi 23240-058		■		
	70554949	Pi 23240-068			■	
	70554948	Pi 23240-069				■
1400	70554947	Pi 23280-057	■			
	70554942	Pi 23280-058		■		
	70554945	Pi 23280-068			■	
	70554946	Pi 23280-069				■

When filter with non bypass configuration is selected the collapse pressure must not be exceeded!

7.2 Filter elements for standard housing design*

Nominal size NG [l/min]	Order number	Type	Filter material	max. Δ p [bar]	Filter surface [cm²]
800	76136220	852014 Sm-N 2	Sm-N 2	20	18533
	76321830	852014 PS 3	PS 3		24830
	76321822	852014 PS 6	PS 6		24830
	76321814	852014 PS 10	PS 10		24830
	76321806	852014 PS 25	PS 25		24830
1400	76136212	852015 Sm-N 2	Sm-N 2	20	42275
	76321897	852015 PS 3	PS 3		57200
	76321889	852015 PS 6	PS 6		57200
	76321871	852015 PS 10	PS 10		57200
	76321863	852015 PS 25	PS 25		57200

*other element types are available on request

8. Technical specifications

Design:	line mounting filter
Nominal pressure:	10^7 load changes 25 bar (360 psi)
Test pressure:	33 bar (470 psi)
Temperature range:	-10 °C to +120 °C
	survival temperature -40 °C (other temperature ranges on request)
	minimum viscosity of the fluid: 10 mm²/s
Bypass setting:	Δ p 3.5 bar ± 10
Filter head material:	GAL
Filter housing material:	AL
Filter cover material:	GAL
Sealing material:	NBR
Maintenance indicator setting	Δ p 2.2 bar ± 10 %
Electrical data of maintenance indicator:	
Max. voltage:	250 V AC/200 V DC
Max. current:	1 A
Contact load:	70 W
Type of protection:	IP 65 in inserted and secured status
Contact:	normally open/closed
Cable sleave:	M20x1.5

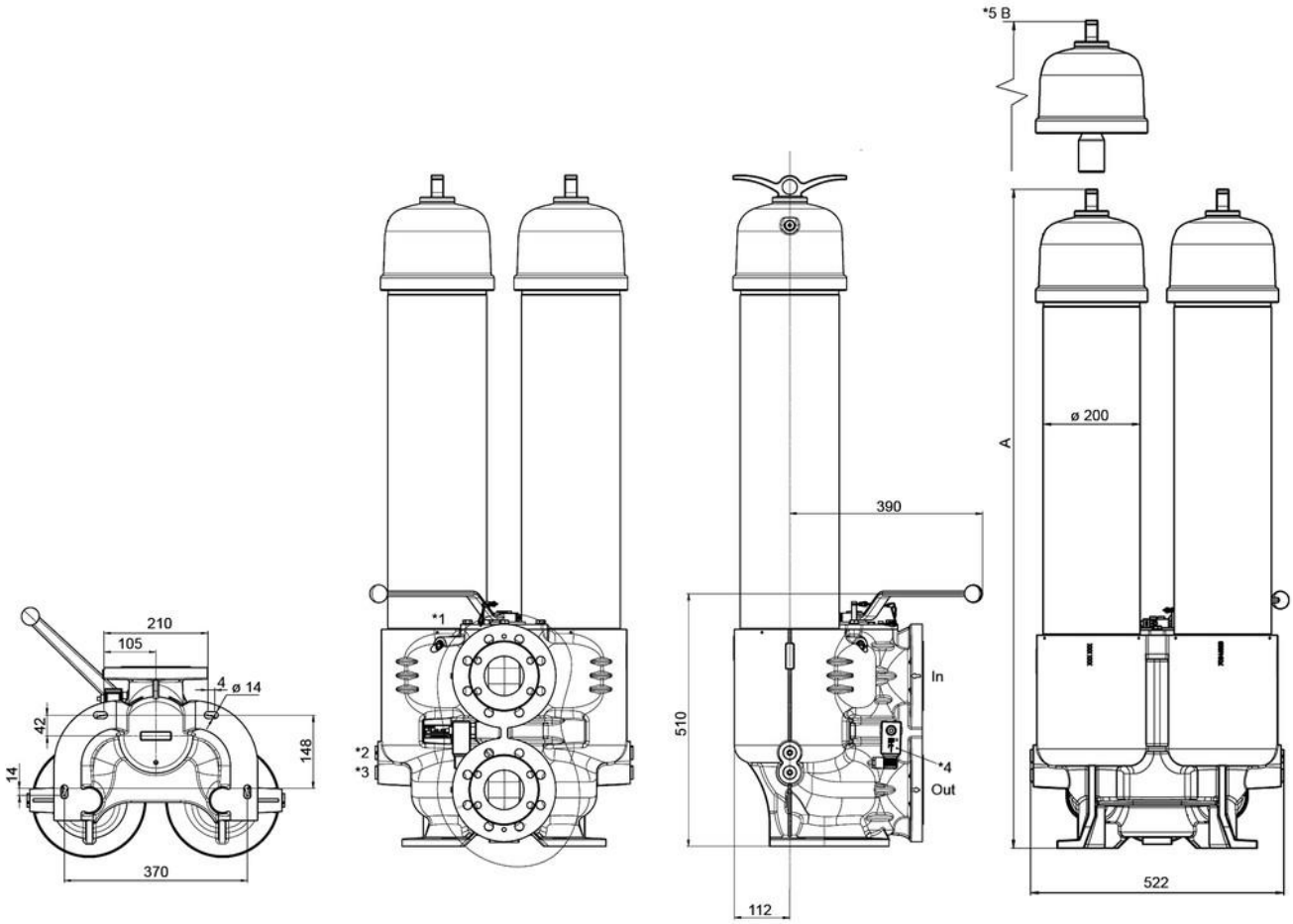
The switching function can be changed by turning the electric upper part by 180° (normally closed contact or normally open contact). The state on delivery is a normally closed contact. By inductivity in the direct current circuit the use of suitable protection circuit should be considered. Further maintenance indicator details and designs are available in the maintenance indicator data sheet.

We draw attention to the fact that all values indicated are average values which do not always occur in specific cases of application. Our products are continually being further developed. Values, dimensions and weights can change as a result of this. Our specialized department will be pleased to offer you advice.

We recommend you to contact us concerning applications of our filters in areas governed by the EU Directive 94/9 EC (ATEX 95). The standard version can be used for liquids based on mineral oil (corresponding to the fluids in Group 2 of Directive 97/23 EC Article 9). If you consider to use other fluids please contact us for additional support.

Subject to technical alteration without prior notice.

9. Dimensions



In	Inlet
Out	Outlet
*1	Pressure equalization screw
*2	Drain dirt side G½
*3	Drain clean side G½
*4	Maintenance indicator
*5	Clearance B

All dimensions in mm.

Type	Connection	A	B	Weight [kg]
Pi 23240	DN 80	805	500	80
Pi 23280	DN 80	1355	1000	90

10. Installation, operating and maintenance instructions

10.1 Filter installation

When installing the filter make sure that sufficient space is available to remove filter element and filter housing.
The maintenance indicator must be visible.

10.2 Connecting the electrical maintenance indicator

The electrical indicator is connected via a 2-pole appliance plug according to DIN EN 175301-803 with poles marked 1 and 2. The electrical section can be inverted to change from normally open to normally closed position or vice versa. The state on delivery is a normally closed contact.

10.3 When should the filter element be replaced?

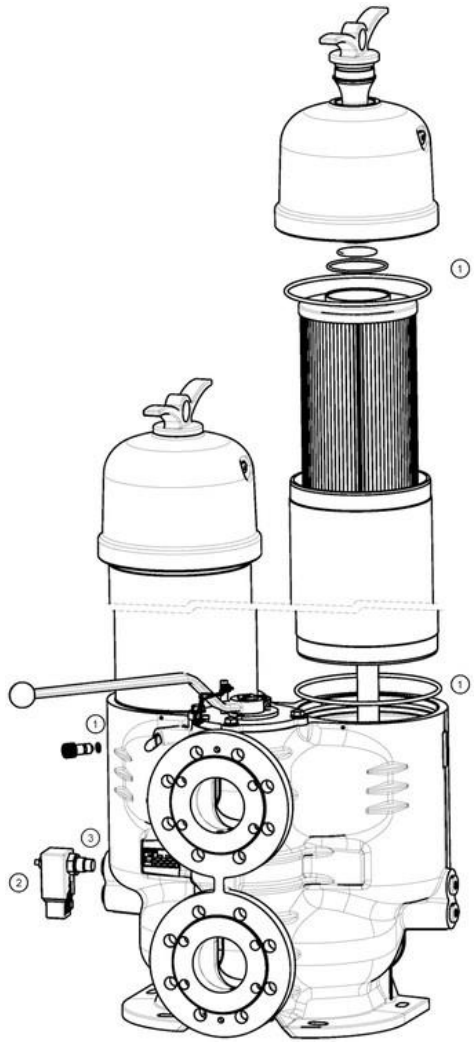
1. Filters equipped with visual and electrical maintenance indicator:
   During cold starts, the indicator may give a warning signal. Press the red button of the visual indicator once again only after operating temperature has been reached. If the red button immediately pops up again and/or the electrical signal has not switched off after reaching operating temperature the filter element must be replaced after the end of the shift.
2. Filters without maintenance indicator:
   The filter element should be replaced after the trial run or flushing of the system. Afterwards follow instructions of the manufacturer.
3. Please always ensure that you have original Filtration Group spare elements in stock: disposable elements (PS, Sm-N) cannot be cleaned.

10.4 Element replacement

Note: Elements may only be replaced by people who are familiar with the function of the filter. When replacing elements, appropriate safety clothing (protective goggles, gloves, safety shoes) must be worn.
Note: The maintenance indicator monitors the filter side in operation, which is identified by the position of the switching lever catch. The change-over transfer valve must be switched prior filter servicing. Now the signal of the maintenance indicators cancelled and the red button can be repressed again.

1. Operate pressure equalizing screw. Swivel switching lever. Place through or drip pan underneath to collect leaving oil. Close pressure equalization screw.
2. Loosen vent screw of the filter side not in use by 2-3 turns.
3. Remove drain plug in housing bottom and drain oil.
4. Unscrew filter cover counter-clockwise.
   Warning: The shift lever may not, from now until the screwing back in of the filter housing (7.), be activated under any circumstances!
5. Lift out filter element.
6. Check seal on filter cover. We recommend replacement in any case.
7. Make sure that the order number on the spare element corresponds to the order number of the filter name-plate. Remove the element packaging and put the element with the o-Ring side down into the housing.
8. Push the element carefully over the spigot and tight cover with the hand-tight.
9. Tighten drain plug housing bottom.
10. To refill the filter chamber, operate only the pressure equalizing screw. Tighten the screw when fluid emerges bubble-free from the drain.
11. Tight vent screw. Check for leckage by actuating the equalizing screw again.

11. Spare parts list



Order numbers for spare parts		
Position	**Type**	**Order number**
①	Seal kit for housing	
	NBR	70566903
	FPM	70566904
	EPDM	70566905
②	Maintenance indicator	
	Visual PiS 3098/2,2	77669971
	Visual/electrical PiS 3097/2,2	77669948
	Electrical upper section only	77536550
②	Seal kit for maintenance indicator	
	NBR	77760309
	FPM	77760317
	EPDM	77760325

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70582030.06/2019

Duplex Filter
Pi 241

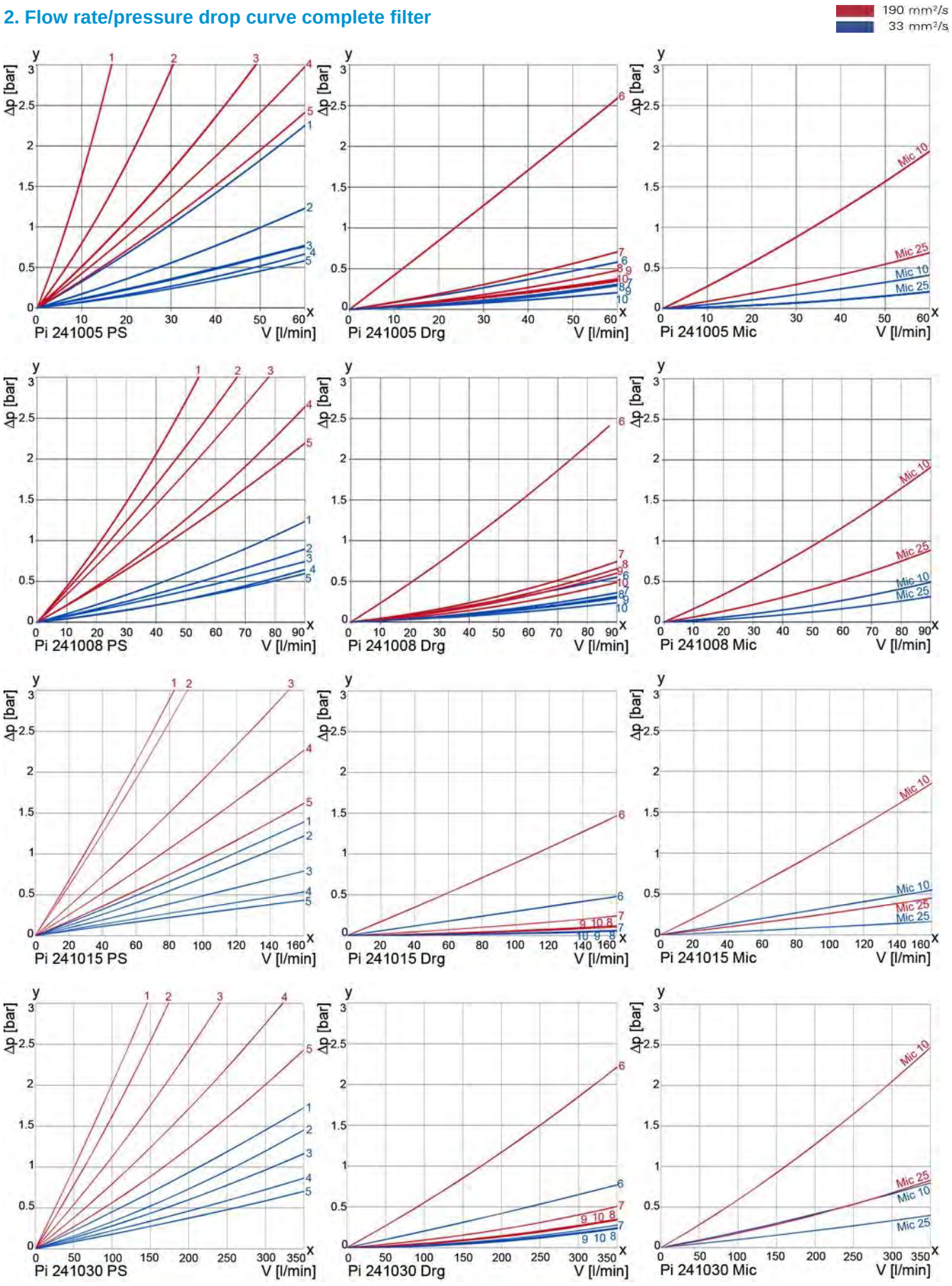
Nominal pressure 40 bar (580 psi), nominal size up to 300

1. Features

High performance filters for modern hydraulic, lubrication and fuel systems

- Modular system
- Compact design
- Minimal pressure drop through optimal flow design
- Constantly flow clearance opening
- Ball switching unit
- Visual/electrical/electronic maintenance indicator
- Flanged and threaded connections
- Variable operating and mounting possibilities
- International certificates of examinations
- Extensive range of accessories
- Quality filters, easy to service
- Equipped with highly efficient Filtration Group filter elements
- Beta rated elements according to ISO 16889 multipass test
- Elements with high differential pressure stability and dirt holding capacity
- Worldwide distribution

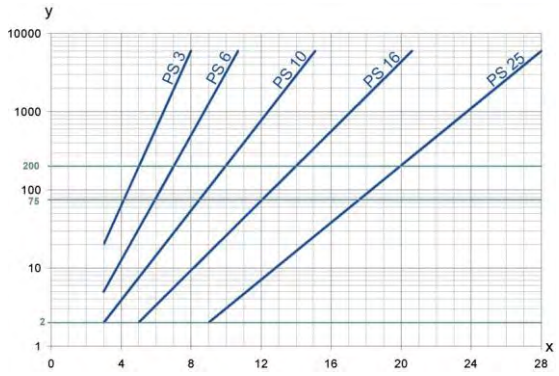
2. Flow rate/pressure drop curve complete filter



y = differential pressure∆ p [bar]
x = flow rate V [l/min]

1 = PS 3	3 = PS 10	5 = PS 25	7 = Drg 25	9 = Drg 60
2 = PS 6	4 = PS 16	6 = Drg 10	8 = Drg 40	10 = Drg 100

3. Separation grade characteristics



y = beta-value
x = particle size [µm]

determined by multipass tests (ISO 16889)
calibration according to ISO 11171 (NIST)

4. Filter performance data

tested according to ISO 16889 (multipass test)

PS elements with max. Δ p 20 bar

PS	3	$\beta_{5(C)}$	≥200
PS	6	$\beta_{7(C)}$	≥200
PS	10	$\beta_{10(C)}$	≥200
PS	16	$\beta_{16(C)}$	≥200
PS	25	$\beta_{20(C)}$	≥200

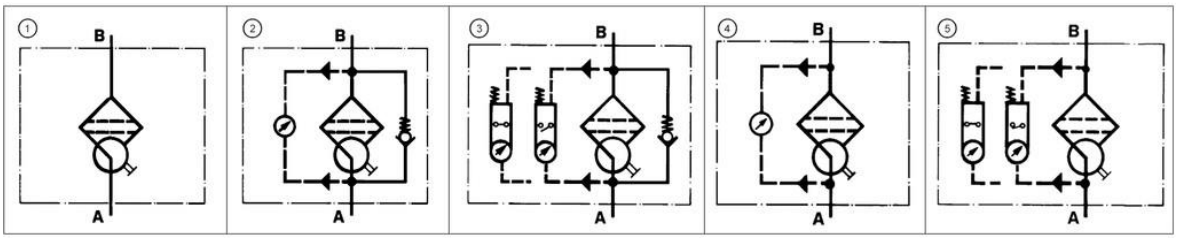
values guaranteed up to
10 bar differential pressure

5. Quality assurance

Filtration Group filters and filter elements are produced according to the following international standards:

Norm	Designation
DIN ISO 2941	Hydraulic fluid power filter elements; verification of collapse/burst resistance
DIN ISO 2942	Hydraulic fluid power filter elements; verification of fabrication integrity
DIN ISO 2943	Hydraulic fluid power filter elements; verification of material compatibility with fluids
DIN ISO 3723	Hydraulic fluid power filter elements; method for end load test
DIN ISO 3724	Hydraulic fluid power filter elements; verification of flow fatigue characteristics
ISO 3968	Hydraulic fluid power filters; evaluation of pressure drop versus flow characteristics
ISO 10771.1	Fatigue pressure testing of metal containing envelopes in hydraulic fluid applications
ISO 16889	Hydraulic fluid power filters; multipass method for evaluation filtration performance of a filter element

6. Symbols



7. Type number key and order numbers

7.1 Type number key housings

Type							
241	Duplex filter						
	Nominal size [l/min]						
	005	NG 50					
	008	NG 80					
	015	NG 150					
	030	NG 300					
		Connection					
		1	SAE flange				
		4	Thread connection				
			Clearance opening				
			C	1" DN 25	(NG 50 - NG 80)		
			F	2" DN 50	(NG 150 - NG 300)		
				Seal material*			
				N	NBR		
				F	FPM		
				C	CR		
					Housing code*		
					-046	with screw plug	
					-057	with bypass and visual indicator	
					-058	with bypass and electrical indicator	
					-068	with visual indicator	
					-069	with electrical indicator	
						Special equipment*	
						-	
Pi 241	**008/**	**1**	**C/**	**N**	**-069/**	**-**	Example for ordering

*Other types on request

Example for ordering filters:

1. Filter housing	2. Filter element
V = 80 l/min, connection 1" SAE, seal NBR and visual/electrical maintenance indicator Type: Pi 241008/1C/N-069 Order number: 70535442	PS 10 Type: Pi 23008 AN PS 10 Order number: 70518877

7.2 Order numbers housings

Nominal size NG [l/min]	Order number	Type	① with blank plug for indicator	② with bypass and visual indicator	③ with bypass and electrical indicator	④ with visual indicator	⑤ with electrical indicator
50	70525737	Pi 241005/1C/N-046	■				
	70535419	Pi 241005/1C/N-057		■			
	70535420	Pi 241005/1C/N-058			■		
	70535421	Pi 241005/1C/N-068				■	
	70535422	Pi 241005/1C/N-069					■
80	70535438	Pi 241008/1C/N-046	■				
	70535439	Pi 241008/1C/N-057		■			
	70535440	Pi 241008/1C/N-058			■		
	70535441	Pi 241008/1C/N-068				■	
	70535442	Pi 241008/1C/N-069					■

When filter with non bypass configuration is selected, the collapse pressure of the element must not be exceeded.

7.2 Order numbers housings							
Nominal size NG [l/min]	Order number	Type	① with blank plug for indicator	② with bypass and visual indicator	③ with bypass and electrical indicator	④ with visual indicator	⑤ with electrical indicator
150	70543016	Pi 241015/1F/N-046	■				
	70543017	Pi 241015/1F/N-057		■			
	70543018	Pi 241015/1F/N-058			■		
	70543019	Pi 241015/1F/N-068				■	
	70543020	Pi 241015/1F/N-069					■
300	70543021	Pi 241030/1F/N-046	■				
	70543022	Pi 241030/1F/N-057		■			
	70543023	Pi 241030/1F/N-058			■		
	70543024	Pi 241030/1F/N-068				■	
	70543025	Pi 241030/1F/N-069					■

When filter with non bypass configuration is selected, the collapse pressure of the element must not be exceeded.

7.3 Filter elements (a wider range of element types is availble on request)					
Nominal size NG [l/min]	Order number	Type	Filter material	max. Δp [bar]	Filter surface [cm²]
50	70526314	Pi 21005 AN PS 3	PS 3	20	820
	70526312	Pi 22005 AN PS 6	PS 6		820
	70526310	Pi 23005 AN PS 10	PS 10		820
	70526308	Pi 24005 AN PS 16	PS 16		820
	70526302	Pi 25005 AN PS 25	PS 25		820
80	70518885	Pi 21008 AN PS 3	PS 3	20	1445
	70518881	Pi 22008 AN PS 6	PS 6		1445
	70518877	Pi 23008 AN PS 10	PS 10		1445
	70518873	Pi 24008 AN PS 16	PS 16		1445
	70518863	Pi 25008 AN PS 25	PS 25		1445
150	70519044	Pi 21015 AN PS 3	PS 3	20	4240
	70519042	Pi 22015 AN PS 6	PS 6		4240
	70519040	Pi 23015 AN PS 10	PS 10		4240
	70519038	Pi 24015 AN PS 16	PS 16		4240
	70519036	Pi 25015 AN PS 25	PS 25		4240
300	70519106	Pi 21030 AN PS 3	PS 3	20	6890
	70519104	Pi 22030 AN PS 6	PS 6		6890
	70519102	Pi 23030 AN PS 10	PS 10		6890
	70519198	Pi 24030 AN PS 16	PS 16		6890
	70519196	Pi 25030 AN PS 25	PS 25		6890

8. Technical specifications

Design:	Duplex filter
Nominal pressure:	
Pi 241005-241008	10^7 load changes 40 bar (580 psi)
Pi 241015-241030	2x 10^6 load changes 40 bar (580 psi)
Test pressure:	60 bar (870 psi)
Temperature range:	-10 °C to +120 °C Survival temperature -40 °C (other temperature ranges on request)
Bypass setting:	Δ p 35 bar ± 10 %
Filter housing material:	EN-GJS-400
Switch parts material:	EN-GJS-400/Stainless steel
Sealing material:	NBR/AL
Maintenance indicator setting:	Δ p 2.2 bar ± 10 %
Electrical data of maintenance indicator:	
Maximum voltage:	250 V AC/200 V DC
Maximum current:	1 A
Contact load:	70 W
Type of protection:	IP 65 in inserted and secured status
Contact:	normally open/closed
Cable sleave:	M20x1.5

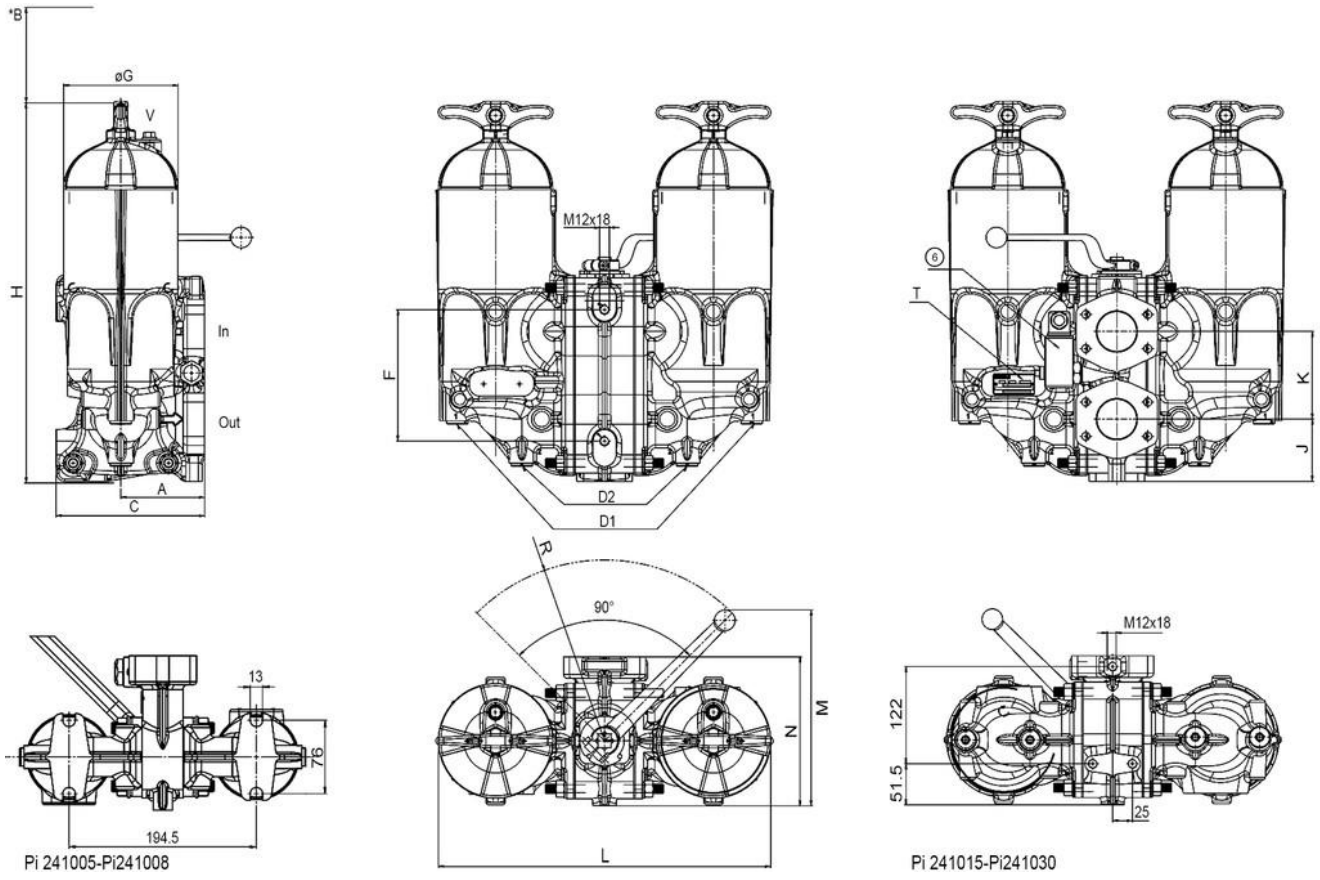
The switching function can be changed by turning the electric upper part by 180° (normally closed contact or normally open contact). The state on delivery is a normally closed contact. By inductivity in the direct current circuit the use of suitable protection circuit should be considered. Further maintenance indicator details and designs are available in the maintenance indicator data sheet.

We draw attention to the fact that all values indicated are average values which do not always occur in specific cases of application. Our products are continually being further developed. Values, dimensions and weights can change as a result of this. Our specialized department will be pleased to offer you advice.

We recommend you to contact us concerning applications of our filters in areas governed by the EU Directive 94/9 EC (ATEX 95). The standard version can be used for liquids based on mineral oil (corresponding to the fluids in Group 2 of Directive 97/23 EC Article 9). If you consider to use other fluids please contact us for additional support.

Subject to technical alteration without prior notice.

9. Dimensions



In	Inlet	D2	Drain outlet clean side $G^1/_2$
Out	Outlet	T	Type plate
V	Venting G¼	⑥	Maintenance indicator optional
D1	Drain outlet dirt side $G^1/_2$	*B	Clearance

9. Dimensions

All dimensions in mm.

Type	Connections*	A	B	C	E SW	F	øG	H	J	K	L	M	N	R	Weight [kg]
241005	SAE DN25/G1	105.0	110	160	27	80	88	248	53.5	80	296	216	160	223	16
241008	SAE DN25/G1	105.0	160	160	27	80	88	286	53.5	80	296	216	160	223	18
241015	SAE DN50/G2	105.5	150	187	32	165	144	387	78.0	110	418	246	167	227	41
241030	SAE DN50/G2	105.5	240	187	32	165	144	477	78.0	110	418	246	167	227	47

* Other connections on request

10. Installation, operating and maintenance instructions

10.1 Filter installation

When installing the filter make sure that sufficient space is available to remove filter element and filter housing. The maintenance indicator ⑥ must be visible.

10.2 Connecting the electrical maintenance indicator

The electrical indicator is connected via a 2-pole appliance plug according to DIN EN 175301-803 with poles marked 1 and 2. The electrical section can be inverted to change from normally open position to normally closed position or vice versa. The state on delivery is a normally closed contact.

10.3 When should the filter element be replaced?

1. Filters equipped with visual and electrical maintenance indicator: During cold starts, the indicator may give a warning signal. Press the red button of the visual indicator once again only after operating temperature has been reached. If the red button immediately pops up again and/or the electrical signal has not switched off after reaching operating temperature, the filter element must be replaced.
2. Filters without maintenance indicator: The filter element should be replaced after the trial run or flushing of the system. Afterwards follow instructions of the manufacturer.
3. Please always ensure that you have original Filtration Group spare elements in stock: Disposable elements cannot be cleaned.

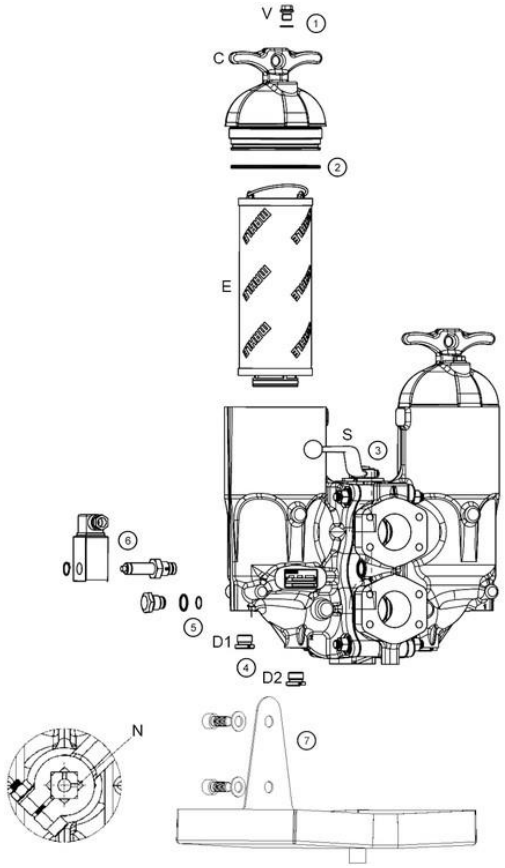
10.4 Element replacement

Note: Elements may only be replaced by people who are familiar with the function of the filter. When replacing elements, appropriate safety clothing (protective goggles, gloves, safety shoes) must be worn.

Note: The maintenance indicator monitors the filter side in operation. This is indicated by notches (N) on the switching shaft. Before carrying out filter maintenance, switch off the housing to be serviced.

1. Move switching lever (S) completely to the stop.
2. Loosen vent plug (V) on the filter side now shut down by 2-3 turns.
   Warning: The shift lever may not, from now until the screwing back in of the filter housing, be activated under any circumstances!
3. Remove drain plug (D1) and allow the medium to drain.
4. Remove drain plug (D2) and allow the medium to drain.
5. Unscrew filter cover (C) by turning in anti-clockwise direction.
6. Lift out filter element (E) from above.
7. Check seal ⑥ on filter cover.We recommend replacement in any case.
8. Make sure that the order number on the spare element corresponds to the order number of the filter name plate (T). Remove the element packaging and insert the element into the housing with the closed side facing upwards.
9. Push the element carefully into the holding fixture and tighten cover against stop.
10. Screw in drain plugs and tighten (30-35 Nm).
11. When filling the filter chamber, move the switching lever to the middle position until the medium flows out of the vent bore bubble-free. Tighten vent plug (30-35 Nm)
12. Check the serviced filter chamber for leaks.
13. Move the switching lever back to stop position and put the serviced filter chamber out of operation again.

11. Spare parts and accessories lists



Order numbers for spare parts		
Position	**Type**	**Order number**
① - ④	Seal kit for housing	
	Pi 241 005 - Pi 241 008	
	NBR	70535673
	FPM	70535674
	CR	70535676
	Pi 241 015 - Pi 241 030	
	NBR	70575730
	FPM	70575731
	CR	70575732
⑤	Seal kit for maintenance indicator	
	NBR	77760309
	FPM	77760317
	CR	70535788

Order numbers for accessories		
Position	**Type**	**Order number**
⑥	Maintenance indicator	
	Visual PiS 3098/2.2	77669971
	Visual/electrical PiS 3097/2.2	77669948
	Electrical upper section only	77536550
⑦	Oil drip pan	
	Pi 241 005 - Pi 241 008	70550102
	Pi 241 015 - Pi 241 030	70576337
	SAE welding counter-flange 3000 psi incl. O-Ring and mounting screws	
	SAE 1" NBR	70535781
	SAE 2" NBR	70527145

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70543420.04/2019

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Duplex Filter
Pi 251

Nominal pressure 10/16 bar (140/230 psi), nominal size 2000

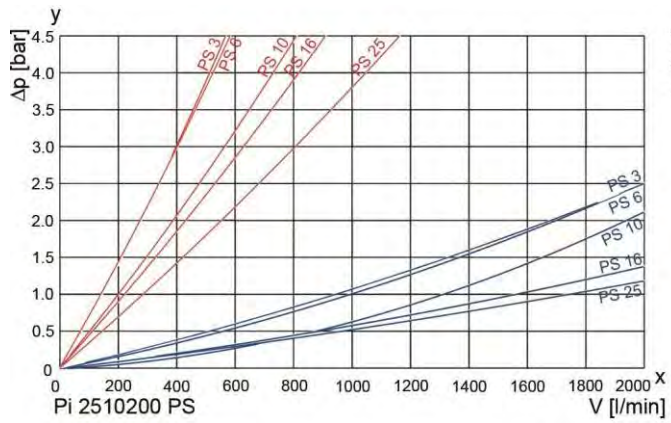
1. Features

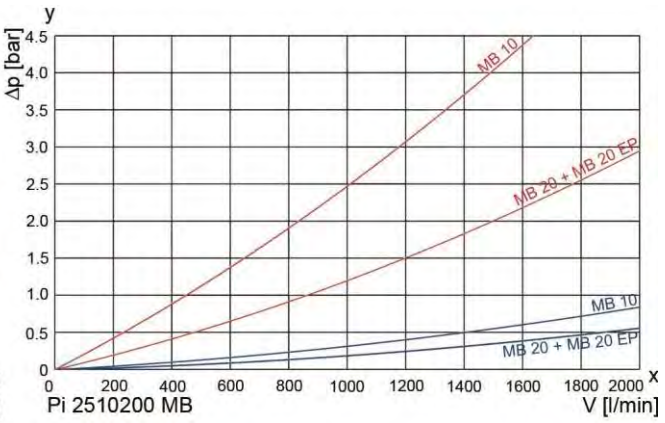
High performance filters for modern hydraulic, lubrication and fuel systems

- Compact design
- Minimal pressure drop through optimal flow design
- Visual/electrical/electronic maintenance indicator
- Extensive range of accessories
- Quality filters, easy to service
- Equipped with highly efficient PS and MB filter elements
- Beta rated elements according to ISO 16889 multipass test
- Elements with high differential pressure stability and dirt holding capacity
- Worldwide distribution

2. Flow rate/pressure drop curve (for Pi 251 0200/2K version)

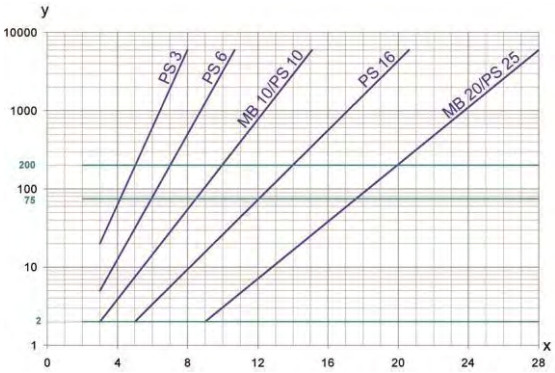
190 mm²/s
33 mm²/s





y = differential pressure Δp [bar]
x = flow rate V [l/min]
EP = e-protect version

3. Separation grade characteristics



y = beta-value
x = particle size [µm]

determined by multipass tests (ISO 16889)
calibration according to ISO 11171 (NIST)

4. Filter performance data

tested according to ISO 16889 (multipass test)

PS elements with max. Δp 20 bar			MB elements with max. Δp 20 bar		
PS	3 $ß_{5(C)}$	≥ 200	MB	10 $ß_{10(C)}$	≥ 200
PS	6 $ß_{7(C)}$	≥ 200	MB	20 $ß_{20(C)}$	≥ 200
PS	10 $ß_{10(C)}$	≥ 200			
PS	16 $ß_{15(C)}$	≥ 200			
PS	25 $ß_{20(C)}$	≥ 200			

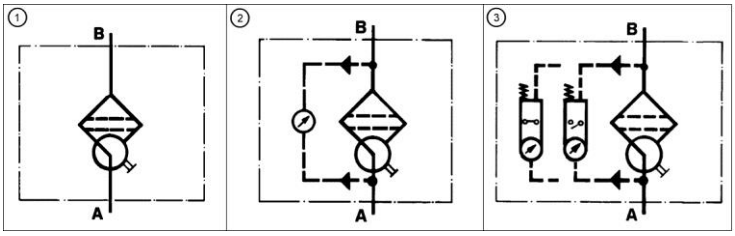
values guaranteed up to
10 bar differential pressure

5. Quality assurance

FGC filters and filter elements are produced according to the following international standards:

Norm	Designation
DIN ISO 2941	Hydraulic fluid power filter elements; verification of collapse/burst resistance
DIN ISO 2942	Hydraulic fluid power filter elements; verification of fabrication integrity
DIN ISO 2943	Hydraulic fluid power filter elements; verification of material compatibility with fluids
DIN ISO 3723	Hydraulic fluid power filter elements; method for end load test
DIN ISO 3724	Hydraulic fluid power filter elements; verification of flow fatigue characteristics
ISO 3968	Hydraulic fluid power-filters-evaluation of pressure drop versus flow characteristics
ISO 10771.1	Fatigue pressure testing of metal containing envelopes in hydraulic fluid applications
ISO 16889	Hydraulic fluid power filters-multipass method for evaluation filtration performance of a filter element

6. Symbols



7. Type number key and order numbers

7.1 Type number key housings

Type									
251	Duplex filter								
	Nominal size								
	0200	NG 2000							
		Connection							
		2	DIN flange						
		3	ANSI flange						
			Nominal widht						
			H	DN 80/3*					
			I	DN 100/4*					
			J	DN 125/5*					
			K	DN 150/6*					
				Nominal pressure					
				1	10 bar/140 psi				
				2	16 bar/230 psi				
					Switch				
					C	Double disc valve			
						Seal material			
						N	NBR		
						F	FPM		
							Housing code		
							060	no options ①	
							118	with visual indicator ②	
							119	with visual /electrical indicator ③	
								Special equipment	
								3.1	Inspection certificate 3.1 acc. to DIN EN 10204
								A	Cover lifting tool
								M	Magnet
Pi 251	**0200/**	**2**	**K/**	**2**	**C/**	**N**	**-119**	**/3.1**	**Example for ordering**

* other types on request

Example for ordering filter:

1. Filter housing	2. 2x Filter elements
V = 2000 l/min, connection DIN DN 150, nominal pressure 16 bar, double disc valve switch, seal NBR and visual/electrical maintenance indicator, with inspection certificate 3.1 Type: Pi 251 0200/2K/2C/N-119/3.1	PS 10 Type: Pi 23200 AN PS 10 Order number: 70561158

7.2 Housing design

Nominal size NG [l/min]	Type	Number of elemente each filter side
2000	see type number key	1

7.3 Filter elements (a wider range of element types is availble on request)					
Nominal size NG [l/min]	**Order number**	**Type**	**Filter material**	**max. Δp [bar]**	**Filter surface [cm²]**
2000	70561113	Pi 21200 AN PS 3	PS 3	**20**	40140
	70561152	Pi 22200 AN PS 6	PS 6		40140
	70561158	Pi 23200 AN PS 10	PS 10		40140
	70561161	Pi 24200 AN PS 16	PS 16		40140
	70561163	Pi 25200 AN PS 25	PS 25		40140
2000	72413295	Pi 41200 AN MB 10	MB 10	**20**	43708
	72351312	Pi 44200 AN MB 20	MB 20		43708
	70597037	Pi 44200 AN MB 20 EP*	MB 20 EP		43708

* e-protect version

8. Technical specifications

Design:	Duplex filter
Nominal pressure:	10 bar or 16 bar
Test pressure:	14.4 or 23.4 bar
Temperature range:	-10 °C up to +100 °C
	(other temperature ranges on request)
Filter housing material:	welded steel
Double disc valve material:	EN-GJS-400
Sealing material:	NBR/C4400
Maintenance indicator setting:	Δ p 1.25 bar +/-10 %
Electrical data of maintenance indicator:	
Maximum voltage:	250 V AC/200 V DC
Maximum current:	1 A
Contact load:	70 W
Type of protection:	IP 65 in inserted and secured status
Contact:	normally open/closed
Cable sleave:	M20x1.5

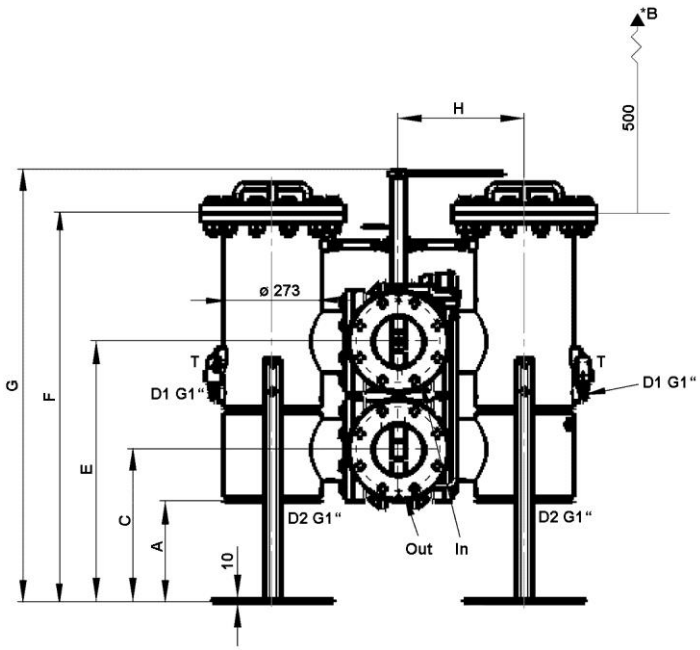
The switching function can be changed by turning the electric upper part by 180° (normally closed contact or normally open contact). The state on delivery is a normally closed contact. By inductivity in the direct current circuit the use of suitable protection circuit should be considered. Further maintenance indicator details and designs are available in the maintenance indicator data sheet.

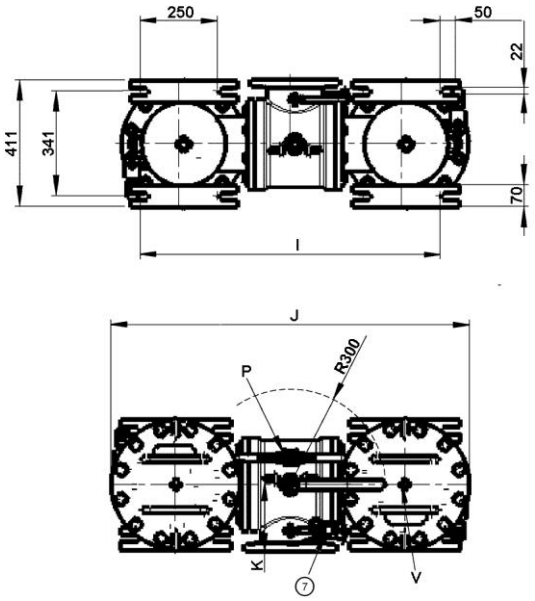
We draw attention to the fact that all values indicated are average values which do not always occur in specific cases of application. Our products are continually being further developed. Values, dimensions and weights can change as a result of this. Our specialized department will be pleased to offer you advice.

We recommend you to contact us concerning applications of our filters in areas governed by the EU Directive 94/9 EC (ATEX 95). The standard version can be used for liquids based on mineral oil (corresponding to the fluids in Group 2 of Directive 97/23 EC Article 9). If you consider to use other fluids please contact us for additional support.

Subject to technical alteration without prior notice.

9. Dimensions





In = Inlet
Out = Outlet
D1 Drain clean side G1
D2 Drain outlet dirt side G1
P Pressure balance valve
T Type plate
V Venting G½
⑦ Maintenance indicator
*B Clearance

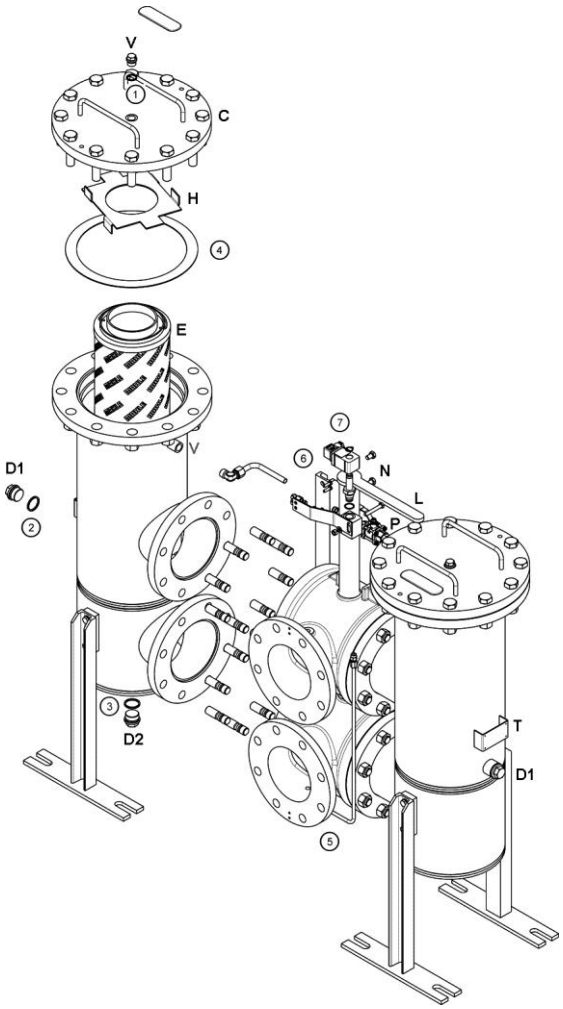
All dimensions in mm.

Type	Connection	A	C	E	F	G	H	I	J	K
Pi2510200/2H/2	DN 80	299	408	638	1046	1211	324	898	1053	170
Pi2510200/2I/2	DN 100	286	408	658	1059	1199	332	914	1069	180
Pi2510200/2J/2	DN 125	303	438	708	1102	1234	362	974	1129	200
Pi2510200/2K/2	DN 150	289	438	748	1116	1240	362	974	1129	210

10. Installation, operating and maintenance instructions

see instruction manual

11. Spare parts and accessories lists



Order numbers for spare parts and accessories		
Position	**Type**	**Order number**
① - ④	Seal kit for element change (per chamber)	
	D-Satz Pi 251 0200 E NBR	70602830
	D-Satz Pi 251 0200 E FPM	70604080
① - ⑤	Seal kit for housing NG 2000	
	DN 80	
	NBR	70604082
	FPM	70604083
	DN 100	
	NBR	70604100
	FPM	70604101
	DN 125	
	NBR	70601686
	FPM	70604078
	DN 150	
	NBR	70601687
	FPM	70604079
⑥	Seal kit for maintenance indicator	
	NBR	77760309
	FPM	77760317
⑦	Maintenance indicator	
	Visual PiS 3098/1.25	77809080
	Electrical PiS 3097/1.25	70328693
	Electrical upper section only	77536550

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72336736.06/2019

FG Fluid Solutions
Filtration Group

MAHLE Industrialfiltration is now Filtration Group. For more information, visit www.FiltrationGroup.com

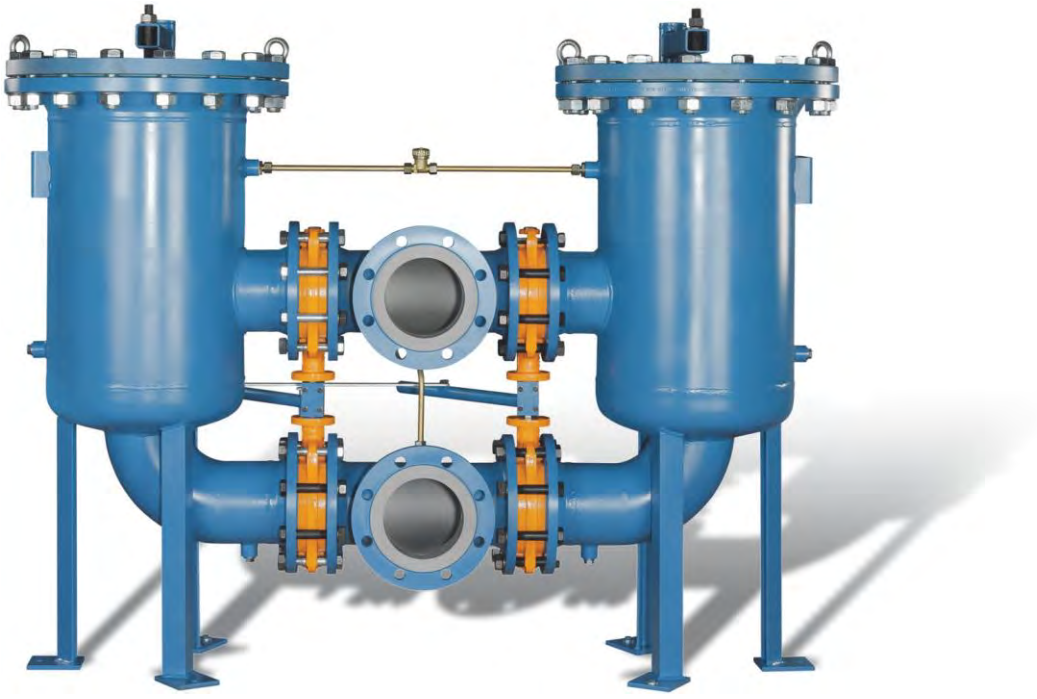
Duplex Filter
Pi 281

Nominal pressure 10/16 bar (140/230 psi), nominal size 1250 up to 8000

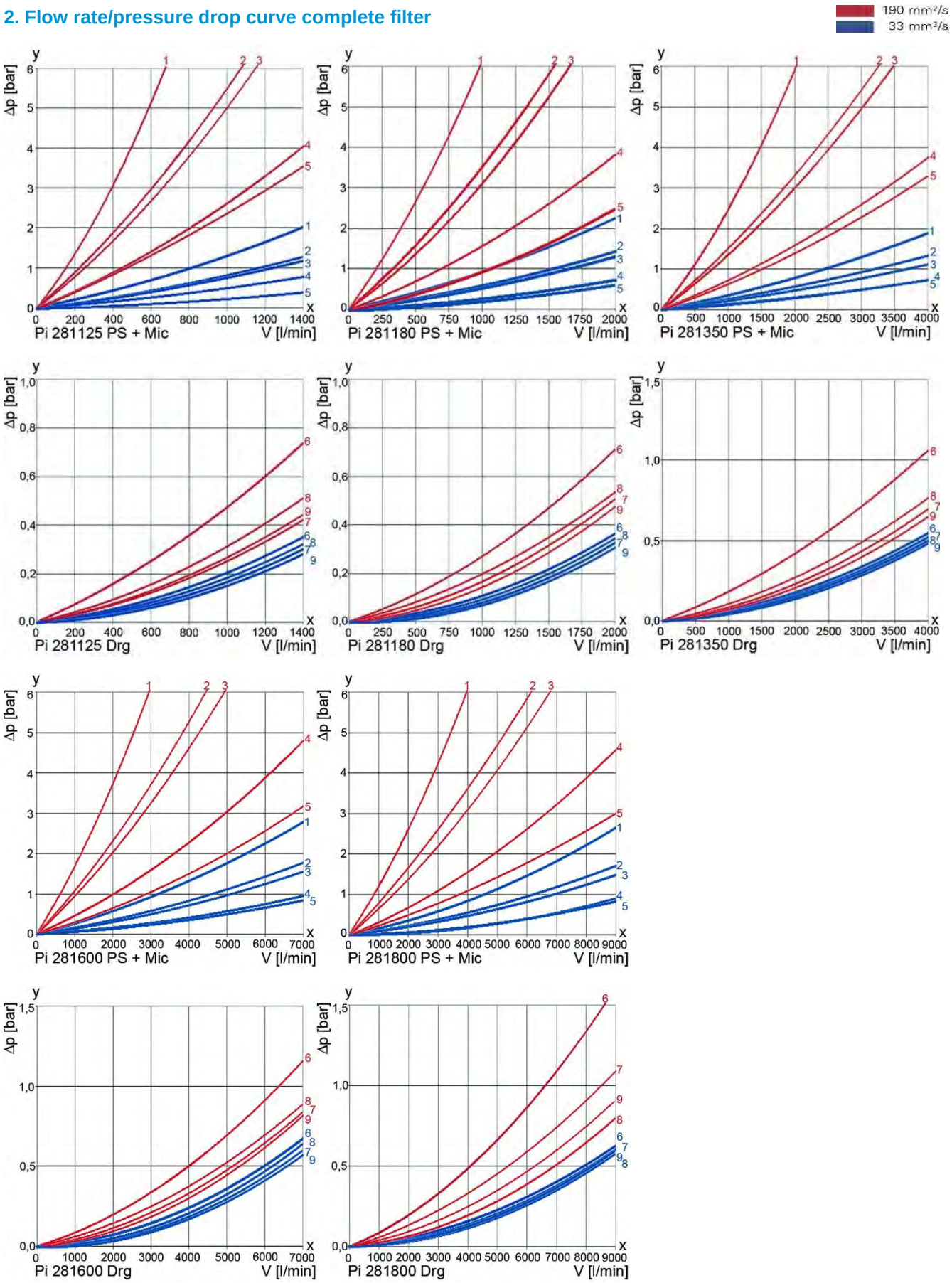
1. Features

High performance filters for modern hydraulic systems

- Modular system
- Compact design
- Minimal pressure drop through optimal flow design
- Visual/electrical/electronic maintenance indicator
- Flanged connections
- Quality filters, easy to service
- Equipped with highly efficient glass fibre PS filter elements
- Beta rated elements according to ISO 16889 multipass test
- Elements with high differential pressure stability and dirt holding capacity
- Worldwide distribution



2. Flow rate/pressure drop curve complete filter

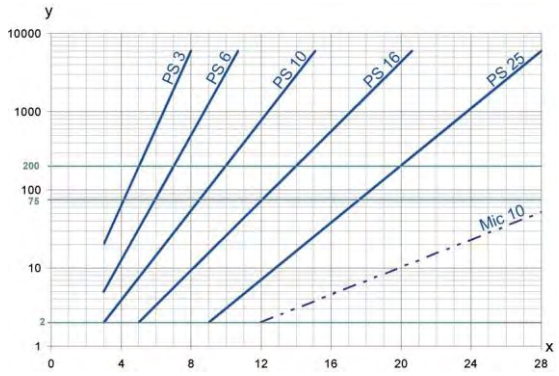


y = differential pressure Δp [bar]

x = flow rate V [l/min]

1 = PS 3	3 = PS 10	5 = Mic 10	7 = Drg 40	9 = Drg 100
2 = PS 6	4 = PS 25	6 = Drg 25	8 = Drg 60	

3. Separation grade characteristics



y = beta-value
x = particle size [µm]

determined by multipass tests (ISO 16889)
calibration according to ISO 11171 (NIST)

4. Filter performance data

tested according to ISO 16889 (multipass test)

PS elements with
max. Δ p 10 bar

PS	3	$\beta_{5(C)} \geq 200$
PS	6	$\beta_{7(C)} \geq 200$
PS	10	$\beta_{10(C)} \geq 200$
PS	25	$\beta_{20(C)} \geq 200$

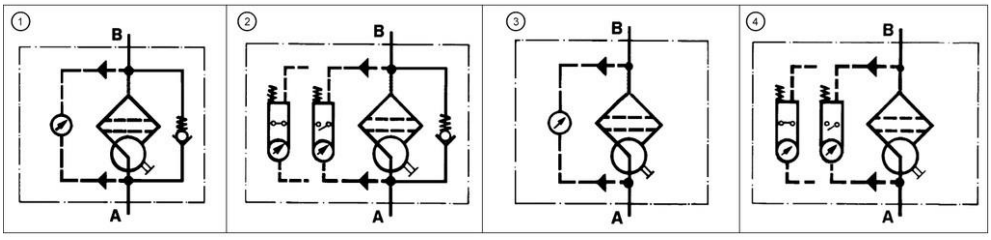
values guaranteed at
5 bar differential pressure

5. Quality assurance

Filtration Group filters and filter elements are produced according to the following international standards:

Norm	Designation
DIN ISO 2941	Hydraulic fluid power; filter elements, verification of collapse/burst resistance
DIN ISO 2942	Hydraulic fluid power; filter elements, verification of fabrication integrity
DIN ISO 2943	Hydraulic fluid power; filter elements, verification of material compatibility with fluids
DIN ISO 3723	Hydraulic fluid power; filter elements, method for end load test
DIN ISO 3724	Hydraulic fluid power; filter elements, verification of flow fatigue characteristics
ISO 3968	Hydraulic fluid power-filters-evaluation of pressure drop versus flow characteristics
ISO 10771.1	Fatigue pressure testing of metal containing envelopes in hydraulic fluid applications
ISO 16889	Hydraulic fluid power filters-multi-passmethod for evaluation filtration performance of a filter element

6. Symbols



7. Type code and order numbers

Pi 281125/21-058/852 888 PS 10

Pi 281	125	/2	1	-058	/825 888 PS 10
1	2	3	4	5	6

1 Filter type

2 Size/Connections
Connection flange
(In, Out): DIN EN 1092-1
- 125 = 1250 l/min - DN 100
- 180 = 1800 l/min - DN 125
- 350 = 3500 l/min - DN 150
- 600 = 6000 l/min - DN 200
- 800 = 8000 l/min - DN 250

3 Nominal pressure
- 1 = 10 bar
- 2 = 16 bar

4 Number of elements
- 1 per filter side from NG 1250 up to NG 1800,
- 3 per filter side from NG 3500 up to NG 6000,
- 4 per filter side at NG 8000

5 Housing design
- 058 = with bypass valve and electrical maintenance indicator
- 069 = electrical maintenance indicator

6 Filter element
- Filter element type and filter rating

Filters DN 100 and DN 125 optional, DN 150 up to DN 250 standard with cover lifting device.

7.1 Housing design

Nominal size NG [l/min]	Type	Number of elements per filter side and element type	Pressure [bar]	② with bypass valve and electrical indicator	④ with electrical indicator
1250	281125/11-058	1x 852 888	10	■	
	281125/11-069				■
	281125/21-058		16	■	
	281125/21-069				■
1800	281180/11-058	1x 852 884	10	■	
	281180/11-069				■
	281180/21-058		16	■	
	281180/21-069				■
3500	281350/13-058	3x 852 888	10	■	
	281350/13-069				■
	281350/23-058		16	■	
	281350/23-069				■
6000	281600/13-058	3x 852 884	10	■	
	281600/13-069				■
	281600/23-058		16	■	
	281600/23-069				■
8000	281800/14-058	4x 852 884	10	■	
	281800/14-069				■
	281800/24-058		16	■	
	281800/24-069				■

7.2 Filter elements (a wider range of element types is available on request)				
Order number	**Type**	**Filter material**	**max. Δp [bar]**	**Filter surface [cm²]**
78263295	852 888 PS 3	PS 3		21850
78354029	852 888 PS 6	PS 6		21850
78226813	852 888 PS 10	PS 10		21850
78226821	852 888 PS 25	PS 25		21850
78207664	852 888 Mic 10	Mic 10	**10**	21850
78228017	852 888 Drg 25	Drg 25		16500
78228025	852 888 Drg 40	Drg 40		16500
78303026	852 888 Drg 60	Drg 60		16500
78228470	852 888 Drg 100	Drg 100		16500
78227431	852 884 PS 3	PS 3		28500
79337916	852 884 PS 6	PS 6		28500
78226797	852 884 PS 10	PS 10		28500
78226805	852 884 PS 25	PS 25		28500
70366315	852 884 Mic 10	Mic 10	**10**	28500
79337460	852 884 Drg 25	Drg 25		23450
78261653	852 884 Drg 40	Drg 40		23450
79700402	852 884 Drg 60	Drg 60		23450
79327750	852 884 Drg 100	Drg 100		23450

8. Technical specifications

Design:	line mounting filter, mounting via through holes at supporting stands
Fitting position:	upright
Butterfly valve switch over device	
Temperature range:	- 10 °C to + 100 °C (other temperature ranges on request)
Filter housing material:	steel welded construction
Material of seals:	NBR (other materials on request)
Bypass opening pressure:	Δ p 3.5 bar +/- 10 %
Activating pressure of optical/electrical contamination indicator:	Δ p 2.2 bar +/-10 %
Electrical data of contamination indicator:	
Maximum voltage:	230 V AC/200 V DC
Maximum current on contact:	1 A
Maximum contact load:	70 W
Type of protection:	IP 65 when inserted and secured
Contact:	bistable
Cable connection:	M20x1.5

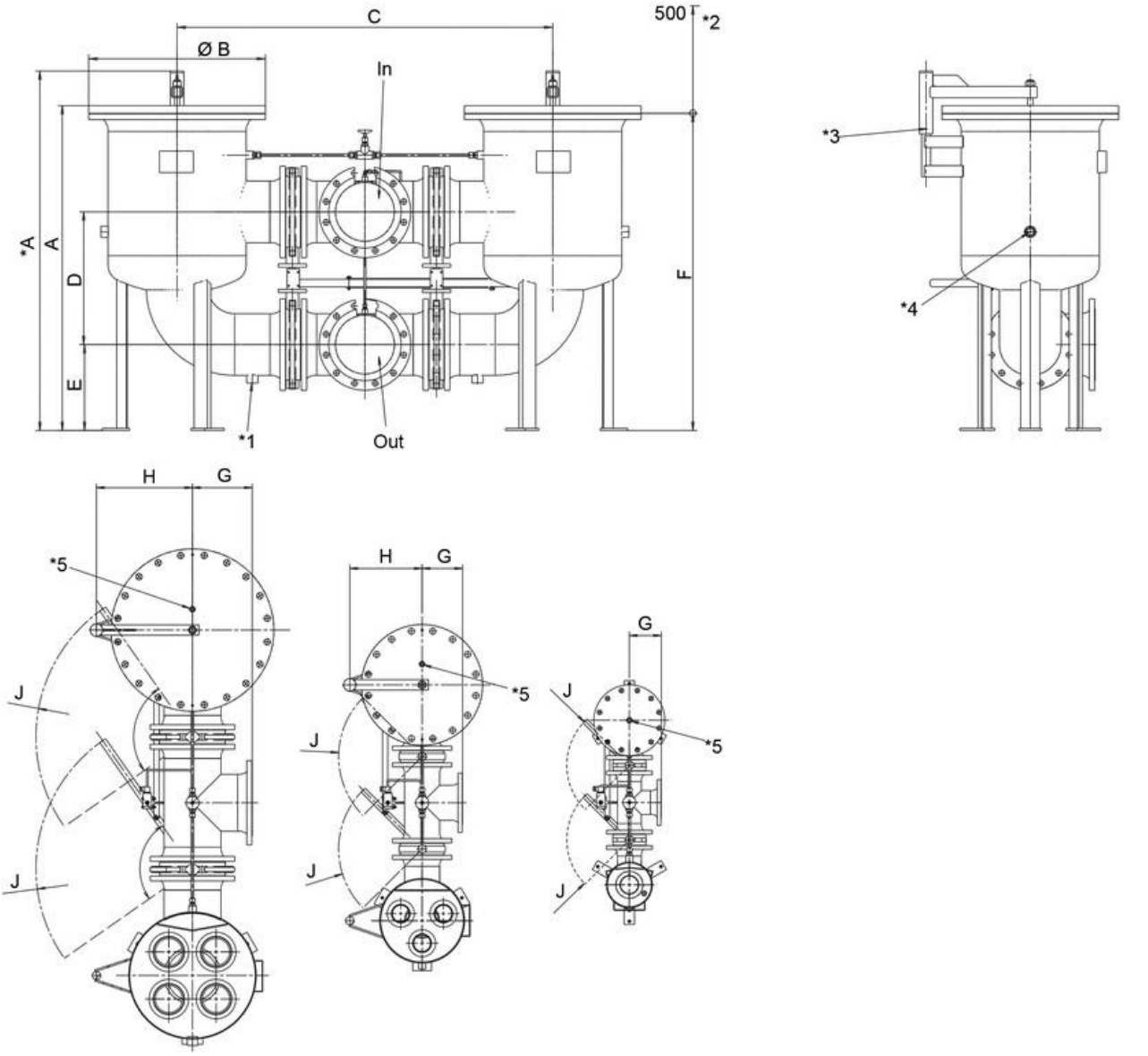
Please contact us in case of using other media.

The switching function can be changed by turning the electric upper part by 180° (normally closed contact or normally open contact). The state on delivery is a normally closed contact. By inductivity in the direct current circuit the use of suitable protection circuit should be considered. Further maintenance indicator details and designs are available in the maintenance indicator data sheet.

We recommend you to contact us concerning applications of our filters in areas governed by the EU Directive 94/9 EC (ATEX 95). The standard version can be used for liquids based on mineral oil (corresponding to the fluids in Group 2 of Directive 97/23 EC Article 9).
If you consider to use other fluids please contact us for additional support.

Subject to technical alteration without prior notice.

9. Dimensions



A for Pi 281125 up to 281180
*A for Pi 281350 up to 281800

*1 drain connection G½
*2 minimum clearance

*3 cover lifting device
*4 drain connection G½

*5 vent screw G½

In = Inlet
Out = Outlet

All dimensions in mm.

Nominal size NG [l/min]	Connection DN	Nominal pressure PN [bar]	A ± 10	B	C ± 10	D ± 1	E ± 1	F	G	H	J
1250	100	10 + 16	984	340	790	365	250	960	153	-	378
1800	125		1091	405	922	391	250	975	175	250	378
3500	150	16	1346	580	1132	435	332	1200	194	340	396
6000	200		1466	715	1332	483	350	1300	236	400	421
8000	250		1610	840	1654	587	380	1403	279	490	726
3500	150	10	1346	565	1132	435	332	1200	194	340	396
6000	200		1450	670	1332	483	350	1300	236	380	421
8000	250		1590	780	1654	587	380	1403	279	460	726

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Duplex Filter
Pi 370

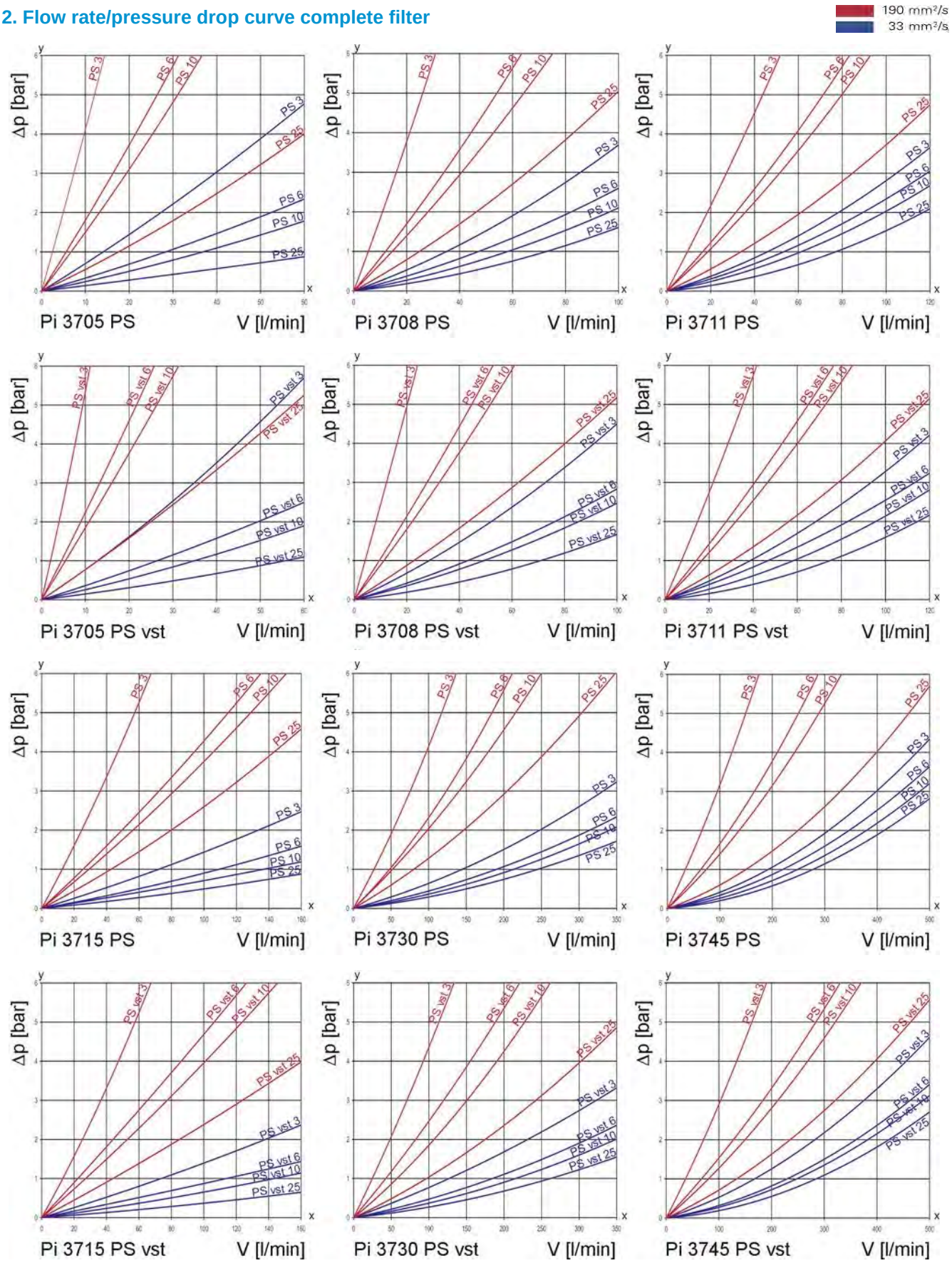
Nominal pressure 200/210/250/315 bar (2900/3040/3620/4570 psi), nominal size up to 450

1. Features

High performance filters for modern hydraulic systems

- Modular system
- Compact design
- Minimal pressure drop through optimal flow design
- Visual/electrical/electronic maintenance indicator
- Threaded connections
- Change over valve on upstream side
- Ergonomic switch-over handle with saftey lock and pressure compensation
- User-optimized one-hand-operation
- Equipped with highly efficient glass-fibre PS filter elements
- Beta rated elements according to ISO 16889 multipass test
- Elements with high differential pressure stability and dirt holding capacity
- NPT- and SAE-connections on request
- Worldwide distribution

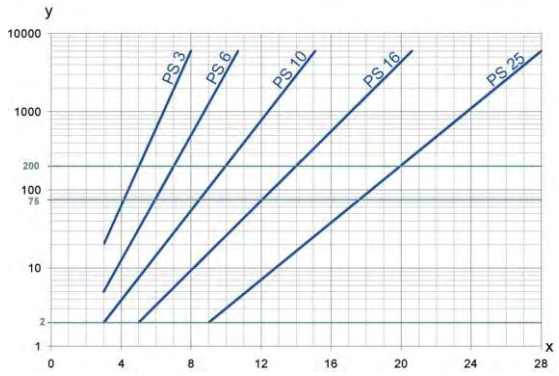
2. Flow rate/pressure drop curve complete filter



y = differential pressure Δp [bar]

x = flow rate V [l/min]

3. Separation grade characteristics



y = beta-value
x = particle size [µm]

determined by multipass tests (ISO 16889)
calibration according to ISO 11171 (NIST)

4. Filter performance data

tested according to ISO 16889 (multipass test)

PS elements with
max. Δ p 20 bar

PS	3	$\beta_{5(C)}$	≥200
PS	6	$\beta_{7(C)}$	≥200
PS	10	$\beta_{10(C)}$	≥200
PS	25	$\beta_{20(C)}$	≥200

values guaranteed up to
10 bar differential pressure

PS vst elements with
max. Δ p 210 bar

PS vst	3	$\beta_{5(C)}$	≥200
PS vst	6	$\beta_{7(C)}$	≥200
PS vst	10	$\beta_{10(C)}$	≥200
PS vst	25	$\beta_{20(C)}$	≥200

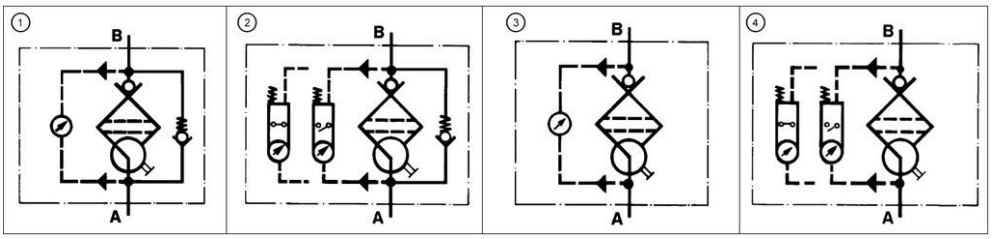
values guaranteed up to
20 bar differential pressure

5. Quality assurance

Filtration Group filters and filter elements are produced according to the following international standards:

Norm	Designation
DIN ISO 2941	Hydraulic fluid power filter elements; verification of collapse/burst pressure
DIN ISO 2942	Hydraulic fluid power filter elements; verification of fabrication integrity
DIN ISO 2943	Hydraulic fluid power filter elements; verification of material compatibility with fluids
DIN ISO 3723	Hydraulic fluid power filter elements; method for end load test
DIN ISO 3724	Hydraulic fluid power filter elements; verification of flow fatigue characteristics
ISO 3968	Hydraulic fluid power filter; evaluation of pressure drop versus flow characteristics
ISO 10771.1	Fatigue pressure testing of metal containing envelopes in hydraulic fluid applications
ISO 16889	Hydraulic fluid power filters; multipass method for evaluation filtration performance of a filter element

6. Symbols



7. Order numbers

Example for ordering filters:

1. Filter housing	2. 2x Filter element
V = 80 l/min and electrical maintenance indicator Type: Pi 3708-015 Order number: 77810369	PS vst 3 Type: Pi 2208 PS vst 3 Order number: 77680200

7.1 Housing design

Nominal size NG [l/min]	Order number	Type	① with bypass valve and visual indicator	② with bypass valve and electrical indicator	③ with visual indicator	④ with electrical indicator
50	77810294	Pi 3705-012	■			
	77810302	Pi 3705-013		■		
	77810310	Pi 3705-014			■	
	77810328	Pi 3705-015				■
80	77810336	Pi 3708-012	■			
	77810344	Pi 3708-013		■		
	77810351	Pi 3708-014			■	
	77810369	Pi 3708-015				■
110	77810377	Pi 3711-012	■			
	77810385	Pi 3711-013		■		
	77810393	Pi 3711-014			■	
	77810401	Pi 3711-015				■
150	77810419	Pi 3715-012	■			
	77810427	Pi 3715-013		■		
	77810435	Pi 3715-014			■	
	77810443	Pi 3715-015				■
300	77810450	Pi 3730-012	■			
	77810468	Pi 3730-013		■		
	77810476	Pi 3730-014			■	
	77810484	Pi 3730-015				■
450	77810492	Pi 3745-012	■			
	77814403	Pi 3745-013		■		
	77814411	Pi 3745-014			■	
	77814429	Pi 3745-015				■

When filter with non bypass configuration is selected, the collapse pressure of the element must not be exceeded.

7.2 Filter elements (a wider range of element types is availble on request)					
Nominal size NG [l/min]	**Order number**	**Type**	**Filter material**	**max. Δp [bar]**	**Filter surface [cm²]**
50	77680135	Pi 2105 PS 3	PS 3	**20**	590
	77943509	Pi 5105 PS 6	PS 6		590
	77680325	Pi 3105 PS 10	PS 10		590
	77680440	Pi 4105 PS 25	PS 25		590
	77680192	Pi 2205 PS vst 3	PS vst 3	**210**	425
	77943533	Pi 5205 PS vst 6	PS vst 6		425
	77680382	Pi 3205 PS vst 10	PS vst 10		425
	77680507	Pi 4205 PS vst 25	PS vst 25		425
80	77680143	Pi 2108 PS 3	PS 3	**20**	1150
	77943517	Pi 5108 PS 6	PS 6		1150
	77680341	Pi 3108 PS 10	PS 10		1150
	77680457	Pi 4108 PS 25	PS 25		1150
	77680200	Pi 2208 PS vst 3	PS vst 3	**210**	850
	77943541	Pi 5208 PS vst 6	PS vst 6		850
	77681190	Pi 3208 PS vst 10	PS vst 10		850
	77680515	Pi 4208 PS vst 25	PS vst 25		850
110	77680150	Pi 2111 PS 3	PS 3	**20**	1700
	77943525	Pi 5111 PS 6	PS 6		1700
	77680333	Pi 3111 PS 10	PS 10		1700
	77680465	Pi 4111 PS 25	PS 25		1700
	77680218	Pi 2211 PS vst 3	PS vst 3	**210**	1275
	77943558	Pi 5211 PS vst 6	PS vst 6		1275
	77680390	Pi 3211 PS vst 10	PS vst 10		1275
	77680523	Pi 4211 PS vst 25	PS vst 25		1275
150	77680168	Pi 2115 PS 3	PS 3	**20**	2425
	77955099	Pi 5115 PS 6	PS 6		2425
	77680358	Pi 3115 PS 10	PS 10		2425
	77680473	Pi 4115 PS 25	PS 25		2425
	77680226	Pi 2215 PS vst 3	PS vst 3	**210**	2010
	77955123	Pi 5215 PS vst 6	PS vst 6		2010
	77680408	Pi 3215 PS vst 10	PS vst 10		2010
	77680531	Pi 4215 PS vst 25	PS vst 25		2010
300	77680176	Pi 2130 PS 3	PS 3	**20**	4620
	77955107	Pi 5130 PS 6	PS 6		4620
	77680366	Pi 3130 PS 10	PS 10		4620
	77680481	Pi 4130 PS 25	PS 25		4620
	77680234	Pi 2230 PS vst 3	PS vst 3	**210**	3800
	77955131	Pi 5230 PS vst 6	PS vst 6		3800
	77680416	Pi 3230 PS vst 10	PS vst 10		3800
	77680549	Pi 4230 PS vst 25	PS vst 25		3800
450	77680184	Pi 2145 PS 3	PS 3	**20**	6865
	77955115	Pi 5145 PS 6	PS 6		6865
	77680374	Pi 3145 PS 10	PS 10		6865
	77680499	Pi 4145 PS 25	PS 25		6865
	77680242	Pi 2245 PS vst 3	PS vst 3	**210**	5600
	77955149	Pi 5245 PS vst 6	PS vst 6		5600
	77680424	Pi 3245 PS vst 10	PS vst 10		5600
	77680556	Pi 4245 PS vst 25	PS vst 25		5600

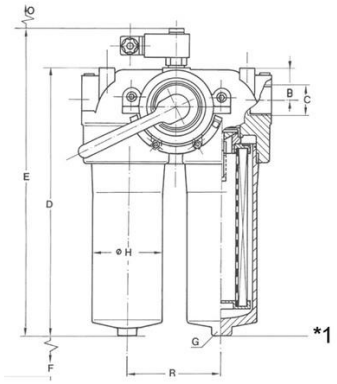
8. Technical specifications

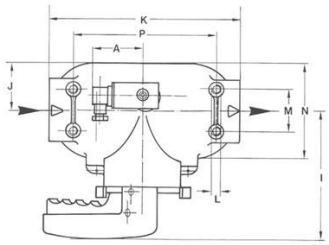
Design:	line mounting filter
Operating pressure:	
Pi 3705 - Pi 3711	10^7 load changes 250 bar (3620 psi) 10^6 load changes 315 bar (4570 psi)
Pi 3715 - Pi 3745	2x 10^6 load changes 210 bar (3040 psi)
Test pressure:	
Pi 3705 - Pi 3711	450 bar (6520 psi)
Pi 3715 - Pi 3745	300 bar (4350 psi)
Pi 3705 - Pi 3745 when use on ships operating/test pressure	200/260 bar (2900/3770 psi)
Temperature range:	-10 °C to +120 °C (other temperature ranges on request)
Bypass opening pressure:	Δ p 7 bar ± 10 %
Filter head material:	GGG
Filter bowl material:	St
Sealing material:	NBR/PTFE
Activating pressure of optical/electrical differential pressure indicator	Δ p 5 bar ± 10 %
Electrical data of contamination indicator:	
Maximum voltage:	250 V AC/200 V DC
Maximum current on contact:	1 A
Inrush current:	70 W
Type of protection:	IP 65 when inserted and secured
Contact:	bistable
Cable connection:	M20x1.5

The switching function can be changed by turning the electric upper part by 180° (normally closed contact or normally open contact). The state on delivery is a normally closed contact. The use of quenching circuits must be checked in the case of inductivity in the DC current circuit. The contamination indicator data sheet contains further information and additional contamination indicator versions.

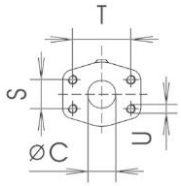
We draw attention to the fact that all values indicated are average values which do not always occur in specific cases of application. Our products are continually being further developed. Values, dimensions and weights can change as a result of this. Our specialized department will be pleased to offer you advice.

We recommend you to contact us concerning applications of our filters in areas governed by the EU Directive 94/9 EC (ATEX 95). The standard version can be used for liquids based on mineral oil (corresponding to the fluids in Group 2 of Directive 97/23 EC Article 9). If you consider to use other fluids please contact us for additional support.





*1 Pi 3730-Pi 3745 with drain screw G¼ DIN 910



9. Dimensions

All dimensions except "C" in mm.

Type	A	B	C*	D	E	F	Weight [kg]
Pi 3705	78	38	G1	219	271	80	11.0
Pi 3708	78	38	G1	294	346	80	12.0
Pi 3711	78	38	G1	370	422	80	15.0
Pi 3715	78	50	G1½	302	354	110	31.5
Pi 3730	78	50	G1½	427	479	110	37.0
Pi 3745	78	50	G1½	543	595	110	41.5

* SAE flange connection on request.

Subject to technical alteration without prior notice.

Type	G SW	H	I	J	K	L	M	N	O	P	R	S	T	U	Weight [kg]
Pi 3705	27	65	144	45	182	M8x15	55	90	45	100	86	-	-	-	11.0
Pi 3708	27	65	144	45	182	M8x15	55	90	45	100	86	-	-	-	12.0
Pi 3711	27	65	144	45	182	M8x15	55	90	45	100	86	-	-	-	15.0
Pi 3715	30	110	175	70	280	M12x18	62	140	45	210	136	-	-	-	31.5
Pi 3730	30	110	175	70	280	M12x18	62	140	45	210	136	-	-	-	37.0
Pi 3745	30	110	175	70	280	M12x18	62	140	45	210	136	35.7	69.85	M12x20	41.5

10. Installation, operating and maintenance instructions

10.1 Filter installation

When installing filter make sure that sufficient space is available to remove filter element and filter housing.
Preferably the filter should be installed with the filter housing pointing downwards.
The maintenance indicator must be visible.

10.2 Connecting the electrical maintenance indicator

The electrical indicator is connected via a 2-pole appliance plug according to DIN EN 175301-803 with poles marked 1 and 2. The electrical section can be inverted to change from normally open to normally closed position or vice versa.

10.3 When should the filter element be replaced?

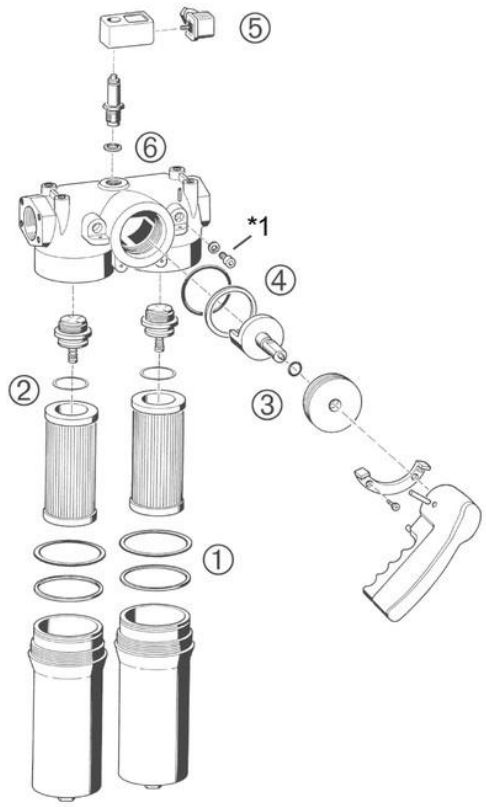
1 . Filters equipped with visual and electrical maintenance indicator:
   During cold starts, the indicator may give a warning signal. Press the red button of the visual indicator once again only after operating temperature has been reached. If the red button immediately pops up again and/or the electrical signal has not switched off after reaching operating temperature the filter element must be replaced after the end of the shift.
2 . Please always ensure that you have original Filtration Group spare elements in stock: Disposable elements (PS) cannot be cleaned.

10.4 Element replacement

Note: Elements may only be replaced by people who are familiar with the function of the filter. When replacing elements, appropriate safety clothing (protective goggles, gloves, safety shoes) must be worn.
Note: The maintenance indicator monitors the filter side in operation, which is identified by the position of the switching lever catch. The change-over transfer valve must be switched prior filter servicing. Now the signal of the maintenance indicators cancelled and the red button can be repressed again.

1 . Operate and hold pressure equalizing lever located behind switching lever. Pull catch knob and swivel switching lever. Engage the catch on the clear filter side. Place through or drip pan underneath to collect leaving oil.
2 . Loosen vent screw of the filter side not in use by 2-3 turns; max. until contact is made with the safety stop.
3 . Unscrew filter housing by rotating same counter-clockwise and clean with a suitable medium.
   Warning: The shift lever may not, from now until the screwing back in of the filter housing (7.), be activated under any circumstances!
4 . Remove filter element with a side-to-side motion.
5 . Check O-ring on the filter house for damage. Replace, if necessary.
6 . Make sure that the order number on the spare element corresponds to the oder number of the filter name-plate.
7 . Lightly lubricate the threads of the filter housing and screw into the filter head. Maximum tightening torque for NG 50 to 110 = 60 Nm, for NG 150 to 450 = 100 Nm.
8 . To refill the filter chamber, operate only the pressure equalizing lever (leave the switching lever arrested in its catch) long enough for the medium to emerge bubble- free from the vent bore.
9 . Tighten vent screw. Check filter for leaks by operating the pressure equalizing lever once again.

11. Spare parts list



*1 vent screw

Order numbers for spare parts		
Position	**Type**	**Order numbers**
① bis ④	Seal kit	
	Pi 3705 - Pi 3711	
	NBR	78305062
	FPM	78305054
	EPDM	78305047
	Pi 3715 - Pi 3745	
	NBR	79375056
	FPM	79375064
	EPDM	79375072
⑤	Maintenance indicator	
	Visual PiS 3093/5	77669914
	Electrical PiS 3092/5	77669864
	Electrical upper section only	77536550
⑥	Seal kit for maintenance indicator	
	NBR	77760275
	FPM	77760283
	EPDM	77760291

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78356909.06/2019

FG Fluid Solutions
Filtration Group

MAHLE Industrialfiltration is now Filtration Group. For more information, visit www.fluid.filtrationgroup.com

Duplex Filter
Pi 2100

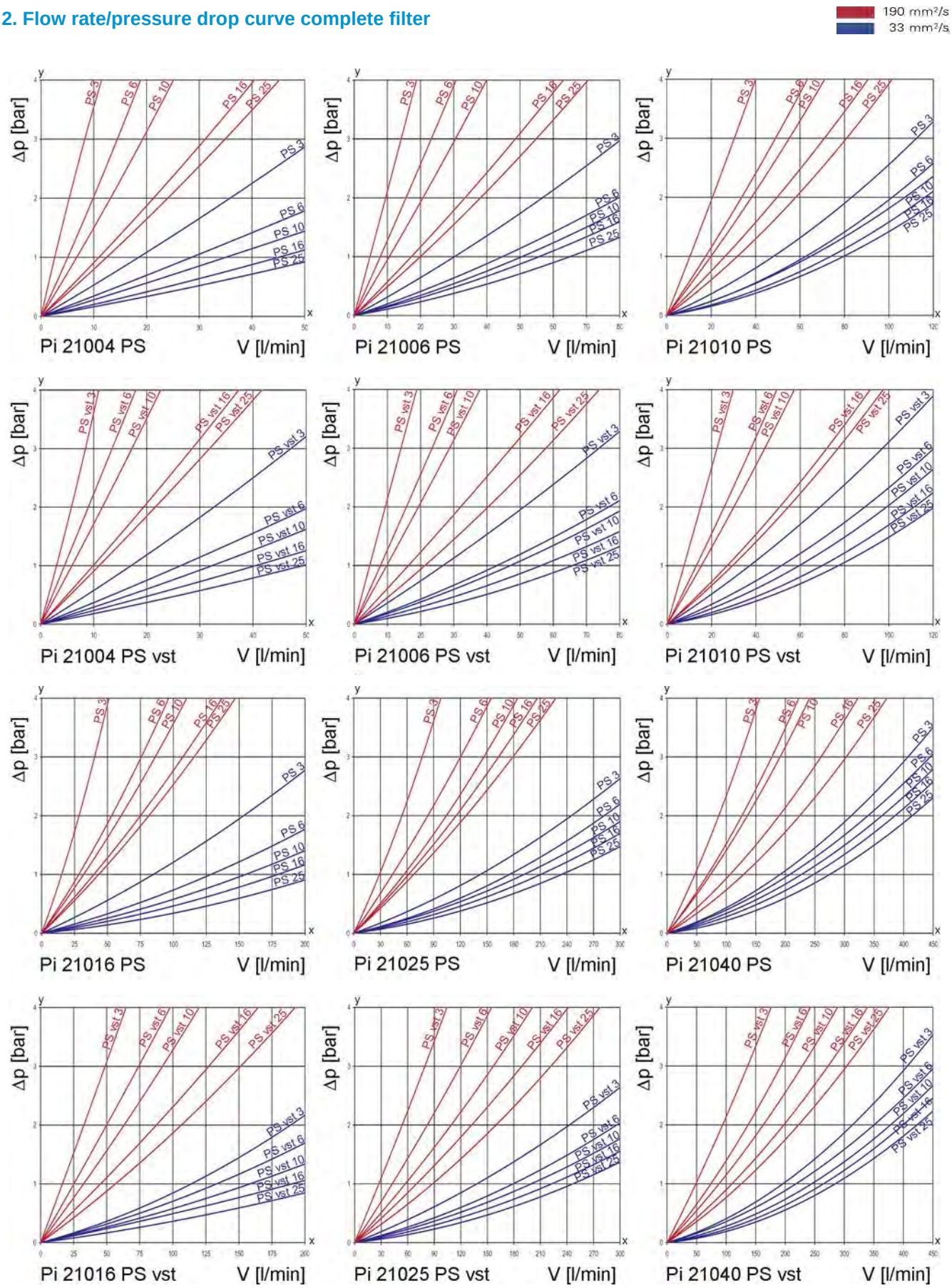
Nominal pressure 32/63 bar (460/900 psi), nominal size up to 400
according to DIN 24550

1. Features

High performance filters for modern hydraulic systems

- Modular system
- Compact design
- Minimal pressure drop through optimal flow design
- Visual/electrical/electronic maintenance indicator
- Threaded connections
- Change over valve on upstream side
- Ergonomic switch-over handle with saftey lock and pressure compensation
- User-optimized one-hand-operation
- Equipped with highly efficient glass fibre PS filter elements
- Beta rated elements according to ISO 16889 multipass test
- Elements with high differential pressure stability and dirt holding capacity
- Other connections on request
- Worldwide distribution

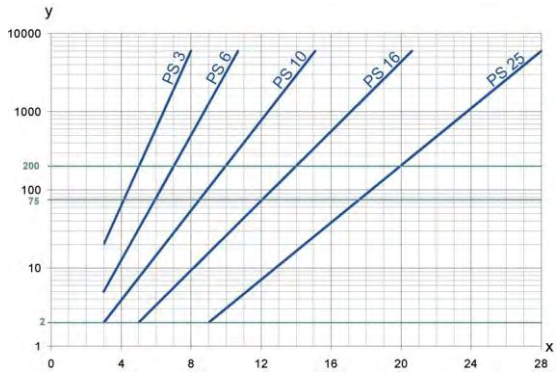
2. Flow rate/pressure drop curve complete filter



y = differential pressure Δp [bar]

x = flow rate V [l/min]

3. Separation grade characteristics



y = beta-value
x = particle size [µm]

determined by multipass tests (ISO 16889)
calibration according to ISO 11171 (NIST)

4. Filter performance data

tested according to ISO 16889 (multipass test)

PS elements with
max. Δ p 20 bar

PS	3	$\beta_{5(C)}$	≥200
PS	6	$\beta_{7(C)}$	≥200
PS	10	$\beta_{10(C)}$	≥200
PS	16	$\beta_{15(C)}$	≥200
PS	25	$\beta_{20(C)}$	≥200

values guaranteed up to
10 bar differential pressure

PS vst elements with
max. Δ p 210 bar

PS vst	3	$\beta_{5(C)}$	≥200
PS vst	6	$\beta_{7(C)}$	≥200
PS vst	10	$\beta_{10(C)}$	≥200
PS vst	16	$\beta_{15(C)}$	≥200
PS vst	25	$\beta_{20(C)}$	≥200

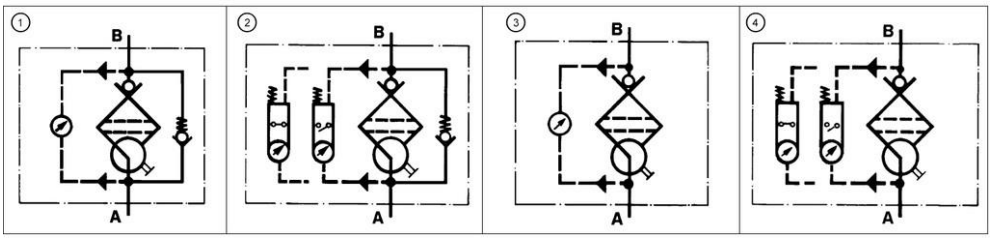
values guaranteed up to
20 bar differential pressure

5. Quality assurance

Filtration Group filters and filter elements are produced according to the following international standards:

Norm	Designation
DIN ISO 2941	Hydraulic fluid power filter elements; verification of collapse/burst resistance
DIN ISO 2942	Hydraulic fluid power filter elements; verification of fabrication integrity
DIN ISO 2943	Hydraulic fluid power filter elements; verification of material compatibility with fluids
DIN ISO 3723	Hydraulic fluid power filter elements; metod for end load test
DIN ISO 3724	Hydraulic fluid power filter elements; verification of flow fatigue characteristics
ISO 3968	Hydraulic fluid power filters; evaluation of pressure drop versus flow characteristics
ISO 10771.1	Fatigue pressure testing of metal containing envelopes in hydraulic fluid applications
ISO 16889	Hydraulic fluid power filters-multipass method for evaluation filtration performance of a filter element

6. Symbols



7. Order numbers

Example for ordering filter:

1. Housing design	2. 2x Filter elements
V = 100 l/min and electrical maintenance indicator Type: Pi 21010-069 Order number: 78204158	PS vst 3 NBR Type: Pi 71010 DN PS vst 3 Order number: 78227480

7.1 Housing design

Nominal size NG [l/min]	Order number	Type	① with bypass valve and visual indicator	② with bypass valve and electrical indicator	③ with visual indicator	④ with electrical indicator
40	79328261	Pi 21004-057	■			
	78304263	Pi 21004-058		■		
	79328279	Pi 21004-068			■	
	79328287	Pi 21004-069				■
63	79715905	Pi 21006-057	■			
	78304271	Pi 21006-058		■		
	79715913	Pi 21006-068			■	
	79715921	Pi 21006-069				■
100	78204125	Pi 21010-057	■			
	78204133	Pi 21010-058		■		
	78204141	Pi 21010-068			■	
	78204158	Pi 21010-069				■
160	79715939	Pi 21016-057	■			
	79715947	Pi 21016-058		■		
	79715954	Pi 21016-068			■	
	79715962	Pi 21016-069				■
250	79328295	Pi 21025-057	■			
	79328303	Pi 21025-058		■		
	79328311	Pi 21025-068			■	
	79328329	Pi 21025-069				■
400	79715970	Pi 21040-057	■			
	79715988	Pi 21040-058		■		
	79715996	Pi 21040-068			■	
	79716002	Pi 21040-069				■

When filter with non bypass configuration is selected, the collapse pressure of the element must not be exceeded.

7.2 Filter elements*					
Nominal size NG [l/min]	**Order number**	**Type**	**Filter material**	**max. Δ p [bar]**	**Filter surface [cm²]**
40	78260929	Pi 21004 DN PS 3	PS 3	**20**	475
	77960859	Pi 22004 DN PS 6	PS 6		475
	77925571	Pi 23004 DN PS 10	PS 10		475
	78260937	Pi 24004 DN PS 16	PS 16		475
	78260945	Pi 25004 DN PS 25	PS 25		475
	78216079	Pi 71004 DN PS vst 3	PS vst 3	**210**	445
	77960156	Pi 72004 DN PS vst 6	PS vst 6		445
	77925654	Pi 73004 DN PS vst 10	PS vst 10		445
	78216087	Pi 74004 DN PS vst 16	PS vst 16		445
	78216095	Pi 75004 DN PS vst 25	PS vst 25		445
63	78260960	Pi 21006 DN PS 3	PS 3	**20**	835
	77960867	Pi 22006 DN PS 6	PS 6		835
	77925589	Pi 23006 DN PS 10	PS 10		835
	78260978	Pi 24006 DN PS 16	PS 16		835
	78260986	Pi 25006 DN PS 25	PS 25		835
	78216137	Pi 71006 DN PS vst 3	PS vst 3	**210**	780
	77960149	Pi 72006 DN PS vst 6	PS vst 6		780
	77925662	Pi 73006 DN PS vst 10	PS vst 10		780
	78216145	Pi 74006 DN PS vst 16	PS vst 16		780
	78216152	Pi 75006 DN PS vst 25	PS vst 25		780
100	78227472	Pi 21010 DN PS 3	PS 3	**20**	1375
	77960875	Pi 22010 DN PS 6	PS 6		1375
	77925597	Pi 23010 DN PS 10	PS 10		1375
	78261000	Pi 24010 DN PS 16	PS 16		1375
	78261018	Pi 25010 DN PS 25	PS 25		1375
	78227480	Pi 71010 DN PS vst 3	PS vst 3	**210**	1275
	77960131	Pi 72010 DN PS vst 6	PS vst 6		1275
	77925670	Pi 73010 DN PS vst 10	PS vst 10		1275
	78261281	Pi 74010 DN PS vst 16	PS vst 16		1275
	78216160	Pi 75010 DN PS vst 25	PS vst 25		1275
160	78261034	Pi 21016 DN PS 3	PS 3	**20**	2530
	77960826	Pi 22016 DN PS 6	PS 6		2530
	77925605	Pi 23016 DN PS 10	PS 10		2530
	78261042	Pi 24016 DN PS 16	PS 16		2530
	78261059	Pi 25016 DN PS 25	PS 25		2530
	77940638	Pi 71016 DN PS vst 3	PS vst 3	**210**	1885
	77960123	Pi 72016 DN PS vst 6	PS vst 6		1885
	77925688	Pi 73016 DN PS vst 10	PS vst 10		1885
	78269797	Pi 74016 DN PS vst 16	PS vst 16		1885
	78216178	Pi 75016 DN PS vst 25	PS vst 25		1885

*a wider range of elemens is available on request

7.2 Filter elements*					
Nominal size NG [l/min]	**Order number**	**Type**	**Filter material**	**max. Δ p [bar]**	**Filter surface [cm²]**
250	78227514	Pi 21025 DN PS 3	PS 3	**20**	4020
	77960834	Pi 22025 DN PS 6	PS 6		4020
	77925613	Pi 23025 DN PS 10	PS 10		4020
	78261075	Pi 24025 DN PS 16	PS 16		4020
	78261083	Pi 25025 DN PS 25	PS 25		4020
	77940646	Pi 71025 DN PS vst 3	PS vst 3	**210**	3090
	77960115	Pi 72025 DN PS vst 6	PS vst 6		3090
	77925696	Pi 73025 DN PS vst 10	PS vst 10		3090
	78269813	Pi 74025 DN PS vst 16	PS vst 16		3090
	78216186	Pi 75025 DN PS vst 25	PS vst 25		3090
400	78227522	Pi 21 040 DN PS 3	PS 3	**20**	6770
	77960842	Pi 22 040 DN PS 6	PS 6		6770
	77925621	Pi 23 040 DN PS 10	PS 10		6770
	78261109	Pi 24 040 DN PS 16	PS 16		6770
	78261117	Pi 25 040 DN PS 25	PS 25		6770
	77940653	Pi 71 040 DN PS vst 3	PS vst 3	**210**	5240
	77960107	Pi 72 040 DN PS vst 6	PS vst 6		5240
	77930829	Pi 73 040 DN PS vst 10	PS vst 10		5240
	78269821	Pi 74 040 DN PS vst 16	PS vst 16		5240
	78260903	Pi 75 040 DN PS vst 25	PS vst 25		5240

*a wider range of elemens is available on request

8. Technical specifications

Design:	line mounting filter
Nominal pressure:	
Pi 21004-21010	10^7 load changes 63 bar (900 psi)
Pi 21016-21040	10^7 load changes 25 bar (360 psi) 2x 10^6 load changes 32 bar (460 psi)
Test pressure:	
Pi 21004-21010	95 bar (1370 psi)
Pi 21016-21040	48 bar (690 psi)
Temperature range:	-10 °C to +120 °C survival temperature - 40 °C (other temperature ranges on request)
Bypass setting:	Δp 3.5 bar ± 10 %
Filter head material:	GAL
Filter housing material:	AL/St.
Sealing material:	NBR/AL
Maintenance indicator setting:	Δp 2.2 bar ± 10 %
Electrical data of maintenance indicator:	
Max. voltage:	250 V AC/200 V DC
Max. current:	1 A
Contact load:	70 W
Type of protection:	IP 65 in inserted and secured status
Contact:	normally open/closed
Cable connection:	M20x1.5

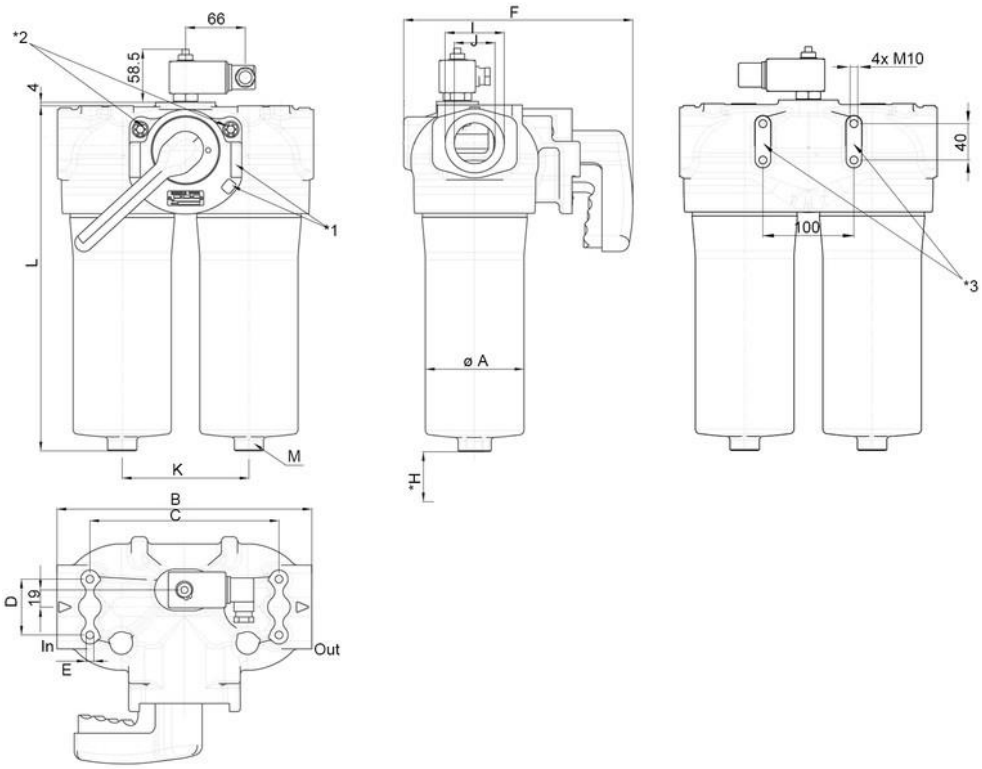
The switching function can be changed by turning the electric upper part by 180° (normally closed contact or normally open contact). The state on delivery is a normally closed contact. By inductivity in the direct current circuit the use of suitable protection circuit should be considered. Further maintenance indicator details and designs are available in the maintenance indicator data sheet.

We draw attention to the fact that all values indicated are average values which do not always occur in specific cases of application. Our products are continually being further developed. Values, dimensions and weights can change as a result of this. Our specialized department will be pleased to offer you advice.

We recommend to contact us concerning applications of our filters in areas governed by the EU Directive 94/9 EC (ATEX 95). The standard version can be used for liquids based on mineral oil (corresponding to the fluids in Goup 2 of Directive 97/23 EC Article 9). If you consider to use other fluids please contact us for additional support.

Subject to technical alteration without prior notice.

9. Dimensions



In Inlet
Out Outlet
*H Minimum clearance required for element change

*1 Lever locking and arresting
*2 Venting screws
*3 Optional wall mounting for NG 160 up to 400

All dimensions except "J" in mm.

Type	øA	B	C	D	E	F	G	H	øI	J*	K	L	M SW	Wt. [kg]
Pi 21004	66	172	100	52	M8x16	189	130	80	47	G1	85	203	27	2.6
Pi 21006	66	172	100	52	M8x16	189	130	80	47	G1	85	261	27	2.9
Pi 21010	66	172	100	52	M8x16	189	130	80	47	G1	85	351	27	3.3
Pi 21016	109	283	210	62	M10x20	252	194	110	65	G1½	140	288	32	8.6
Pi 21025	109	283	210	62	M10x20	252	194	110	65	G1½	140	389	32	9.5
Pi 21040	109	283	210	62	M10x20	252	194	110	65	G1½	140	531	32	19.0

* SAE flange connections (3000 psi), NPT and SAE connections on request

10. Installation, operating and maintenance instructions

10.1 Filter installation

When installing filter make sure that sufficient space is available to remove filter element and filter housing.
Preferably the filter should be installed with the filter housing pointing downwards.
The maintenance indicator must be visible.

10.2 Connecting the electrical maintenance indicator

The electrical indicator is connected via a 2-pole appliance plug according to DIN EN 175301-803 with poles marked 1 and 2. The electrical section can be inverted to change from normally open to normally closed position or vice versa. The state on delivery is a normally closed contact.

10.3 When should the filter element be replaced?

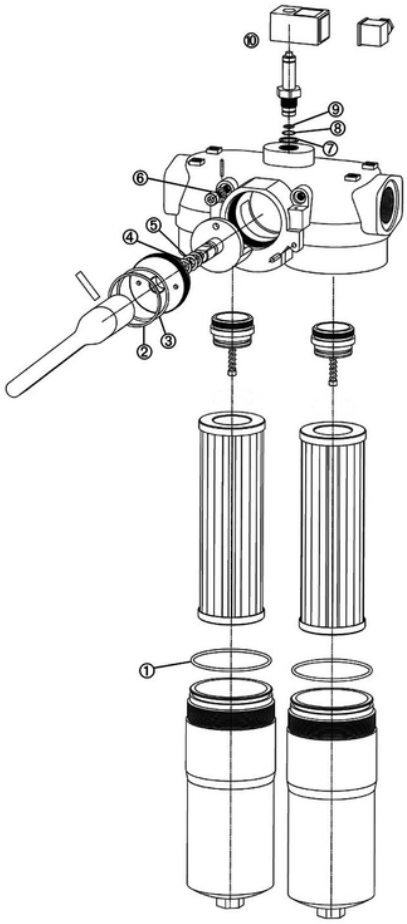
1. Filters equipped with visual and electrical maintenance indicator:
   During cold starts, the indicator may give a warning signal. Press the red button of the visual indicator once again only after operating temperature has been reached. If the red button immediately pops up again and/or the electrical signal has not switched off after reaching operating temperature the filter element must be replaced after the end of the shift.
2. Please always ensure that you have original Filtration Group spare elements in stock: Disposable elements cannot be cleaned.

10.4 Element replacement

Note: Elements may only be replaced by people who are familiar with the function of the filter. When replacing elements, appropriate safety clothing (protective goggles, gloves, safety shoes) must be worn.
Note: The maintenance indicator monitors the filter side in operation, which is identified by the position of the switching lever catch. The change-over transfer valve must be switched prior filter servicing. Now the signal of the maintenance indicators cancelled and the red button can be repressed again:

1. Operate and hold pressure equalizing lever located behind switching lever. Pull catch knob and swivel switching lever. Engage the catch on the clear filter side. Place through or drip pan underneath to collect leaving oil.
2. Loosen vent screw of the filter side not in use by 2-3 turns; max. until contact is made with the safety stop.
3. Unscrew filter housing by rotating same counter-clockwise and clean with a suitable medium.
   Warning: The shift lever may not, from now until the screwing back in of the filter housing (7.), be activated under any circumstances!
4. Remove filter element with a side-to-side motion.
5. Check O-ring on the filter house for damage. Replace, if necessary.
6. Make sure that the order number on the spare element corresponds to the oder number of the filter name-plate.
7. Lightly lubricate the threads of the filter housing and screw into the filter head. Maximum tightening torque for NG 40 to 100 = 30 Nm, for NG 160 to 400 = 50 Nm.
8. To refill the filter chamber, operate only the pressure equalizing lever (leave the switching lever arrested in its catch) long enough for the medium to emerge bubble- free from the vent bore.
9. Tighten vent screw. Check filter for leaks by operating the pressure equalizing lever once again.

11. Spare parts list



Order number for spare parts		
Position	**Type**	**Order number**
① bis ⑥	Seal kit for housing	
	Pi 21004 - Pi 21010	
	NBR	79774258
	FPM	79774266
	EPDM	79774274
	Pi 21016 - Pi 21040	
	NBR	79774282
	FPM	79774290
	EPDM	79774308
⑦ bis ⑨	Seal kit for maintenance indicator	
	NBR	77760309
	FPM	77760317
	EPDM	77760325
⑩	Maintenance indicator	
	Visual PiS 3098/2.2	77669971
	Electrical PiS 3097/2.2	77669948
	Electrical upper section only	77536550

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79336280.06/2019

Filtration Group®
Filtering The World

MAHLE Industrialfiltration is now Filtration Group. For more information, visit www.FiltrationGroup.com

Duplex Filter
Pi 2110

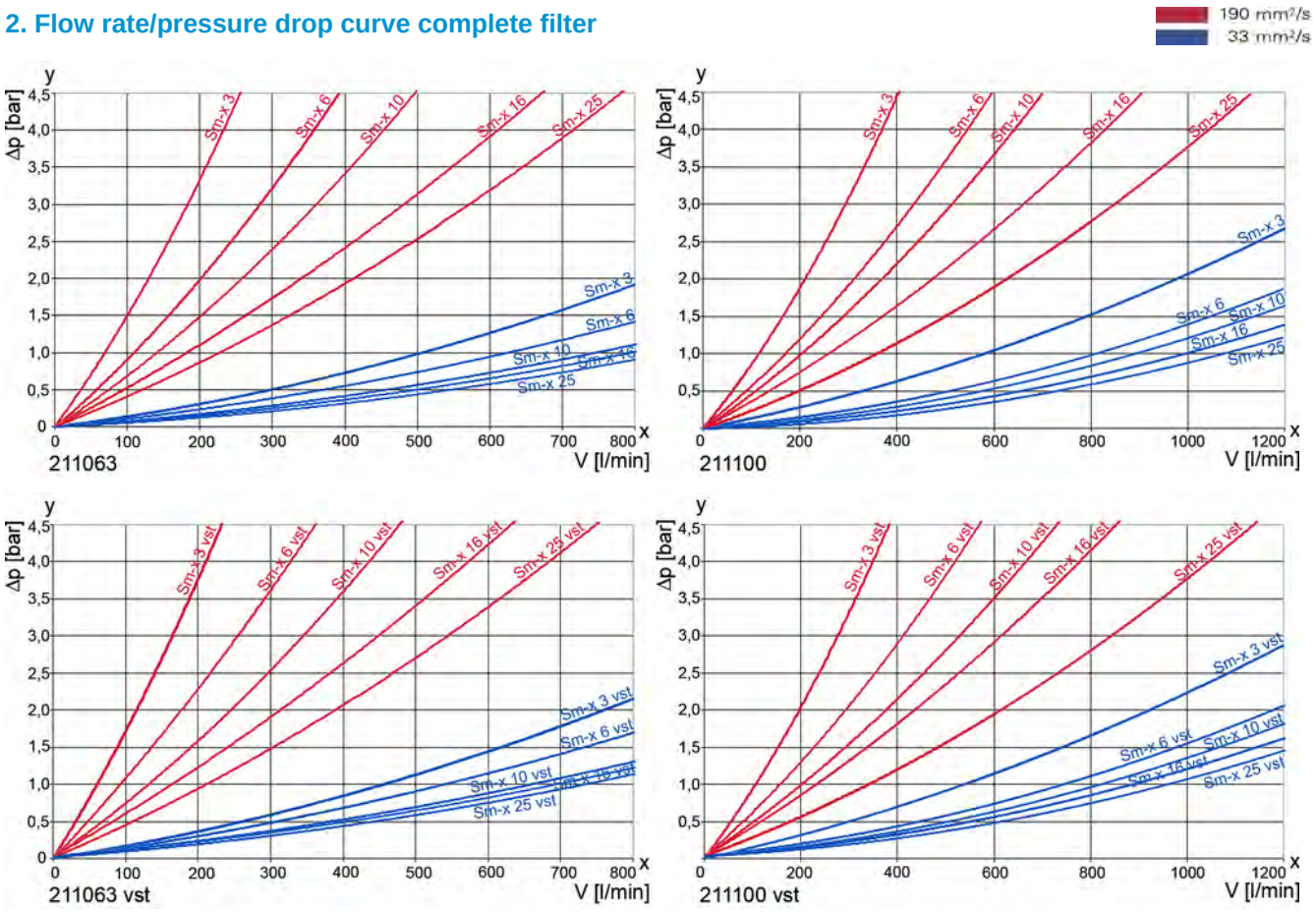
Nominal pressure 40 bar (570 psi), nominal size 630 and 1000
according DIN 24550

1. Features

High performance filters for modern hydraulic systems

- Modular system
- Compact design
- Minimal pressure drop through optimal flow design
- Visual/electrical/electronic maintenance indicator
- Flanged connections
- Quality filters, easy to service
- Equipped with highly efficient glass fibre Sm-x filter elements
- Beta rated elements according to ISO 16889 multipass test
- Elements with high differential pressure stability and dirt holding capacity
- Worldwide distribution

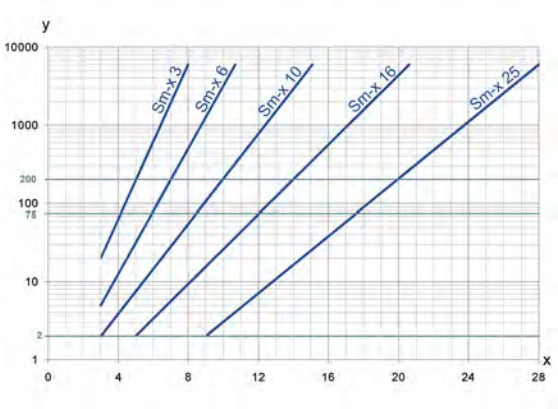
2. Flow rate/pressure drop curve complete filter



y = differential pressure Δp [bar]

x = flow rate V [l/min]

3. Separation grade characteristics



y = beta-value
x = partcle size [µm]

determined by multipass tests (ISO 16889)
calibration according to ISO 11171 (NIST)

4. Filter performance data

tested according to ISO 16889 (multipass test)

Sm-x elements with
max. Δ p 20 bar

Sm-x	3	$\beta_{5(C)}$	≥200
Sm-x	6	$\beta_{7(C)}$	≥200
Sm-x	10	$\beta_{10(C)}$	≥200
Sm-x	16	$\beta_{15(C)}$	≥200
Sm-x	25	$\beta_{20(C)}$	≥200

values guaranteed up to
10 bar differential pressure

Sm-x vst elements with
max. Δ p 210 bar

Sm-x vst	3	$\beta_{5(C)}$	≥200
Sm-x vst	6	$\beta_{7(C)}$	≥200
Sm-x vst	10	$\beta_{10(C)}$	≥200
Sm-x vst	16	$\beta_{15(C)}$	≥200
Sm-x vst	25	$\beta_{20(C)}$	≥200

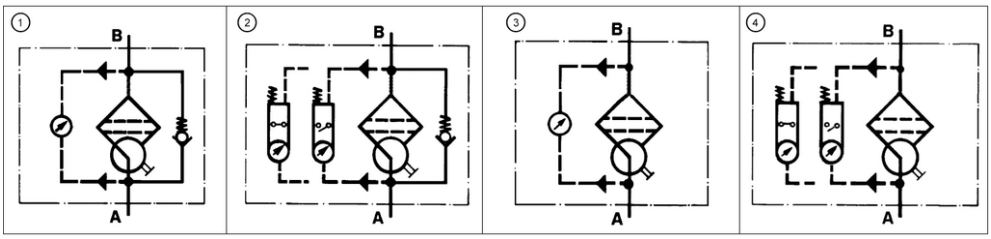
values guaranteed up to
20 bar differential pressure

5. Quality assurance

Filtration Group filters and filter elements are produced according to the following international standards:

Norm	Designation
DIN ISO 2941	Hydraulic fluid power filter elements; verification of collapse/burst resistance
DIN ISO 2942	Hydraulic fluid power filter elements, verification of fabrication integrity
DIN ISO 2943	Hydraulic fluid power filter elements, verification of material compatibility with fluids
DIN ISO 3723	Hydraulic fluid power filter elements, methods for end load test
DIN ISO 3724	Hydraulic fluid power filter elements, verification of flow fatigue charactersitics
ISO 3968	Hydraulic fluid power filters; evaluation of pressure drop versus flow characteristics
ISO 10771.1	Fatigue pressure testing of metal containing envelopes in hydraulic fluid applications
ISO 16889	Hydraulic fluid power filters; multipass method for evaluation filtration performance of a filter element

6. Symbols



7. Order numbers

Example for ordering filters:

1. Housing design	2. 2 x Filter element
V = 630 l/min and visual/electrical maintenance indicator Type: Pi 211063-069 Order number: 70316223	Sm-x vst 25 Type: Pi 75063 DN Sm-x vst 25 Order number: 77961568

7.1 Housing design

Nominal size NG [l/min]	Order number	Type	① with bypass valve and visual indicator	② with bypass valve and electrical indicator	③ with visual indicator	④ with electrical indicator
630	70316221	Pi 211063-057	■			
	70316207	Pi 211063-058		■		
	70316222	Pi 211063-068			■	
	70316223	Pi 211063-069				■
1000	70316224	Pi 211100-057	■			
	70316226	Pi 211100-058		■		
	70316227	Pi 211100-068			■	
	70316228	Pi 211100-069				■

When filter with non bypass configuration is selected the collapse pressure must not be exceeded!

7.2 Filter elements*

Nominal size NG [l/min]	Order number	Type	Filter material	max. Δp [bar]	Filter surface [cm²]
630	77961519	Pi 21063 DN Sm-x 3	Sm-x 3	20	9300
	77943699	Pi 22063 DN Sm-x 6	Sm-x 6		9300
	77925639	Pi 23063 DN Sm-x 10	Sm-x 10		9300
	77961527	Pi 24063 DN Sm-x 16	Sm-x 16		9300
	77961535	Pi 25063 DN Sm-x 25	Sm-x 25		9300
	77961543	Pi 71063 DN Sm-x vst 3	Sm-x vst 3	210	7230
	77960099	Pi 72063 DN Sm-x vst 6	Sm-x vst 6		7230
	77925712	Pi 73063 DN Sm-x vst 10	Sm-x vst 10		7230
	77961550	Pi 74063 DN Sm-x vst 16	Sm-x vst 16		7230
	77961568	Pi 75063 DN Sm-x vst 25	Sm-x vst 25		7230
1000	77961618	Pi 21100 DN Sm-x 3	Sm-x 3	20	14500
	77943723	Pi 22100 DN Sm-x 6	Sm-x 6		14500
	77925647	Pi 23100 DN Sm-x 10	Sm-x 10		14500
	77961626	Pi 24100 DN Sm-x 16	Sm-x 16		14500
	77961634	Pi 25100 DN Sm-x 25	Sm-x 25		14500
	77961642	Pi 71100 DN Sm-x vst 3	Sm-x vst 3	210	11450
	77960081	Pi 72100 DN Sm-x vst 6	Sm-x vst 6		11450
	77925720	Pi 73100 DN Sm-x vst 10	Sm-x vst 10		11450
	77961659	Pi 74100 DN Sm-x vst 16	Sm-x vst 16		11450
	77961667	Pi 75100 DN Sm-x vst 25	Sm-x vst 25		11450

* A wider range of element types is available on request.

8. Technical specifications

Design:	line mounting filter
Nominal pressure:	40 bar (570 psi)
Test pressure:	60 bar (850 psi)
Temperature range:	-10 °C to +120 °C
	(other temperature ranges on request)
	Minimum viscosity of the fluid: 10 mm²/s
	(if viscosity of the fluid < 10 mm²/s on request)
Bypass setting:	Δ p 3.5 bar ± 10 %
Filter head material:	GGG
Filter housing material:	St
Filter cover material:	GGG
Sealing material:	NBR
Maintenance indicator setting:	Δ p 2.2 bar ± 0.3 bar
Electrical data of maintenance indicator:	
Max. voltage:	250 V AC/200 V DC
Max. current:	1 A
Contact load:	70 W
Type of protection:	IP 65 in inserted and secured status
Contact:	normally open/closed
Cable sleave:	M20x1.5

The switching function can be changed by turning the electric upper part by 180° (normally closed contact or normally open contact). The state on delivery is a normally closed contact. By inductivity in the direct current circuit the use of suitable protection circuit should be considered. Further maintenance indicator details and designs are available in the maintenance indicator data sheet.

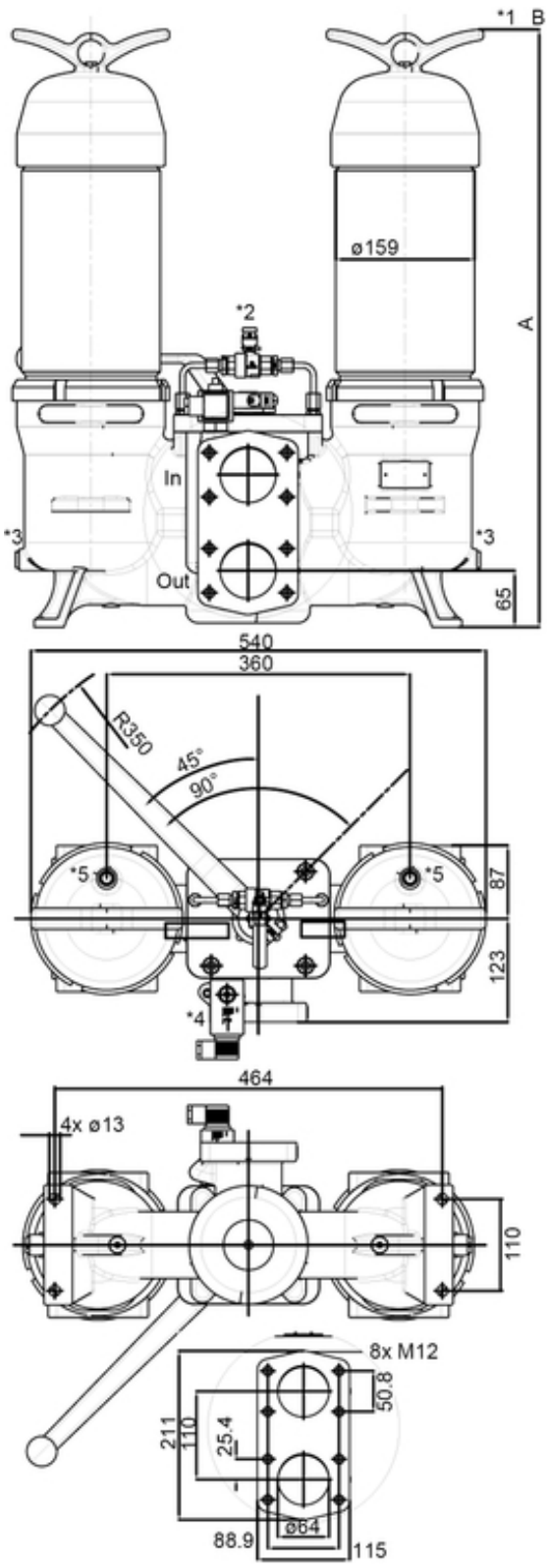
We draw attention to the fact that all values indicated are average values which do not always occur in specific cases of application. Our products are continually being further developed. Values, dimensions and weights can change as a result of this. Our specialized department will be pleased to offer you advice.

We recommend you to contact us concerning applications of our filters in areas governed by the EU Directive 94/9 EC (ATEX 95). The standard version can be used for liquids based on mineral oil (corresponding to the fluids in Group 2 of Directive 97/23 EC Article 9). If you consider to use other fluids please contact us for additional support.

Subject to technical alteration without prior notice.

In = Inlet
Out = Outlet

*1 Clearance B
*2 Pressure equalization valve
*3 Drain screw G¼
*4 Maintenance indicator
*5 Vent screw



9. Dimensions

All dimensions in mm.

Type	Connection	A	B	Weight [kg]
Pi 211063	DN 64	690	300	80
Pi 211100	DN 64	920	530	100

10. Installation, operating and maintenance instructions

10.1 Filter installation

When installing the filter make sure that sufficient space is available to remove filter element and filter housing.
The maintenance indicator must be visible.

10.2 Connecting the electrical maintenance indicator

The electrical indicator is connected via a 2-pole appliance plug according to DIN EN 175301-803 with poles marked 1 and 2. The electrical section can be inverted to change from normally open to normally closed position or vice versa.

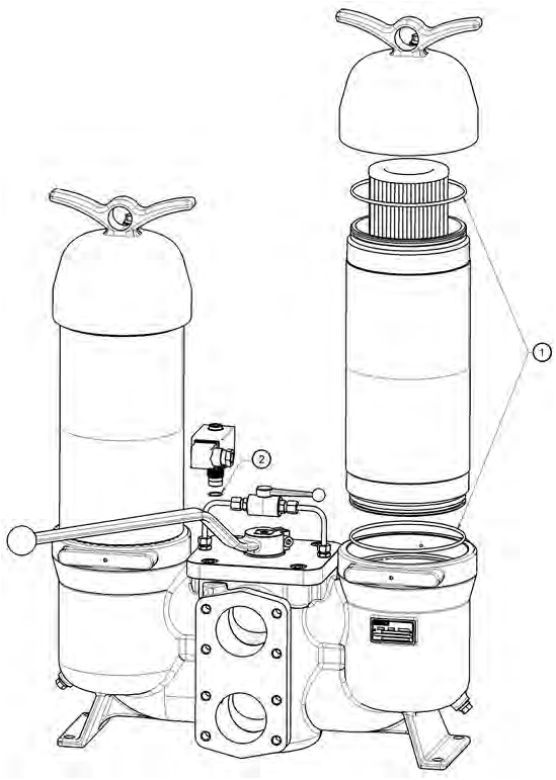
10.3 When should the filter element be replaced?

1 . Filters equipped with visual and electrical maintenance indicator:
   During cold starts, the indicator may give a warning signal. Press the red button of the visual indicator once again only after operating temperature has been reached. If the red button immediately pops up again and/or the electrical signal has not switched off after reaching operating temperature the filter element must be replaced after the end of the shift.
2 . Filters without maintenance indicator:
   The filter element should be replaced after the trial run or flushing of the system. Afterwards follow instructions of the manufacturer.
3 . Please always ensure that you have original Filtration Group spare elements in stock: disposable elements (Sm-x) cannot be cleaned.

10.4 Element replacement

Note: The maintenance indicator monitors the filter side in operation, which is identified by the position of the switching lever catch. The change-over transfer valve must be switched prior filter servicing. Now the signal of the maintenance indicators cancelled and the red button can be repressed again.

1 . Operate and hold pressure equalizing lever located behind switching lever. Pull catch knob and swivel switching lever. Place through or drip pan underneath to collect leaving oil. Close pressure equalization valve.
2 . Loosen vent screw of the filter side not in use by 2-3 turns; max. until contact is made with the safety stop.
3 . Remove drain plug in housing bottom and drain oil.
4 . Unscrew filter cover counter-clockwise.
5 . Lift out filter element.
6 . Check seal on filter cover. We recommend replacement in any case.
7 . Make sure that the order number on the spare element corresponds to the order number of the filter name-plate. To ensure no contamination occurs during the exchange of the element first open the plastic bag and push the element over the spigot in the filter head. Now remove plastic bag.
8 . Push the element carefully over the spigot and tight cover until full stop. Back off the cover 1/8 turn.
9 . Tighten drain plug housing bottom.
10 . To refill the filter chamber, operate only the pressure equalizing lever, until fluid emerges bubble-free from the drain cavity.
11 . Tight vent screw. Check for leckage by actuating the equalizing lever again.



11. Spare parts list

Order numbers for spare parts		
Position	**Type**	**Order number**
①	Seal kit for housing	
	NBR	70318468
	FPM	70318469
	EPDM	70318471
	Maintenance indicator	
	Visual PiS 3098/2,2	77669971
	Visual/electrical PiS 3097/2,2	77669948
	Electrical upper section only	77536550
②	Seal kit for maintenance indicator	
	NBR	77760309
	FPM	77760317
	EPDM	77760325

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Fax +49 7941 6466-429, sales@filtrationgroup.com, www.filtrationgroup.com
70352585.12/2016

FG Fluid Solutions
Filtration Group

MAHLE Industrialfiltration is now Filtration Group. For more information, visit www.fluid.filtrationgroup.com

Duplex Filter
Pi 3700

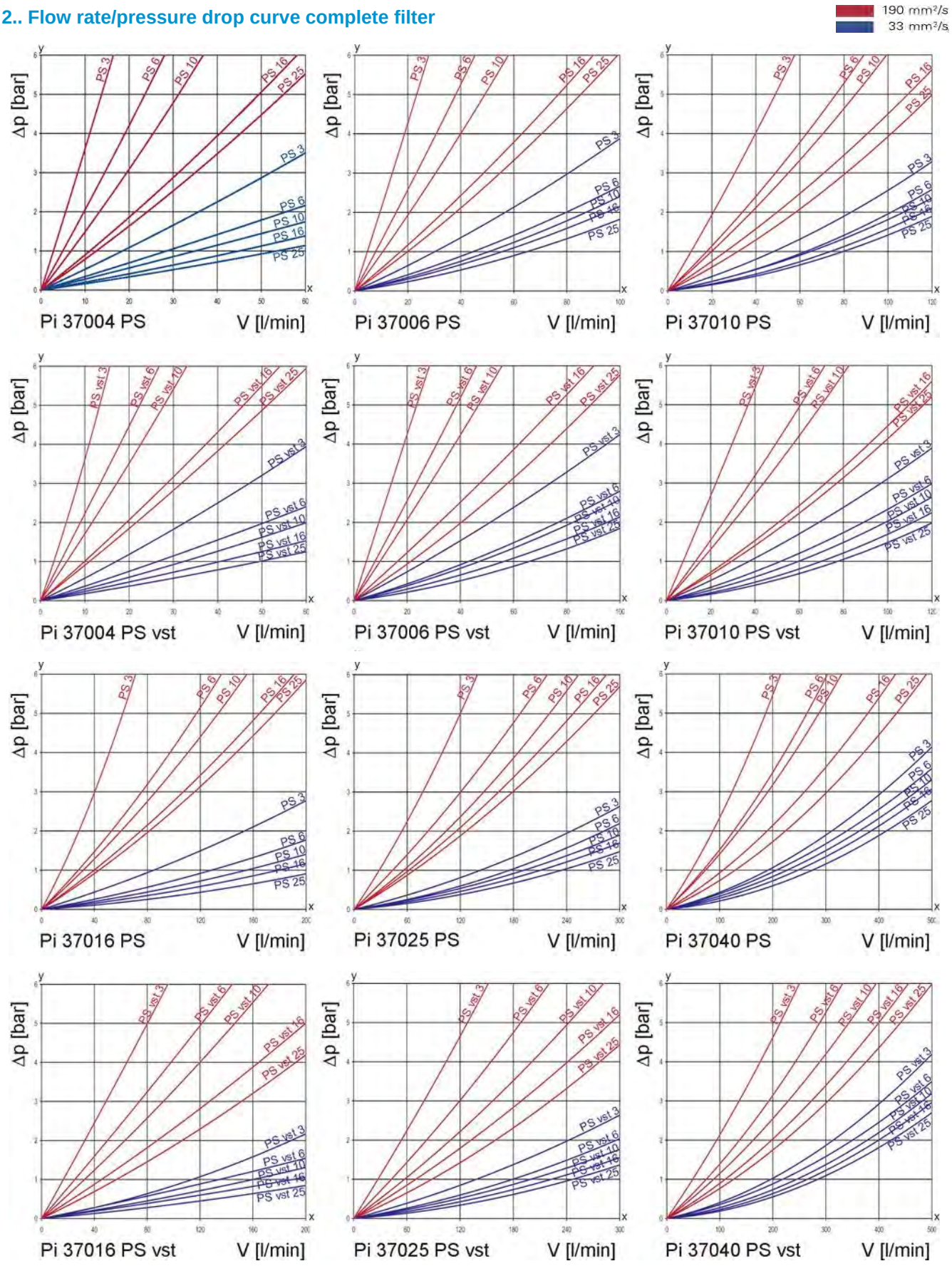
Nominal pressure 200/250/315 bar (2900/3620/4570 psi), nominal size up to 400
according DIN 24550

1. Features

High performance filters for modern hydraulic systems

- Modular system
- Compact design
- Minimal pressure drop through optimal flow design
- Visual/electrical/electronic maintenance indicator
- Threaded connections
- Change over valve on upstream side
- Ergonomic switch-over handle with safety lock and pressure compensation
- User-optimized one-hand-operation
- Equipped with highly efficient glass fibre PS filter elements
- Beta rated elements according to ISO 16889 multipass test
- Elements with high differential pressure stability and dirt holding capacity
- NPT- and SAE-connections on request
- Worldwide distribution

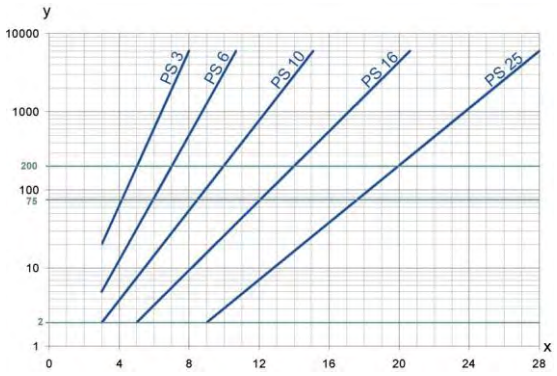
2.. Flow rate/pressure drop curve complete filter



y = differential pressure Δp [bar]

x = flow rate V [l/min]

3. Separation grade characteristics



y = beta-value
x = particle size [µm]

determined by multipass tests (ISO 16889)
calibration according to ISO 11171 (NIST)

4. Filter performance data

tested according to ISO 16889 (multipass test)

PS elements with
max. Δ p 20 bar

PS	3	$\beta_{5(C)}$	≥200
PS	6	$\beta_{7(C)}$	≥200
PS	10	$\beta_{10(C)}$	≥200
PS	16	$\beta_{15(C)}$	≥200
PS	25	$\beta_{20(C)}$	≥200

values guaranteed up to
10 bar differential pressure

PS vst elements with
max. Δ p 210 bar

PS vst	3	$\beta_{5(C)}$	≥200
PS vst	6	$\beta_{7(C)}$	≥200
PS vst	10	$\beta_{10(C)}$	≥200
PS vst	16	$\beta_{15(C)}$	≥200
PS vst	25	$\beta_{20(C)}$	≥200

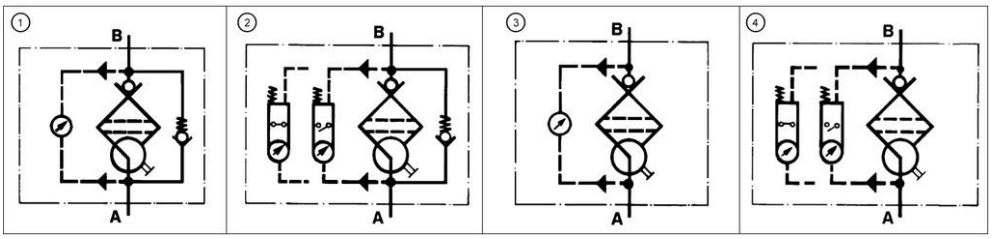
values guaranteed up to
20 bar differential pressure

5. Quality assurance

Filtration Group filters and filter elements are produced according to the following international standards:

Norm	Designation
DIN ISO 2941	Hydraulic fluid power filter elements; verification of collapse/burst resistance
DIN ISO 2942	Hydraulic fluid power filter elements; verification of fabrication integrity
DIN ISO 2943	Hydraulic fluid power filter elements; verification of material compatibility with fluids
DIN ISO 3723	Hydraulic fluid power filter elements; method for end load test
DIN ISO 3724	Hydraulic fluid power filter elements; verification of flow fatigue characteristics
ISO 3968	Hydraulic fluid power filters; evaluation of pressure drop versus flow characteristics
ISO 10771.1	Fatigue pressure testing of metal containing envelopes in hydraulic fluid applications
ISO 16889	Hydraulic fluid power filters; multipass method for evaluation filtration performance of a filter element

6. Symbols



7. Order numbers

Example for ordering filters:

1. Filter housing	2. 2x Filter element
V = 100 l/min and electrical maintenance indicator Type: Pi 37010-015 Order number: 78208423	PS vst 3 Type: Pi 71010 DN PS vst 3 Order number: 78227480

7.1 Housing design

Nominal size NG [l/min]	Order number	Type	① with bypass valve and visual indicator	② with bypass valve and electrical indicator	③ with visual indicator	④ with electrical indicator
40	78208290	Pi 37004-012	■			
	78259889	Pi 37004-013		■		
	78208316	Pi 37004-014			■	
	78208324	Pi 37004-015				■
63	78208340	Pi 37006-012	■			
	78259897	Pi 37006-013		■		
	78208365	Pi 37006-014			■	
	78208373	Pi 37006-015				■
100	78208399	Pi 37010-012	■			
	78259905	Pi 37010-013		■		
	78208415	Pi 37010-014			■	
	78208423	Pi 37010-015				■
160	78208449	Pi 37016-012	■			
	78259913	Pi 37016-013		■		
	78208464	Pi 37016-014			■	
	78208472	Pi 37016-015				■
250	78208498	Pi 37025-012	■			
	78259921	Pi 37025-013		■		
	78208514	Pi 37025-014			■	
	78259863	Pi 37025-015				■
400	78208530	Pi 37040-012 FL	■			
	78259939	Pi 37040-013 FL		■		
	78208555	Pi 37040-014 FL			■	
	78208563	Pi 37040-015 FL				■

When filter with non bypass configuration is selected the collapse pressure of the element must not be exceeded.

7.2 Filter elements*					
Nominal size NG [l/min]	**Order number**	**Type**	**Filter material**	**max. Δ p [bar]**	**Filter surface [cm²]**
40	78260929	Pi 21004 DN PS 3 NBR	PS 3	**20**	475
	77960859	Pi 22004 DN PS 6 NBR	PS 6		475
	77925571	Pi 23004 DN PS 10 NBR	PS 10		475
	78260937	Pi 24004 DN PS 16 NBR	PS 16		475
	78260945	Pi 25004 DN PS 25 NBR	PS 25		475
	78216079	Pi 71004 DN PS vst 3 NBR	PS vst 3	**210**	445
	77960156	Pi 72004 DN PS vst 6 NBR	PS vst 6		445
	77925654	Pi 73004 DN PS vst 10 NBR	PS vst 10		445
	78216087	Pi 74004 DN PS vst 16 NBR	PS vst 16		445
	78216095	Pi 75004 DN PS vst 25 NBR	PS vst 25		445
63	78260960	Pi 21006 DN PS 3 NBR	PS 3	**20**	835
	77960867	Pi 22006 DN PS 6 NBR	PS 6		835
	77925589	Pi 23006 DN PS 10 NBR	PS 10		835
	78260978	Pi 24006 DN PS 16 NBR	PS 16		835
	78260986	Pi 25006 DN PS 25 NBR	PS 25		835
	78216137	Pi 71006 DN PS vst 3 NBR	PS vst 3	**210**	780
	77960149	Pi 72006 DN PS vst 6 NBR	PS vst 6		780
	77925662	Pi 73006 DN PS vst 10 NBR	PS vst 10		780
	78216145	Pi 74006 DN PS vst 16 NBR	PS vst 16		780
	78216152	Pi 75006 DN PS vst 25 NBR	PS vst 25		780
100	78227472	Pi 21010 DN PS 3 NBR	PS 3	**20**	1375
	77960875	Pi 22010 DN PS 6 NBR	PS 6		1375
	77925597	Pi 23010 DN PS 10 NBR	PS 10		1375
	78261000	Pi 24010 DN PS 16 NBR	PS 16		1375
	78261018	Pi 25010 DN PS 25 NBR	PS 25		1375
	78227480	Pi 71010 DN PS vst 3 NBR	PS vst 3	**210**	1275
	77960131	Pi 72010 DN PS vst 6 NBR	PS vst 6		1275
	77925670	Pi 73010 DN PS vst 10 NBR	PS vst 10		1275
	78261281	Pi 74010 DN PS vst 16 NBR	PS vst 16		1275
	78216160	Pi 75010 DN PS vst 25 NBR	PS vst 25		1275

*a wider range of element types is available on request

7.2 Filter elements*					
Nominal size NG [l/min]	**Order number**	**Type**	**Filter material**	**max. Δ p [bar]**	**Filter surface [cm²]**
160	78261034	Pi 21016 DN PS 3 NBR	PS 3	**20**	2530
	77960826	Pi 22016 DN PS 6 NBR	PS 6		2530
	77925605	Pi 23016 DN PS 10 NBR	PS 10		2530
	78261042	Pi 24016 DN PS 16 NBR	PS 16		2530
	78261059	Pi 25016 DN PS 25 NBR	PS 25		2530
	77940638	Pi 71016 DN PS vst 3 NBR	PS vst 3	**210**	1885
	77960123	Pi 72016 DN PS vst 6 NBR	PS vst 6		1885
	77925688	Pi 73016 DN PS vst 10 NBR	PS vst 10		1885
	78269797	Pi 74016 DN PS vst 16 NBR	PS vst 16		1885
	78216178	Pi 75016 DN PS vst 25 NBR	PS vst 25		1885
250	78227514	Pi 21025 DN PS 3 NBR	PS 3	**20**	4020
	77960834	Pi 22025 DN PS 6 NBR	PS 6		4020
	77925613	Pi 23025 DN PS 10 NBR	PS 10		4020
	78261075	Pi 24025 DN PS 16 NBR	PS 16		4020
	78261083	Pi 25025 DN PS 25 NBR	PS 25		4020
	77940646	Pi 71025 DN PS vst 3 NBR	PS vst 3	**210**	3090
	77960115	Pi 72025 DN PS vst 6 NBR	PS vst 6		3090
	77925696	Pi 73025 DN PS vst 10 NBR	PS vst 10		3090
	78269813	Pi 74025 DN PS vst 16 NBR	PS vst 16		3090
	78216186	Pi 75025 DN PS vst 25 NBR	PS vst 25		3090
400	78227522	Pi 21 040 DN PS 3 NBR	PS 3	**20**	6770
	77960842	Pi 22 040 DN PS 6 NBR	PS 6		6770
	77925621	Pi 23 040 DN PS 10 NBR	PS 10		6770
	78261109	Pi 24 040 DN PS 16 NBR	PS 16		6770
	78261117	Pi 25 040 DN PS 25 NBR	PS 25		6770
	77940653	Pi 71 040 DN PS vst 3 NBR	PS vst 3	**210**	5240
	77960107	Pi 72 040 DN PS vst 6 NBR	PS vst 6		5240
	77930829	Pi 73 040 DN PS vst 10 NBR	PS vst 10		5240
	78269821	Pi 74 040 DN PS vst 16 NBR	PS vst 16		5240
	78260903	Pi 75 040 DN PS vst 25 NBR	PS vst 25		5240

* a wider range of element types is available on request

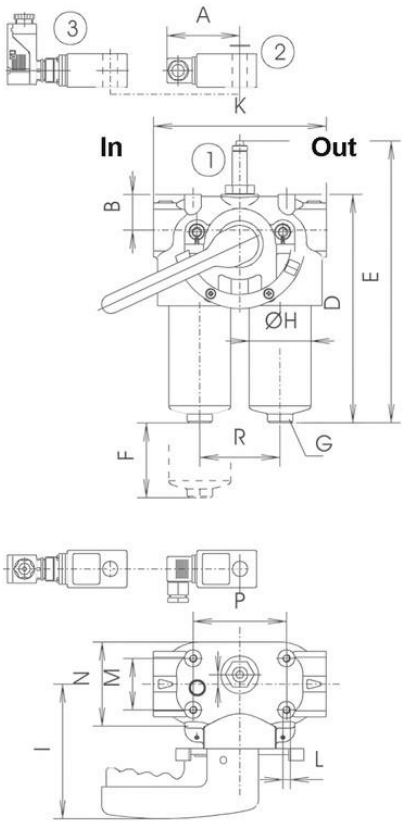
8. Technical specifications

Design:	line mounting filter
Nominal: Pi 37004-37010	10^7 load changes 250 bar (3620 psi)
	10^6 load changes 315 bar (4570 psi)
Pi 37016-37040	2x 10^6 load changes 200 bar (2900 psi)
Test pressure: Pi 37004-37010	450 bar (6520 psi)
Pi 37016-37040	260 bar (3770 psi)
Pi 37004 - Pi 37040 when use on ships operating/test pressure	200/260 bar (2900/3770 psi)
Temperature range:	-10 °C to +120 °C (other temperature ranges on request)
Bypass setting:	Δ p 7 bar ± 10 %
Filter head material:	GGG
Filter housing material:	St
Sealing material:	NBR/PTFE
Maintenance indicator setting:	Δ p 5 bar ± 10 %
Electrical data of maintenance indicator:	
Max. voltage:	250 V AC/200 V DC
Max. current:	1 A
Contact load:	70 W
Type of protection:	IP 65 in inserted and secured status
Contact:	normally open/closed
Cable sleave:	M20x1.5

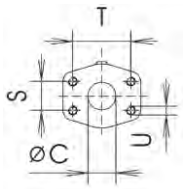
The switching function can be changed by turning the electric upper part by 180° (normally closed contact or normally open contact). The state on delivery is a normally closed contact. By inductivity in the direct current circuit the use of suitable protection circuit should be considered. Further maintenance indícator details and designs are available in the maintenance indicator data sheet.

We draw attention to the fact that all values indicated are average values which do not always occur in specific cases of application. Our products are continually being further developed. Values, dimensions and weights can change as a result of this. Our specialized department will be pleased to offer you advice.

We recommend to contact us concerning applications of our filters in areas governed by the EU Directive 94/9 EC (ATEX 95). The standard version can be used for liquids based on mineral oil (corresponding to the fluids in Group 2 of Directive 97/23 EC Article 9). If you consider to use other fluids please contact us for additional support.



In = inlet
Out = outlet
Pos. 1 Visual maintenance indicator
Pos. 2 Electrical upper section
Connector acc. DIN EN 175301-803
Version: PiS 3092, 3105, 3115
Pos. 3 Electrical upper section
Connector acc. DIN EN 175301-804
Version: PiS 3102, 3122, 3110
Pos. 4 NG 250, 400 with drain plug G ¼ DIN 910



DN 38 ≥ SAE 11/2" 6000 psi flange, Bolts and O-rings not included in delivery

Subject to technical alteration without prior notice.

9. Dimensions

All dimensions except "C" in mm.

Type	A	B	C*	D	E	F	G SW	H	I	K	L	M	N	O	P	R	S	T	U	Weight [kg]
Pi 37004	78	38	G1	228	285	80	27	66	144	182	M8x15	55	90	10	100	86	-	-	-	10.5
Pi 37006	78	38	G1	288	345	80	27	66	144	182	M8x15	55	90	10	100	86	-	-	-	12.0
Pi 37010	78	38	G1	370	427	80	27	66	144	182	M8x15	55	90	10	100	86	-	-	-	14.0
Pi 37016	78	50	G1½	311	363	110	30	110	160	280	M12x18	62	140	28	210	136	-	-	-	30.0
Pi 37025	78	50	G1½	412	463	110	30	110	160	280	M12x18	62	140	28	210	136	-	-	-	35.0
Pi 37040	78	50	DN 38	562	614	110	20	110	160	280	M12x18	62	140	28	210	136	35.7	69.85	M12x20	41.0

* SAE-connections on request

10. Installation, operating and maintenance instructions

10.1 Filter installation

When installing the filter make sure that sufficient space is available to remove filter element and filter housing. Preferably the filter should be installed with the filter housing pointing downwards. The maintenance indicator must be visible.

10.2 Connecting the electrical maintenance indicator

The electrical indicator is connected via a 2-pole appliance plug according to DIN EN 175301-803 with poles marked 1 and 2. The electrical section can be inverted to change from normally open to normally closed position or vice versa.

10.3 When should the filter element be replaced?

1. Filters equipped with visual and electrical maintenance indicator:
   During cold starts, the indicator may give a warning signal. Press the red button of the visual indicator once again only after operating temperature has been reached. If the red button immediately pops up again and/or the electrical signal has not switched off after reaching operating temperature the filter element must be replaced after the end of the shift.
2. Please always ensure that you have original Filtration Group spare elements in stock: Disposable elements (PS) cannot be cleaned.

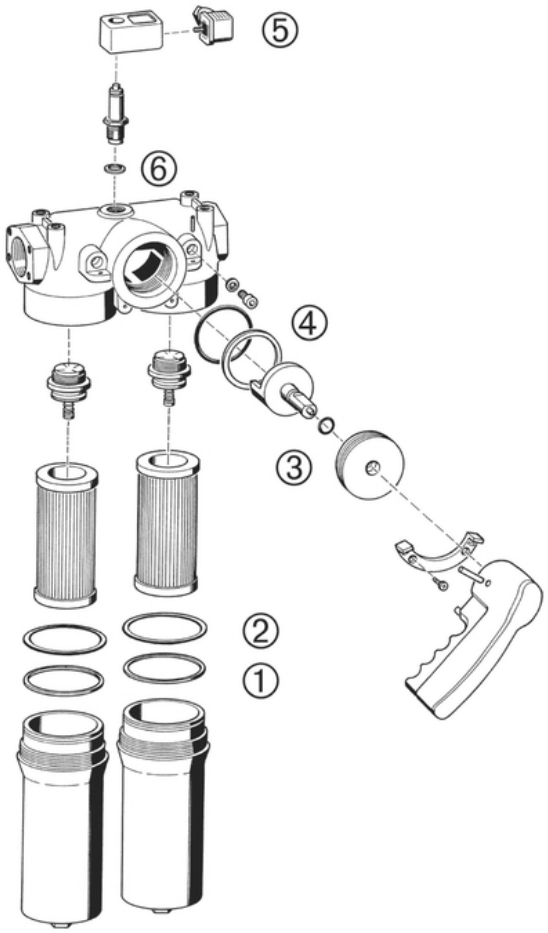
10.4 Element replacement

Note: Elements may only be replaced by people who are familiar with the function of the filter. When replacing elements, appropriate safety clothing (protective goggles, gloves, safety shoes) must be worn.

Note: The maintenance indicator monitors the filter side in operation, which is identified by the position of the switching lever catch. The change-over transfer valve must be switched prior filter servicing. Now the signal of the maintenance indicators cancelled and the red button can be repressed again.

1. Operate and hold pressure equalizing lever located behind switching lever. Pull catch knob and swivel switching lever. Engage the catch on the clear filter side. Place through or drip pan underneath to collect leaving oil.
2. Loosen vent screw of the filter side not in use by 2-3 turns; max. until contact is made with the safety stop.
3. Unscrew filter housing by turning counter-clockwise. Clean the housing using a suitable cleaning solvent.
   Warning: The shift lever may not, from now until the screwing back in of the filter housing (7.), be activated under any circumstances!
4. Remove filter element by pulling down carefully.
5. Check o-ring on the filter housing for damage. Replace, if necessary.
6. Make sure that the order number on the spare element corresponds to the order number of the filter name-plate.
   To ensure no contamination occurs during the exchange of the element first open the plastic bag and push the element over the spigot in the filter head. Now remove plastic bag.
7. Lightly lubricate the threads of the filter housing and screw into the filter head. Maximum tightening torque for NG 40 to 100 = 60 Nm, for NG 160 to 400 = 100 Nm.
8. To refill the filter chamber, operate only the pressure equalizing lever (leave the switching lever arrested in its catch) long enough for the medium to emerge bubble-free from the vent bore.
9. Tighten vent screw. Check filter for leaks by operating the pressure equalizing lever once again.

11. Spare parts list



Order numbers for spare parts		
Position	**Type**	**Order numbers**
① bis ④	Seal kit	
	Pi 37004 - Pi 37010	
	NBR	79322009
	FPM	79322017
	EPDM	79322025
	Pi 37016 - Pi 37040	
	NBR	79375213
	FPM	79375221
	EPDM	79375239
⑤	Maintenance indicator	
	Visual PiS 3093/5	77669914
	Electrical PiS 3092/5	77669864
	Electrical upper section only	77536550
⑥	Seal kit for maintenance indicator	
	NBR	77760275
	FPM	77760283
	EPDM	77760291

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78368631.06/2019

FG Fluid Solutions
Filtration Group

MAHLE Industrialfiltration is now Filtration Group. For more information, visit www.fluid.filtrationgroup.com

Duplex Filter
Pi 4700

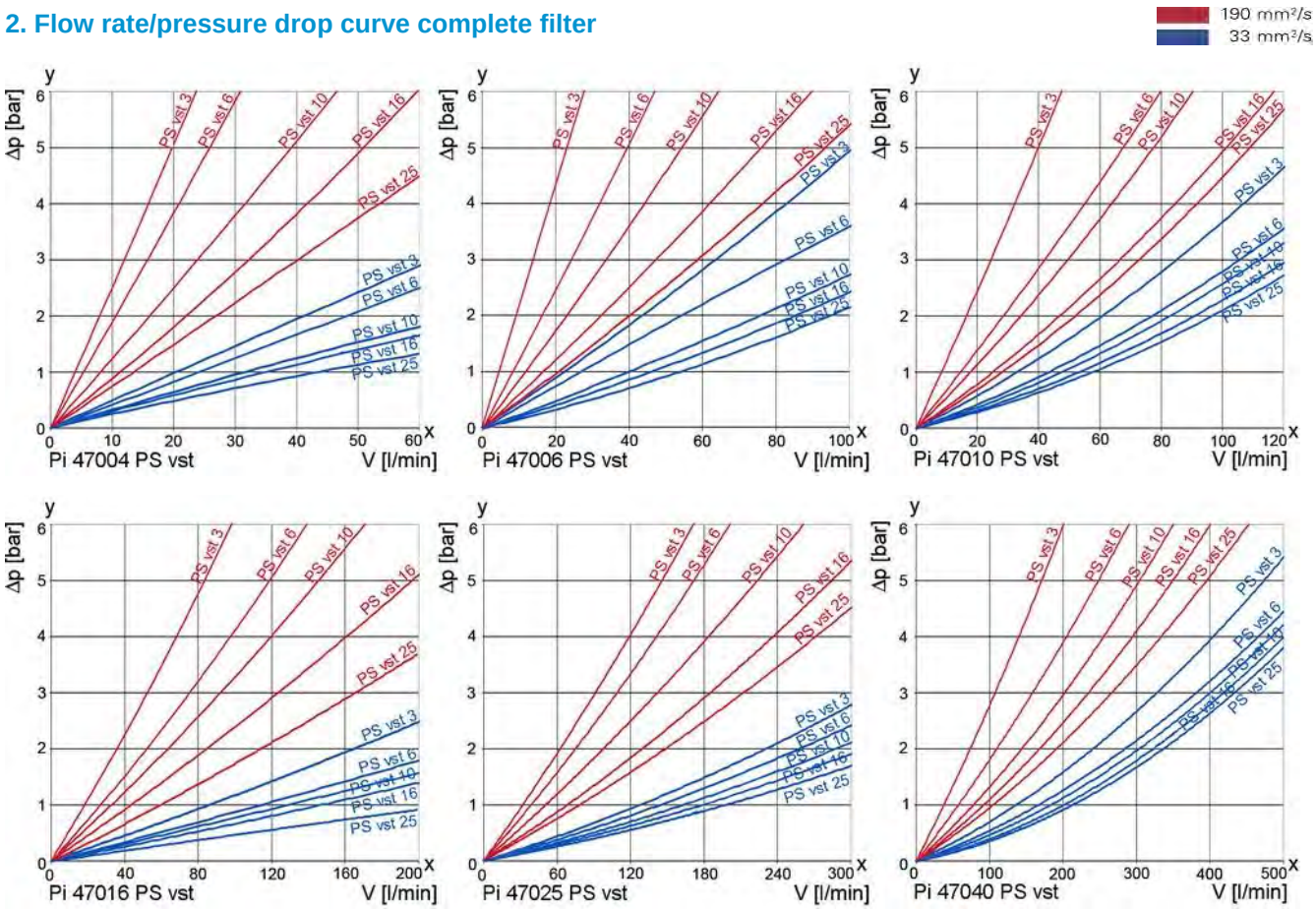
Nominal pressure up to 315/350 bar (4570/4980 psi), nominal size 40 up to 400
according to DIN 24550

1. Features

High performance filters for modern hydraulic systems

- Provided for pipe installation
- Modular system
- Compact design
- Minimal pressure drop through optimal flow design
- Visual/electrical/electronic maintenance indicator
- Threaded connections
- Ergonomic switch-over handle with saftey lock user-optimized one-hand-operation
- Quality filters, easy to service
- Equipped with highly efficient glass fibre PS filter elements
- Beta rated elements according to ISO 16889 multipass test
- Elements with high differential pressure stability and dirt holding capacity
- NPT- and SAE-connections on request
- Worldwide distribution

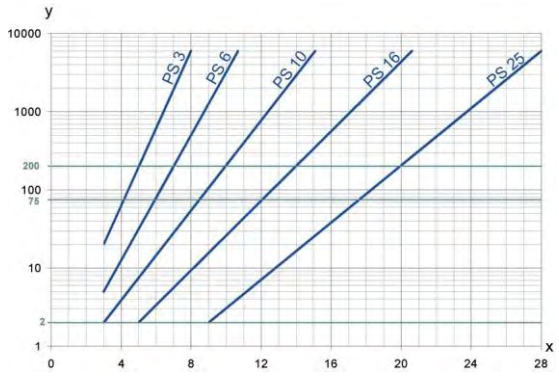
2. Flow rate/pressure drop curve complete filter



y = differential pressure Δp [bar]

x = flow rate V [l/min]

3. Separation grade characteristics



y = beta-value
x = particle size [µm]

determined by multipass tests (ISO 16889)
calibration according to ISO 11171 (NIST)

4. Filter performance data

tested according to ISO 16889 (multipass test)

PS vst elements with
max. Δ p 210 bar

PS vst	3	$\beta_{5(C)}$	≥ 200
PS vst	6	$\beta_{7(C)}$	≥ 200
PS vst	10	$\beta_{10(C)}$	≥ 200
PS vst	16	$\beta_{15(C)}$	≥ 200
PS vst	25	$\beta_{20(C)}$	≥ 200

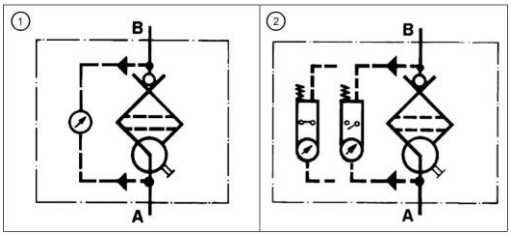
values guaranteed up to
20 bar differential pressure

5. Quality assurance

Filtration Group filters and filter elements are produced according to the following international standards:

Norm	Designation
DIN ISO 2941	Hydraulic fluid power filter elements; verification of collapse/burst resistance
DIN ISO 2942	Hydraulic fluid power filter elements; verification of fabrication integrity
DIN ISO 2943	Hydraulic fluid power filter elements; verification of material compatibility with fluids
DIN ISO 3723	Fluidtechnik-Hydraulik Filterelemente, method for end load test
DIN ISO 3724	Hydraulic fluid power filter elements; verification of flow fatigue characteristics
ISO 3968	Hydraulic fluid power-filters-evaluation of pressure drop versus flow characteristics
ISO 10771.1	Fatigue pressure testing of metal containing envelopes in hydraulic fluid applications
ISO 16889	Hydraulic fluid power filters-multipass method for evaluation filtration performance of a filter element

6. Symbols



7. Order numbers

Example for ordering filters:

1. Housing design	2. 2x Filter element
V = 100 l/min and viusal/electrical maintenance indication Type: Pi 47010-015 Order number: 70304308	PS vst 10 Type: Pi 73010 DN PS vst 10 Order number: 77925670

7.1 Housing design

Nominal size NG [l/min]	Order number	Type	with indicator cavity	① with visual indication	② with electrical indication
40	70304318	Pi 47004-010	■		
	70304300	Pi 47004-014		■	
	70304306	Pi 47004-015			■
63	70304319	Pi 47006-010	■		
	70304301	Pi 47006-014		■	
	70304307	Pi 47006-015			■
100	70304320	Pi 47010-010	■		
	70304302	Pi 47010-014		■	
	70304308	Pi 47010-015			■
160	70304338	Pi 47016-010	■		
	70304340	Pi 47016-014		■	
	70304341	Pi 47016-015			■
250	70304332	Pi 47025-010	■		
	70304335	Pi 47025-014		■	
	70304331	Pi 47025-015			■
400	70304333	Pi 47040-010	■		
	70304336	Pi 47040-014		■	
	70304337	Pi 47040-015			■

When filter with non bypass configuration is selected the max. Δ p pressure of the element must not be exceeded.

7.2 Filter elements*

Nominal size NG [l/min]	Order number	Type	Filter material	max. Δ p [bar]	Filter surface [cm²]
40	78216079	Pi 71004 DN PS vst 3	PS vst 3	210	445
	77960156	Pi 72004 DN PS vst 6	PS vst 6		
	77925654	Pi 73004 DN PS vst 10	PS vst 10		
	78216087	Pi 74004 DN PS vst 16	PS vst 16		
	78216095	Pi 75004 DN PS vst 25	PS vst 25		
63	78216137	Pi 71006 DN PS vst 3	PS vst 3		780
	77960149	Pi 72006 DN PS vst 6	PS vst 6		
	77925662	Pi 73006 DN PS vst 10	PS vst 10		
	78216145	Pi 74006 DN PS vst 16	PS vst 16		
	78216152	Pi 75006 DN PS vst 25	PS vst 25		
100	78227480	Pi 71010 DN PS vst 3	PS vst 3		1275
	77960131	Pi 72010 DN PS vst 6	PS vst 6		
	77925670	Pi 73010 DN PS vst 10	PS vst 10		
	78261281	Pi 74010 DN PS vst 16	PS vst 16		
	78216160	Pi 75010 DN PS vst 25	PS vst 25		

*a wider range of element types is available on request

7.2 Filter elements*					
Nominal size NG [l/min]	**Order number**	**Type**	**Filter material**	**max. Δ p [bar]**	**Filter surface [cm²]**
160	77940638	Pi 71016 DN PS vst 3	PS vst 3	**210**	1885
	77960123	Pi 72016 DN PS vst 6	PS vst 6		
	77925688	Pi 73016 DN PS vst 10	PS vst 10		
	78269797	Pi 74016 DN PS vst 16	PS vst 16		
	78216178	Pi 75016 DN PS vst 25	PS vst 25		
250	77940646	Pi 71025 DN PS vst 3	PS vst 3	**210**	3090
	77960115	Pi 72025 DN PS vst 6	PS vst 6		
	77925696	Pi 73025 DN PS vst 10	PS vst 10		
	78269813	Pi 74025 DN PS vst 16	PS vst 16		
	78216186	Pi 75025 DN PS vst 25	PS vst 25		
400	77940653	Pi 71040 DN PS vst 3	PS vst 3	**210**	5240
	77960107	Pi 72040 DN PS vst 6	PS vst 6		
	77930829	Pi 73040 DN PS vst 10	PS vst 10		
	78269821	Pi 74040 DN PS vst 16	PS vst 16		
	78260903	Pi 75040 DN PS vst 25	PS vst 25		

* a wider range of element types ia available on request

8. Technical specifications

Design: line mounting filter
Nominal pressure: Pi 47016-47040 315 bar (4480 psi)
Pi 47004-Pi 47010 350 bar (4980 psi)
Test pressure: Pi 47016-47040 410 bar (5830 psi)
Pi 47004-Pi 47010 455 bar (6470 psi)
Temperature range: -10 °C to +120 °C
(other temperature ranges on request)
Filter head material: St
Filter housing material: St
Sealing material: NBR/PTFE
Maintenance indicator setting: Δ p 5 bar ± 10 %
Electrical data of maintenance indicator:
Max. voltage: 250 V AC/200 V DC
Max. current: 1 A
Contact load: 70 W
Type of protection: IP 65 in inserted and secured status
Contact: normally open/closed
Cable sleave: M20x1.5

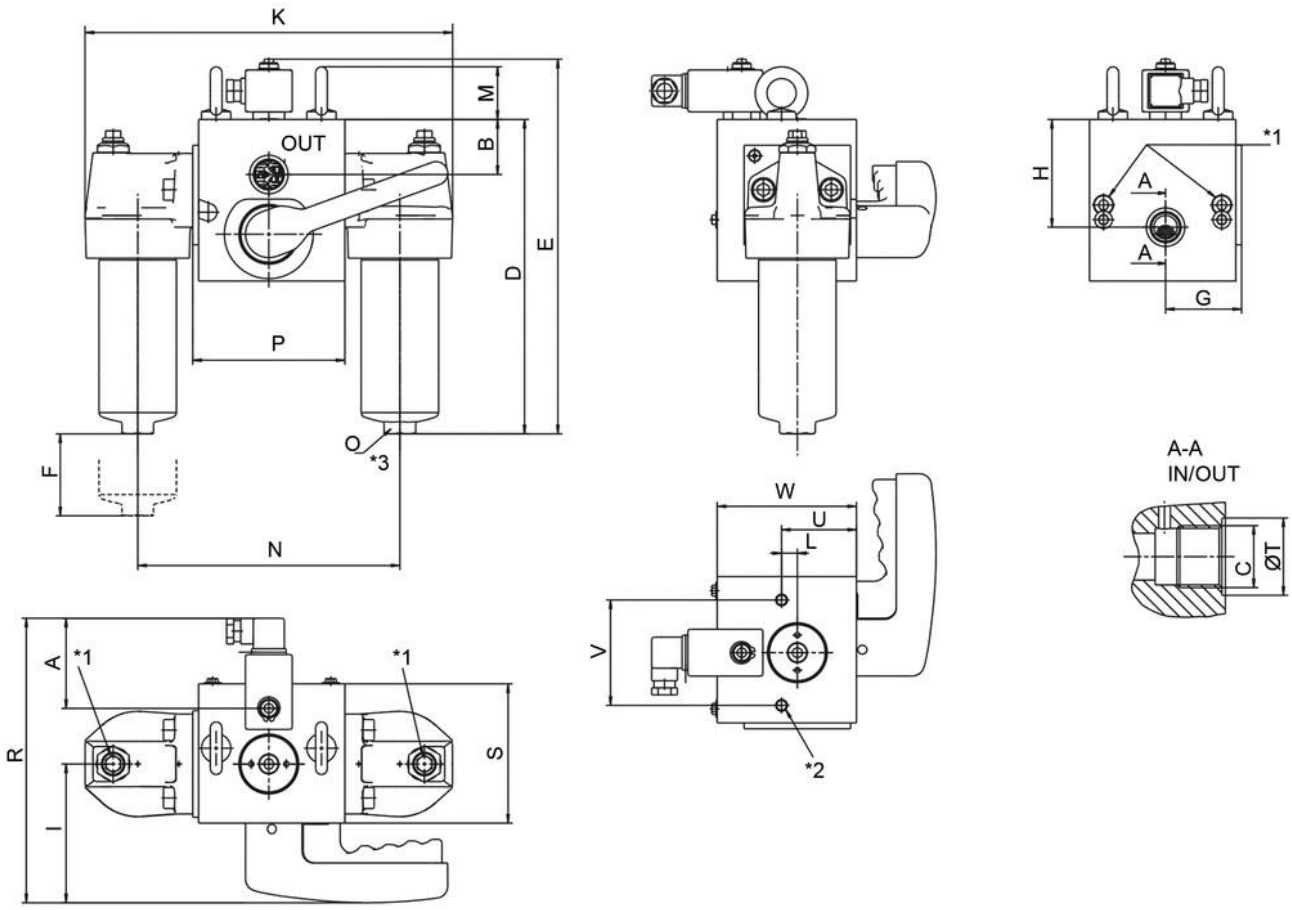
The switching function can be changed by turning the electric upper part by 180° (normally closed contact or normally open contact). The state on delivery is a normally closed contact. By inductivity in the direct current circuit the use of suitable protection circuit should be considered. Further maintenance indicator details and designs are available in the maintenance indicator data sheet.

We draw attention to the fact that all values indicated are average values and do not always occur in specific cases of application. Our products are continually being further developed. Values, dimensions and weights can change as a result of this. Our specialized department will be pleased to offer you advice.

We recommend you to contact us concerning applications of our filters in areas governed by the EU Directive 94/9 EC (ATEX 95). The standard version can be used for liquids based on mineral oil (corresponding to the fluids in Group 2 of Directive 97/23 EC Article 9). If you consider to use other fluids please contact us for additional support.

Subject to technical alteration without prior notice.

9. Dimensions



*1 Vent screw

*2 Mounting cavity
M10x20 for Pi 47004 up to Pi 47010
M16x20 for Pi 47016 up to Pi 47040

*3 Drain screw Pi 47016 up to Pi 47040

All dimensions except "C" in mm.

Type	A	B	C	D	E	F	G	H	I	K	L
Pi 47004	78	47	G¾	269	320	110	65	92	119	314	14
Pi 47006	78	47	G¾	347	398	110	65	92	119	314	14
Pi 47010	78	47	G¾	423	474	110	65	92	119	314	14
Pi 47016	78	53	G1½	334	396	110	75	125	135	450	23
Pi 47025	78	53	G1½	424	486	110	75	125	135	450	23
Pi 47040	78	53	G1½	574	636	110	75	125	135	450	23

Type	M	N	O	P	R	S	T	U	V	W	Weight [kg]
Pi 47004	45	224	SW27	130	243	119	33	64	90	119	22
Pi 47006	45	224	SW27	130	243	119	33	64	90	119	23
Pi 47010	45	224	SW27	130	243	119	33	64	90	119	25
Pi 47016	62	300	SW30	150	271	150	65	90	100	150	56
Pi 47025	62	300	SW30	150	271	150	65	90	100	150	61
Pi 47040	62	300	SW30	150	271	150	65	90	100	150	66

10. Installation, operating and maintenance instructions

10.1 Filter installation

Install filter in accordance with the identified flow direction. The filter head is provided with threaded holes for mounting the filters. Ascertain that the required clearance is provided so that the filter element and the filter housing can be removed. Preferably the filter should be installed with the filter housing pointing downwards. The maintenance indicator must be visible.

10.2 Connecting the electrical maintenance indicator

The electrical indicator is connected via a 2-pole appliance plug according to DIN EN 175301-803 with poles marked 1 and 2. The electrical section can be inverted to change from normally open to normally closed position or vice versa.

10.3 When should the filter element be replaced?

1. Filters equipped with visual and electrical maintenance indicator: During cold starts, the indicator may give a warning signal. Press the red button of the visual indicator once again only after operating temperature has been reached. If the red button immediately pops up again and/or the electrical signal has not switched off after reaching operating temperature the filter lement must be replaced after the end of the shift.
2. Filters without maintenance indicator:
   The filter element should be replaced after the trial run or flushing of the system. Afterwards follow instructions of the manufacturer.
3. Please always ensure that you have original Filtration Group spare elements in stock: Disposable elements (PS) cannot be cleaned.

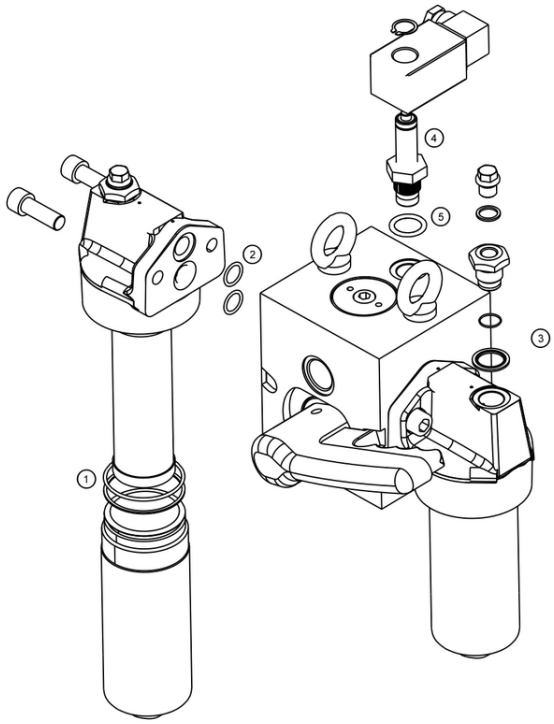
10.4 Element replacement

Note: Elements may only be replaced by people who are familiar with the function of the filter. When replacing elements, appropriate safety clothing (protective goggles, gloves, safety shoes) must be worn

Note: The maintenance indicator monitors the filter side in operation, which is identified by the position of the switching lever catch. The change-over transfer valve must be switched prior filter servicing. Now the signal of the contamination indicatoris cancelled and the red button can be repressed again:

1. Operate and hold pressure equalizing lever located behind switching lever. Pull catch knob and swivel switching lever. Engage the catch on the clear filter side. Place through or drip pan underneath to collect leaving oil.
2. Loosen vent screw of the filter side not in use by 2 to 3 turns.
3. Unscrew filter housing by turning counter-clockwise. Clean the housing using a suitable cleaning solvent.
   Warning: The shift lever may not, from now until the screwing back in of the filter housing (7.), be activated under any circumstances!
4. Remove filter element by pulling down carefully.
5. Check O-ring on the filter housing for damage. Replace, if necessary.
6. Make sure that the order number on the spare element corresponds to the order number of the filter name-plate. Open the plastic bag and push element over the spigot in the filter head. Now remove plastic bag.
7. Lightly lubricate the threads of the filter housing and screw into the filter head. Maximum tightening torque for NG 40 to 100 = 60 Nm, for NG 160 to 400 = 100 Nm.
8. To refill the filter chamber, operate only the pressure equalizing lever (leave the switching lever arrested in its catch) long enough for the medium to emerge bubble-free from the vent bore.
9. Tighten vent screw. Check filter for leaks by operating the pressure equalizing lever once again.

11. Spare parts



Order number for spare parts		
Position	**Type**	**Order number**
① - ③	Seal kit for housing	
	Pi 47004-47010	
	NBR	70304944
	FPM	70304945
	EPDM	70304946
	Pi 47016-47040	
	NBR	70304922
	FPM	70304924
	EPDM	70304925
④	Maintenance indicator	
	Visual PiS 3093/5	77669914
	Electrical PiS 3092/5	77669864
	Electrical upper part only	77536550
⑤	Seal kit for maintenance indicator	
	NBR	77760275
	FPM	77760283
	EPDM	77760291

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70349845.06/2019

Maintenance Indicators

1. Features

Filter elements are economically used only if their dirt holding capacity is fully exploited. This is achieved by using filter housings with a maintenance indicator.
Filtration Group manufactures maintenance indicators of the following designs:

- Differential pressure indicators
- Pressure indicators/switches/gauges
- Vacuum switches/gauges

With any filter element the collection of dirt particles continously reduces the number of open pores or, in other words: The open cross section for allowing the liquid to flow is continously reduced. Thus the pressure on the upstream side of the element (dirt side) increases continously.

With pressure filters, the pressure is measured upstream and downstream of the filter element (differential pressure). With return line filters the pressure is measured only on the upstream side because, depending on the tank design, atmospheric pressure exits on the downstream side of the filter element is measured analog. With suction filters the vacuum is measured downstream.

A piston with attached magnet is moved against the force of a spring, with which the indicating point is determined by the piston surface. A homopolar poled magnet is fitted in the outer part in the indicating button.

The closer the pole-springs move towards each other, the stronger is the force with the magnets mutually repel, until finally the red button on the indicator pops out.

This red button remains visible until it is pushed in during the daily check which is to be performed while the plant is at operating temperature. If the button pops out immediately after being pushed in, the filter element must be replaced latest at the end of the shift.

This optical function may also be used for generating contactless electrical signals. For this purpose an electrical upper part is pushed over the hydraulic/optical part. This upper part incorporates all electrical switching elements.

- Optical and electrical indicator with standard check function
- Normally open/normally closed combination - standard feature
- Electrical function, easy to install at a later time
- Two-step indication, at 75 % and 100 % optional
- Signal lock out up to approx. 30 °C optional
- Rugged, non-bypass design
- Optimal element exploitation
- Worldwide distribution

2. Differential pressure indicators

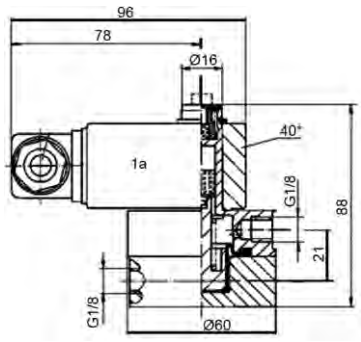


Fig. 1

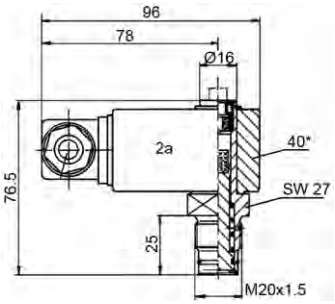


Fig. 2

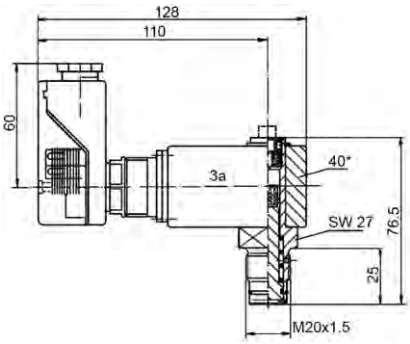


Fig. 3

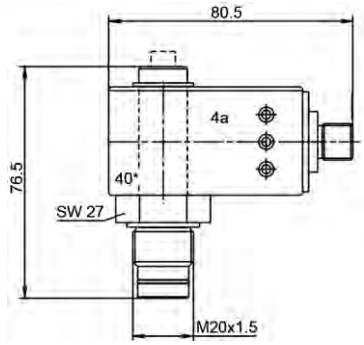


Fig. 4

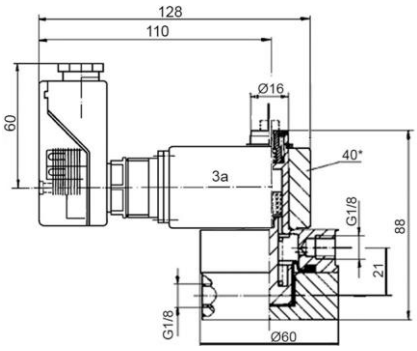


Fig. 15

40* = 40 mm wide

Differential pressure indicators									
Nominal pressure [bar]	**Temper-ature [°C]**	**Type**	**Order number**	**Indicator setting [bar]**	**Indication**	**Contact type***	**Fig.**	**Materi-al lower section**	**Material up-per section**
10	-30 - +120	PiS 3087	77738990	**1.2**	visual	-	1	Al	
		PiS 3086	77737513		visual/electr.	1	1 + 1a		PA 6
		PiS 3104	78236994		visual/electr.	4	1 + 3a (15)		
160	-30 - +120	PiS 3097	70328693	**1.25**	visual/elektr	1	2 + 2a	Al	PA 6
160	-30 - +120	PiS 3098	77669971	**2.2**	visual	-	2	Al	
		PiS 3097	77669948		visual/electr.	1	2 + 2a		PA 6
		PiS 3116	78308074		visual/electr.	3	2 + 2a		
160	-30 - +120	PiS 3119	78309122	**1.7/2.2**	visual/electr.	2	2 + 2a	Al	PA 6
		PiS 3012	78308454		visual/electr.	4	3 + 3a		
		PiS 3131	79760869		visual/electr.	5	3 + 3a		
		PiS 3141	79761859		visual/electr.	6	3 + 3a		
		PiS 3151	79761909		visual/electr.	8	4 + 4a		
		PiS 3154	76300339		visual/electr.	9	4 + 4a		
		PiS 3157	76326706		visual/electr.	11	4 + 4a		
160	-30 - +120	PiS 3098	77938582	**3.5**	visual	-	2	Al	
		PiS 3097	78236648		visual/electr.	1	2 + 2a		PA 6
160	-30 - +120	PiS 3098	77669989	**5.0**	visual	-	2	Al	
		PiS 3097	77669955		visual/electr.	1	2 + 2a		PA 6
		PiS 3116	78308082		visual/electr.	3	2 + 2a		
160	-30 - +120	PiS 3119	78309130	**3.7/5.0**	visual/electr.	2	2 + 2a	Al	PA 6
		PiS 3012	78308447		visual/electr.	4	3 + 3a		
		PiS 3157	76326714		visual/electr.	11	4 + 4a		
		PiS 3131	79760877		visual/electr.	5	3 + 3a		
		PiS 3141	79761867		visual/electr.	6	3 + 3a		
		PiS 3151	79761917		visual/electr.	8	4 + 4a		
		PiS 3154	76300321		visual/electr.	9	4 + 4a		

Differential pressure indicators									
Nominal pressure [bar]	**Temper-ature [°C]**	**Type**	**Order number**	**Indicator setting [bar]**	**Indication**	**Contact-type***	**Fig.**	**Material lower section**	**Material upper section**
400	-30 - +120	PiS 3093	77669898	**2.2**	visual	-	2	CuZn	
		PiS 3092	77669856		visual/electr.	1	2 + 2a		PA 6
		PiS 3115	78308041		visual/electr.	3	2 + 2a		
400	-30 - +120	PiS 3105	77970387	**1.7/2.2**	visual/electr.	2	2 + 2a	CuZn	PA 6
		PiS 3102	77942139		visual/electr.	4	3 + 3a		
		PiS 3132	79760919		visual/electr.	5	3 + 3a		
		PiS 3142	79761875		visual/electr.	6	3 + 3a		
		PiS 3152	79761925		visual/electr.	8	4 + 4a		
		PiS 3155	76300354		visual/electr.	9	4 + 4a		
		PiS 3158	76326722		visual/electr.	11	4 + 4a		
400	-30 - +120	PiS 3093	77669914	**5.0**	visual	-	2	CuZn	
		PiS 3092	77669864		visual/electr.	1	2 + 2a		PA 6
		PiS 3115	78308058		visual/electr.	3	2 + 2a		
		PiS 3115 M12	79764010		visual/electr.	10	4 + 4a		
400	-30 - +120	PiS 3105	77970395	**3.7/5.0**	visual/electr.	2	2 + 2a	CuZn	PA 6
		PiS 3102	77942147		visual/electr.	4	3 + 3a		
		PiS 3155	76300362		visual/electr.	9	4 + 4a		
		PiS 3132	79760919		visual/electr.	5	3 + 3a		
		PiS 3142	79761883		visual/electr.	6	3 + 3a		
		PiS 3152	79761933		visual/electr.	8	4 + 4a		
		PiS 3158	76326730		visual/electr.	11	4 + 4a		
400	-30 - +120	PiS 3093	77669880	**8**	visual	-	2	CuZn	
		PiS 3092	77669872		visual/electr.	1	2 + 2a		PA 6
		PiS 3115	78308066		visual/electr.	3	2 + 2a		
450	-30 - +120	PiS 3193	77844061	**2.2**	visual	-	2	1.4301	
		PiS 3192	78308488		visual/electr.	1	2 + 2a		PA 6
		PiS 3110	79353574		visual/electr.	7	3 + 3a		
450	-30 - +120	PiS 3193	78308538	**5.0**	visual	-	2	1.4301	
		PiS 3192	78308546		visual/electr.	1	2 + 2a		PA 6
		PiS 3110	79353582		electrical	7	3 + 3a		

*Contact type

1 Normally open/normally closed; 1 setting point; wiring box DIN EN 175301-803; max. 250 V AC/200 V DC; max. 1 A
2 Normally closed; 2 setting points; wiring box DIN EN 175301-803; max. 150 V; max. 1 A
3 Change-over contact; 1 setting point; wiring box DIN EN 175301-803; max. 150 V; max. 1 A
4 Change-over contact; 2 setting points; LED; Mercedes Benz Norm DBL 9666 EA; wiring box DIN EN 175201-804; max. 10-30 V; max. 1 A
5 Change-over contact; 2 setting points; LED; signal surpression; time delay; wiring box DIN EN 175201-804; 10-30 V; max. 1 A
6 Change-over contact; 2 setting points; LED; signal surpression; wiring box DIN EN 175201-804, 10-30 V; max. 1 A
7 Analog signal 4-20 mA; 2 setting points; LED; signal cold start; wiring box DIN EN 175201-804; 24 V; max. 1 A
8 Normally open/normally closed; 2 setting points; LED; signal surpression; plug connection M12x1; 10-30 V; max. 1 A
9 Normally open/normally closed; 2 setting points; LED; plug connection M12x1; 10-30 V; max. 1 A
10 Change-over contact;1 setting point; plug connection M12x1; 150 V; max. 1 A
11 Normally closed/normally closed; 2 setting points; LED; plug connection M12x1; 150 V; max. 1 A

3. Pressure indicators/pressure switches

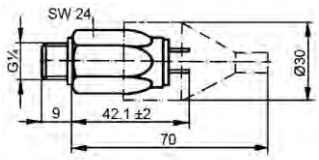


Fig. 5

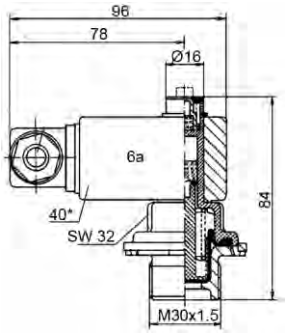


Fig. 6

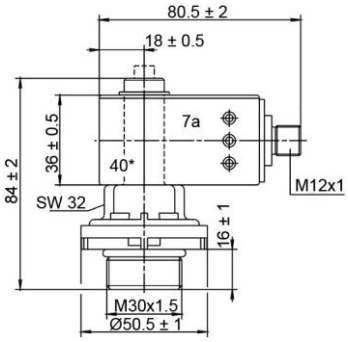


Fig. 7

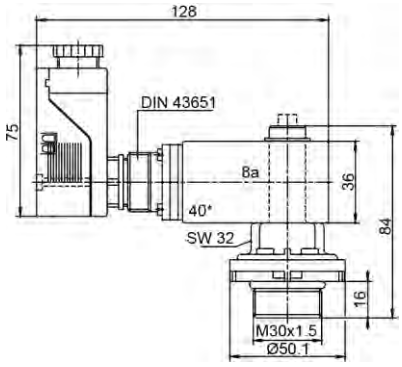


Fig. 8

40* = 40 mm wide

Pressure indicators/pressure switches									
Nominal pressure [bar]	**Temper-ature [°C]**	**Type**	**Order number**	**Indicator setting [bar]**	**Indication**	**Contact type***	**Fig.**	**Material lower section**	**Material upper section**
10	-10 - +80	PiS 3084	77669781	**1.2**	visual	-	6	PA 66	
		PiS 3085	77669807		visual/electr.	1	6 + 6a		PA 6
		PiS 3125	78308033		visual/electr.	3	6 + 6a		
10	-10 - +80	PiS 3106	78309155	**0.9/1.2**	visual/electr.	2	6 + 6a	PA 66	PA 6
		PiS 3103	77942170		visual/electr.	4	8 + 8a		
10	-10 - +80	PiS 3084	77737802	**2.2**	visual	-	6	PA 66	
		PiS 3085	77738032		visual/electr.	1	6 + 6a		PA 6
		PiS 3125	78308108		visual/electr.	3	6 + 6a		
		PiS 3125 M12	79764747		visual/electr.	10	7 + 7a		
10	-10 - +80	PiS 3156	76300370	**1.7/2.2**	opt./elektr.	9	7 + 7a	PA 66	PA 6
		PiS 3159	76326748		visual/electr.	11	7 + 7a		
		PiS 3143	79761891		visual/electr.	6	8 + 8a		
		PiS 3153	79761941		visual/electr.	8	7 + 7a		
		PiS 3133	79760927		visual/electr.	5	6 + 3a		
		PiS 3106	78308850		visual/electr.	2	6 + 6a		
		PiS 3103	77970429		visual/electr.	4	8 + 8a		
10	-25 - +85	DSS/1.2	77863814	**1.2**	electrical	norm. open	5	galvanized steel	delivered with protection cap
		DSO/1.2	77870587		electrical	n. closed	5		
10	-25 - +85	DSS/2.2	77845845	**2.2**	electrical	norm. open	5		
		DSO/2.2	77870595		electrical	n. closed	5		
10	-25 - +85	DSS/5	77863822	**5.0**	electrical	norm. open	5		
		DSO/5	77870603		electrical	n. closed	5		

*Contact type

see remarks below 2. Differential pressure indicators

4. Vacuum/pressure gauges

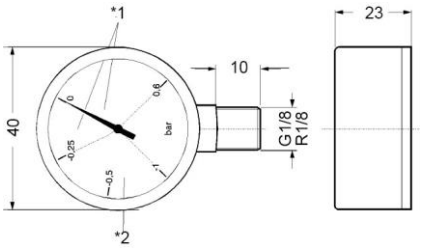


Fig. 9
*1 = Green area/*2 = Red area

Fig. 10

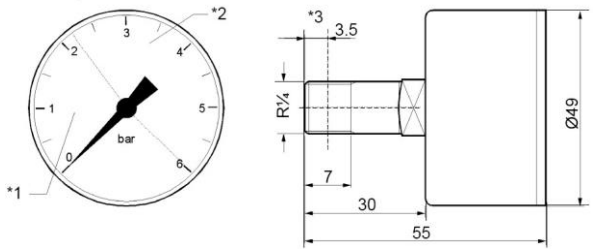


Fig. 11
*3 = Metering level

Vacuum/pressure gauges							
Nominal size [NG]	**Type**	**Order number**	**Indicating range [bar]**	**Connection size**	**Fig.**	**Class**	**Dial face**
40	Vacuum gauge	76345763	**-1 - +0.6**	R1/8 conical	9	min. 2.5	Red/Green area sep. line -0.25 bar
		77545908		G1/8	9		
50		77617558	**-1 - 0**	R¼ conical	10		white
50	Pressure gauge	78381998	**0 - 6**	R¼ conical	11		Red/Green area sep. line 2.2 bar

5. Vacuum switches

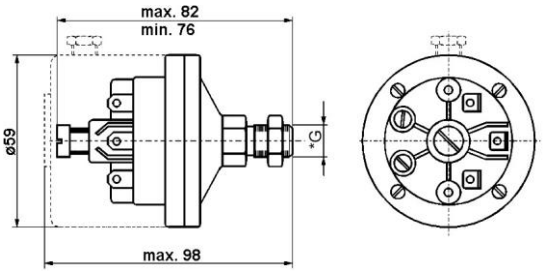


Fig. 12
*G = Connection

Vacuum switches									
Permissible over-pressure [bar]	**Temper-ature [°C]**	**Type**	**Order number**	**Switch setting[mbar]**	**Contact type**	**Fig.**	**Connection *G**	**Material lower section**	**Material upper section**
0.5	-10 - +70	PiS 3070	77669690	**-15 - -80**	single pole change-over switch, snap-in joint	12	G¼	GD-Al	PA 6
1			77669724	**-50 - -600**			G1/8		

6. Vacuum indicators/air filters

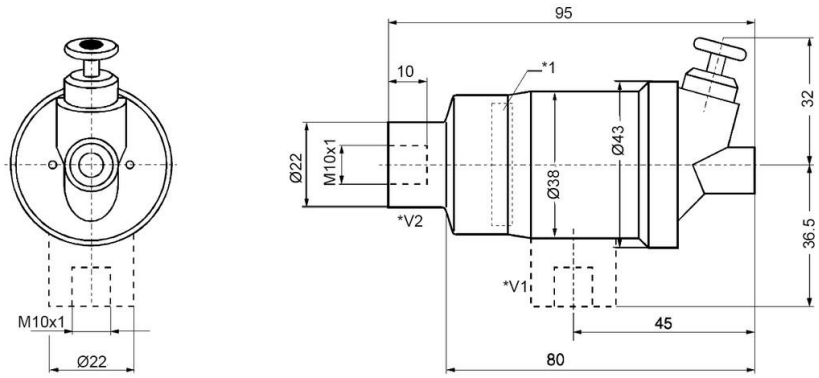


Fig. 14
*1 = Indication: position of display in mbar
*V1 = Version 1
*V2 = Version 2

Vacuum indicators/air filters						
Temperature [°C]	**Type**	**Order number**	**Indicator setting ±10 % [mbar]**	**Indication type**	**Fig.**	**Version**
-40 - +110	TB 745	78309056	-50	optical self locking	14	1
	TB 745/1	78309064	-50			2

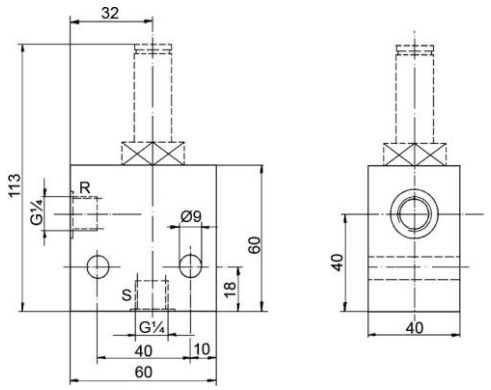
7. Accessories

7.1 Seal kits			
Type	**NBR**	**FPM**	**EPDM**
	Order number		
PiS 3092, 3093, 3102, 3105, 3115, 3132, 3142, 3152, 3155, 3192, 3193, 3158	77760275	77760283	77760291
PiS 3012, 3097, 3098, 3116, 3119, 3131, 3141, 3151, 3154, 3157	77760309	77760317	77760325
PiS 3084, 3085, 3103, 3106, 3125, 3133, 3143, 3153, 3156, 3159	78383382	78383390	78383408
PiS 3086, 3087, 3104	77760242	77760259	-

7.2 Electrical expansion kit/spare parts	
Designation	**Order number**
Electrical upper section normally open/closed for PiS 3084, 3087, 3093, 3098, 3193 (contact type 1)	77536550
Wiring box with lamp insert 12 - 230 V for electrical upper section normally open (acc. to DIN EN 175301-803)	78307548
Electrical upper section change-over contact for PiS 3084, 3087, 3093, 3098, 3193 (contact type 3)	78308017
Wiring box with 2 LEDs 10 - 30 V for electrical upper section change over contact (acc. to DIN EN 175301-803)	78308025

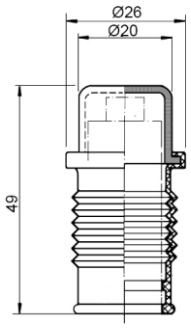
Designation	**Order number**
Electrical upper section change-over contact M12x1für PiS 3084, 3087, 3093, 3098, 3193 (contact type 10)	79764036
Electrical upper section 2SP-LED-M12x1-SU (contact type 8) spare part for 2 setting points indicator!	76116651
Electrical upper section 2SP-LED-M12x1 (contact type 9) spare part for 2 setting points indicator!	76300412
Electrical upper section W-2SP-LED-SU-VERZ (contact type 5) spare part for 2 setting points indicator!	79760943
Electrical upper section W-2SP-LED-SU (contact type 6) spare part for 2 setting points indicator!	76118590
Electrical upper section W-2SP/Ö-LED-M12x1 (contact type 11) spare part for 2 setting points indicator!	76326755
Electrical upper section normally closed with signal surpression PiS 3003	77765357
Electrical upper section normally open with signal surpression PiS 3002	77765365

7.3 Mounting block for differential pressure indicators (M20x1.5)	
Designation	**Order number**
Mounting block (St)	77809098
Mounting block (1.4301), 450 bar	77698517



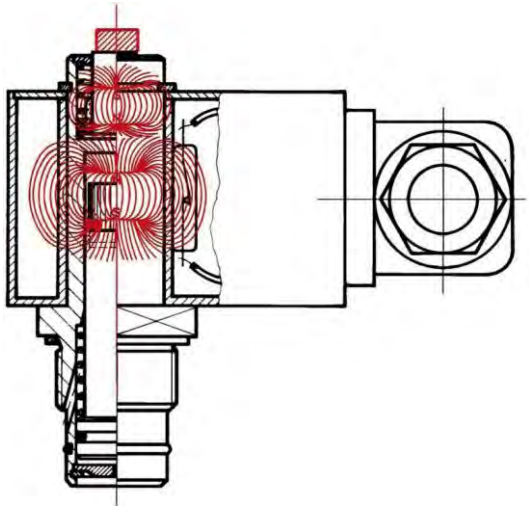
R = clean side
S = dirt side

7.4 Protection cap	
Designation	**Order number**
Protection cap for all visual pressure and differential pressure indicators, -20 °C to +80 °C Resistant to: gasoil, purifying agent, insolation, dust, salt, water, concret	78285330

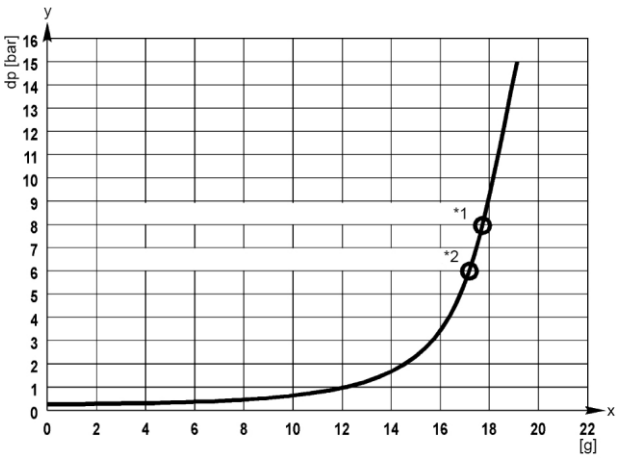


8. Function

The magnetic field as previously described, contactless operates reed contacts in the electrical upper part. The desired contact type is selected by inverting upper part. Another option keeping the electrical signal electronically suppressed up to 30 °C operating temperature is also available. This eliminates false electrical signal during the cold start phase.
For efficient servicing it is desirable to have a pre-warning device (so that the filter element can be replaced, e.g. with the next tool change). For this purpose electrical upper parts with two indicating points, i.e. at 75 % and at 100 % of the indicator setting are available.



Pressure/vacuum gauges give an analog reading of the existing state of contamination of the filter elements. They require continous control to ensure that the service time and reserve capacity are not unduly exceeded. If the contamination signal is disregarded, the filter element may collapse or, if a bypass valve is installed, part of the contamination fluid may reach the hydraulic components via the bypass valve and cause failure of the hydraulics.
Pressure/vacuum switches are provided with snap action switches, which ascertains that signal are issued only when the limit values have been fully reached.



Dirt holding capacity - Δp curve
x = dirt holding capacity [g]
y = differential pressure Δp [bar]
*1 = signal step maintenance indicator 100 %
*2 = signal step maintenance indicator 75 %

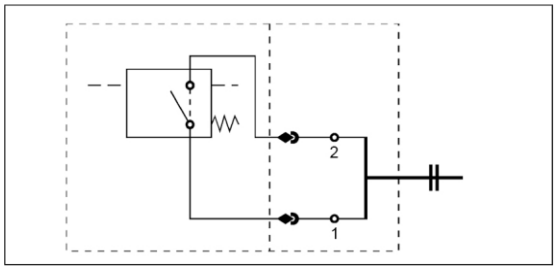
9. Technical specifications

9.1 Contact type normally open/normally closed

Contact type 1
Types PiS 3085, 3086, 3092, 3097, 3192

Max. voltage:	250 V AC/ 200 V DC
Max. current:	1 A
Contact load:	70 W
Type of protection:	IP 65 in inserted and secured status
Contact type :	normally open/normally closed
Cable sleave:	M20x1.5
Wiring box:	DIN EN 175 301-803

The switching function can be changed by turning the electric upper part by 180° (normally closed contact or normally open contact). The state on delivery is a normally closed contact.
By inductivity in the direct current circuit the use of suitable protection circuit should be considered. Electrical parts are insulated (plastic material housing).



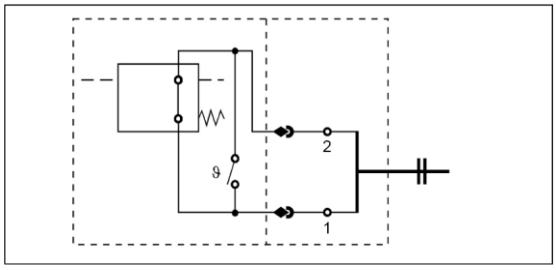
9.2 Contact type normally closed or open with signal suppression

Contact type normally closed
Type PiS 3003 (expansion kit)
Contact type normally open
Type PiS 3002 (expansion kit)

Signal suppression by thermorelay

Signal is released at +30 °C

for further technical details see 9.1

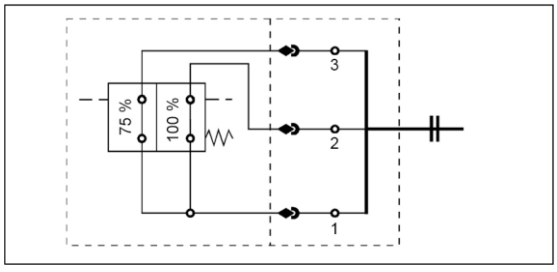


9.3 Contact type normally closed 2 setting points

Contact type 2
Types PiS 3105, 3106, 3119
1. setting point at 75 % of the indicating pressure
2. setting point at 100 % of the indicating pressure

Max. voltage:	150 V AC/DC
Max. current:	1 A
Contact load:	20 VA/20W

for further technical details see 9.1

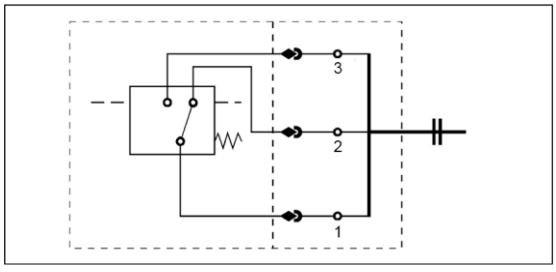


9.4 Contact type Change-over contact

Contact type 3
Types PiS 3115, 3116, 3125

Max. voltage:	150 V AC/DC
Max. current:	1 A
Contact load:	20 VA/20W

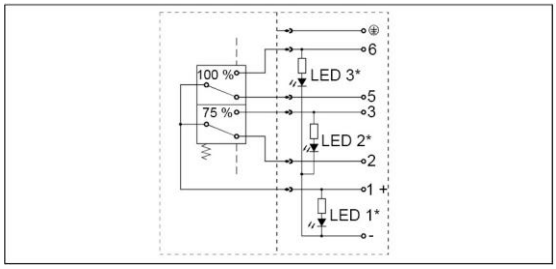
for further technical details see 9.1



9.5 Contact type change-over contact, 2 setting points LED

Contact type 4
Types PiS 3012, 3102, 3103,
3104
1. setting point at 75 % of the indicating pressure
2. setting point at 100 % of the indicating pressure

Max. voltage:	10 - 30 V DC
Max. current:	1 A
Contact load:	20 VA/20 W
Type of protection	IP 65 in inserted and secured status
Plug connection:	DIN EN 175201-804

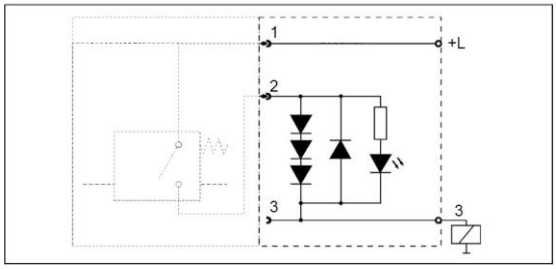


9.6 Wiring box with insert lamp

Will be suplied instead of standard connection.

Not to be combined with indicators with 2 setting points.

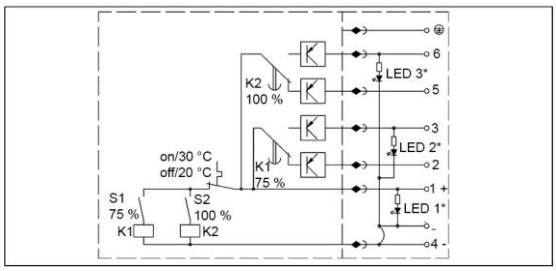
Max. voltage:	12-230 V AC/DC



9.7 Contact type change-over contact, 2 setting points, LED, signal suppression, time delay

Contact type 5
Types PiS 3131, 3132, 3133
1. setting point at 75 % of the indicating pressure
2. setting point at 100 % of the indicating pressure

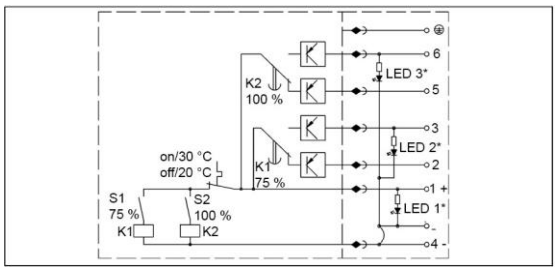
Max. voltage:	10 - 30 V DC
Max. current:	1 A
Contact load:	20 W
Type of protection:	IP 65 in inserted and secured status
Plug connection:	DIN EN 175201-804
Signal suppression:	by thermorelay
Signal released:	at + 30 °C
Signal change down:	at + 20 °C
Impulse surpression K1 and K2	time delay 10 s



9.8 Contact type change-over contact, 2 setting points, LED, signal suppression

Contact type 6
Types PiS 3141, 3142, 3143
1. setting point at 75 % of the indicating pressure
2. setting point at 100 % of the indicating pressure

Max. voltage:	10 - 30 V DC
Max. current:	1 A
Contact load:	20 W
Type of protection:	IP 65 in inserted and secured status
Plug connection:	DIN EN 175201-804
Signal suppression:	by thermorelay
Signal released:	at + 30 °C
Signal change down:	at + 20 °C

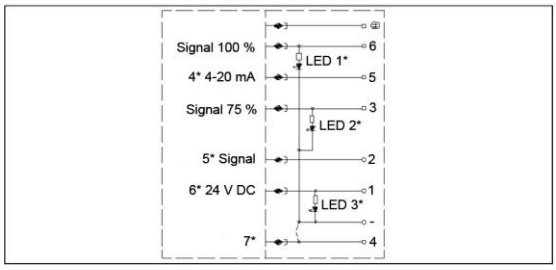


LED 1* = Operating LED green
LED 2* = Setting point 75 % LED yellow
LED 3* = Setting point 100 % LED red

9.9 Contact type analog 4-20 mA, 2 setting points, LED, signal suppression

Contact type 7
Types PiS 3110, 3120

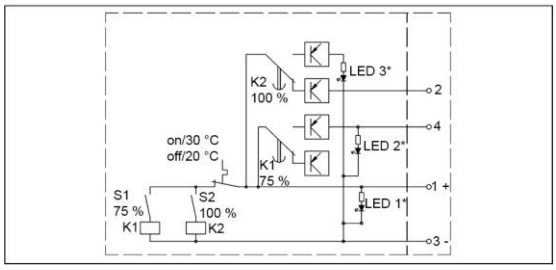
Max. voltage:	24 V DC
Max. current:	200 mA
Resistance:	500 Ω
Type of protection:	IP 65 in inserted and secured status
Plug connection:	nach DIN EN 175201-804
Output signal:	4-20 mA
Outputs (PNP, max. 200 mA):	cold start signal 75 % setting point 100 % setting point
Signal damping:	20 s



9.10 Contact type normally open/normally closed, 2 setting points, LED, signal suppression

Contact type 8
Types PiS 3151, 3152, 3153
1. setting point at 75 % of the indicating pressure (normally open)
2. setting point at 100 % of the indicating pressure (normally closed)

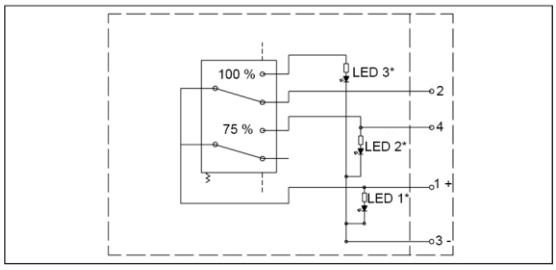
Max. voltage:	10 - 30 V DC
Max. current:	1 A
Contact load:	20 W
Type of protection:	IP 65 in inserted and secured status
Plug connection:	M12x1, 4 pole
Signal suppression:	by thermorelay
Signal release:	at + 30 °C
Signal change down:	at + 20 °C



9.11 Contact type normally open/normally closed, 2 setting points

Contact type 9
PiS 3154, 3155, 3156
1. setting point at 75 % of the indicating pressure (normally open)
2. setting point at 100 % of the indicating pressure (normally closed)

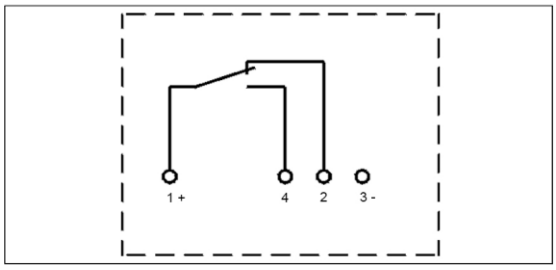
Max. voltage:	10-30 V DC
Max. current:	1 A
Contact load:	20 W
Type of protection:	IP 65 in inserted and secured status
Plug connection:	M12x1, 4 pole



9.12 Contact type change-over contact

Contact type 10
PiS 3115-M12x1, 3116-M12x1, 3125-M12x1

Max. voltage:	150 V
Max. current:	1 A
Contact load:	20 W
Type of protection:	IP 65 in inserted and secured status
Plug connection:	M12x1, 4 pole

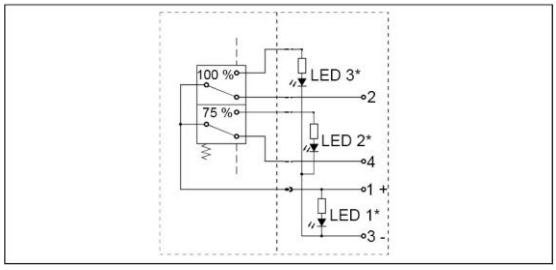


LED 1* = Operating LED green
LED 2* = Setting point 75 % LED yellow
LED 3* = Setting point 100 % LED red

9.13 Contact type normally closed, 2 setting points

Contact type 11
Types PiS 3157, 3158, 3159
1. setting point at 75 % of the indicating pressure (normally closed)
2. setting point at 100 % of the indicating pressure (normally closed)

Max. voltage:	10-30 V DC
Max. current:	1 A
Contact load:	20 W
Type of protection:	IP 65 in inserted and secured status
Plug connection:	M12x1, 4 pole

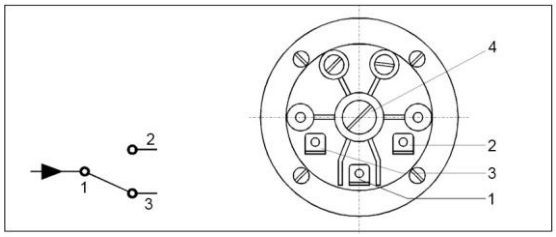


LED 1* = Operating LED green
LED 2* = Setting point 75 % LED yellow
LED 3* = Setting point 100 % LED red

9.14 Vacuum switch PiS 3070

Contact type 1 pole change-over contact

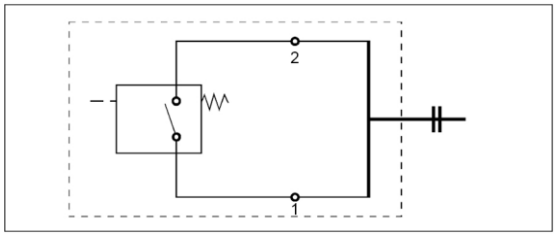
Electrical connection:	AMP 6,3 DIN 43248 bushings DIN 46247
Max. voltage:	230 V AC/DC
Max. current:	6 A
Type of protection:	IP 00 without cover IP 54 with cover
Position of installation:	individual (position of installation is to be adviced if setting pont is adjusted)



1 = Supply line
2 = Operating contact
3 = Normally closed contact
4 = Adjusting screw

9.15 Pressure switch DSS

Contact type:	normally open
Electrical Connection:	AMP 6,3 DIN 46248 bushings DIN 46247 switch type 2 pole
Max. voltage:	42 V
Max. current:	2 A
Contact load:	100 VA
Duty classification:	200/min



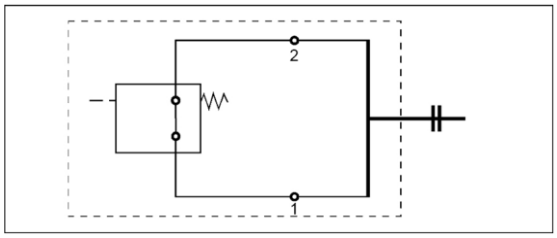
Maintenance indicators PiS 3084, 3087, 3093, 3098, 3193 can be mounted in 45°.

Tightening torque:
Maintenance indicator aluminum with threat M20x1.5
60 Nm
Maintenance indicator CuZn with threat M20x1.5
90 Nm
Maintenance indicator stainless steel with threat M20x1.5
90 Nm
Maintenance indicator plasic with threat M30x1.5
3 Nm

9.16 Pressure Switch DSO

Contact type:	normally closed

for further technical details see 9.17



We draw attention to the fact that all values indicated are average values which do not always occur in specific cases of application: Our products are continually being further developed. Values, dimensions and weights can change as a result of this. Our specialized departement will be pleased to offer you advice.

When using our filters in areas which are to be classified according to EU directive 2014/34/EU (ATEX), we recommend prior discussion with us. The standard version can be used for liquids based on mineral oil /corresponding to the fluids in Group 2 of Directive 97/23 EG Articlel 9). Please consult with us if using other media.

Subject to technical alterations without prior notice.

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78357428.06/2019

Electrical Maintenance Indicators
PiS 3200

with AMP plug connection

1. Features

Filter elements are economically used only if their dirt holding capacity is fully exploited. A reliable indication of the optimal time to replace the element is therefore vital.
These maintenance indicators include an AMP Junior-Power-Timer plug connection and are available in normally open or normally closed contact type version.
Thanks to the Filtration Group modular system these maintenance indicators can be used with all Filtration Group pressure filters.

2. Differential pressure indicators

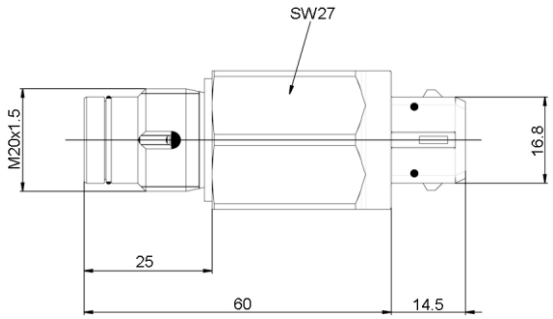


Fig. 1

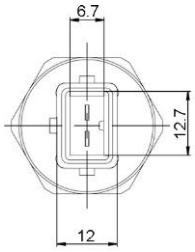


Fig. 2

Differential pressure indicators									
Nominal pressure [bar]	**Temper-ature [°C]**	**Type**	**Order number**	**Indicator setting [bar]**	**Indication**	**Contact type***	**Fig.**	**Material housing**	**Material plug con-nection**
160	-30 - +120	PiS3203/2.2	70520455	**2.2**	electr.	norm. closed	1 + 2	Al	PA
		PiS3206/2.2	70520459			norm. open	1 + 2		
400	-30 - +120	PiS3204/5.0	70520457	**5.0**	electr.	norm. closed	1 + 2	CuZN	PA
		PiS3207/5.0	70520460			norm. open	1 + 2		

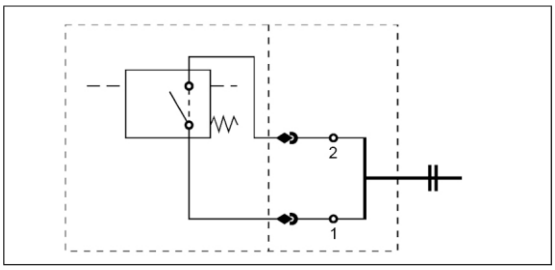
*Contact type

1 Normally open or normally closed; 1 setting point; AMP Junior-Power-Timer 2.8 2 poles; max. 48 V DC; max. 0.5 A

3. Technical specifications

3.1 Contact type normally open/normally closed

Contact type 1	
Types PiS 3203, 3204	normally closed
Types PiS 3206, 3207	normally open
Material seal:	NBR*
Max. voltage:	48 V DC
Max. current:	0.5 A
Contact load:	10 VA
Type of protection:	IP 65 in inserted and secured status
Plug connection:	AMP Junior-Power-Timer 2.8 2 poles



* other seals on request

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70563111.06/2019

Electrical Maintenance Indicators
PiS 3200

with DIN plug connection

1. Features

Filter elements are economically used only if their dirt holding capacity is fully exploited. A reliable indication of the optimal time to replace the element is therefore vital.
These maintenance indicators include a DIN EN 175301-803 plug connection and are available in normally open, normally closed or change-over contact type version.
Thanks to the Filtration Group modular system these maintenance indicators can be used with all Filtration Group pressure filters.

2. Differential pressure indicators

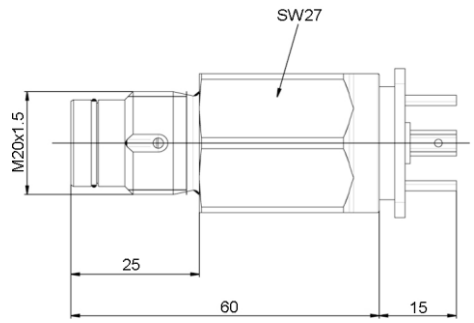


Fig. 1

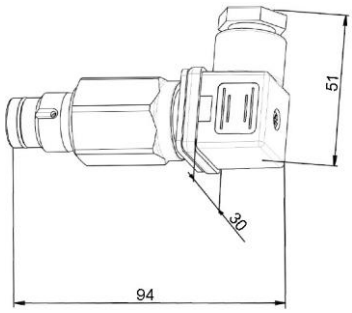


Fig. 2

Differential pressure indicators									
Nominal pressure [bar]	**Temper-ature [°C]**	**Type**	**Order number**	**Indicator setting [bar]**	**Indication**	**Contact-type***	**Fig.**	**Material housing**	**Material plug con-nection**
160	-30 - +120	PiS 3209	70520470	**2.2**	electr.	norm. closed	1 + 2	Al	PA
		PiS 3212	70520472			norm. open	1 + 2		
		PiS 3215	70520477			3	1 + 2		
400	-30 - +120	PiS 3210	70520471	**5.0**	electr.	norm. closed	1 + 2	CuZN	PA
		PiS 3213	70520476			norm. open	1 + 2		
		PiS 3216	70520478			3	1 + 2		

*Contact type

1 Normally open or normally closed; 1 setting point; DIN EN 175301-803; max. 48 V DC; max. 0.5 A

3 Change-over contact; 1 setting point; DIN EN 175301-803; max. 48 V; max. 0.5 A

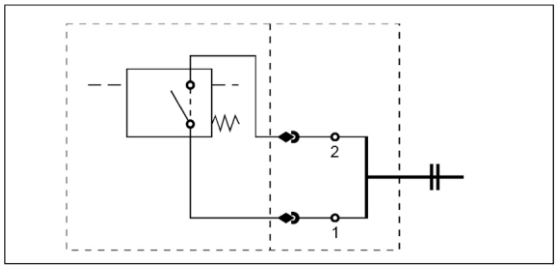
3. Technical specifications

3.1 Contact type normally open/normally closed

Contact type 1

Types PiS 3209, 3210	normally closed
Types PiS 3212, 3213	normally open
Material seal:	NBR*
Max. voltage:	48 V DC
Max. current:	0.5 A
Contact load:	10 VA
Type of protection:	IP 65 in inserted and secured status
Plug connection:	DIN EN 175 301-803

* other seals on request

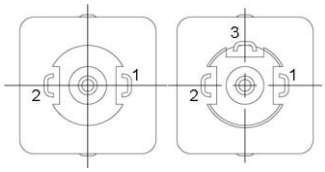


3.2 Contact type Change-over contact

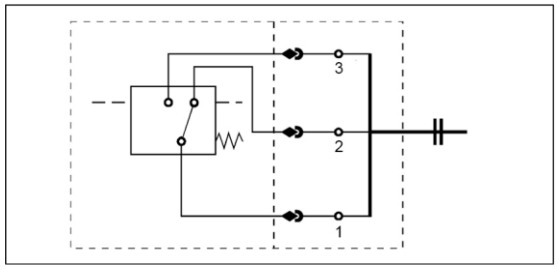
Contact type 3

Types PiS 3215, 3216 change-over contact

for further technical details see 3.1



normally closed/normally open-change-over contact



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Electronic maintenance indicators
PiS 3300-2.9 2SP LED

1. Features

Filter elements are economically used only if their dirt holding capacity is fully exploited. A reliable indication of the optimal time to replace the element both on the filter itself and in the plant control or monitoring system is therefore vital. In a return line filter, the flow resistance increases as a function of operating time owing to the dirt that is retained in the filter element and the differential pressure rises accordingly. The service life can now be additionally extended thanks to an intelligent monitoring device for differential pressure.

The newly developed PiS 3300-2.9 2SP LED maintenance indicator is a self-checking, microprocessor-controlled pressure switch for Filtration Group return line filters with two alarm outputs, high-intensity LEDs for all-round visibility and pulse and cold start suppression.

2. Function

An electronic pressure sensor measures the pressure continuously upstream of the return line filter element. The oil temperature is simultaneously measured by a temperature sensor. The device swaps to operation mode as soon as the filter reaches its normal service temperature (> 30 °C); this is indicated by the green LEDs lighting up permanently. The temperature and pressure sensors are installed in the same measuring cell, in direct contact with the hydraulic oil inside the filter. The pressure and temperature are thus measured without any intervening mechanical parts. If the oil temperature falls below 30 °C, the green LEDs flash and the alarm outputs are locked to prevent false alarms due to high viscosity during cold starts.
If the pressure in the filter reaches 2.2 bar at operating temperature because the filter element is exhausted, one alarm output (NO contact) is activated and the yellow LEDs also light up. This corresponds to 75 % of the maximum value.
At the maximum pressure value (2.9 bar), a second alarm output (NC contact) is activated and the red LEDs light up as well. It is now time to replace the filter element!

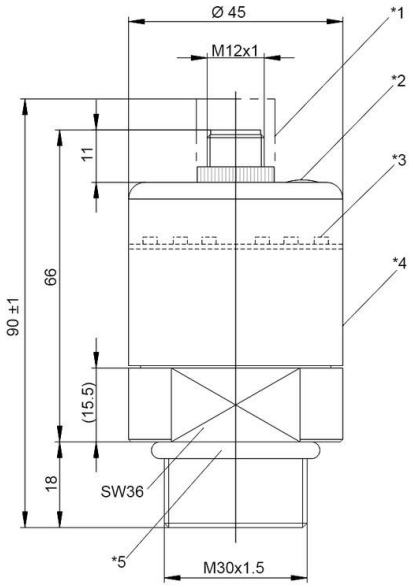
The switching values are much higher than with mechanical pressure switches because the sensor measures directly and extremely precisely with almost no hysteresis. This makes for more efficient use of the element capacity, so that the service life of the filter elements is prolonged and the overall costs of ownership reduced.
Short-term pressure peaks (up to 4 s) in the return line, for example owing to the high return flow rate when the tank is discharged, are suppressed to prevent false alarms.
The switching states of the electrical outputs and the LEDs remain stored when the plant is shut down until the reset button is pressed or the indicator power supply interrupted (e.g. by unplugging the cable).
This pressure indicator can be used with all MAHLE return line filters in the Pi 5000 series from size 40 to 1000.

3. Technical specifications

Material:	Aluminium/plastic
Seals:	NBR*
Nominal pressure:	10 bar (144 psi)
Burst pressure:	approx. 25 bar (360 psi)
Temperature range:	-20 °C to +85 °C
Max. voltage:	24 V DC ±10 %
Max. current:	<100 mA
Max. switching current at outputs:	1 A at 24 V DC
Cable sleave:	M12x1
Type of protection:	IP 65
Signal suppression:	<30 °C
Min. time to activate outputs:	4 s

* other seals on request

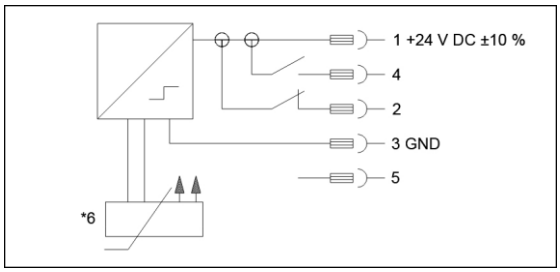
4. Dimensions



*1 = Protection cap
*2 = Reset button
*3 = LED corona
*4 = MAHLE type plate
*5 = O-Ring 26.5x3.2 NBR

5. Order numbers

Type	Order number
PiS 3300-2.9 2SP LED	70360437



4 = Output 1 2 = Output 2 *6 = Temperature sensor

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MAHLE Industrialfiltration is now Filtration Group. For more information, visit www.fluid.filtrationgroup.com

Electronic maintenance indicator PiS 3303

1. Features

Filter elements are only used economically when their dirt absorption capacity is completely exploited. For this reason, the filter and system control or monitor must reliably indicate when the filter element requires replacement. This maintenance indicator has an electrical M12 8-pole connection in accordance with IEC 61076-2-101. Thanks to the Filtration Group modular system, the electronic maintenance indicator can be used on all Filtration Group pressure filters.

Merkmale

- Analogue output signals for dynamic pressure and differential pressure in one sensor
- Switching contact 75% soiling as a pre-warning signal for replacing the filter element
- Switching contact 100% soiling as a warning signal for the filter element being exhausted
- High switching precision of the contacts to better exploit filter capacities
- Cold start suppression optional
- Worldwide distribution

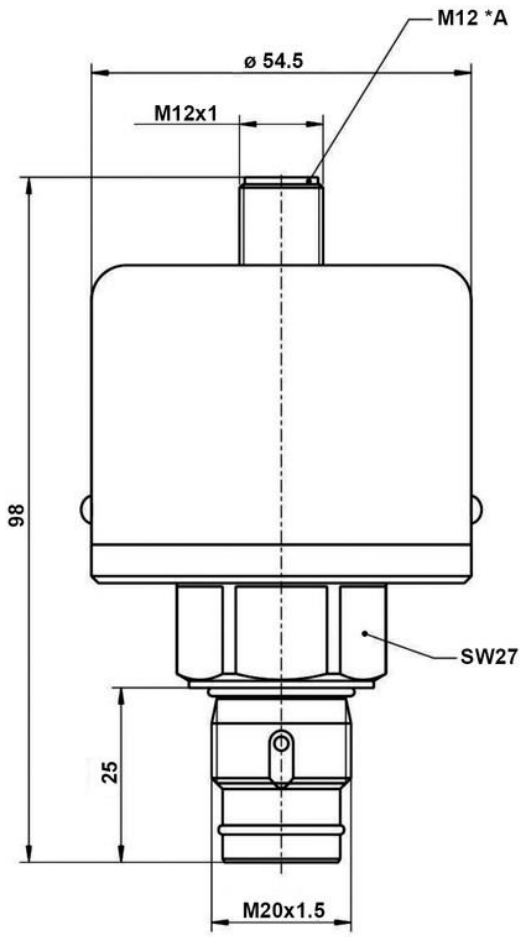
2. Function

The electronic maintenance indicator is made up of two sensors which record input and output pressure at the filter. The sensor signals p1 and p2 are converted analogue-digital and processed by an electronic system controlled by micro-controller. The differential pressure dp is calculated using the difference p1-p2.
Two analogue output signals are transmitted. The first output delivers a current signal 4...20 mA proportional to the dynamic pressure p1.
The second output delivers a current signal 4...20 mA proportional to the differential pressure dp.
Two semiconductor relays K1 and K2 can be configured in the factory either as normally open or normally closed contacts. Contact K1 switches at 75% soiling level and contact K2 subsequently at 100% soiling level.
If cold start monitoring is active, the contacts do not switch at a media temperature below +30 °C.

3. Technical data

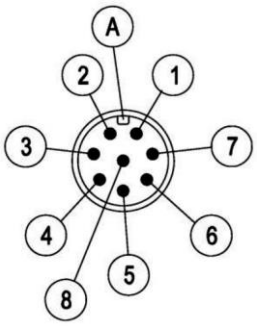
Material:	AL
Contact with media:	FKM, AL, ceramic, stainless steel
Process connection:	connecting piece M20x1.5
Electr. connection:	M12 plug-type connector, 8-pole, IEC 61076-2-101
Operating temperature:	-30 °C to +85 °C
Ambient temperature:	-40 °C to +85 °C
Storage temperature:	-40 °C to +85 °C
Humidity:	0 to 95 % rel. hum.
Soiling 100 %:	3.5 bar
Dynamic pressure p1:	0 to 25 bar
Accuracy p1:	1 % (FS 25 bar)
Differential pressure dp:	0 to 8 bar
Accuracy dp:	1 % (FS 25 bar)
Max. overload (p1, dp):	37.5 bar
Compensation range:	-10 °C bis +70 °C
Output signal (p1, dp):	4 bis 20 mA
	max. 600 Ω
Contact 1 (75 %):	2.6 bar
Contact 2 (100 %):	3.5 bar
Contact type:	N/O or N/C
Switching current:	200 mA
Switching delay:	5 s ±5 %
Nominal voltage:	24 V DC
Perm. operating voltage:	20 to 30 V DC
Electr. connection type:	3 conductors
Max. power consumption:	2 W
with switching outputs:	8 W
Protection type:	IP 65

4. Dimensions



*A = Plug connection
Maximum torque 33 Nm

5. Connection



1	Supply	+Ub		white
2	Supply	GND		brown
3	Switching output K1	75 %		green
4	Output signal	p1	4 to 20 mA	yellow
5	Output signal	dp	4 to 20 mA	grey
6	Switching output K2	100 %		pink
7	Functional earth	FE		blue
8	internal use	not wired		red
A	Coding			

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Filter elements for liquid filters
Degree of filtration 2 µm up to 500 µm

Nominal size 5 up to 1800
Differential pressure resistant up to 210 bar (3045 psi)

1. Features

High performance elements for nearly all fluids

- PS: new Filtration Group Premium Select high performance disposable filter elements with innovativ design for hydraulic oils and lubricants, fuels, aqueous media and synthetic media
- Sm-N: disposable deep filtration elements with highest degree of filtration and dirt holding capacity
- Sm-x: standard disposable glass fibre filter elements for various applications
- Mic: inexpensive disposable filter elements
- Drg: cleanable surface filter element, made of wire mesh
- KS-Mic: high efficient disposable depth filter elements for cooling emulsions
- WS-Mic WS-PS and WS-Sm-x: Filter elements with additional water absorption ability
- Designed for Filtration Group filter housings, as alternative elements in the dimensions of other manufacturers and according to a customized specification
- Complete product range according DIN 24550
- Beta rated elements according to ISO 16889 multipass test
- Elements with high differential pressure stability and dirt holding capacity
- Worldwide distribution

2. Preface

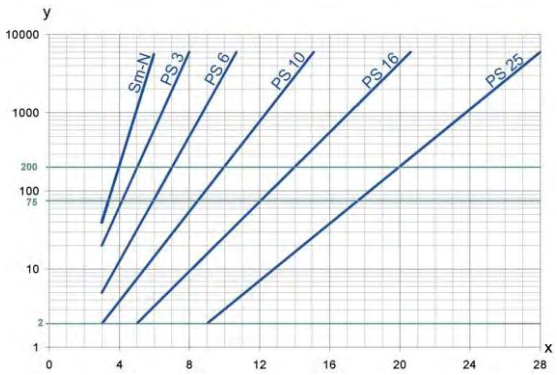
Filter elements are the virtual part of a filter through which the filtration process is realised. For the different liquids and applications Filtration Group developed different filter materials. Therefore a variety of elements are available which would fit into the same housing, but would suit different applications.

3.1 Filter material PS and Sm-N

Depth filters consisting of several layers of glass fibre (progressive design) to filter hydraulic oils and lubricants, flame resistant liquids, fuels and synthetic liquids.

- PS is available in ratings of 5 µm (c), 7 µm (c), 10 µm (c), 15 µm (c) and 20 µm (c) according to ISO 16889 (3µm, 6 µm, 10 µm, 16 µm and 25 µm according to ISO 4572) with a very high dirt holding capacity and simultaneous very low flow resistance.
- Sm-N 2 is available in ratings of 4 µm (c) according to ISO 16889 (2 µm according to ISO 4572) with an extremely high dirt holding capacity for very demanding requirements in regards to the filtration quality, for off-line filtration and for single-pass applications.

Separation grade characteristics



y = beta-value
x = particle size [µm]

determined by multipass tests (ISO 16889)
calibration according to ISO 11171 (NIST)

Filter performance data

tested according to ISO 16889 (multipass test)

PS/Sm-N elements with max. Δp 10 bar

Sm-N	2	$\beta_{4(C)}$	≥	200
PS	3	$\beta_{5(C)}$	≥	200
PS	6	$\beta_{7(C)}$	≥	200
PS	10	$\beta_{10(C)}$	≥	200
PS	16	$\beta_{15(C)}$	≥	200
PS	25	$\beta_{20(C)}$	≥	200

values guaranteed up to 10 bar differential pressure.

In a hydraulic or lubrication system a filter has the task to reduce the contamination to the accepted cleanliness level and to keep it for as long as possible. For the identification of solid particles in industrial hydraulics it is common practice to count particles according to ISO 4406. Subsequently the achievable cleanliness classes of the Sm-x and Sm-N. These values mirror our longtime experience in designing hydraulic filters and could be considered as guide values.

Cleanliness classes	
Filter material	Cleanliness classes according to ISO 4406 (1999), > 4 µm(c)/ > 6 µm (c)/ >14 µm (c)
Sm-N 2	13/11/08
PS 3	14/12/09
PS 6	16/13/10
PS 10	17/15/11
PS 16	20/17/12
PS 25	23/19/13

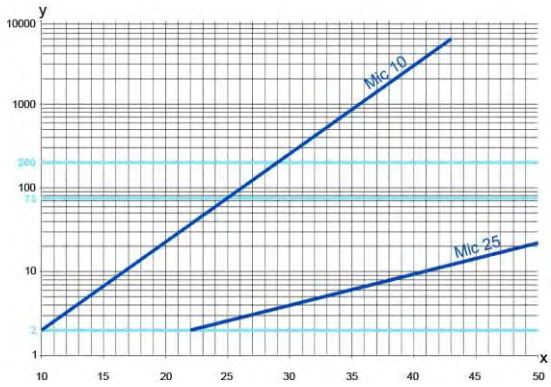
3.2 Filter material Sm-x

Deep filters with glasfibre filter material for all purposes. Filter performance, retention rates and the achievable cleaniness classes are fully corresponding to the new PS filter material.

3.3 Filter material Mic

Depth filters made of cellulose or glass fibre layers with a high dirt holding capacity and a low flow resistance. Degree of filtration 10 µm and 25 µm according to FGC norm. Use in hydraulic oil and lubricants filtration as suction filter as well as low cost filtration in plants with minor demands in regards to the filtrat quality.

Separation grade characteristics



y = beta-value
x = particle size [µm]

Filter performance data

tested according to ISO 16889 (multipass test)

Mic	10	β_{10}	≥	2
Mic	25	β_{25}	≥	2

determined by multipass tests (ISO 16889)
calibration according to ISO 11171 (NIST)

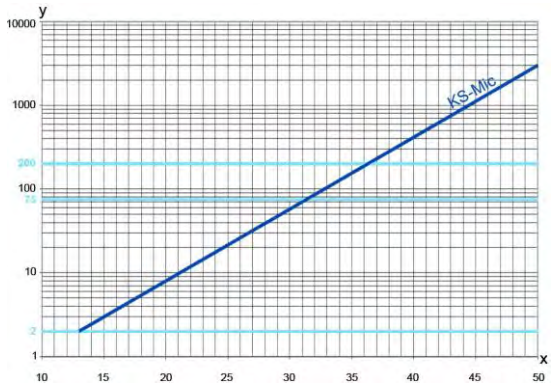
3.4 Filter material Drg

Surface filters made of stainless steel wire mesh with a very low flow resistance designed in the following weaves: plait, twill and linen. Degree of filtration 10 µm, 25 µm, 40 µm, 60 µm, 100 µm, 200 µm, 300 µm and 500 µm. For a wire mesh filter element the degree of filtration is determined by the largest diameter of a globular particle which would be able to pass the fabric. Wire mesh filter elements are used in hydraulic oil and lubricants filtration as suction or coarse filters, for high viscose fluids as well as safety filters for coolant filtration. Wire mesh elements possess a defined removal size as surface filter and a low dirt holding capacity as depth filter.

3.5 Filter material KS-Mic

Depth filter consisting of several, coordinated, binder-free polyester materials with a very high dirt holding capacity and low flow resistance. Degree of filtration: 25 µm according to FGC norm. Use as disposable filter in coolant filtration.

Separation grade characteristics



y = beta-value
x = particle size [µm]

Filter performance data

tested according to ISO 16889 (multipass test)

KS-Mic	25	β_{25}	≥	5

determined by multipass tests (ISO 16889)
calibration according to ISO 11171 (NIST)

3.6 Filter materials WS-Mic, WS-Sm-x and WS-Sm-N

Filtration Group WS-elements for water removal are available as water absorber elements WS-Mic 25 with a low filter efficiency for particles or in combination with the highly efficient Sm-N 2 and Sm-x 10 configuration. A super absorper will change its chemical structure while absorbing water and indicates the amount of absorbed free water by an increase of flow resistance. The free water will be absorbed until the saturation limit is reached. WS-elements are applicable for all common lubrication and hydraulic fluids. The filter property complies with the corresponding Mic-, Sm-x- and Sm-N 2 element. The flow resistance of a water-free liquid would be insignificantly higher.

4. Quality assurance

Filtration Group filters and filter elements are produced according to the following international standards:

Norm	Designation
DIN ISO 2941	Hydraulic fluid power filter elements; verification of collapse/burst resistance
DIN ISO 2942	Hydraulic fluid power filter elements; verification of fabrication integrity
DIN ISO 2943	Hydraulic fluid power filter elements; verification of material compatibility with fluids
DIN ISO 3723	Hydraulic fluid power filter elements; method for end load te
DIN ISO 3724	Hydraulic fluid power filter elements; verification of flow fatigue characteristics
ISO 3968	Hydraulic fluid power-filters-evaluation of pressure drop versus flow characteristics
ISO 10771.1	Fatigue pressure testing of metal containing envelopes in hydraulic fluid applications
ISO 16889	Hydraulic fluid power filters-multipass method for evaluation filtration performance of a filter element

5. Technical specifications

Pleated filter elements
Flow direction from outside to inside
Corrosion protected, chrome VI free, end caps and support tube
Berst pressure resistance up to 210 bar
Filter material and filter area see table
Temperature range of application: -10 °C to +120 °C
Possible applications see description „Filter material“ chapter 3.1
Standard sealings for DIN elements: NBR, other sealing materials available on request
Elements with stainless steel parts available on request

6.1 Type number key and order numbers filter elements for in-line filters

6.1.1 Type number key filter elements for in-line filters

Type			
Pi	in-line filter		
	Filter material and degree of filtration		
	01	Sm-N 2	
	10	Mic 25	
	11	Mic 10	
	21	PS 3	
	22	PS vst 3	
	31	PS 10	
	32	PS vst 10	
	41	PS 25	
	42	PS vst 25	
	51	PS 6	
	52	PS vst 6	
	81	Drg 10	
	82	Drg 25	
	83	Drg 40	
	84	Drg 60	
	85	Drg 100	
	86	Drg 200	
	87	Drg 300	
	88	Drg 500	
	89	Drg special version	
	91	Drg vst 10	
	92	Drg vst 25	
	93	Drg vst 40	
	94	Drg vst 60	
	95	Drg vst 100	
	96	Drg vst 200	
	97	Drg vst 300	
	98	Drg vst 500	
	99	metal edge	
		Nominal size	
		05	NG 50
		08	NG 80
		11	NG 110
		15	NG 150
		30	NG 300
		45	NG 450
Pi	**10**	**05**	**Selection example**

6.1.2 Filter elements* for in-line filters					
Nominal size NG [l/min]	**Order number**	**Type**	**Filter material**	**max. Δ p [bar]**	**Filter surface [cm²]**
50	77576630	Pi 1105 Mic 10	Mic 10	**20**	640
	77718620	Pi 1005 Mic 25	Mic 25		640
	77680135	Pi 2105 PS 3	PS 3		590
	77943509	Pi 5105 PS 6	PS 6		590
	77680325	Pi 3105 PS 10	PS 10		590
	77680440	Pi 4105 PS 25	PS 25		590
	77680192	Pi 2205 PS vst 3	PS vst 3	**210**	470
	77943533	Pi 5205 PS vst 6	PS vst 6		470
	77680382	Pi 3205 PS vst 10	PS vst 10		470
	77680507	Pi 4205 PS vst 25	PS vst 25		470
	77680895	Pi 8105 Drg 10	Drg 10	**20**	590
	77680911	Pi 8205 Drg 25	Drg 25		590
	77680960	Pi 8305 Drg 40	Drg 40		590
	77576648	Pi 8405 Drg 60	Drg 60		365
	77681067	Pi 8505 Drg 100	Drg 100		590
	77718687	Pi 8605 Drg 200	Drg 200		365
	77718703	Pi 8705 Drg 300	Drg 300		365
	77718695	Pi 8805 Drg 500	Drg 500		590
	77689102	Pi 9105 Drg vst 10	Drg vst 10	**210**	470
	77689128	Pi 9205 Drg vst 25	Drg vst 25		470
	77689169	Pi 9305 Drg vst 40	Drg vst 40		470
	77689219	Pi 9405 Drg vst 60	Drg vst 60		470
	77689276	Pi 9505 Drg vst 100	Drg vst 100		470
	77740921	Pi 9605 Drg vst 200	Drg vst 200		470
	77740939	Pi 9705 Drg vst 300	Drg vst 300		470
	77740947	Pi 9805 Drg vst 500	Drg vst 500		470
	on request	on request	KS-Mic25	**20**	-
	on request	on request	Sm-N 2		-
80	77680085	Pi 1108 Mic 10	Mic 10	**20**	1250
	77657174	Pi 1008 Mic 25	Mic 25		1250
	77680143	Pi 2108 PS 3	PS 3		1150
	77943517	Pi 5108 PS 6	PS 6		1150
	77680341	Pi 3108 PS 10	PS 10		1150
	77680457	Pi 4108 PS 25	PS 25		1150
	77680200	Pi 2208 PS vst 3	PS vst 3	**210**	900
	77943541	Pi 5208 PS vst 6	PS vst 6		900
	77681190	Pi 3208 PS vst 10	PS vst 10		900
	77680515	Pi 4208 PS vst 25	PS vst 25		900
	77718737	Pi 8108 Drg 10	Drg 10	**20**	1150
	77680929	Pi 8208 Drg 25	Drg 25		1150
	77680978	Pi 8308 Drg 40	Drg 40		1150
	77681018	Pi 8408 Drg 60	Drg 60		725

* A wider range of element types is available on request.

6.1.2 Filter elements* for in-line filters					
Nominal size NG [l/min]	**Order number**	**Type**	**Filter material**	**max. Δ p [bar]**	**Filter surface [cm²]**
80	77681075	Pi 8508 Drg 100	Drg 100	**20**	744
	77718711	Pi 8608 Drg 200	Drg 200		725
	77668528	Pi 8708 Drg 300	Drg 300		725
	77718729	Pi 8808 Drg 500	Drg 500		1150
	77689110	Pi 9108 Drg vst 10	Drg vst 10	**210**	950
	77740954	Pi 9208 Drg vst 25	Drg vst 25		950
	77740970	Pi 9308 Drg vst 40	Drg vst 40		950
	77689227	Pi 9408 Drg vst 60	Drg vst 60		950
	77740962	Pi 9508 Drg vst 100	Drg vst 100		950
	77740988	Pi 9608 Drg vst 200	Drg vst 200		950
	77740996	Pi 9708 Drg vst 300	Drg vst 300		950
	77741002	Pi 9808 Drg vst 500	Drg vst 500		950
	on request	on request	KS-Mic 25	**20**	-
	on request	on request	SM-N 2		-
110	77680093	Pi 1111 Mic 10	Mic 10	**20**	1840
	77657182	Pi 1011 Mic 25	Mic 25		1840
	77680150	Pi 2111 PS 3	PS 3		1700
	77943525	Pi 5111 PS 6	PS 6		1700
	77680333	Pi 3111 PS 10	PS 10		1700
	77680465	Pi 4111 PS 25	PS 25		1700
	77680218	Pi 2211 PSvst 3	PS vst 3	**210**	1275
	77943558	Pi 5211 PS vst 6	PS vst 6		1275
	77680390	Pi 3211 PS vst 10	PS vst 10		1275
	77680523	Pi 4211 PS vst 25	PS vst 25		1275
	77680903	Pi 8111 Drg 10	Drg 10	**20**	1700
	77680937	Pi 8211 Drg 25	Drg 25		1700
	77680986	Pi 8311 Drg 40	Drg 40		1700
	77681026	Pi 8411 Drg 60	Drg 60		1080
	77718778	Pi 8511 Drg 100	Drg 100		1700
	77718760	Pi 8611 Drg 200	Drg 200		1080
	77718752	Pi 8711 Drg 300	Drg 300		1080
	77718745	Pi 8811 Drg 500	Drg 500		1700
	77741010	Pi 9111 Drg vst 10	Drg vst 10	**210**	1410
	77689136	Pi 9211 Drg vst 25	Drg vst 25		1410
	77689177	Pi 9311 Drg vst 40	Drg vst 40		1410
	77689235	Pi 9411 Drg vst 60	Drg vst 60		1410
	77689284	Pi 9511 Drg vst 100	Drg vst 100		1410
	77668544	Pi 9611 Drg vst 200	Drg vst 200		1410
	77668551	Pi 9711 Drg vst 300	Drg vst 300		1410
	77741028	Pi 9811 Drg vst 500	Drg vst 500		1410
	76182067	Pi 1011 KS-Mic 25	KS-Mic 25	**20**	1240
	on request	on request	Sm-N 2		-

* A wider range of element types is available on request.

6.1.2 Filter elements* for in-line filters					
Nominal size NG [l/min]	**Order number**	**Type**	**Filter material**	**max. Δ p [bar]**	**Filter surface [cm²]**
150	77680101	Pi 1115 Mic 10	Mic 10	**20**	2565
	77657190	Pi 1015 Mic 25	Mic 25		2565
	77680168	Pi 2115 PS 3	PS 3		2425
	77955099	Pi 5115 PS 6	PS 6		2425
	77680358	Pi 3115 PS 10	PS 10		2425
	77680473	Pi 4115 PS 25	PS 25		2425
	77680226	Pi 2215 PS vst 3	PS vst 3	**210**	2010
	77955123	Pi 5215 PS vst 6	PS vst 6		2010
	77680408	Pi 3215 PS vst 10	PS vst 10		2010
	77680531	Pi 4215 PS vst 25	PS vst 25		2010
	77711120	Pi 8115 Drg 10	Drg 10	**20**	2250
	77680945	Pi 8215 Drg 25	Drg 25		2250
	77680994	Pi 8315 Drg 40	Drg 40		2250
	77681034	Pi 8415 Drg 60	Drg 60		1575
	77681083	Pi 8515 Drg 100	Drg 100		2250
	77711138	Pi 8615 Drg 200	Drg 200		1575
	77711146	Pi 8715 Drg 300	Drg 300		1575
	77711153	Pi 8815 Drg 500	Drg 500		2250
	77741036	Pi 9115 Drg vst 10	Drg vst 10	**210**	1800
	77689144	Pi 9215 Drg vst 25	Drg vst 25		1800
	77689185	Pi 9315 Drg vst 40	Drg vst 40		1800
	77689243	Pi 9415 Drg vst 60	Drg vst 60		1800
	77689292	Pi 9515 Drg vst 100	Drg vst 100		1800
	77741044	Pi 9615 Drg vst 200	Drg vst 200		1800
	77741051	Pi 9715 Drg vst 300	Drg vst 300		1800
	77741069	Pi 9815 Drg vst 500	Drg vst 500		1800
	on request	on request	KS-Mic 25	**20**	-
	76373112	Pi 0115 SM-N 2	Sm-N 2		2150
300	77680119	Pi 1130 Mic 10	Mic 10	**20**	4885
	77657208	Pi 1030 Mic 25	Mic 25		4885
	77680176	Pi 2130 PS 3	PS 3		4620
	77955107	Pi 5130 PS 6	PS 6		4620
	77680366	Pi 3130 PS 10	PS 10		4620
	77680481	Pi 4130 PS 25	PS 25		4620
	77680234	Pi 2230 PS vst 3	PS vst 3	**210**	3800
	77955131	Pi 5230 PS vst 6	PS vst 6		3800
	77680416	Pi 3230 PS vst 10	PS vst 10		3800
	77680549	Pi 4230 PS vst 25	PS vst 25		3800
	77718810	Pi 8130 Drg 10	Drg 10	**20**	4280
	77680952	Pi 8230 Drg 25	Drg 25		4280
	77718802	Pi 8330 Drg 40	Drg 40		4280
	77681042	Pi 8430 Drg 60	Drg 60		2975

* A wider range of element types is available on request.

6.1.2 Filter elements* for in-line filters					
Nominal size NG [l/min]	**Order number**	**Type**	**Filter material**	**max. Δ p [bar]**	**Filter surface [cm²]**
300	77689078	Pi 8530 Drg 100	Drg 100	**20**	4280
	77668510	Pi 8630 Drg 200	Drg 200		2975
	77718786	Pi 8730 Drg 300	Drg 300		2975
	77718794	Pi 8830 Drg 500	Drg 500		4280
	77741077	Pi 9130 Drg vst 10	Drg vst 10	**210**	3400
	77689151	Pi 9230 Drg vst 25	Drg vst 25		3400
	77689193	Pi 9330 Drg vst 40	Drg vst 40		3400
	77689250	Pi 9430 Drg vst 60	Drg vst 60		3400
	77689300	Pi 9530 Drg vst 100	Drg vst 100		3400
	77741085	Pi 9630 Drg vst 200	Drg vst 200		3400
	77741093	Pi 9730 Drg vst 300	Drg vst 300		3400
	77741101	Pi 9830 Drg vst 500	Drg vst 500		3400
	78268625	Pi 1030 KS-Mic 25	KS-Mic 25	**20**	4190
	77879877	Pi 0130 Sm-N 2	Sm-N 2		4215
450	77680127	Pi 1145 Mic 10	Mic 10	**20**	7265
	77711161	Pi 1045 Mic 25	Mic 25		7265
	77680184	Pi 2145 PS 3	PS 3		6865
	77955115	Pi 5145 PS 6	PS 6		6865
	77680374	Pi 3145 PS 10	PS 10		6865
	77680499	Pi 4145 PS 25	PS 25		6865
	77680242	Pi 2245 PS vst 3	PS vst 3	**210**	5600
	77955149	Pi 5245 PS vst 6	PS vst 6		5600
	77680424	Pi 3245 PS vst 10	PS vst 10		5600
	77680556	Pi 4245 PS vst 25	PS vst 25		5600
	77711179	Pi 8145 Drg 10	Drg 10	**20**	6370
	77711187	Pi 8245 Drg 25	Drg 25		6370
	77681000	Pi 8345 Drg 40	Drg 40		6370
	77681059	Pi 8445 Drg 60	Drg 60		4410
	77689094	Pi 8545 Drg 100	Drg 100		6370
	77725534	Pi 8645 Drg 200	Drg 200		4410
	77725559	Pi 8745 Drg 300	Drg 300		4410
	77725542	Pi 8845 Drg 500	Drg 500		6370
	77741119	Pi 9145 Drg vst 10	Drg vst 10	**210**	5020
	77741127	Pi 9245 Drg vst 25	Drg vst 25		5020
	77689201	Pi 9345 Drg vst 40	Drg vst 40		5020
	77689268	Pi 9445 Drg vst 60	Drg vst 60		5020
	77689318	Pi 9545 Drg vst 100	Drg vst 100		5020
	77741135	Pi 9645 Drg vst 200	Drg vst 200		5020
	77741143	Pi 9745 Drg vst 300	Drg vst 300		5020
	77741150	Pi 9845 Drg vst 500	Drg vst 500		5020
	79359746	Pi 1045 KS-Mic 25	KS-Mic 25	**20**	6230
	79337130	Pi 0145 Sm-N 2	Sm-N 2		6260

* A wider range of element types is available on request.

6.2 Type number key and order numbers filter elements for DIN filters

6.2.1 Type number key filter elements acc. DIN 24550 part 3 and part 4

Typ						
Pi	in-line filter					
	Filter material					
	1	Mic				
	2	PS				
	3	Drg				
	7	PS vst				
	8	Drg vst				
		Degree of filtration				
		1	3 µm			
		2	6 µm			
		3	10 µm			
		4	16 µm			
		5	25 µm			
		6	40 µm			
		7	60 µm			
		8	100 µm			
		9	250 µm			
		S	optional			
			Nominal size			
			004	NG 40		
			006	NG 60		
			010	NG 100		
			016	NG 160		
			025	NG 250		
			040	NG 400		
			063	NG 630		
			100	NG 1000		
				Version		
				D	pressure filter	
				R	return line filter	
					Seal material	
					N	NBR
					E	EPDM
					F	FPM
					P	PTFE or PTFE coated
					C	CR
Pi	**2**	**5**	**006**	**D**	**N**	**Selection example**

Optional degree of filtration: the degree of filtration (µ**m)** will be added to the corresponding type designation, e.g. Pi 3S 004 DN **500**

6.2.2 Filter elements for in-line filters acc. DIN 24550 part 3					
Nominal size NG [l/min]	**Order number**	**Type**	**Filter material**	**max. Δ p [bar]**	**Filter surface [cm²]**
40	77929698	Pi 13004 DN Mic 10	Mic 10	**20**	475
	78260911	Pi 15004 DN Mic 25	Mic 25		475
	78260929	Pi 21004 DN PS 3	PS 3		475
	77960859	Pi 22004 DN PS 6	PS 6		475
	77925571	Pi 23004 DN PS 10	PS 10		475
	78260937	Pi 24004 DN PS 16	PS 16		475
	78260945	Pi 25004 DN PS 25	PS 25		475
	78216079	Pi 71004 DN PS vst 3	PS vst 3	**210**	445
	77960156	Pi 72004 DN PS vst 6	PS vst 6		445
	77925654	Pi 73004 DN PS vst 10	PS vst 10		445
	78216087	Pi 74004 DN PS vst 16	PS vst 16		445
	78216095	Pi 75004 DN PS vst 25	PS vst 25		445
	70317774	Pi 33004 DN Drg 10	Drg 10	**20**	475
	79769308	Pi 35004 DN Drg 25	Drg 25		475
	79704461	Pi 36004 DN Drg 40	Drg 40		475
	76116909	Pi 37004 DN Drg 60	Drg 60		475
	79703802	Pi 38004 DN Drg 100	Drg 100		475
	70314654	Pi 39004 DN Drg 250	Drg 250		475
	76371090	Pi 83004 DN Drg vst 10	Drg vst 10	**210**	445
	79737461	Pi 85004 DN Drg vst 25	Drg vst 25		445
	78266587	Pi 86004 DN Drg vst 40	Drg vst 40		445
	79713942	Pi 87004 DN Drg vst 60	Drg vst 60		445
	on request	Pi 88004 DN Drg vst 100	Drg vst 100		-
63	77929706	Pi 13006 DN Mic 10	Mic 10	**20**	835
	78260952	Pi 15006 DN Mic 25	Mic 25		835
	78260960	Pi 21006 DN PS 3	PS 3		835
	77960867	Pi 22006 DN PS 6	PS 6		835
	77925589	Pi 23006 DN PS 10	PS 10		835
	78260978	Pi 24006 DN PS 16	PS 16		835
	78260986	Pi 25006 DN PS 25	PS 25		835
	78216137	Pi 71006 DN PS vst 3	PS vst 3	**210**	780
	77960149	Pi 72006 DN PS vst 6	PS vst 6		780
	77925662	Pi 73006 DN PS vst 10	PS vst 10		780
	78216145	Pi 74006 DN PS vst 16	PS vst 16		780
	78216152	Pi 75006 DN PS vst 25	PS vst 25		780
	76362586	Pi 33006 DN Drg 10	Drg 10	**20**	835
	70307615	Pi 35006 DN Drg 25	Drg 25		835
	on request	Pi 36006 DN Drg 40	Drg 40		-
	on request	Pi 37006 DN Drg 60	Drg 60		-
	76132369	Pi 38006 DN Drg 100	Drg 100		835
	on request	Pi 83006 DN Drg vst 10	Drg vst 10	**210**	-
	on request	Pi 85006 DN Drg vst 25	Drg vst 25		-
	on request	Pi 86006 DN Drg vst 40	Drg vst 40		780
	70318732	Pi 87006 DN Drg vst 60	Drg vst 60		525
	on request	Pi 88006 DN Drg vst 100	Drg vst 100		780
	76940050	Pi 89006 DN Drg vst 200	Drg vst 250		525

6.2.2 Filter elements for in-line filters acc. DIN 24550 part 3					
Nominal size NG [l/min]	**Order number**	**Type**	**Filter material**	**max. Δ p [bar]**	**Filter surface [cm²]**
100	77929714	Pi 13010 DN Mic 10	Mic 10	**20**	1375
	78260994	Pi 15010 DN Mic 25	Mic 25		1375
	78227472	Pi 21010 DN PS 3	PS 3		1375
	77960875	Pi 22010 DN PS 6	PS 6		1375
	77925597	Pi 23010 DN PS 10	PS 10		1375
	78261000	Pi 24010 DN PS 16	PS 16		1375
	78261018	Pi 25010 DN PS 25	PS 25		1375
	78227480	Pi 71010 DN PS vst 3	PS vst 3	**210**	1275
	77960131	Pi 72010 DN PS vst 6	PS vst 6		1275
	77925670	Pi 73010 DN PS vst 10	PS vst 10		1275
	78261281	Pi 74010 DN PS vst 16	PS vst 16		1275
	78216160	Pi 75010 DN PS vst 25	PS vst 25		1275
	70305610	Pi 33010 DN Drg 10	Drg 10	**20**	1375
	79735762	Pi 35010 DN Drg 25	Drg 25		1375
	76329098	Pi 36010 DN Drg 40	Drg 40		1375
	76344501	Pi 37010 DN Drg 60	Drg 60		1375
	79394677	Pi 38010 DN Drg 100	Drg 100		1375
	76330898	Pi 39010 DN Drg 250	Drg 250		1375
	on request	Pi 83010 DN Drg vst 10	Drg vst 10	**210**	1275
	79755877	Pi 85010 DN Drg vst 25	Drg vst 25		1275
	79359886	Pi 86010 DN Drg vst 40	Drg vst 40		1275
	79714239	Pi 87010 DN Drg vst 60	Drg vst 60		1275
	on request	Pi 88010 DN Drg vst 100	Drg vst 100		1275
160	77929722	Pi 13016 DN Mic 10	Mic 10	**20**	2530
	78261026	Pi 15016 DN Mic 25	Mic 25		2530
	78261034	Pi 21016 DN PS 3	PS 3		2530
	77960826	Pi 22016 DN PS 6	PS 6		2530
	77925605	Pi 23016 DN PS 10	PS 10		2530
	78261042	Pi 24016 DN PS 16	PS 16		2530
	78261059	Pi 25016 DN PS 25	PS 25		2530
	77940638	Pi 71016 DN PS vst 3	PS vst 3	**210**	1885
	77960123	Pi 72016 DN PS vst 6	PS vst 6		1885
	77925688	Pi 73016 DN PS vst 10	PS vst 10		1885
	78269797	Pi 74016 DN PS vst 16	PS vst 16		1885
	78216178	Pi 75016 DN PS vst 25	PS vst 25		1885
	on request	Pi 33016 DN Drg 10	Drg 10	**20**	2225
	79701954	Pi 35016 DN Drg 25	Drg 25		2225
	79363474	Pi 36016 DN Drg 40	Drg 40		2225
	76111991	Pi 37016 DN Drg 60	Drg 60		2225
	76371900	Pi 38016 DN Drg 100	Drg 100		2225
	on request	Pi 83016 DN Drg vst 10	Drg vst 10	**210**	-
	76940621	Pi 85016 DN Drg vst 25	Drg vst 25		1660
	on request	Pi 86016 DN Drg vst 40	Drg vst 40		-
	on request	Pi 87016 DN Drg vst 60	Drg vst 60		-
	76371967	Pi 88016 DN Drg vst 100	Drg vst 100		1660

6.2.2 Filter elements for in-line filters acc. DIN 24550 part 3					
Nominal size NG [l/min]	**Order number**	**Type**	**Filter material**	**max. Δ p [bar]**	**Filter surface [cm²]**
250	77929730	Pi 13025 DN Mic 10	Mic 10	**20**	4020
	78261067	Pi 15025 DN Mic 25	Mic 25		4020
	78227514	Pi 21025 DN PS 3	PS 3		4020
	77960834	Pi 22025 DN PS 6	PS 6		4020
	77925613	Pi 23025 DN PS 10	PS 10		4020
	78261075	Pi 24025 DN PS 16	PS 16		4020
	78261083	Pi 25025 DN PS 25	PS 25		4020
	77940646	Pi 71025 DN PS vst 3	PS vst 3	**210**	3090
	77960115	Pi 72025 DN PS vst 6	PS vst 6		3090
	77925696	Pi 73025 DN PS vst 10	PS vst 10		3090
	78269813	Pi 74025 DN PS vst 16	PS vst 16		3090
	78216186	Pi 75025 DN PS vst 25	PS vst 25		3090
	on request	Pi 33025 DN Drg 10	Drg 10	**20**	-
	76347199	Pi 35025 DN Drg 25	Drg 25		3530
	79736430	Pi 36025 DN Drg 40	Drg 40		3530
	79766882	Pi 37025 DN Drg 60	Drg 60		3530
	76370514	Pi 38025 DN Drg 100	Drg 100		3530
	on request	Pi 83025 DN Drg vst 10	Drg vst 10	**210**	-
	on request	Pi 85025 DN Drg vst 25	Drg vst 25		-
	on request	Pi 86025 DN Drg vst 40	Drg vst 40		-
	70303520	Pi 87025 DN Drg vst 60	Drg vst 60		3090
	76106504	Pi 88025 DN Drg vst 100	Drg vst 100		3090
400	77929748	Pi 13040 DN Mic 10	Mic 10	**20**	6770
	78261091	Pi 15040 DN Mic 25	Mic 25		6770
	78227522	Pi 21040 DN PS 3	PS 3		6770
	77960842	Pi 22040 DN PS 6	PS 6		6770
	77925621	Pi 23040 DN PS 10	PS 10		6770
	78261109	Pi 24040 DN PS 16	PS 16		6770
	78261117	Pi 25040 DN PS 25	PS 25		6770
	77940653	Pi 71040 DN PS vst 3	PS vst 3	**210**	5240
	77960107	Pi 72040 DN PS vst 6	PS vst 6		5240
	77930829	Pi 73040 DN PS vst 10	PS vst 10		5240
	78269821	Pi 74040 DN PS vst 16	PS vst 16		5240
	78260903	Pi 75040 DN PS vst 25	PS vst 25		5240
	on request	Pi 33040 DN Drg 10	Drg 10	**20**	-
	76180749	Pi 35040 DN Drg 25	Drg 25		5900
	76344949	Pi 36040 DN Drg 40	Drg 40		5900
	76114367	Pi 37040 DN Drg 60	Drg 60		3950
	76131809	Pi 38040 DN Drg 100	Drg 100		5900
	on request	Pi 83040 DN Drg vst 10	Drg vst 10	**210**	4900
	on request	Pi 85040 DN Drg vst 25	Drg vst 25		4900
	76370803	Pi 86040 DN Drg vst 40	Drg vst 40		4900
	78381196	Pi 87040 DN Drg vst 60	Drg vst 60		3300
	76180673	Pi 88040 DN Drg vst 100	Drg vst 100		4900

6.2.2 Filter elements for in-line filters acc. DIN 24550 part 3					
Nominal size NG [l/min]	**Order number**	**Type**	**Filter material**	**max. Δ p [bar]**	**Filter surface [cm²]**
630	77929755	Pi 13063 DN Mic 10	Mic 10	**20**	9300
	77961501	Pi 15063 DN Mic 25	Mic 25		9300
	77961519	Pi 21063 DN PS 3	PS 3		9300
	77943699	Pi 22063 DN PS 6	PS 6		9300
	77925639	Pi 23063 DN PS 10	PS 10		9300
	77961527	Pi 24063 DN PS 16	PS 16		9300
	77961535	Pi 25063 DN PS 25	PS 25		9300
	77961543	Pi 71063 DN PS vst 3	PS vst 3	**210**	7230
	77960099	Pi 72063 DN PS vst 6	PS vst 6		7230
	77925712	Pi 73063 DN PS vst 10	PS vst 10		7230
	77961550	Pi 74063 DN PS vst 16	PS vst 16		7230
	77961568	Pi 75063 DN PS vst 25	PS vst 25		7230
	79308107	Pi 33063 DN Drg 10	Drg 10	**20**	8685
	77943707	Pi 35063 DN Drg 25	Drg 25		8685
	77999154	Pi 36063 DN Drg 40	Drg 40		8685
	77943715	Pi 37063 DN Drg 60	Drg 60		8685
	77963408	Pi 38063 DN Drg 100	Drg 100		8685
	79309915	Pi 39063 DN Drg 250	Drg 250		8685
1000	77929763	Pi 13100 DN Mic 10	Mic 10	**20**	14950
	77961600	Pi 15100 DN Mic 25	Mic 25		14950
	77961618	Pi 21100 DN PS 3	PS 3		14950
	77943723	Pi 22100 DN PS 6	PS 6		14950
	77925647	Pi 23100 DN PS 10	PS 10		14950
	77961626	Pi 24100 DN PS 16	PS 16		14950
	77961634	Pi 25100 DN PS 25	PS 25		14950
	77961642	Pi 71100 DN PS vst 3	PS vst 3	**210**	11700
	77960081	Pi 72100 DN PS vst 6	PS vst 6		11700
	77925720	Pi 73100 DN PS vst 10	PS vst 10		11700
	77961659	Pi 74100 DN PS vst 16	PS vst 16		11700
	77961667	Pi 75100 DN PS vst 25	PS vst 25		11700
	on request	Pi 33100 DN Drg 10	Drg 10	**20**	14000
	77943731	Pi 35100 DN Drg 25	Drg 25		14000
	78229569	Pi 36100 DN Drg 40	Drg 40		14000
	77943749	Pi 37100 DN Drg 60	Drg 60		14000
	77977465	Pi 38100 DN Drg 100	Drg 100		14000
	78264095	Pi 39100 DN Drg 250	Drg 250		14000

6.2.3 Filter elements for tank top return line filters acc. DIN 24550 part 4					
Nominal size NG [l/min]	**Order number**	**Type**	**Filter material**	**max. Δ p [bar]**	**Filter surface [cm²]**
40	77925001	Pi 13004 RN Mic 10	Mic 10	**10**	900
	77962210	Pi 15004 RN Mic 25	Mic 25		900
	77923998	Pi 21004 RN PS 3	PS 3		820
	77964034	Pi 22004 RN PS 6	PS 6		820
	77924004	Pi 23004 RN PS 10	PS 10		820
	77962244	Pi 24004 RN PS 16	PS 16		820
	77960206	Pi 25004 RN PS 25	PS 25		820
	on request	Pi 33004 RN Drg 10	Drg 10		-
	77962277	Pi 35004 RN Drg 25	Drg 25		520
	77999394	Pi 36004 RN Drg 40	Drg 40		520
	77962301	Pi 37004 RN Drg 60	Drg 60		520
	on request	Pi 38004 RN Drg 100	Drg 100		-
63	77925019	Pi 13006 RN Mic 10	Mic 10	**10**	1585
	77962228	Pi 15006 RN Mic 25	Mic 25		1585
	77924012	Pi 21006 RN PS 3	PS 3		1445
	77964042	Pi 22006 RN PS 6	PS 6		1445
	77924020	Pi 23006 RN PS 10	PS 10		1445
	77962251	Pi 24006 RN PS 16	PS 16		1445
	77960214	Pi 25006 RN PS 25	PS 25		1445
	76345326	Pi 33006 RN Drg 10	Drg 10		-
	77962285	Pi 35006 RN Drg 25	Drg 25		915
	77999402	Pi 36006 RN Drg 40	Drg 40		915
	77962319	Pi 37006 RN Drg 60	Drg 60		915
	78266520	Pi 38006 RN Drg 100	Drg 100		915
100	77925027	Pi 13010 RN Mic 10	Mic 10	**10**	2610
	77962236	Pi 15010 RN Mic 25	Mic 25		2610
	77924038	Pi 21010 RN PS 3	PS 3		2380
	77940844	Pi 22010 RN PS 6	PS 6		2380
	77924046	Pi 23010 RN PS 10	PS 10		2380
	77962269	Pi 24010 RN PS 16	PS 16		2380
	77960222	Pi 25010 RN PS 25	PS 25		2380
	on request	Pi 33010 RN Drg 10	Drg 10		-
	77962293	Pi 35010 RN Drg 25	Drg 25		1510
	77999410	Pi 36010 RN Drg 40	Drg 40		1510
	77962327	Pi 37010 RN Drg 60	Drg 60		1510
	78298226	Pi 38010 RN Drg 100	Drg 100		1510
160	77925035	Pi 13016 RN Mic 10	Mic 10	**10**	3750
	77963598	Pi 15016 RN Mic 25	Mic 25		3750
	77924137	Pi 21016 RN PS 3	PS 3		3750
	77964067	Pi 22016 RN PS 6	PS 6		3750
	77924145	Pi 23016 RN PS 10	PS 10		3750
	77963648	Pi 24016 RN PS 16	PS 16		3750
	77960230	Pi 25016 RN PS 25	PS 25		3750
	on request	Pi 33016 RN Drg 10	Drg 10		-
	77963697	Pi 35016 RN Drg 25	Drg 25		2020
	77999428	Pi 36016 RN Drg 40	Drg 40		2020
	77963747	Pi 37016 RN Drg 60	Drg 60		2020
	on request	Pi 38016 RN Drg 100	Drg 100		-

6.2.3 Filter elements for tank top return line filters acc. DIN 24550 part 4					
Nominal size NG [l/min]	**Order number**	**Type**	**Filter material**	**max. Δ p [bar]**	**Filter surface [cm²]**
250	77925043	Pi 13025 RN Mic10	Mic 10	**10**	6050
	77963606	Pi 15025 RN Mic 25	Mic 25		6050
	77924152	Pi 21025 RN PS 3	PS 3		6050
	77964075	Pi 22025 RN PS 6	PS 6		6050
	77924160	Pi 23025 RN PS 10	PS 10		6050
	77963655	Pi 24025 RN PS 16	PS 16		6050
	77960248	Pi 25025 RN PS 25	PS 25		6050
	on request	Pi 33025 RN Drg 10	Drg 10		-
	77963705	Pi 35025 RN Drg 25	Drg 25		3250
	77999436	Pi 36025 RN Drg 40	Drg 40		3250
	77963754	Pi 37025 RN Drg 60	Drg 60		3250
	79335746	Pi 38025 RN Drg 100	Drg 100		3250
400	77925050	Pi 13040 RN Mic 10	Mic 10	**10**	9450
	77963614	Pi 15040 RN Mic 25	Mic 25		9450
	77924178	Pi 21040 RN PS 3	PS 3		8250
	77964083	Pi 22040 RN PS 6	PS 6		8250
	77924186	Pi 23040 RN PS 10	PS 10		8250
	77963663	Pi 24040 RN PS 16	PS16		8250
	77960255	Pi 25040 RN PS 25	PS 25		8250
	on request	Pi 33040 RN Drg 10	Drg 10		-
	77963713	Pi 35040 RN Drg 25	Drg 25		6370
	77999444	Pi 36040 RN Drg 40	Drg 40		6370
	77963762	Pi 37040 RN Drg 60	Drg 60		6370
	78267833	Pi 38040 RN Drg 100	Drg 100		6370
	79335894	Pi 39040 RN Drg 250	Drg 250		6370
630	77925068	Pi 13063 RN Mic 10	Mic 10	**10**	15550
	77963622	Pi 15063 RN Mic 25	Mic 25		15550
	77924194	Pi 21063 RN PS 3	PS 3		13515
	77964091	Pi 22063 RN PS 6	PS 6		13515
	77924202	Pi 23063 RN PS 10	PS 10		13515
	77963671	Pi 24063 RN PS 16	PS 16		13515
	77960263	Pi 25063 RN PS 25	PS 25		13515
	on request	Pi 33063 RN Drg 10	Drg 10		-
	77963721	Pi 35063 RN Drg 25	Drg 25		10320
	77999451	Pi 36063 RN Drg 40	Drg 40		10320
	77963770	Pi 37063 RN Drg 60	Drg 60		10320
	78264459	Pi 38063 RN Drg 100	Drg 100		10320
	79309253	Pi 39063 RN Drg 250	Drg 250		10320

6.2.3 Filter elements for tank top return line filters acc. DIN 24550 part 4					
Nominal size NG [l/min]	**Order number**	**Type**	**Filter material**	**max. Δ p [bar]**	**Filter surface [cm²]**
1000	77925076	Pi 13100 RN Mic 10	Mic 10	**10**	18335
	77963630	Pi 15100 RN Mic 25	Mic 25		18335
	77924210	Pi 21100 RN PS 3	PS 3		18335
	77964109	Pi 22100 RN PS 6	PS 6		18335
	77924228	Pi 23100 RN PS 10	PS 10		18335
	77963689	Pi 24100 RN PS 16	PS 16		18335
	77960271	Pi 25100 RN PS 25	PS 25		18335
	on request	Pi 33100 RN Drg 10	Drg 10		-
	77963739	Pi 35100 RN Drg 25	Drg 25		14210
	77999469	Pi 363100 RN Drg 40	Drg 40		14210
	77963788	Pi 37100 RN Drg 60	Drg 60		9590
	78299174	Pi 38100 RN Drg 250	Drg 100		14210

6.3 Filter elements 852 xxx series

6.3.1 Filter elements 852 xxx series						
Nominal size NG [l/min]	**Order number**	**Type**	**Filter material**	**max. Δ p [bar]**	**Filter surface [cm²]**	**Used in housing**
5	77684566	**852 149**	Mic 10	**20**	190	**Pi 4301**
	77684582		Mic 25		190	
	on request		Sm-N 2		-	
	77684632		Sm-x 3		165	
	on request		Sm-x 6		-	
	77684640		Sm-x 10		165	
	77684665		Sm-x 25		165	
5	77684681	**852 149**	Sm-x vst 3	**160**	150	**Pi 4301**
	on request		Sm-x vst 6		-	
	77684699		Sm-x vst 10		150	
	77684715		Sm-x vst 25		150	
5	77684343	**852 149**	Drg 10	**20**	165	**Pi 4301**
	77684368		Drg 25		165	
	77684384		Drg 40		165	
	77684400		Drg 60		165	
	77684525		Drg 100		165	
	77856990		Drg 200		165	
	on request		Drg 250		-	
	77857014		Drg 500		165	
5	77684434	**852 149**	Drg vst 10	**160**	150	**Pi 4301**
	77684459		Drg vst 25		150	
	77684475		Drg vst 40		150	
	77684483		Drg vst 60		150	
	77684509		Drg vst 100		150	

6.3.1 Filter elements 852 xxx series						
Nominal size NG [l/min]	**Order number**	**Type**	**Filter material**	**max. Δ p [bar]**	**Filter surface [cm²]**	**Used in housing**
20	77685340	**852 243**	Mic 10	**20**	360	**Pi 41002**
	77685373		Mic 25		360	
	on request		Sm-N 2		-	
	77685407		PS 3		305	
	78216038		PS 6		305	
	77740327		PS 10		305	
	78216053		PS 16		305	
	77685415		PS 25		305	
20	77685423	**852 243**	PS vst 3	**160**	275	**Pi 41002**
	78216046		PS vst 6		275	
	77685431		PS vst 10		275	
	78216061		PS vst 16		275	
	77685449		PS vst 25		275	
20	77740301	**852 243**	Drg 10	**20**	305	**Pi 41002**
	77685316		Drg 25		305	
	on request		Drg 40		-	
	77685324		Drg 60		305	
	77740319		Drg 100		305	
	77872625		Drg 200		305	
	on request		Drg 300		-	
	on request		Drg 500		-	
20	77740822	**852 243**	Drg vst 10	**160**	275	**Pi 41002**
	77740830		Drg vst 25		275	
	on request		Drg vst 40		-	
	77685332		Drg vst 60		275	
	77740848		Drg vst 100		275	
35	78309387	**852 939**	Mic 10	**5**	870	**Pi 53003**
	78206781		Mic 25		870	
35	77699705	**852 588**	Mic 10	**10**	920	**Pi 53003**
	78206328		Mic 25		920	
	79312117		Sm-x 3		650	
	79355595		Sm-x 6		650	
	79312125		Sm-x 10		650	
	on request		Sm-x 16		-	
	79312133		Sm-x 25		650	
	79353509		Drg 25		590	
	77696065		Drg 100		590	
50	78309205	**852 940**	Mic 10	**5**	1100	**Pi 53005**
	79312299		Mic 25		1100	
50	79312158	**852 945**	Sm-x 3	**10**	810	**Pi 53005**
	on request		Sm-x 6		-	
	79312166		Sm-x 10		810	
	on request		Sm-x 16		-	
	79312174		Sm-x 25		810	
	79362690		Drg 25		750	

6.3.1 Filter elements 852 xxx series						
Nominal size NG [l/min]	**Order number**	**Type**	**Filter material**	**max. Δ p [bar]**	**Filter surface [cm²]**	**Used in housing**
50	77675903	**852 275**	Mic 10	**5**	27000	**Pi 1975**
	77675911		Mic 25		27000	
	79735952		KS-Mic 25		18150	
	79309303		Sm-N 2		13150	
	77956220		PS 3		15500	
	on request		PS 6		-	
	77725583		PS 10		15500	
	on request		PS 16		-	
	on request		PS 25		-	
	on request		Drg 10		-	
	77678048		Drg 25		14000	
	77910011		Drg 40		14000	
	on request		Drg 60		-	
	77678097		Drg 100		14000	
	on request		Drg 200		-	
	79747114		Drg 250		14000	
	on request		Drg 500		-	
80	77729338	**852 753**	Mic 10	*	5700	**Pi 1607**
	77729429		Mic 25		5700	
	77729551		Sm-x 10		3750	
	77729577		Sm-x 25		3750	
	77998388		Drg 10		2300	
	on request		Drg 25		-	
	77729460		Drg 40		2300	
	77862345		Drg 60		2300	
	77729486		Drg 100		2300	
	on request		Drg 250		-	
	on request		Drg 500		-	
100	77729387	**852 754**	Mic 10	*	15850	**Pi 1615**
	77729445		Mic 25		15850	
	77730179		Sm-x 10		10400	
	77730195		Sm-x 25		10400	
	on request		Drg 10		-	
	on request		Drg 25		-	
	77729510		Drg 40		6250	
	77862352		Drg 60		6250	
	77729528		Drg 100		6250	
	on request		Drg 250		-	
	on request		Drg 500		-	

* Suction filters: flow direction from inside to outside

6.3.1 Filter elements 852 xxx series						
Nominal size NG [l/min]	**Order number**	**Type**	**Filter material**	**max. Δ p [bar]**	**Filter surface [cm²]**	**Used in housing**
160	77874514	**852 821**	Mic 10	*	16750	**Pi 1620**
	77874522		Mic 25		16750	
	77999089		Sm-x 10		11000	
	77874530		Sm-x 25		11000	
	on request		Drg 10		-	
	on request		Drg 25		-	
	on request		Drg 40		-	
	77874548		Drg 60		6650	
	77874555		Drg 100		6650	
	78376238		Drg 250		6650	
	on request		Drg 500		-	
400	77774441	**852 760**	Mic 10	**5**	23800	**Pi 1535**
	77806581		Mic 25		23800	
	79364407		KS-Mic 25		19000	
	77955859		Sm-N 2		16000	
400	77774433	**852 760**	PS 3	**10**	14500	**Pi 1535**
	78299042		PS 6		14500	
	77774425		PS 10		14500	
	77806565		PS 25		14500	
	on request		Drg 10		-	
	77936594		Drg 25		11680	
	on request		Drg 40		-	
	78367682		Drg 60		11680	
	77914773		Drg 100		11680	
	on request		Drg 250		-	
	79336785		Drg 500		11680	
630	77774409	**852 761**	Mic 10	**5**	47600	**Pi 1560**
	77806599		Mic 25		47600	
	79364134		KS-Mic 25		38000	
	78375867		Sm-N 2		38000	
630	77774391	**852 761**	PS 3	**10**	29000	**Pi 1560**
	78225898		PS 6		29000	
	77774383		PS 10		29000	
	77806573		PS 25		29000	
	on request		Drg 10		-	
	78269938		Drg 25		23360	
	79376542		Drg 40		23360	
	78264574		Drg 60		23360	
	77896913		Drg 100		23360	
	78379653		Drg 250		23360	
	77974629		Drg 500		23360	

* Suction filters: flow direction from inside to outside

6.3.1 Filter elements 852 xxx series						
Nominal size NG [l/min]	**Order number**	**Type**	**Filter material**	**max. Δ p [bar]**	**Filter surface [cm²]**	**Used in housing**
800	76113369	**852 014**	Mic 10	**20**	26440	**Pi 23040**
	76113385		Mic 25		26440	
	76113401		KS-Mic 25		22690	
	76136220		Sm-N 2		18533	
	76321830		PS 3		24830	
	76321822		PS 6		24830	
	76321814		PS 10		24830	
	76321806		PS 25		24830	
	on request		Drg 10		-	
	70367987		Drg 25		21860	
	on request		Drg 40		-	
	on request		Drg 60		-	
	on request		Drg 100		-	
	70367986		Drg 250		14350	
	on request		Drg 500		-	
1250	78207664	**852 888**	Mic 10	**10**	21850	**Pi 1907** **Pi 281**
	78226839		Mic 25		21850	
	76111371		KS-Mic 25		20100	
	76114979		Sm-N 2		14000	
	78263295		PS 3		21850	
	78354029		PS 6		21850	
	78226813		PS 10		21850	
	78226821		PS 25		21850	
	on request		Drg 10		-	
	78228017		Drg 25		16500	
	78228025		Drg 40		16500	
	78303026		Drg 60		16500	
	78228470		Drg 100		16500	
	78382772		Drg 250		16500	
	79337148		Drg 500		16500	
1400	76113427	**852 015**	Mic 10	**20**	60900	**Pi 23080**
	76113443		Mic 25		60900	
	76345995		KS-Mic 25		52250	
	76136212		Sm-N 2		42275	
	76321897		PS 3		57200	
	76321889		PS 6		57200	
	76321871		PS 10		57200	
	76321863		PS 25		57200	
	on request		Drg 10		-	
	70341663		Drg 25		51450	
	76940290		Drg 40		51450	
	70360020		Drg 60		34242	
	76919666		Drg 100		51450	
	on request		Drg 200		-	
	on request		Drg 250		-	
	on request		Drg 500		-	

6.3.1 Filter elements 852 xxx series						
Nominal size NG [l/min]	**Order number**	**Type**	**Filter material**	**max. Δ p [bar]**	**Filter surface [cm²]**	**Used in housing**
1800	70366315	**852 884**	Mic 10	**10**	-	**Pi 1907** **Pi 281**
	78267171		Mic 25		28500	
	on request		KS-Mic 25		-	
	79715434		Sm-N 2		23450	
	78227431		PS 3		28500	
	79337916		PS 6		28500	
	78226797		PS 10		28500	
	78375925		PS 16		28500	
	78226805		PS 25		28500	
	on request		Drg 10		-	
	79337460		Drg 25		23450	
	78261653		Drg 40		23450	
	79700402		Drg 60		23450	
	79327750		Drg 100		23450	
	78367393		Drg 250		23450	
	78376204		Drg 500		23450	

7. When should the filter element be replaced?

1 . Filters equipped with visual and electrical maintenance indicator:
During cold starts, the indicator may give a warning signal. Press the red button of the visual indicator once again only after operating temperature has been reached. If the red button immediately pops up again and/or the electrical signal has not switched off after reaching operating temperature, the filter element must be replaced after the end of the shift.

2 . Filters without maintenance indicator:
The filter element should be replaced after the trial run or flushing of the system. Afterwards follow instructions of the manufacturer.

3 . Please always ensure that you have original Filtration Group spare
elements in stock. Disposable elements (Mic, KS-Mic, PS and Sm-x) cannot be cleaned .

8. Possibilities of cleaning wire gauge elements

1. Ultrasonic cleaning

Immerse contaminated filter element into the ultrasonic bath for approx. 90 – 120 minutes, then flush with clean solvent. Then carefully blow out filter element from the clean side in outward direction using compressed air. As solvent, cleaning gasoline etc. may be used.

2. Manual cleaning

Only for degree of filtration ≥ 40 µm.

1 . Remove coarse external dirt with a brush or similar tool in a separate cleaning container filled with solvent such as cleaning gasoline.

2 . Put filter element into a clean liquid solvent (approx. 20 minutes).

3 . Flush filter element with liquid solvent from inside to outside.

4 . Blow out filter element from the clean side in outward direction using compressed air.

With either method ascertain that no dirt can deposit on the inside (clean side) of the filterelement. Further it needs to be considered that the element will not be damaged because of proper handling. An entire cleaning (100 %) cannot be achieved (especially at a grade of filtration≤ 25 µm. The service life of the element will decrease con-

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Filter elements for hydraulic and lubricating fluids
e-protect

electrostatically conductive

1. Features

High-performance filter elements for low conductive hydraulic and lubricating oils

The FGC e-protect filter element made by Filtration Group, has been designed for use with low conductive hydraulic and lubricating oils (e.g. turbine lubricating oil in power plant technology) . The filter element is distinguished by reliable conductivity, which has been registered for patent approval, as well as an element design that is optimised to suit electrostatic properties. The special element design prevents damage in the filter layers caused by electrostatic discharge.

The long-term advantages of using FGC e-protect filter elements:

- No disruptive discharge or damage in the filter material caused by electrostatic discharge
- Reliable filtration during the entire service life of the element
- Guaranteed equipment availability
- Prevention of follow-up costs
- Increase of oil service life
- Prevention of varnish build-up on the element caused by electrostatic effects
- No additional maintenance requirements needed because of direct compatibility with conventional filter elements
- Reliable filtration in electrostatically critical applications
- High dirt-holding capacity, defined filtration rate and efficient differential pressure properties
- Worldwide distribution

2. Description

Charge separation in fluid systems is a well-known phenomenon in high-performance filters (filter fineness < 10 µm).
Charge separation occurs during perfusion of the filter's fine pores due to the viscous friction between the oil molecules and the surface of the fibre. Electron transfer takes place as a result of the close contact between the friction partners.
The intensity and direction of the electron transfer depends on the material properties of the friction partners (triboelectric series). Depending on the electric properties of the filter material and of the oil, there is a subsequent charge equalisation or charge accumulation (after charge separation).
With the fluids that have dominated the market so far, the charge separation is equalised again depending on the so-called relaxation time so that there are no noticeable effects in the fluid components including the filter elements or in the fluids (TRBS 2153).

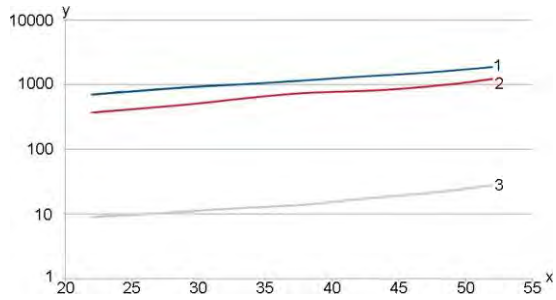
A significant increase of electrostatic charge within the fluid systems can have many causes:

- Low retention time due to increasingly compact systems with low oil volumes
- Increasing filtration requirements, even in lubrication applications
- Increased application of environmentally-friendly zinc and ash-free oils

3. Practical consequences

If these requirements are satisfied, electrostatic charges can occur in the filter element and in the fluid, which are equalised through local discharge with a higher energy. Indicators of intense discharge processes range from audible crackling to detectable damage in the filter layers and components. Effects on oil ageing and the appearance of "varnish" plus the malfunction of electronic components cannot be excluded. However, these depend on additional limiting conditions in the respective system. Filters that prevent electrostatic discharge must be used when high viscosity lubricating oils are utilised with fine filters as well as in the field of power plant technology.

To prevent electrostatic charges, the conductivity of the fluid should be at least 500 pS/m.
With the new zinc and ash-free hydraulic oils however, there are fluids on the market that are far below the minimum conductivity mentioned above, which can lead to increased electrostatic charges.



x = Oil temperature °C
y = Conductivity pS/m

1 = High-alloy hydraulic oil, contains Zn
2 = Synthetic ester (HEES)
3 = Low-alloy hydraulic oil, Zn-free

Filter materials with discharge traces when using zinc and ash-free oil.

4. Prevention of damaging discharge

We generally recommend the application of FGC e-protect filter elements or hydraulic and lubricating oils with conductivity < 500 pS/m (e.g. zinc and ash-free oils) or when electrostatic effects occur in the system (e.g. discharge sounds).

Designation examples:	
Pi 3105 PS 10	Standard design
Pi 3105 PS 10 EP	e-protect design

The FGC e-protect design is available as an additional feature with PS, SM-x and MB elements. The e-protect design is marked with the addition "EP" in the element description.

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FG Fluid Solutions
Filtration Group

MAHLE Industrialfiltration is now Filtration Group. For more information, visit www.fluid.filtrationgroup.com

Filter elements
2-stage filter elements for fuel treatment systems FC-001-030-19

Nominal size up to 800 l/h

1. Features

2-stage filter element for fuel treatment
The Filtration Group 2-stage filter element with the unique structure for an effective particle separation and a wrapped glass fibre layer for coalescing drops. These filter element is used in the fuel treatment system KFWA 1.

- Filter elements with two filtration stages for the treatment of fuel of industrial engines
- Unique, folding star-shape filter design made of chemically and thermally resistant materials
- Progressive structure: The degree of fineness of the glass fibre material decreases from the inside to the outside, combining the advantages of a depth filter with those of a large effective filtering surface. The result: greater dirt pick-up capacity even at lower pressure loss in conjunction with a defined discharging rate
- Supporting fibre on both sides made of high-quality stainless steel ensures the high rigidity of the folding star-shape
- Chemical resistance is guaranteed by the use of high-grade stainless steel wire mesh
- Supporting body and end plates are made of materials free of chromium VI
- Low initial differential pressure
- High differential pressure stability and dirt pick-up capacity of the elements
- Beta rated elements according to ISO 16889 or 19438 multi-pass test
- Easy to service
- Other grades of filtration on request
- Worldwide distribution

2. Separation grades

2.1 Separation grade solids

Particle separation acc. to ISO16889 or ISO 19438

2.2 Separation grade water

Water separation acc. to ISO16332 (measured at volume flow of 1500 l/h

Solid particles ø in µm	Medial separation grade in %		Medial ø drop size distribution intake in µm	Medial separation grade in %
Fineness 19 µm FC-001-030-19			**Fineness 19 µm FC-001-030-19**	
4	≥ 75		1.500 ppm water concentration intake	
6	≥ 85		60	≥ 95
10	≥ 98		300	≥ 97
15	≥ 99		20.000 ppm water concentration intake	
			60	≥ 85

3. Quality assurance

Filtration Group filters and filter elements are manufactured and/or tested in compliance with the following international standards:

Standard	Title
DIN ISO 2941	Hydraulic fluid power; filter elements; verification of collapse/burst resistance
DIN ISO 2942	Hydraulic fluid power; filter elements; verification of fabrication integrity
DIN ISO 2943	Hydraulic fluid power; filter elements; verification of material compatibility with fluids
DIN ISO 3723	Hydraulic fluid power; filter elements; method for end load test
DIN ISO 3724	Hydraulic fluid power; filter elements; determination of resistance to flow fatigue
ISO 3968	Hydraulic fluid power-filters-evaluation of pressure drop versus flow characteristics
ISO 10771.1	Fatigue pressure testing of metal containing envelopes in hydraulic fluid applications
ISO 16332	Diesel engines – Fuel filters – Method for evaluating fuel/water separation efficiency
ISO 16889	Hydraulic fluid power filters-multipass method for evaluation filtration performance of a filter element
ISO 19438	Diesel fuel and petrol filters for internal combustion engines – Filtration efficiency using particle counting and contaminant retention capacity

4. Order numbers

Order number	Designation
72428149	FC-001-030-19

5. Technical data

Design:	element for use in KFWA 1
Element design:	Pleated (star-pleated)
Filter media:	19
Direction of flow:	from the inside to the outside
End plates and supporting tubes:	free of chromium VI
max. flow rate:	800 l/h
max. differential pressure:	5 bar
Operating temperature range:	+2 °C to +45 °C
Seals:	FKM (fluororubber)

Permitted operating fluid (media):

Diesel Fuel EN590, ASTM D975 1D&2D, BS2869

Heizöl EL nach DIN 51603 Teil 1

Diesel Fuel with particular low sulfur (15 ppm

Marine Diesel Fuel (MDF) or Marine Gas Oil (MGO):
DMX, DMA, DMZ, DMC acc. to ISO 8217

Bundeswehr Nato Fuel F75 acc. to TL-9140-0003, 8

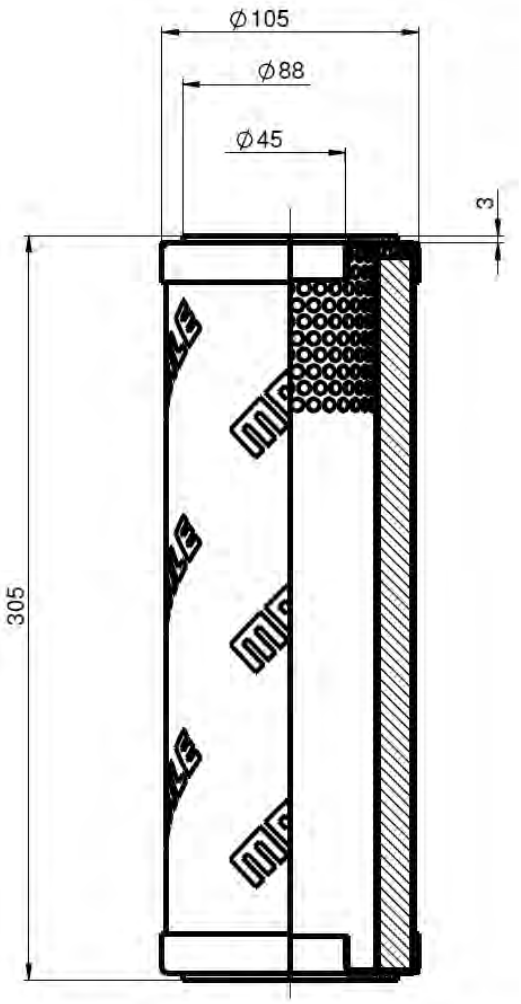
Bundeswehr Nato Fuel F76 acc. to DEFSTAN 91-4, 7

We draw attention to the fact that all values indicated are average values and do not always occur in specific cases of application. Our products are continually being further developed. Values, dimensions and weights can change as a result of this. Our specialized department will be pleased to offer you advice.

We recommend you to contact us concerning applications of our filters in areas governed by the EU Directive 94/9 EC (ATEX 95). The standard version can be used for specified fuels. If you consider to use other fluids please contact us for additional support.

Subject to technical alteration without prior notice.

6. Dimensions



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06/2019

Filter elements
2-stage filter elements for fuel treatment systems

Nominal size up to 2200 l/h

1. Features

2-stage filter element for fuel treatment
The Filtration Group 2-stage filter element with the unique Premium Select element structure for an effective particle separation and a wrapped glass fibre layer for coalescing drops. These filter elements are used in the fuel treatment system KFWA 2-4.

- Filter elements with two filtration stages for the treatment of fuel of industrial engines
- Unique, multilayer Filtration Group Premium Select (PS) folding star-shape filter design made of chemically and thermally resistant materials
- Progressive structure: The degree of fineness of the glass fibre material decreases from the inside to the outside, combining the advantages of a depth filter with those of a large effective filtering surface. The result: greater dirt pick-up capacity even at lower pressure loss in conjunction with a defined discharging rate
- Supporting fibre on both sides made of high-quality stainless steel ensures the high rigidity of the folding star-shape
- Chemical resistance is guaranteed by the use of high-grade stainless steel wire mesh
- Supporting body and end plates are made of materials free of chromium VI
- Low initial differential pressure
- High differential pressure stability and dirt pick-up capacity of the elements
- Beta rated elements according to ISO 16889 or 19438 multi-pass test
- Easy to service
- Other grades of filtration on request
- Worldwide distribution

2. Separation grades

2.1 Separation grade solids

Particle separation acc. to ISO16889 or ISO 19438

2.2 Separation grade water

Water separation acc. to ISO16332 (measured at volume flow of 1500 l/h

Solid particles ø in µm	Medial separation grade in %		Medial ø drop size distribution intake in µm	Medial separation grade in %
Fineness 10 µm FC-001-040-PS 10			**Fineness 10 µm FC-001-040-PS 10**	
4	≥ 77		1.500 ppm water concentration intake	
6	≥ 94		60	≥ 98
10	≥ 99		300	≥ 98
15	≥ 99,9		20.000 ppm water concentration intake	
			60	≥ 97
Fineness 19 µm FC-001-040-19			**Fineness 19 µm FC-001-040-19**	
4	≥ 77		1.500 ppm water concentration intake	
6	≥ 76		60	≥ 99
10	≥ 90		300	≥ 99
19	≥ 99,7		20.000 ppm water concentration intake	
			60	≥ 96

3. Quality assurance

Filtration Group filters and filter elements are manufactured and/or tested in compliance with the following international standards:

Standard	Title
DIN ISO 2941	Hydraulic fluid power; filter elements; verification of collapse/burst resistance
DIN ISO 2942	Hydraulic fluid power; filter elements; verification of fabrication integrity
DIN ISO 2943	Hydraulic fluid power; filter elements; verification of material compatibility with fluids
DIN ISO 3723	Hydraulic fluid power; filter elements; method for end load test
DIN ISO 3724	Hydraulic fluid power; filter elements; determination of resistance to flow fatigue
ISO 3968	Hydraulic fluid power-filters-evaluation of pressure drop versus flow characteristics
ISO 10771.1	Fatigue pressure testing of metal containing envelopes in hydraulic fluid applications
ISO 16332	Diesel engines – Fuel filters – Method for evaluating fuel/water separation efficiency
ISO 16889	Hydraulic fluid power filters-multipass method for evaluation filtration performance of a filter element
ISO 19438	Diesel fuel and petrol filters for internal combustion engines – Filtration efficiency using particle counting and contaminant retention capacity

4. Order numbers

Order number	Designation
72360943	FC-001-040-PS 10
72403280	FC-001-040-19
72360945	FC-001-040-06 (optionally for superior fuel systems – technical details on request)

5. Technical data

Design:	element for use in KFWA 2-4
Element design:	Pleated (star-pleated)
Filter media:	PS 10
Direction of flow:	from the inside to the outside
End plates and supporting tubes:	free of chromium VI
max. flow rate:	2200 l/h
max. differential pressure:	5 bar
Operating temperature range:	+2 °C to +45 °C
Seals:	FKM (fluororubber)

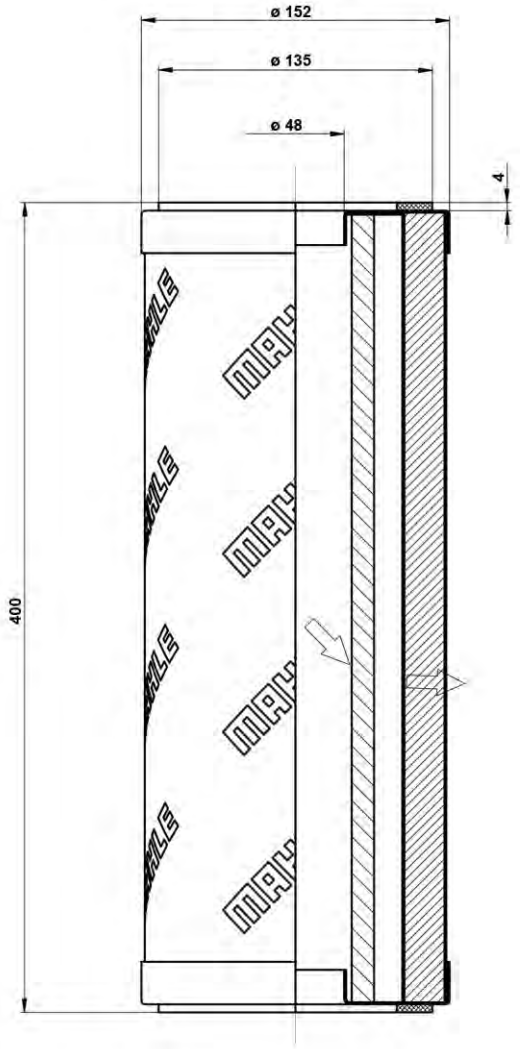
Permitted operating fluid (media):
Diesel Fuel EN590, ASTM D975 1D&2D, BS2869
Heizöl EL nach DIN 51603 Teil 1
Diesel Fuel with particular low sulfur (15 ppm
Marine Diesel Fuel (MDF) or Marine Gas Oil (MGO):
DMX, DMA, DMZ, DMC acc. to ISO 8217
Bundeswehr Nato Fuel F75 acc. to TL-9140-0003, 8
Bundeswehr Nato Fuel F76 acc. to DEFSTAN 91-4, 7

We draw attention to the fact that all values indicated are average values and do not always occur in specific cases of application. Our products are continually being further developed. Values, dimensions and weights can change as a result of this. Our specialized department will be pleased to offer you advice.

We recommend you to contact us concerning applications of our filters in areas governed by the EU Directive 94/9 EC (ATEX 95). The standard version can be used for specified fuels. If you consider to use other fluids please contact us for additional support.

Subject to technical alteration without prior notice.

6. Dimensions



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Filter element
2-stage filter elements for lubricating oil filtration

Resistant to differential pressure up to 30 bar, nominal size 110 to 220 l/min

1. Brief description

2-Stage filter element for lubricating systems
The Filtration Group 2-stage filter element with the unique Premium Select element structure, with integrated reliable bypass valves and the sturdy safety insert is used as for gear oil filtration in wind turbine plants. These filter elements are used in the oil filter modules Pi 831x and the low-pressure filters Pi 260.

- Filter elements with two filtration stages for the filtration of lubricating in wind turbine gearboxes
- Unique, multilayer Filtration Group Premium Select (PS) folding star-shape filter design made of chemically and thermally resistant materials
- Filter performance that fits like a glove: A force-fit fixing fleece material presses the folding star-shape tight to the supporting body and fixes the folds in place in such a way as to prevent block formation. At the same time, the fixing fleece takes over a pre-filter function
- Progressive structure: The degree of fineness of the glass fibre material decreases from the inside to the outside, combining the advantages of a depth filter with those of a large effective filtering surface. The result: greater dirt pick-up capacity even at lower pressure loss in conjunction with a defined discharging rate (multipass test in compliance with ISO 16889)
- Supporting fibre on both sides made of high-quality stainless steel ensures the high rigidity of the folding star-shape
- Chemical resistance is guaranteed by the use of high-grade stainless steel wire mesh
- Supporting body and end plates are made of materials free of chromium VI
- Suitable for universal use for hydraulic and lubricating fluids, fuels, aqueous media and synthetic fluids
- Low initial differential pressure
- Version for Filtration Group filter housing, as alternative elements in the dimensions of other manufacturers and in customer-specific designs
- High differential pressure stability and dirt pick-up capacity of the elements
- Global sales

2. Quality assurance

Filtration Group filters and filter elements are manufactured and/or tested in compliance with the following international standards:

Norm	Titel
DIN ISO 2941	Hydraulic fluid power; filter elements; verification of collapse/burst resistance
DIN ISO 2942	Hydraulic fluid power; filter elements; verification of fabrication integrity
DIN ISO 2943	Hydraulic fluid power; filter elements; verification of material compatibility with fluids
DIN ISO 3723	Hydraulic fluid power; filter elements; method for end load test
DIN ISO 3724	Hydraulic fluid power; filter elements; determination of resistance to flow fatigue
ISO 3968	Hydraulic fluid power-filters-evaluation of pressure drop versus flow characteristics
ISO 10771.1	Fatigue pressure testing of metal containing envelopes in hydraulic fluid applications
ISO 16889	Hydraulic fluid power filters-multipass method for evaluation filtration performance of a filter element

3. Funktional description

The filter element is the central component in which the filtration process takes place.

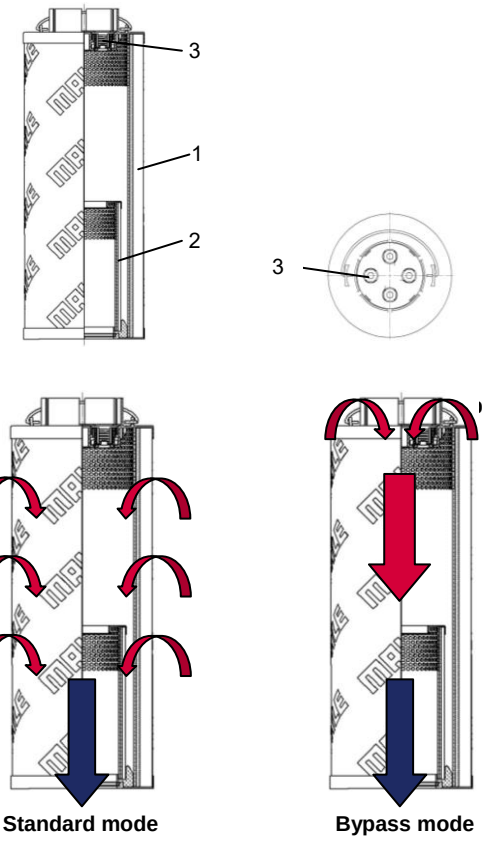
The 2-stage filter elements used for lubricating oil filtration in wind turbines are a combination of depth filter (1st filter stage – glass fibre) and surface filter (2nd filter stage – wire mesh).

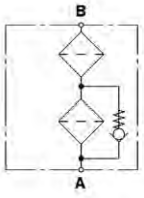
The direction of flow through the 2-stage filter element is from the outside to the inside. The first filter stage (1), the multilayer star-pleated depth filter, is responsible for the prescribed purity class being achieved. Inside the first filter stage, the protection filter (2) is installed in such a way that only filtered oil is allowed to flow into the gearbox.

There are 2 operating modes, normal mode and bypass mode

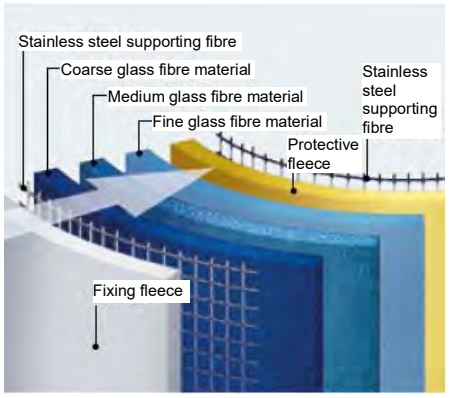
Normal mode:
The bypass valves (3) in the upper end plate are closed so that the unfiltered oil flows through the 1st filter stage (1), the depth filter.
Then the pre-filtered oil flows the 2nd filter stage (2), the surface filter.

Bypass mode:
With a lubrication system cold start, the viscosity of the lubricating oil (ISO VG 320) can be so high that the pressure built up at the filter element is high enough to open the bypass valves (3). This means that part of the unfiltered oil flows past the first filter stage (1) and gets into the inside of the 2-stage filter element unfiltered and flows through the second filter stage (2). This guarantees that the wind turbine gearbox is always supplied with filtered oil.

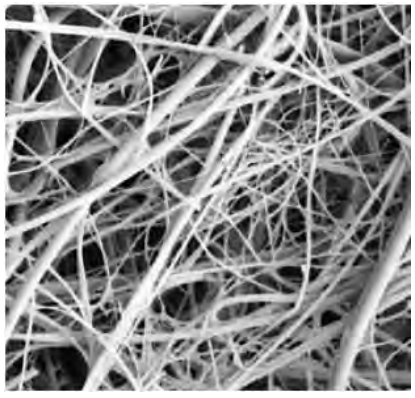


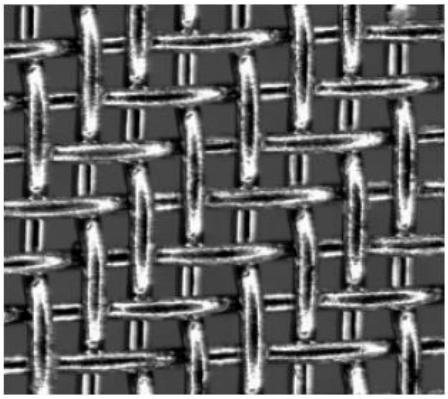


4. Filter media

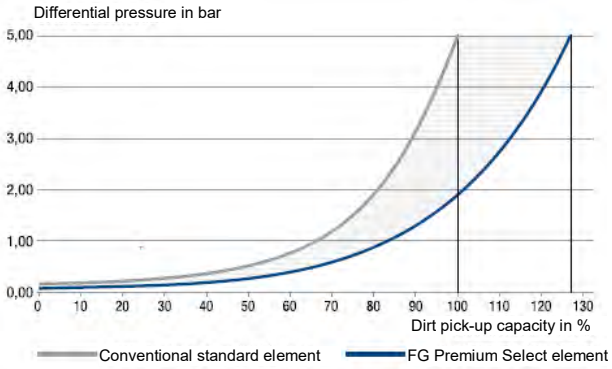


Structure of a PS folding star-shape


Micro-fibre glass


Wire mesh

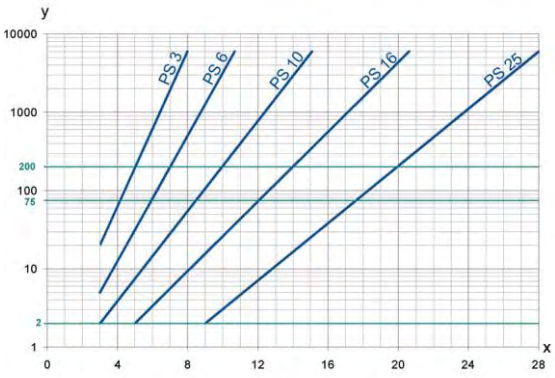
4.1 Filter media PS



Permanently more capacity plus longer service life: innovative Premium Select element with 30% increase in dirt pick.-up capacity, lower differential pressure and optimised differential pressure curve – for reduced energy consumption.

There is a complete range of filter elements available for use in wind power applications. Our Filtration Group Premium Select elements reduce solid soiling to the prescribed soiling class and maintain the properties of the lubricating fluid over a long period.

Our Filtration Group Premium Select elements are tested to all the usual hydraulic standards. Because we want results we can objectively prove to customers. For this reason, we only monitor our products against globally recognised standards such as ISO 16889. Here, our filters achieve outstanding values for dirt pick-up capacity, beta-value stability and retaining rate.



y = beta value
x = particle size [µm]

determined from multipass measurements (ISO 16889)
Calibration in accordance with ISO 11171 (NIST)

measured in accordance with ISO 16889 (multipass test)

PS elements with max. Δp 10 bar

PS	3 $ß_{5(C)}$	≥ 200
PS	6 $ß_{7(C)}$	≥ 200
PS	10 $ß_{10(C)}$	≥ 200
PS	25 $ß_{20(C)}$	≥ 200

up to 10 bar differential pressure

In a hydraulic or lubricating system, the filters have the task of keeping the soiling level of the fluid to the required level by filtering out particulate matter and keeping this level constant over a long operating period. In industrial hydraulics, it is usual to use codes for the numbers of particles in accordance with ISO 4406 to mark solid impurities. The purity classes which can be achieved with PS filter elements are listed below. These values reflect our long years of experience in designing hydraulic filters and are to be viewed as reference values.

Purity classes	
Filter material	**Purity classes in accordance with ISO 4406 (1999), > 4 µm(c)/ > 6 µm (c)/ >14 µm (c)**
PS 3	14/12/09
PS 6	16/13/10
PS 10	17/15/11
PS 16	20/17/12
PS 25	23/19/13

4.2 Filter media Drg

The filter element of the 2nd filter stage is made of stainless steel wire mesh and has very low flow resistance properties. The fineness levels usual in the gear oil filtration of wind power plants are 40 µm (mesh weave: twill) and 50 µm (weave: single lacing).
In the case of wire mesh elements the filter fineness is the diameter of the largest spherical particle that can just about pass through the mesh. Wire mesh elements are used in hydraulic and lubricating oil filtration as suction filters or coarse filters, with high-viscosity media as well as in safety filters in cooling lubricant filtration. Wire mesh elements have a sharp cut point as surface filters and a lower dirt pick-up capacity than depth filters.

5. Designation, ordering example and order numbers

5.1 Ordering example

Type				
852 099	Series			
	Filter material 1st stage			
	PS 10	Premium Select, Feinheit 10 µm		
		Filter material 2nd stage		
		DRG 50	Wire mesh, fineness 50 µm	
			Bypass valve	
			V5.0	Opening pressure 5 bar
852 099	**PS 10/**	**DRG 50/**	**V5.0**	Ordering example

5.2 Order numbers 2-stage elements for housing/oil filter modules from Filtration Group

Oil filter module	Designation	Order number	Filter area [cm³]	Dirt pick-up capacity* [g]
Pi 831x	852 099 PS 6/DRG 50/V3.0	70535932	22100	450
	852 099 PS 6/DRG 50/V5.0	70534327		
	852 099 PS 10/DRG 50/V3.0	70536627		
	852 099 PS 10/DRG 50/V5.0	70514957		
	852 100 PS 6/DRG 50/V5.0	70535918	52000	1200
	852 100 PS 10/DRG 50/V5.0	70517355		

Customized execution on request

5.3 Bestellnummern 2-Stufen Elemente für Gehäuse/Ölfiltermodule Wettbewerb

Oil filter module	Designation	Order number	Filter area [cm³]	Dirt pick-up capacity* [g]
Pi 831x	852 105 PS 10/DRG 50/V3.0	70582987	18500	380
	852 105 PS 10/DRG 50/V5.0	70583161		
	852 270 PS 10/DRG 50/V5.0	72341076	31760	730
	852 750 PS 10/DRG 50/V5.0	72359048	36860	850

* according to ISO 16889

6. Technical data

Folding star-shape	Pleated (star-pleated)
Direction of flow	from the outside to the inside
End plates and supporting tubes	Free of chromium VI
Resistance to collapse	30 bar
Operating temperature range	-10 °C to +120 °C
Seals	NBR (other materials on request)
Adhesive	Epoxy resin

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Filtration Group

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Filter elements
3-stage filter elements for lubricating oil filtration

Resistant to differential pressure up to 30 bar, nominal size 100 to 300 l/min

1. Features

3-stage filter element for lubricating systems
The Filtration Group 3-stage filter element with the unique Premium Select element structure, reliable integrated bypass valves and the sturdy safety insert is used for gearbox oil filtration in wind turbines. These filter elements are used in the oil filter modules Pi 831x and the low-pressure filters Pi 260.

- Filter elements with three filtration stages for the filtration of lubricating oil in wind turbine gearboxes.
- Unique, multilayer Filtration Group Premium Select (PS) folding star-shape filter design made of chemically and thermally resistant materials.
- Filter performance that fits like a glove: A force-fit fixing fleece material, the so called ***PulseShield™ Pro***, presses the folding star-shape tight to the supporting body and fixes the folds in place in such a way as to prevent block formation. The fixing fleece takes over a pre-filter function at the same time.
- Progressive structure: The degree of fineness of the glass fibre material decreases from the inside to the outside, combining the advantages of a depth filter with those of a large effective filtering surface. The result: greater dirt pick-up capacity even at lower pressure loss in conjunction with a defined discharging rate (multipass test in compliance with ISO 16889).
- Supporting fibre on both sides made of high-quality stainless steel ensures the high rigidity of the folding star-shape.
- Chemical resistance is guaranteed by the use of high-grade stainless steel wire mesh.
- Supporting body and end plates are made of materials free of chromium VI.
- Suitable for universal use for hydraulic and lubricating fluids, fuels, aqueous media and synthetic fluids.
- Low initial differential pressure
- Version for Filtration Group filter housing as alternative elements in the dimensions of other manufacturers and in customer-specific designs.
- High differential pressure stability and dirt pick-up capacity of the elements
- Worldwide distribution

2. Quality assurance

Filtration Group filters and filter elements are manufactured and/or tested in compliance with the following international standards:

Standard	Designation
DIN ISO 2941	Hydraulic fluid power filter elements; verification of collapse/burst resistance
DIN ISO 2942	Hydraulic fluid power filter elements; verification of fabrication integrity
DIN ISO 2943	Hydraulic fluid power filter elements; verification of material compatibility with fluids
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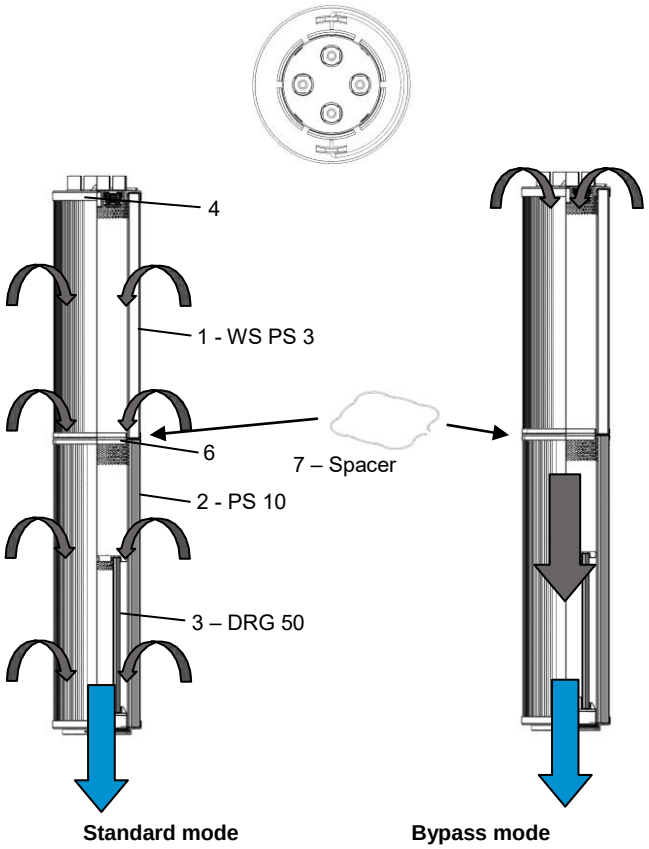
ISO 10771.1	Fatigue pressure testing of metal containing envelopes in hydraulic fluid applications
ISO 16889	Hydraulic fluid power filters-multipass method for evaluating filtration performance of a filter element

3. Functional description

The filter element is the central component in which the filtration process takes place.

The 3-stage filter elements used for lubricating oil filtration in wind turbines are a combination of depth filters (1st and 2nd filter stage) and a surface filter (3rd filter stage – wire mesh).

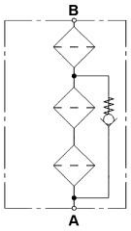
The upper end plate (4) contains the bypass valves (explanation, see bypass mode) and fixing tabs that are tailored to the filter cover so that the filter element is always in the center of the housing and does not touch the inside of the filter housing. This ensures that the same hydraulic cross-section is always available to ensure constant filtration.
The first filter stage (1) is the WS PS 3 filter stage (water adsorber integrated in the Premium Select folding star-shape, filter fineness 3 µm). Water is also taken in during this filter stage to absorb the dirt and separate oil ageing products. The second filter stage (2) is the PS 10 filter stage (Premium Select, filter fineness 10 µm).
The intermediate plate (6) connects the first filter stage (WS PS 3) and the second filter stage (PS 10) and is designed with a spacer (7) so that the filter element does not rest on the inner wall of the filter housing when the filter cover is loosened to replace the element. This makes it easy to handle and change the filter element when replacing the element.
The spacer is reusable and therefore not part of the replacement element delivery. The spacer have to be disassembled from the old soiled filter element and then be mounted on the new filter element.
The lower end plate (5) incl. the O-ring is used to mount the filter element in the filter head.



The direction of flow through the 3-stage filter element is from the outside to the inside. The filter stages 1 and 2, the multilayer star-pleated depth filter, are responsible for achieving the prescribed purity class. Inside the first filter stage (1), the protection filter (3), a wire mesh surface filter, is installed in such a way that only filtered oil is allowed to flow into the gearbox at all times.

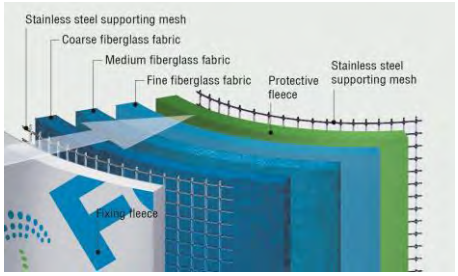
There are 2 operating modes, standard mode and bypass mode

Standard mode:
The bypass valves in the upper end plate (4) are closed so that the unfiltered oil flows through the 1st and 2nd filter stage (1 and 2), the depth filters, at the same time.
Then the pre-filtered oil and the oil released from the water flows through the surface filter (3), the 3rd filter stage.

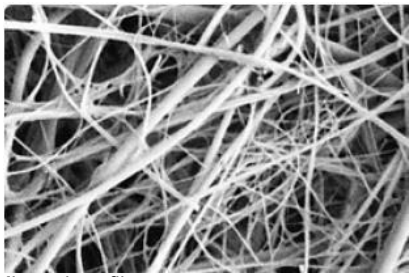


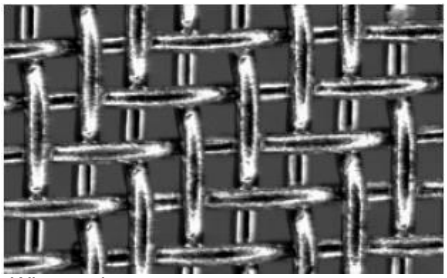
Bypass mode:
With a lubrication system cold start, the viscosity of the lubricating oil (ISO VG 320) can be so high that the pressure built up at the filter element is high enough to open the bypass valves integrated in the upper end plate (4). This means that part of the unfiltered oil flows past the filter stages (1 and 2) and gets into the inside of the 3-stage filter element unfiltered and where it flows through the third filter stage (3). This guarantees that the wind turbine gearbox is always supplied with filtered oil.

4. Filter media

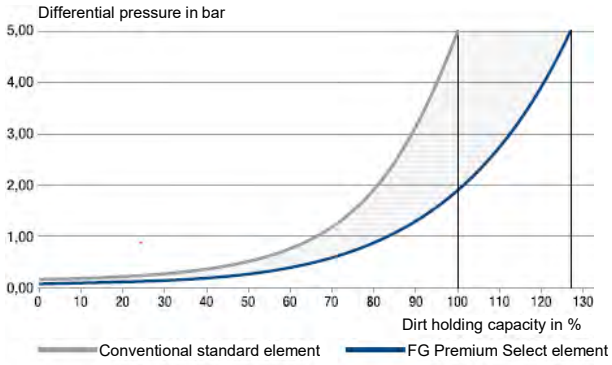


Structure of a PS folding star-shape


Micro-glass fibre


Wire mesh

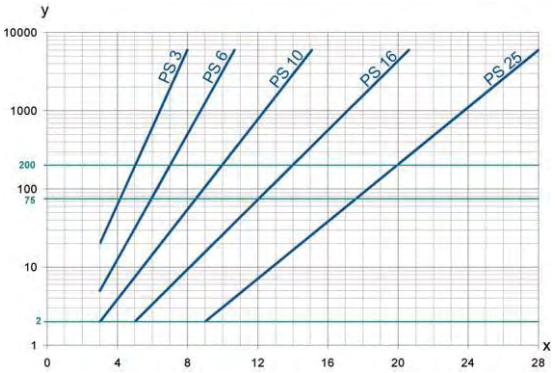
4.1 Filter medium PS



Higher performance in the long term plus a longer service life: Innovative Premium Select element with 30 % more dirt pick-up capacity, lower differential pressure and optimised differential pressure distribution – for reduced energy consumption.

There is a complete range of filter elements available for use in wind power applications. Filtration Group Premium Select elements reduce solid soiling to the prescribed soiling class and maintain the properties of the lubricating fluid over a long period.

Filtration Group Premium Select elements are tested to all the usual hydraulic standards. After all, we want results we can objectively prove to customers. For this reason, we only monitor our products against globally recognized standards such as ISO 16889. Here our filters achieve outstanding values in terms of their dirt holding capacity, beta-value stability and retaining rate.



Tested in accordance with ISO 16889 (multipass test)

PS elements with max. Δp 10 bar

PS	3 $ß_{5(C)}$	≥ 200
PS	6 $ß_{7(C)}$	≥ 200
PS	10 $ß_{10(C)}$	≥ 200
PS	25 $ß_{20(C)}$	≥ 200

up to 10 bar differential pressure

y = beta value
x = particle size [µm]

determined by multipass tests (ISO 16889)
Calibration in accordance with ISO 11171 (NIST)

The filters in a hydraulic or lubricating system have the task of controlling and maintaining the contamination of the fluid at the required level over a long period of time during operation. It is usual to use codes for the numbers of particles to mark solid impurities in industrial hydraulics in accordance with ISO 4406. The purity classes which can be achieved with PS filter elements are listed below. These values reflect our long years of experience in designing hydraulic filters and are to be viewed as reference values.

Purity classes	
Filter media	**Purity classes in accordance with ISO 4406 (1999), > 4 µm(c)/ > 6 µm (c)/ >14 µm (c)**
PS 3	14/12/09
PS 6	16/13/10
PS 10	17/15/11
PS 16	20/17/12
PS 25	23/19/13

4.2 Filter material Drg

The filter element of the 3rd filter stage is made of stainless steel wire mesh and has very low flow resistance properties. The common fineness in the filtration of gearbox oil in wind turbines is 40 µm (type of weave: Twill weave) and 50 µm (type of weave: single braid). In the case of wire mesh elements the filter fineness is the diameter of the largest spherical particle that can just about pass through the mesh. Wire mesh elements are used in hydraulic and lubricating oil filtration as suction filters or coarse filters, with high-viscosity media as well as in safety filters in cooling lubricant filtration. Wire mesh elements have a sharp cut point as surface filters and a lower dirt pick-up capacity than depth filters.

5. Designation, ordering example and order numbers

5.1 Ordering example

Type					
852 273	Series				
	Filter media 1st stage				
	WS PS 3	Premium Select, fineness 10 µm			
		Filter media 2nd stage			
		PS 10	Water adsorber integrated in the Premium Select folding star-shape, fineness 3 µm		
			Filter media 3rd stage		
			DRG 50	Wire mesh, fineness 50 µm	
				Bypass valve	
				V5.0	Setting 5 bar
852 273	**WS PS 3/**	**PS 10/**	**DRG 50/**	**V5.0**	**Ordering example**

5.2 Order numbers for 2-stage elements for housing/oil filter modules from competitors

Oil filter module	Designation	Element order no.	Spacer order no.		Filter area [cm³]	Dirt pick-up capacity * [g]
852 273	852 273 WS PS 3/PS 10/DRG 50/V5.0	72453688	72460354	WS PS 3	**16.691**	260
				PS 10	**21.769**	500
				DRG 50	**2.655**	-

Customer-specific version on request

6. Technical data

Folding star-shape	Pleated (star-pleated)
Direction of flow	from the outside to the inside
End plates and supporting tubes	Free of chromium VI
Resistance to collapse	30 bar
Operating temperature range	-10°C to +120°C
Seals	NBR (other materials on request)
Adhesive	Epoxy resin

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06/2019

FG Fluid Solutions
Filtration Group

MAHLE Industrialfiltration is now Filtration Group. For more information, visit www.fluid.filtrationgroup.com

Filterelemente
Einbauanleitung Abstandhalter/Spacer assembly instruction

Ablauf der Montage bzw. Demontage der Abstandhalter

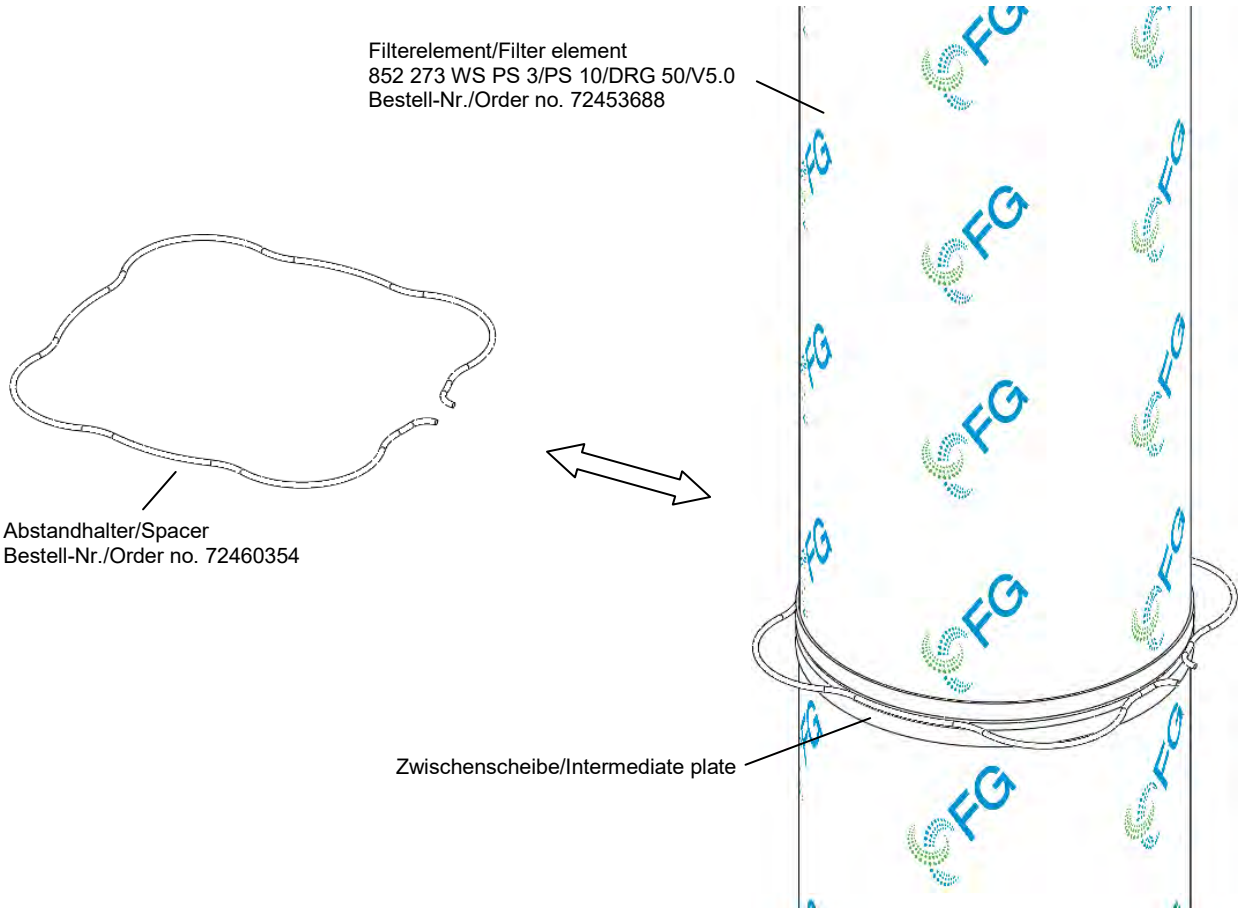
1. Altes verschmutztes Element ausbauen und Abstandhalter abnehmen.
2. Abstandhalter um die Zwischenscheibe des neuen Filterelementes spannen und ins Gehäuse einsetzen.

Der Abstandhalter ist wieder zu verwenden!

Sequence of assembly or disassembly of a spacer

1. Disassemble the old soiled filter element and remove the spacer.
2. Tighten the spacer around the intermediate plate of the new filter element and insert it into the housing.

The spacer is re-usable!



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72460362.06/2019

Mobile Filter Units
Pi 8100

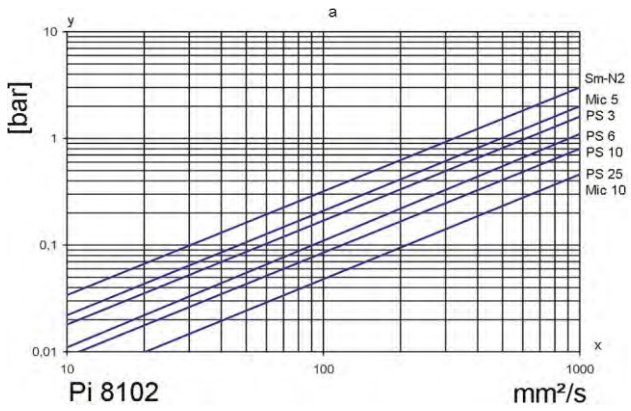
Flow rates 27/32 and 55/66 l/min

1. Features

High performance filters for modern hydraulic systems

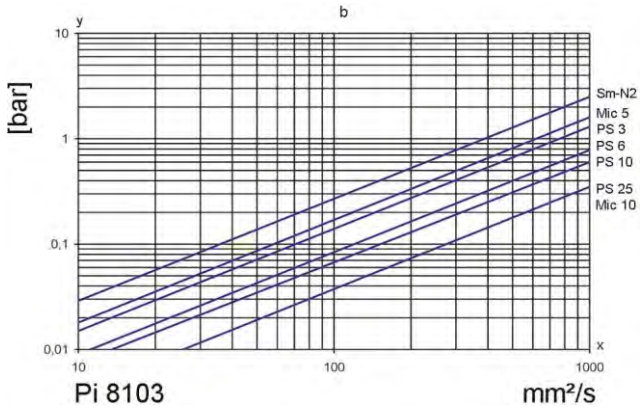
- Mobile bypass filtration for hydraulic and lubricating systems
- System and container filling
- Pumping out of old oil
- Transfer pumping of container contents
- Reduces dirt loading of system filters on start-up and following repairs
- Achievement of specified cleanliness classes using Filtration Group PS filter elements
- Excellent contamination absorption performance using Filtration Group Sm-N 2 filter elements
- Easy to service
- Filtration Group low pressure filter Pi 150 housing with quick-release cover for fast element replacement
- Oil collection tank/automatic bleeding
- Automatic pump cut-off
- Low operating noise
- Robust feed pump with helical gearing and integrated bypass valve
- Suitable for mineral oils, HFC and biodegradable oils
- Good suction performance, also suitable for high viscosity products
- Worldwide distribution

2. Flow rate/pressure drop curve complete filter



a = differential pressure-viscosity curve Pi 8102
flow rate = 27 l/min
y = differential pressure [bar]
x = viscosity [mm²/s]

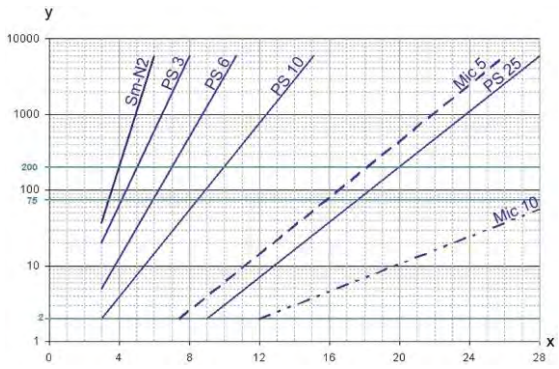
Illustration shows initial Δp of complete filter (housing incl. element) of the mobile filter units.



b = differential pressure-viscosity curve Pi 8103
flow rate = 55 l/min
y = differential pressure [bar]
x = viscosity [mm²/s]

Recommended initial Δp:
max. 0.5 bar at bypass filtration
max. 0.8 bar for filling or transfer by pump

3. Separation grade characteristics



y = beta-value
x = particle size [µm]

determined by multipass tests (ISO 16889)
calibration according to ISO 11171 (NIST)

4. Filter performance data

tested according to ISO 16889 (multipass test)
Sm-N/PS elements with max. Δ p 10 bar

Sm-N	2	$\beta_{4(C)} \geq 200$
PS	3	$\beta_{5(C)} \geq 200$
PS	6	$\beta_{7(C)} \geq 200$
PS	10	$\beta_{10(C)} \geq 200$
PS	25	$\beta_{20(C)} \geq 200$

values guaranteed up to 10 bar differential pressure.

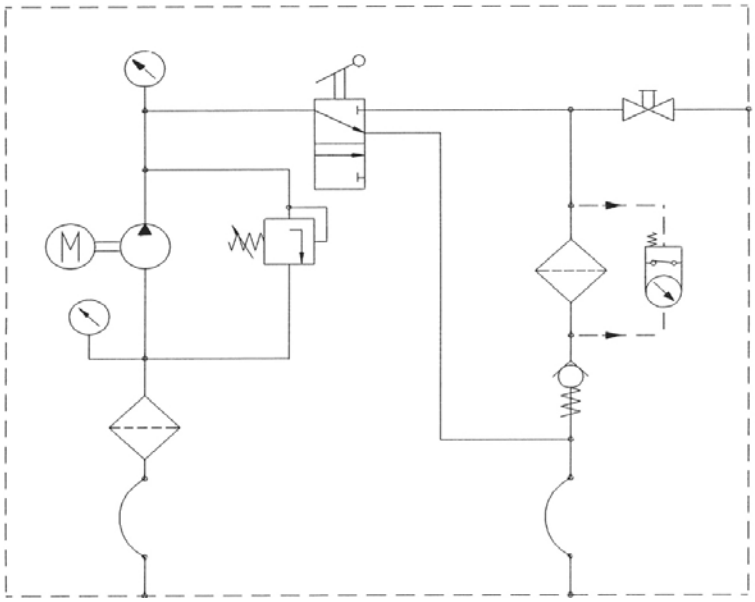
The filter element Sm-N 2 has a very high dirt load capacity and is very suitable for bypass filtration.

5. Quality assurance

Filtration Group filters and filter elements are prodcued according to the following international standards:

Norm	Designation
DIN ISO 2941	Hydraulic fluid power filter elements; verification of collapse/burst resistance
DIN ISO 2942	Hydraulic fluid power filter elements; verification of fabrication integrity
DIN ISO 2943	Hydraulic fluid power filter elements; verification of material compatibility with fluids
DIN ISO 3723	Hydraulic fluid power filter elements; method for end load test
DIN ISO 3724	Hydraulic fluid power filter elements; verification of flow fatigue characteristics
ISO 3968	Hydraulic fluid power-filters-evaluation of pressure drop versus flow characteristics
ISO 10771.1	Fatigue pressure testing of metal containing envelopes in hydraulic fluid applications
ISO 16889	Hydraulic fluid power filters-multipass method for evaluation filtration performance of a filter element

6. Wiring diagram



7. Order numbers

Example for ordering filters:

1. Filter Unit	2. Replacement element to 1
55 l/min with filter element Sm-N 2 Type: Pi 8103-069/852 761 Sm-N 2	Sm-N 2 Type: Pi 852 761 Sm-N 2 Order number: 78375867

7.1 Housing design*		
Flow rate [l/min]	**Type**	**Design**
27/32	Pi 8102-069	with visual/electrical maintenance indicator and pump cut off
57/66	Pi 8103-069	

* other designs are available on request

7.2 Filter elements*					
Flow rate [l/min]	**Order number**	**Type**	**Filter material**	**max. Δ p [bar]**	**Filter Surface [cm²]**
27/32	77774458	852 760 Mic 5	Mic 5	**5**	23800
	77774441	852 760 Mic 10	Mic 10		23800
	77955859	852 760 Sm-N 2	Sm-N 2	**10**	16000
	77774433	852 760 PS 3	PS 3		14500
	78299042	852 760 PS 6	PS 6		14500
	77774425	852 760 PS 10	PS 10		14500
	77806565	852 760 PS 25	PS 25		14500
55/66	77774417	852 761 Mic 5	Mic 5	**5**	47600
	77774409	852 761 Mic 10	Mic 10		47600
	78375867	852 761 Sm-N 2	Sm-N 2	**10**	32000
	77774391	852 761 PS 3	PS 3		29000
	78225898	852 761 PS 6	PS 6		29000
	77774383	852 761 PS 10	PS 10		29000
	77806573	852 761 PS 25	PS 25		29000

* a wider range of element types is available on request

8. Technical specifications

Filtration unit type	**Pi 8102-069**	**Pi 8103-069**
Delivery flow	27 l/min at 50 Hz	55 l/min at 50 Hz
	32 l/min at 60 Hz	66 l/min at 60 Hz
Motor output	0.75 KW/1400 1/min at 220 - 245/380 - 420 V/50 Hz	1.5 KW/1410 1/min at 220 - 245/380 - 420 V/50 Hz
	0.90 KW/1680 1/min at 220 - 280/380 - 480 V/60 Hz	1.8 KW/1692 1/min at 220 - 280/380 - 480 V/60 Hz
Power supply (standard)	3 AC 400 V/50 Hz	
	others on request	
Connection cable	7 m with EEC connector	7 m with EEC connector
Pressure limiting valve	5 bar	5 bar
Pump, type	WP gear pump with outward-facing helical gear shafts	WP gear pump with outward-facing helical gear shafts
Pump protection filter	Cleanable 150 µm wire mesh suction filter	Cleanable 150 µm wire mesh suction filter
Minimum suction pressure	0.6 bar	0.6 bar
Maximum suction pressure	1.4 bar	1.4 bar
Pump viscosity range	7.5 - 2500 mm²/s	7.5 - 2500 mm²/s
Pump temperature range	-20 °C to +120 °C	-20 °C to +120 °C
Filtration Group low pressure filter	Pi 1535/10-069	Pi 1560/10-069
Nominal pressure	10 bar	10 bar
Filter element	see options table	see options table
Filter area loading	0.0011-0.0019 l/min/cm²	0.0011-0.0019 l/min/cm²
Filter monitor	visual/electrical differential pressure indicator and automatic pump cut-off	visual/electrical differential pressure indicator and automatic pump cut-off
Δp reading threshold pressure	2.2 bar	2.2 bar
Unit monitor	Vacuum pressure gauge at the pump and pressure gauge suction points	Vacuum pressure gauge at the pump and pressure gauge suction points
Filtration unit/ filter element operating range	see differential/viscosity curves	see differential pressure/viscosity curves
Pipes	Screw fittings and pipes are zinc plated and chromated	Screw fittings and pipes are zinc plated and chromated
2.5 m flexible ransparent suction hose with suction pipe	DN 25	DN 38
2.5 m flexible delivery hose, with pipe lance	DN 19	DN 25
Noise level	< 72 db (A)	< 72 db (A)
Seals	FPM (Viton)*	FPM (Viton)*
Weight	approx. 80 kg	approx. 108 kg

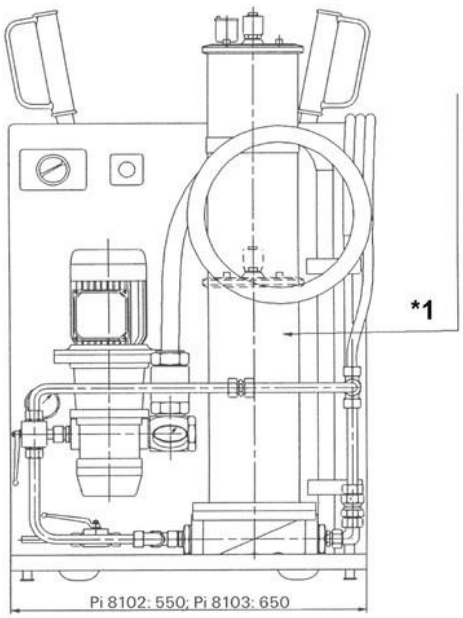
* other seals can be supplied on request

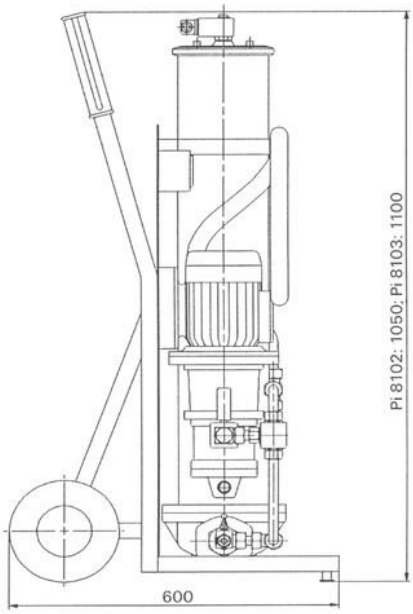
We draw attention to the fact that all values indicated are average values which do not always occur in specific cases of application. Our products are continually being further developed. Values, dimensions and weights can change as a result of this. Our specialized department will be pleased to offer you advice.

We recommend to contact us concerning applications of our filters in areas governed by the EU Directive 94/9 EC /ATEX 95). The standard version can be used for liquids based on mineral oil (corresponding to the fluids in Group 2 of Directive 97/23 EC Article 9). If you consider to use other fluids please contact us for additional support.

Subject to technical alteration without prior notice.

8. Technical specifications





*1
low pressure filter
Pi 8102 (dashed): Pi 1535
Pi 8103: Pi 1560

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79781899.06/2019

Filter Aggregate
Pi 8200

Volume flow 14 and 35 l/min

1. Features

Compact, ready-to connect filter aggregates for modern hydraulic and lubrication systems

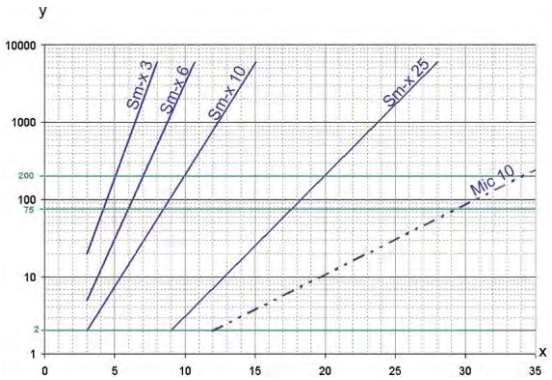
- Low noise internal gear pump with double bearing driving shaft
- Minimum loss of performance due to the high efficiency and the volume flow optimized design of parts
- Integrated pressure limitation valve
- Visual/electrical maintenance indicators
- Equipped with highly efficient Filtration Group Sm-x spin-on cartridges
- Beta rated elements according to ISO 16889 multipass test
- High dirt holding capacity due to the large filter surface
- Defined cleanliness classes
- Easy to service
- Worldwide distribution

2. Mode of operation

The filter assembly consists of a filter block with an integrated electric motor, a gear pump, a filter housing and a spin-on cartridge.
With its double-bearing drive shaft design, the internal-gear pump is extremely quiet and virtually vibration-free, with excellent suction capacity and sophisticated mechanical- and volumetric efficiencies.
The Filtration Group spin-on cartridges can be supplied with filter ratings ranging from 3 µm to 25 µm and Sm-x assembly (ß5(c) to ß20(c) according to ISO 16889) or with Mic elements with a nominal size of 10 and 25 µm.
In bypass mode, superior oil cleanliness codes per ISO 4406 of up to 14/12/09 and better can be achieved with these filter units and the Filtration Group Sm-x spin-on cartridges.

To monitor the filter element, a differential pressure indicator is supplied as standard. For customer-specific requirements, the entire range of Filtration Group differential pressure indicators is available with one or two switching levels, LED displays, various contact types, and connector plugs.
The pump units are suitable for all mineral-oil-based hydraulic oils and lubricating oils.
The standard scope of supply includes the complete unit with On/Off switch, motor protection feature, 2-m plug power cord, pump, maintenance indicator, and the selected spin-on cartridge.
Units are available for prompt delivery.

3. Separation grade characteristics



y = beta-value
x = particle size [µm]

determined by multipass tests (ISO 16889)
calibration according to ISO 11171 (NIST)

4. Filter performance data

tested according to ISO 16889 (multipass test)

Sm-x elements with max. Δ p 10 bar

Sm-x	3	$\beta_{5(C)} \geq 200$
Sm-x	6	$\beta_{7(C)} \geq 200$
Sm-x	10	$\beta_{10(C)} \geq 200$
Sm-x	25	$\beta_{20(C)} \geq 200$

values guaranteed up to 10 bar differential pressure

5. Quality assurance

Filtration Group filters and filter elements are produced according to the following international standards:

Norm	Designation
DIN ISO 2941	Hydraulic fluid power filter elements; verification of collapse/burst resistance
DIN ISO 2942	Hydraulic fluid power filter elements; verification of fabrication integrity
DIN ISO 2943	Hydraulic fluid power filter elements; verification of material compatibility with fluids
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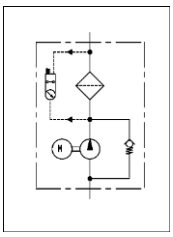
ISO 3968	Hydraulic fluid power-filters-evaluation of pressure drop versus flow characteristics
ISO 10771.1	Fatigue pressure testing of metal containing envelopes in hydraulic fluid applications
ISO 16889	Hydraulic fluid power filters-multipass method for evaluation filtration performance of a filter element

6. Symbols



7. Order numbers

Example for ordering filters:

1. Filter aggregate	2. Spare part spin-on cartridge
V = 14 l/min with visual/electr. maintenance indicator and PX 33 spin-on cartridge Type: Pi 82001-069 PX33-13-2-Smx10 Order number: 70383014	Sm-x 10 Type: PX33-13-2-Smx10 Order number: 70541523

7.1 Filter aggregates

Nominal size NG [l/min]	Order number	Type	with visual/electr. indicator
14	70383013	Pi 82001-069 PX33-13-2-Mic10	
	70383014	Pi 82001-069 PX33-13-2-Smx10	
	70383015	Pi 82001-069 PX37-13-2-Mic10	
	70383019	Pi 82001-069 PX37-13-2-Smx3	
	70383017	Pi 82001-069 PX37-13-2-Smx6	
	70320065	Pi 82001-069 PX37-13-2-Smx10	
	70383016	Pi 82001-069 PX37-13-2-Smx25	
35	70377257	Pi 82003-069 PX37-13-2-Mic10	
	70383025	Pi 82003-069 PX37-13-2-Smx3	
	70383024	Pi 82003-069 PX37-13-2-Smx6	
	70383023	Pi 82003-069 PX37-13-2-Smx10	
	70383022	Pi 82003-069 PX37-13-2-Smx25	

7.2 Spin-on cartridges

Nominal size NG [l/min]	Order number	Type	Filter material	max. Δ p [bar]	Filter surface [cm²]
14 + 35	70541525	PX33-13-2-Mic10	Mic 10	5	7000
	70541523	PX33-13-2-Smx10	Sm-x 10		3400
	70541540	PX37-13-2-Mic10	Mic 10		13500
	70541536	PX37-13-2-Smx3	Sm-x 3		7400
	70541537	PX37-13-2-Smx6	Sm-x 6		
	70541538	PX37-13-2-Smx10	Sm-x 10		
	70541539	PX37-13-2-Smx25	Sm-x 25		

8. Technical specifications

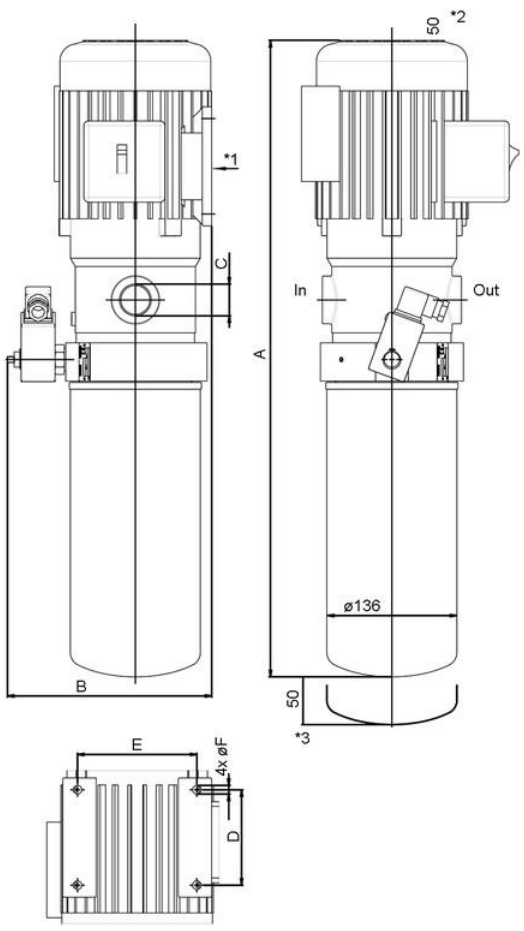
	Pi 82001-069/Pi 82003-069
Volume flow:	14 l/min/35 l/min
Temperature range:	-10 to +80 °C
Setting pressure limiting valve:	4 ±0.5 bar
Maintenance indicator setting:	2.2 bar
Connection suction side:	G¾/G1
Connection pressure side:	G¾/G1
Motor output:	0.25 kW/0.55 kW
Revolutions:	1400 1/min
Voltage:	230V AC/50 Hz
Nominal current:	2.5 A/4.2 A
Type of protection:	IP 54 in inserted and secured status
Contact:	normally open/closed
Cable sleave:	M20x1.5
Viscosity range:	10 – 200 mm²/s

The switching function can be changed by turning the electric upper part by 180° (normally closed contact or normally open contact). The state on delivery is a normally closed contact. By inductivity in the direct current circuit the use of suitable protection circuit should be considered. Further maintenance indicator details and designs are available in the maintenance indicator data sheet.

We draw attention to the fact that all values indicated are average values and do not always occur in specific cases of application. Our products are continually being further developed. Values, dimensions and weights can change as a result of this. Our specialized department will be pleased to offer you advice.

We recommend you to contact us concerning applications of our filters in areas governed by the EU Directive 94/9 EC (ATEX 95). The standard version can be used for liquids based on mineral oil (corresponding to the fluids in Group 2 of Directive 97/23 EC Article 9). If you consider to use other fluids please contact us for additional support.

Subject to technical alteration without prior notice!



In = Inlet
Out = Outlet
*1 = View mounting
*2 = Minimum clearance
*3 = Clearance for cartridge change

9. Dimensions

All dimensions except "C" in mm.

Aggregate type	Spin-on cartridge type	A	B	C	D	E	F
Pi 82001-069	PX33	495	183	G¾	90	112	7
	PX37	633	183	G¾	90	112	7
Pi 82003-069	PX37	667	214	G1	100	125	9

10. Installation, operating and maintenance instructions

10.1 Filter aggregate installation

When installing the filter aggregate make sure that sufficient space is available to remove the spin-on cartridge. The filter aggregate should be installed with the spin-on cartridge pointing downwards.
The maintenance indicator must be visible.

10.2 Connecting the electrical maintenance indicator

The electrical indicator is connected via a 2-pole appliance plug according to DIN EN 175301-803 with poles marked 1 and 2.
The electrical section can be inverted to change from normally open position to normally closed position or vice versa.

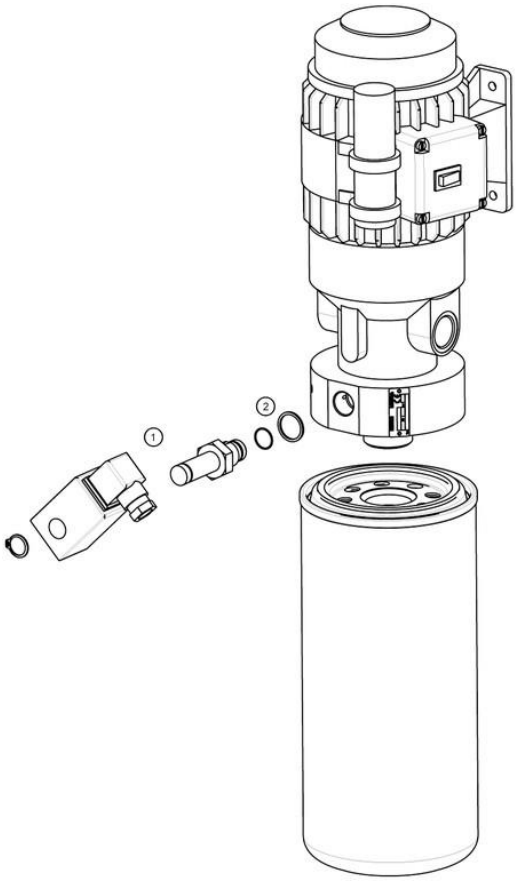
10.3 When should the filter element be replaced?

1. Filter aggregates equipped with visual and electrical maintenance
   indicator:
   During cold starts, the indicator may give a warning signal. Press the red button of the visual indicator once again only after operating temperature has been reached. If the red button immediately pops up again and/or the electrical signal has not switched off after reaching operating temperature, the filter element must be replaced after the end of the shift.
2. Filter aggregates without maintenance indicator:
   The spin-on cartridge should be replaced after the trial run or flushing of the system. Afterwards follow instructions of the manufacturer.
3. Please always ensure that you have original Filtration Group spare
   spin-on cartridges in stock.

10.4 Spin-on cartrige exchange

1. Stop system and relieve filter aggregate from pressure.
2. Unscrew the spin-on cartridge with the aid of a belt spanner by turning some to the left.
3. Make sure that the order number on the spin-on cartridge corresponds to the order number of the plate.
4. The seal of the screw-on cartridge should be lightly oiled.
5. Screw cartridge on in accordance with the printed-on instructions.

11. Spare parts list



Order number for spare parts		
Position	**Type**	**Order number**
①	Maintenance indicator	
	Visual PiS 3098/2,2	77669971
	Electrical PiS 3097/2,2	77669948
	Electrical upper part only	77536550
②	Seal kit for maintenance indicator	
	NBR	77760309

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70383043.06/2019

Mobile Filter Unit
Pi 8210

Flow rate 15 l/min

1. Features

High performance filter unit for modern hydraulic and lubrication systems

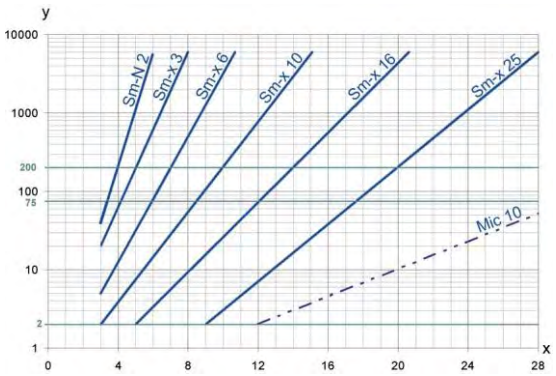
- Simple filling and cleaning of hydraulic and lubrication systems
- Sturdy and stable, flexible handling thanks to a frame with wheels and folding carrying handle, even stairs present no obstacle (like a case trolley)
- Folding down the handle allows the unit to be carried in one hand
- Low-noise internal gear pump with drive shaft mounted in double bearings and integrated pressure relief valve
- Complete with intake and delivery hose, suction lance with coarse screen
- Integrated oil drip pan
- Minimum power loss thanks to high efficiency and optimum flow design of the components
- Maintenance indicator (pressure gauge)
- Equipped with highly efficient Filtration Group Sm-x spin-on cartridges
- Beta rated elements according to ISO 16889 multipass test
- Elements with high dirt holding capacity thanks to large filter surface
- Achievement of defined purity classes
- Easy to service
- Worldwide distribution

2. Mode of operation

The self-priming internal gear wheel pump draws in the medium from the extraction point via the lance in the suction hose and delivers it via the spin-on cartridge and the pressure hose with lance to the delivery point. A significant improvement in the oil quality is thus achieved during filling and refilling oil tanks. Filtration Group PX Series spin-on cartridges are available as filters.

In bypass mode, outstanding oil cleanliness classes to ISO 4406/1999 can be achieved with this unit and the Filtration Group Sm-x spin-on cartridges. A gauge with red/green field is installed to monitor the filter cartridges. The filter unit is suitable for all mineral oil-based hydraulic and lubricating oils.

3. Separation grade characteristics



y = beta-value
x = particle size [µm]
determined by multi-pass measurements (ISO 16889)
calibration according to ISO 11171 (NIST)

4. Filter performance data

tested according to ISO 16889 (multipass test)

Sm-N	2	$ß_{4(C)} \geq 200$
Sm-x	3	$ß_{5(C)} \geq 200$
Sm-x	6	$ß_{7(C)} \geq 200$
Sm-x	10	$ß_{10(C)} \geq 200$
Sm-x	25	$ß_{20(C)} \geq 200$

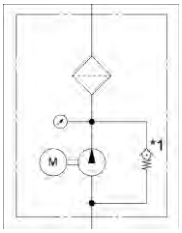
up to 10 bar differential pressure

5. Quality assurance

Filtration Group filter and filter elements are produced and tested according to the following international standards:

Standard	Title
DIN ISO 2941	Hydraulic fluid power filter elements; verification of collapse/burst resistance
DIN ISO 2942	Hydraulic fluid power filter elements; verification of fabrication integrity
DIN ISO 2943	Hydraulic fluid power filter elements; verification of material compatibility with fluids
DIN ISO 3723	Hydraulic fluid power filter elements; method for end load test
DIN ISO 3724	Hydraulic fluid power filter elements; verification of flow fatigue characteristics
ISO 3968	Hydraulic fluid power-filters-evaluation of pressure drop versus flow characteristics
ISO 10771.1	Fatigue pressure testing of metal containing envelopes in hydraulic fluid applications
ISO 16889	Hydraulic fluid power filters-multipass method for evaluation filtration performance of a filter element

6. Symbols



*1 pressure relief valve 4 bar ± 0.5 %

7. Order numbers

Ordering example for filter:

1. Filter unit	2. Replacement spin-on cartridge
V = 15 l/min with gauge and Sm-x 3 spin-on cartridge Type designation: Pi 82101-063/PX33-13-2 Sm-x3 Order number: 70551659	Sm-x 3 Type designation: PX33-13-2 Sm-x3 Order number: 70541521

7.1 Filter unit

Nominal size NG [l/min]	Order number	Type designation	with gauge
15	70573194	Pi 82101-063/PX33-13-2 Sm-N2	
	70551659	Pi 82101-063/PX33-13-2 Sm-x3	
	70573195	Pi 82101-063/PX33-13-2 Sm-x6	
	70573196	Pi 82101-063/PX33-13-2 Sm-x10	
	70573197	Pi 82101-063/PX33-13-2 Sm-x25	
	70573198	Pi 82101-063/PX33-13-2 Mic10	
	70573199	Pi 82101-063/PX33-13-2 Mic25	

7.2 Spin-on cartridges

Nominal size NG [l/min]	Order number	Type designation	Filter material	max. Δ p [bar]	Filter surface [cm²]
100	70548477	PX33-13-2 Sm-N2	Sm-N 2	5	3400
	70541521	PX33-13-2 Sm-x3	Sm-x 3		3400
	70541522	PX33-13-2 Sm-x6	Sm-x 6		3400
	70541523	PX33-13-2 Sm-x10	Sm-x 10		3400
	70541524	PX33-13-2 Sm-x25	Sm-x 25		3400
	70541525	PX33-13-2 Mic10	Mic 10		7000
	70541527	PX33-13-2 Mic25	Mic 25		7000

8. Technical specifications

Delivery volume:	15 l/min
Perm. temperature:	-10 to +80 °C
Setting pressure limiting valve:	4 ±0.5 bar
Green/red gauge border line:	2.2 bar
Motor output:	0.25 kW
Revolutions:	1400 1/min
Voltage:	230 V AC/50 Hz
Rated current:	1.9 A
Protection class:	IP54
Viscosity range:	10 – 400 mm²/s
Length of hoses:	2.5 m
Weight:	18 kg

We draw attention to the fact that all values indicated are average values. Our products are continually being further developed. Values, dimensions and weights can change as a result of this. Our specialised department will be pleased to help you.

Please contact us before using our filters in areas governed by EU Directive 94/9/EC (ATEX 95). The standard version can be used for liquids based on mineral oil (corresponding to the fluids in Group 2 of Directive 97/23 EC Article 9). If you consider to use other fluids please contact us for additional support.

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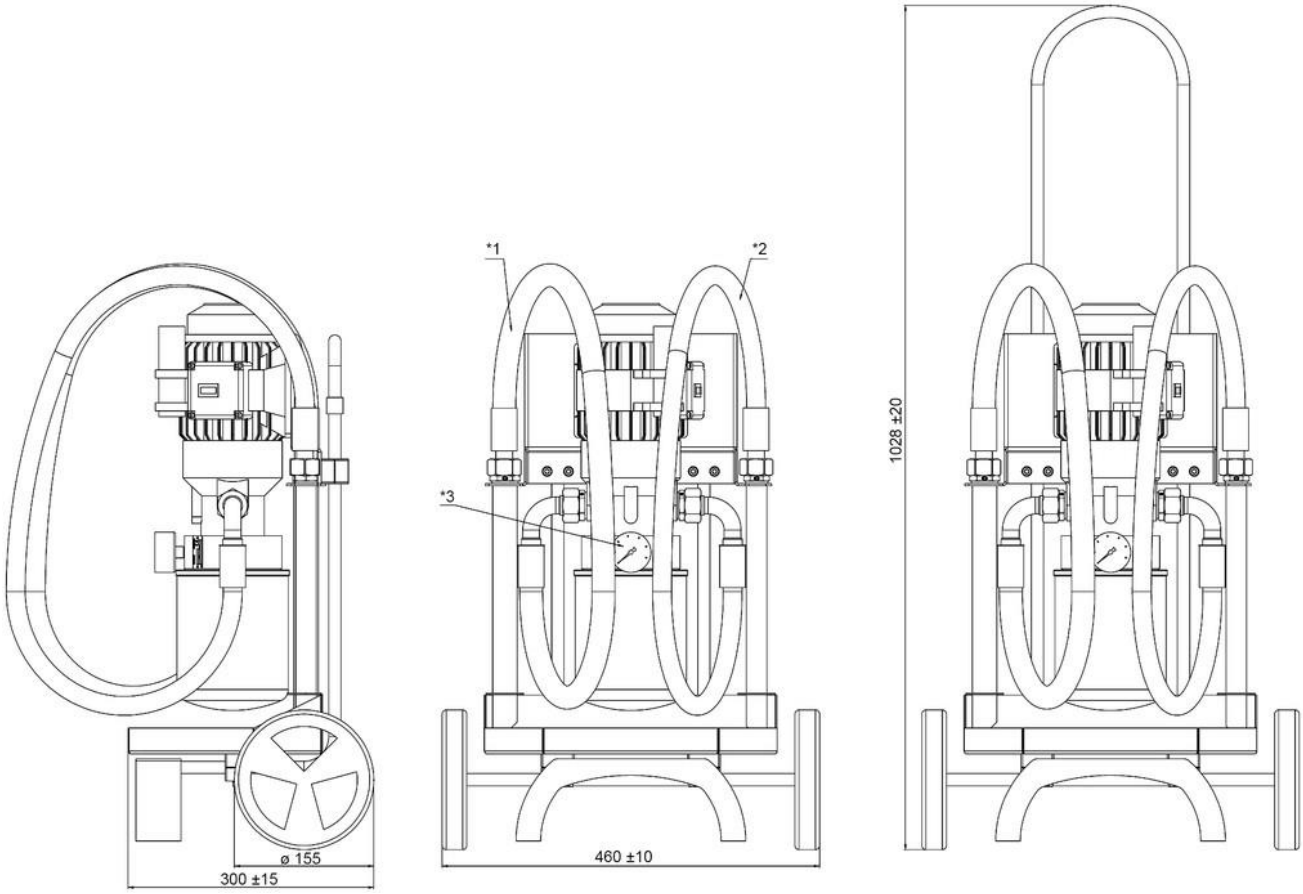
9. Dimensions



*1 = Suction hose DN19
*2 = Pressure hose DN16
*3 = Gauge

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FG Fluid Solutions
Filtration Group

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Oil Filter Module
Pi 83116

Flow rate 220/260 l/min

1. Features

Compact, ready-to-connect oil filter modules for modern gearboxes, hydraulic and lubrication systems

- Low noise gear pump
- Minimal power losses due to high efficiencies and streamlined design of all components
- Integrated non-return valve
- Integrated pressure relief valve
- Optical/electrical maintenance indicator
- Integrated thermo valve
- Pressure sensor
- Drain on dirt side
- Equipped with highly efficient FG Premium Select filter elements
- Compact and weight-optimized design
- Garantierte Abscheideraten gemäß Multipass-Test nach ISO 16889
- High dirt holding capacity
- Achievement of defined purity classes according to ISO 4406
- Easy to service
- Worldwide sales and service

2. Mode of operation

The main components of the oil filter module are filter, adapter, electric pump and thermo valve. The adapter, with CFD analysis optimized channel guidance, ensures a flow with lowest flow resistance. A pressure relief valve is integrated into the adapter so that the oil can flow back into the tank if the viscosity is too high.

The low-noise gear pump is characterised by very good suction properties and excellent mechanical and volumetric efficiency.

In wind power, 3 or 2-stage filter elements are used for filtration (see the corresponding element data sheets). With these FG PS filter elements incl. PulseShieldTM Pro fixation fleece, excellent cleanliness classes according to ISO 4406/1999 are achieved.

A differential pressure indicator is used to monitor the filter elements.

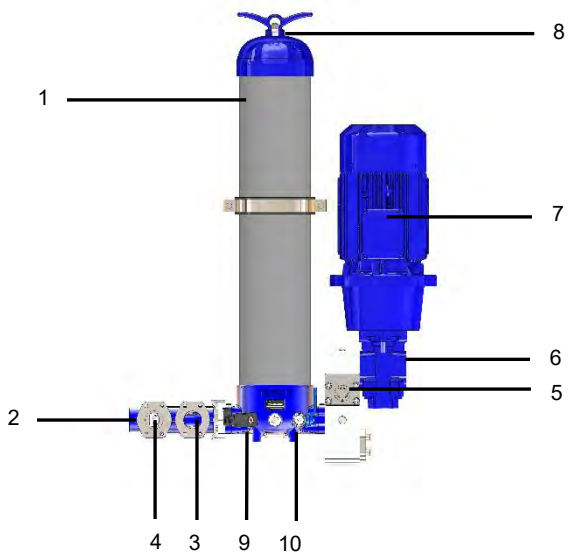
The oil filter module is suitable for all hydraulic and lubricating oils based on mineral oil. The standard delivery includes the complete unit with electric motor, gear pump, filter housing, maintenance indicator, pressure sensor, filter element and thermo valve. The oil filter module is designed for an operating pressure of up to 25 bar.

The gear pump (7) sucks the oil out of the tank via the inlet (6) and pumps it through the adapter into the filter housing. In the filter housing, the oil flows through the filter element (1) and the filter head. In the thermo valve (2), the oil is conducted to the cooler (outlet 3) or directly to the gear unit (outlet 4) depending on the temperature.

When the maximum differential pressure is reached, the maintenance indicator (9) emits an electrical signal. The filter element (1) must then be replaced and disposed of properly.

The vent line (8) is screwed to the tank on site to prevent the formation of an air cushion in the filter housing. The hose line can be supplied as an option.

The pressure relief valve (5) protects the system from excessive pressure. The backflow of the oil through the oil filter module into the tank is prevented by a check valve integrated in the filter head.



1 Filter element (inside)
2 Thermo valve
3 Outlet cooler
4 Outlet gearbox
5 Outlet pressure relief valve*
6 Inlet
7 Motor
8 Vent connection
9 Electrical maintenance indicator
10 Drain dirt side

* The pressure relief valve must be connected by the customer.

3. Technical specifications

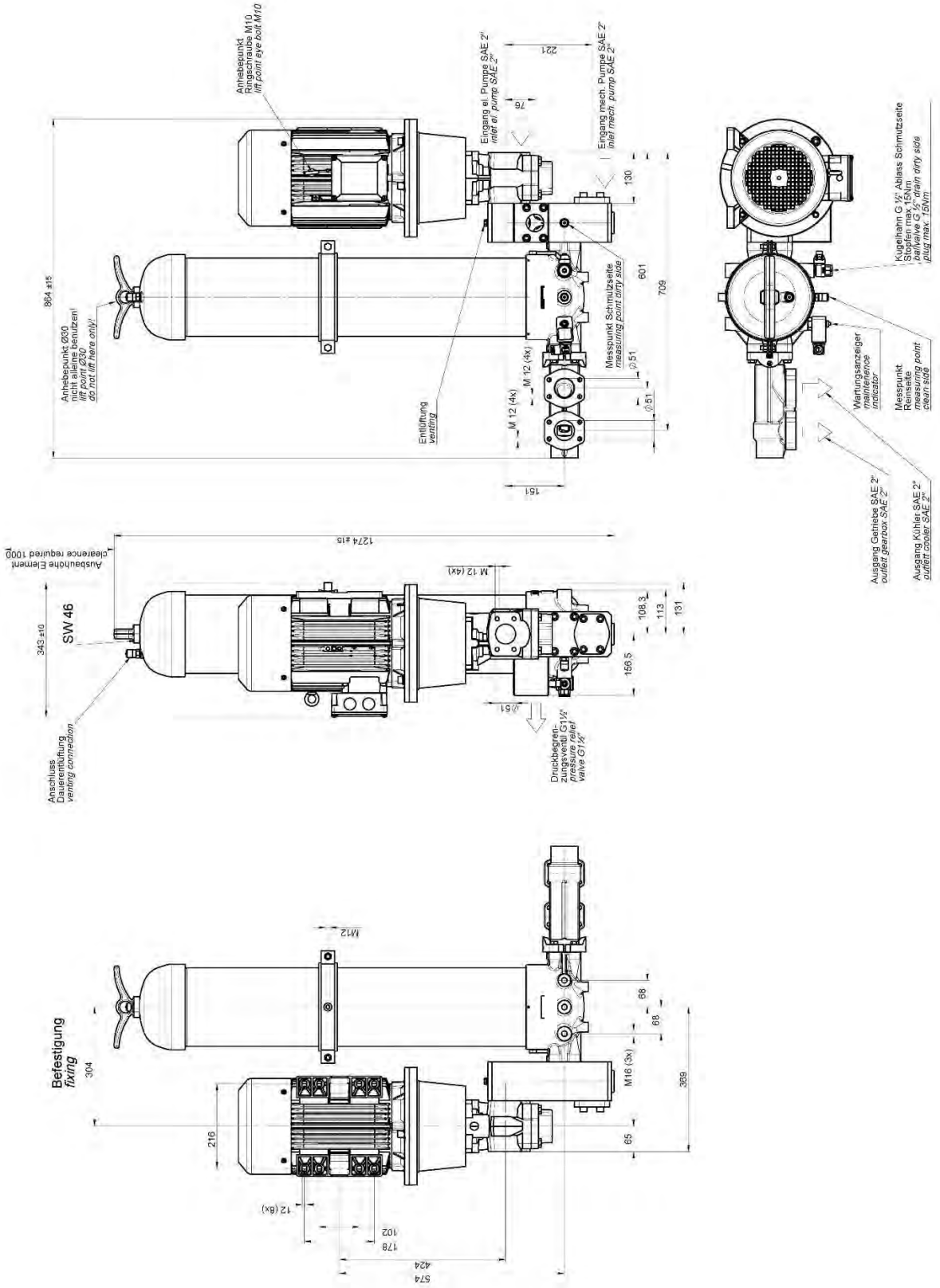
3.1 Oil filter module/pump

Nominal volume flow:	
at 50 Hz:	73/156 l/min
at 60 Hz:	80/188 l/min
Max. ambient temperature:	60 °C
Media temperature range:	-30 °C to +100 °C
Connection suction side:	SAE 2“
Outlet thermo valve cooler or gearbox:	SAE 2“
Max. viskosity:	10000 cSt
Rated speed at	
50 Hz:	705/1440 U/min
60 Hz:	850/1745 U/min
Rated power at 40 °C	
50 Hz:	4.5/6.0 kW
60 Hz:	5.4/7.2 kW
Rated voltage at	
50 Hz:	400 V
60 Hz:	460 V
Rated current at	
50 Hz:	9.9/11.5 A
60 Hz:	8.2/11.5 A
Rated frequency:	50 Hz
	60 Hz
Protection class:	IP55
Setting pressure limiting valve:	12 ± 10 % bar

3.2 Maintenance indicator PiS 3119/3.5

Switching pressure:	3.5 ± 10 % bar
Voltage range:	12 -150 V AC/DC
Max. switching current:	1 A
Max. switching capacity:	20 W
Contact type:	Normally closed
Protection class:	IP65
Switching point 1:	75 %
Switching point 2:	100 %

4. Dimensions



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05/2019

Off-line Oil Filter Module
Pi 8400

Volume flow 3 l/min

1. Features

Compact, ready-to connect oil filter module for modern hydraulic and lubrication systems

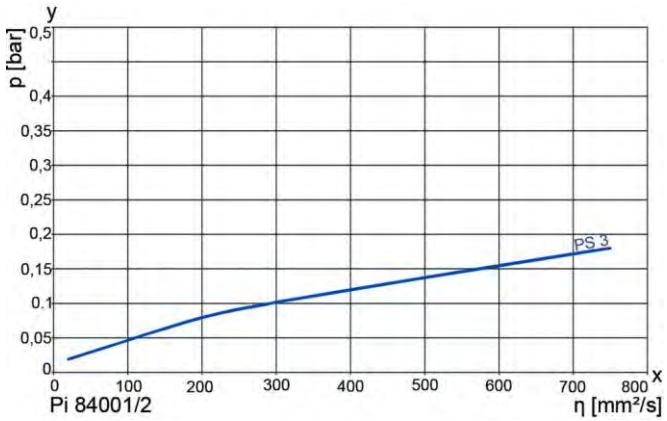
- Low noise internal gear pump
- Minimum loss of performance due to the high efficiency and the volume flow optimised design of parts
- Integrated pressure relieve valve
- Visual maintenance indicator (gauge)
- Drain outlet dirt side
- Equipped with highly efficient Filtration Group Premium Select filter elements
- Compact and weight optimised design
- Guaranteed retention rates according to ISO 16889 multipass test
- High dirt holding capacity due to the large filter surface
- Defined cleanliness classes according to ISO 4406
- Easy to service
- Worldwide sales and service

2. Mode of operation

The oil filter module consists of an electric motor, a gear pump, a filter housing and a filter element.
The internal-gear pump is extremely quiet and virtually vibration-free, with excellent suction capacity and sophisticated mechanical and volumetric efficiencies.
Two versions of the oil filter modul are available. Type Pi 84001/1-063 is fitted with standard DIN-norm elements. Type 84001/2-063 is fitted with Filtration Group designed elements 852 109 WS. These elements have the additional characteristics of water adsorption. 852 109 WS elements do not fit into Pi 84001/1-063 housings.

Usually 10 micron filtration is beeing used in the main filtration circuit. Therefore we recommend a 3 micron retention rate at the off-line circuit. Other degrees of filtration are available on request. All retention rates are according to ISO 16889.
In bypass mode, superior oil cleanliness codes per ISO 4406 of up to 14/12/09 and better can be achieved with these filter units and the Filtration Group PS filter elements.
For monitoring the filter element, a gauge is mounted. The oil filter modules are suitable for all mineral-oil-based hydraulic oils and lubricating oils.
Units are available for prompt delivery

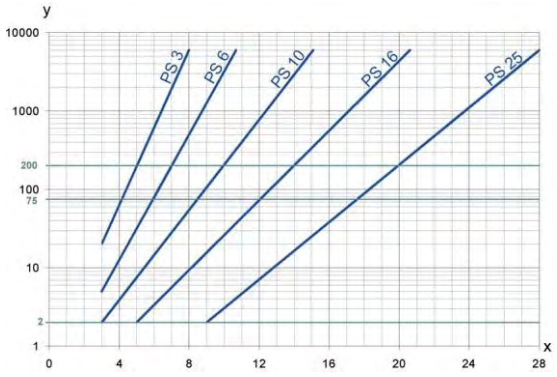
3. Flow rate/pressure drop curve (filter housing incl. element)



y = pressure p [bar]
x = viscosity [mm²/s]

A wider range of grade of filtration on request.

4. Separation grade characteristics



y = beta-value
x = particle size [µm

determined by multipass tests (ISO 16889)
calibration according to ISO 11171 (NIST)

5. Filter performance data

tested according to ISO 16889 (Multipass-Test)

PS elements with max.Δ p 10 bar

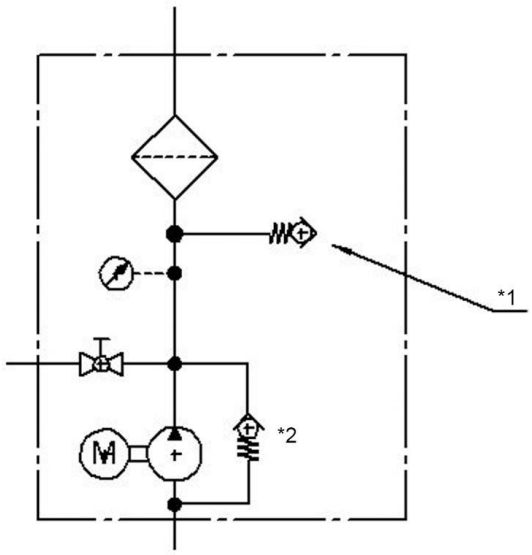
PS	3	$\beta_{5(C)} \geq 200$
PS	6	$\beta_{7(C)} \geq 200$
PS	10	$\beta_{10(C)} \geq 200$
PS	16	$\beta_{15(C)} \geq 200$
PS	25	$\beta_{20(C)} \geq 200$

6. Quality assurance

Filtration Group filters and filter elements are produced according to the following international standards:

Norm	Designation
DIN ISO 2941	Hydraulic fluid power filter elements; verification of collapse/burst resistance
DIN ISO 2942	Hydraulic fluid power filter elements; verification of fabrication integrity
DIN ISO 2943	Hydraulic fluid power filter elements; verification of material compatibility with fluids
DIN ISO 3723	Hydraulic fluid power filter elements; method for end load test
DIN ISO 3724	Hydraulic fluid power filter elements; verification of flow fatigue characteristics
ISO 3968	Hydraulic fluid power-filters-evaluation of pressure drop versus flow characteristics
ISO 10771.1	Fatigue pressure testing of metal containing envelopes in hydraulic fluid applications
ISO 16889	Hydraulic fluid power filters-multipass method for evaluation filtration performance of a filter element

7. Symbols



*1 measuring connection available

*2 pressure relieve valve 4.8 bar (70 psi) ± 10 %

8. Order numbers

Example for ordering filters:

1. Off-line oil filter module	2. Filter element
with gauge Type: Pi 84001/1-063 Order number: 70562951	PS 10 Type: Pi 23025 PS 10 Order number: 77924160

8.1 Off-line oil filter module		
Type	**Order number**	**with gauge**
Pi 84001/1-063	70562951	
Pi 84001/2-063	70562883	

8.2 Filter elements				
Off-line oil filter module	**Order number**	**Type**	**Degree of filtration [µm]**	**Filter surface [cm²]**
Pi 84001/1-063	77924152	Pi 21025 RN PS 3	3	5940
	77964075	Pi 22025 RN PS 6	6	5940
	77924160	Pi 23025 RN PS 10	10	5940
	77963655	Pi 24025 RN PS 16	16	5940
	77960248	Pi 25025 RN PS 25	25	5940
Pi 84001/2-063	70566180	852 109 WS PS 3	3	10.507

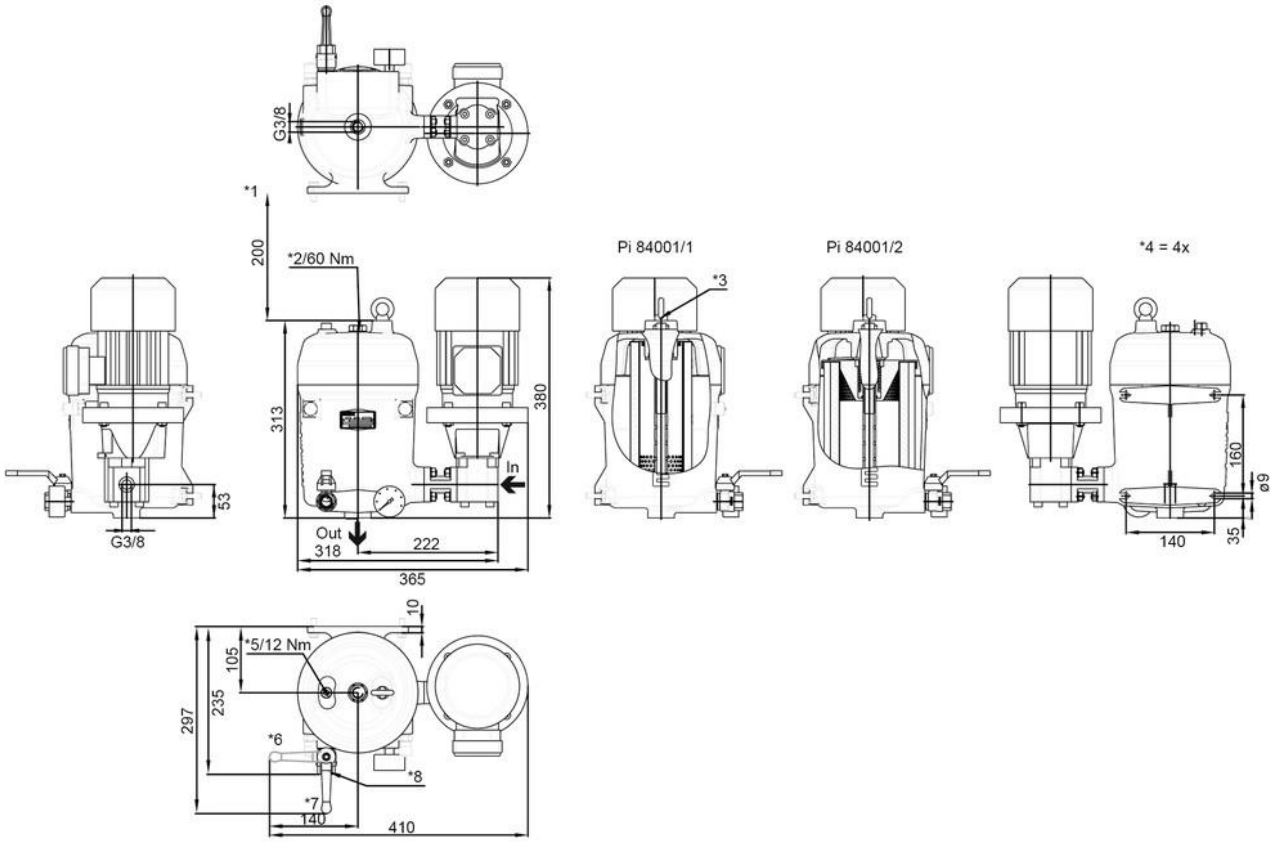
9. Technical specifications

Type:	Pi 8400
Material main components:	Aluminium
	Optional paint on customer request
Volume flow:	3 l/min
Nominal pressure:	10 bar (145 psi)
Pressure relieve valve setting:	4.8 bar (70 psi) ± 10 %
Oil temperature:	-10 °C to +80 °C
Gauge (red/green scale):	2.2 bar (32 psi)
Connection suction side:	G3/8
Connection pressure side:	G3/8
Motor output:	0.18 kW
Revolutions:	1380 1/min
Voltage:	230 V AC/50 Hz
Nominal current:	1,25 A
Type of protection:	IP55
Viscosity start:	700 mm²/s
Viscosity operation:	20 mm²/s - 120 mm²/s

Other motor versions on request

Subject to technical alteration without prior notice

10. Dimensions



In	Inlet	*4	Fixing points (4x ø 9 mm)
Out	Outlet	*5	Venting screw (12 Nm)
*1	Minimum clearance for filter element	*6	Ball valve drain dirt side closed
*2	Cover fixing (60 Nm)	*7	Ball valve drain dirt side open
*3	Connection maintenance indicator (optional)	*8	Drain dirt side

11. Installation, operating and maintenance instructions

11.1 Off-line oil filter module installation

When installing the filter make sure that sufficient space is available to remove filter element. The filter must be installed with the filter housing pointing upwards. The gauge must be visible.

11.2 When should the filter element be replaced?

1 . The filter element should be replaced after the trial run or flushing of the system. Afterwards follow instructions of the manufacturer.

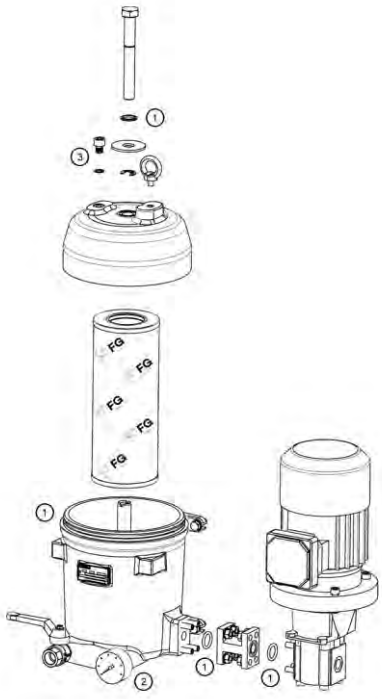
2 . Please always ensure that you have original Filtration Group spare
elements in stock: Disposable elements (PS) cannot be cleaned.

11.3 Element replacement

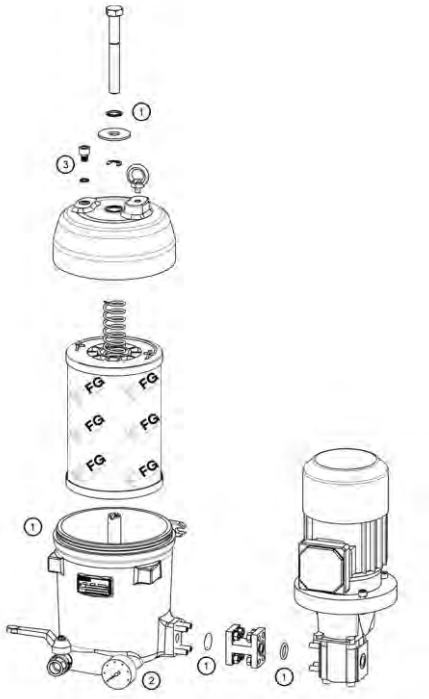
1 . Stop system and relieve filter module from pressure.
2 . Unscrew the cover with an open-end wrench and remove it.
3 . Open the drain and discharge the housing completely.
4 . Remove element out of the housing carefully.
5 . Check seals on the filter housing for damage. Replace, if necessary.
6 . Make sure that the order number on the spare element corresponds to the order number of the filter name-plate.
To ensure no contamination occurs during the exchange of the element first open the plastic bag and push the element over the spigot in the filter head. Now remove plastic bag.
7 . Close the drain.
8 . Tighten the cover (tightening torque 60 Nm).
9 . Vent the filter module (tightening torque of the venting screw 12 Nm).

12. Spare parts list

Pi 84001/1



Pi 84001/2



Order numbers for spare parts		
Position	**Type**	**Order number**
①	Seal kit	70560114
②	Gauge	78381998
③	Venting screw incl. seal	70560152

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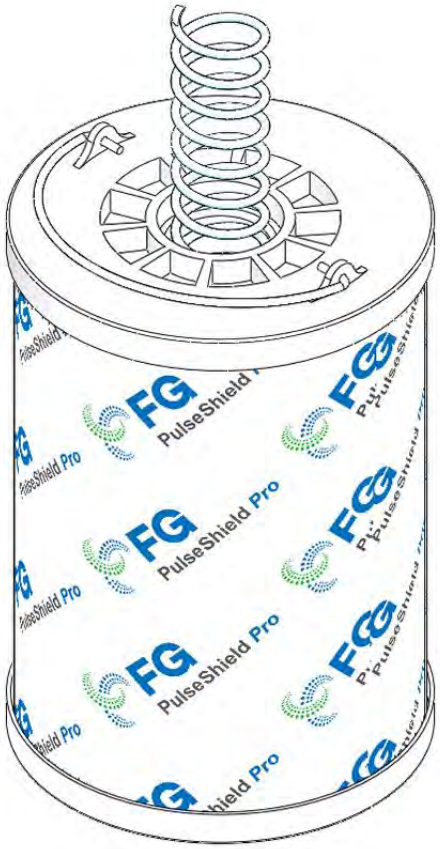
1. Inhalt/Content FG Bestell-Nr./Order no. 70566180

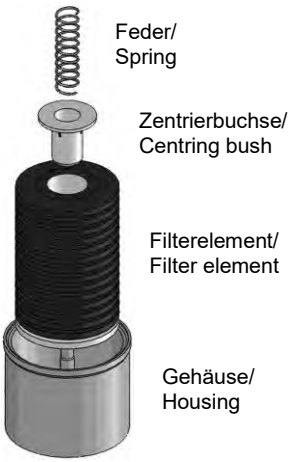
Filterelement/Filter element 852 109 WS PS 3
Dichtungssatz für/Seal kit for Pi 8400
Begleitblatt/Enclosure

Das Filterelement 852 109 WS PS 3 besteht aus einer Baugruppe. Dreiteilig aufgebaute Filterelemente können durch das Filterelement 852 109 WS PS 3 ersetzt werden.
The filter element 852 109 WS PS 3 consist of one component. Threepart designed filter elements can be replaced by the filter element 852 109 WS PS 3.



2. Optional zu ersetzende Filterelemente/Optional replacements

Andere Ausführung
Different design



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01/2019

Particle Monitor
PiC 1500

Nominal pressure 420 bar (6000 psi)

1. Features

Filtration Group PiC 1500 Particle Monitor for continuous monitoring of the particle contamination of hydraulic fluids

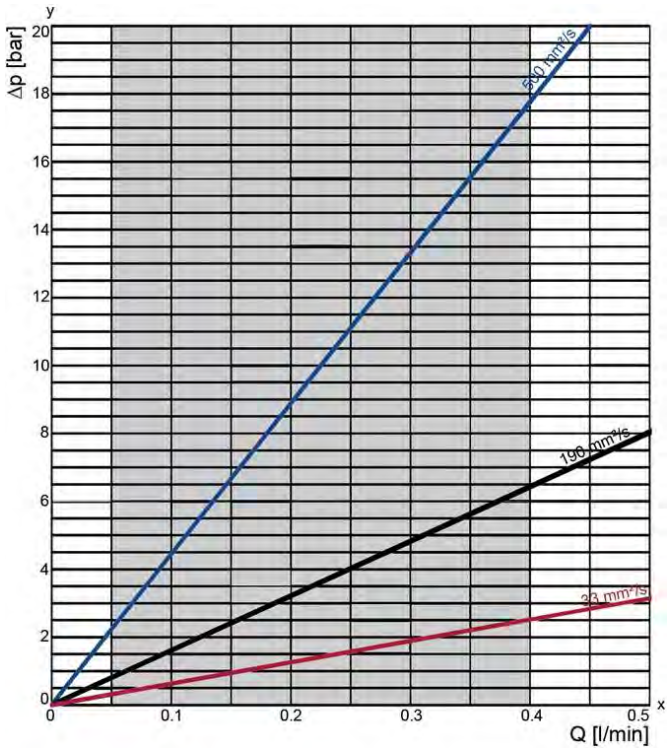
- Use as a mobile and stationary system for quick and simple determination of the cleanliness of fluids
- Simple menu-prompted operation at the unit
- Laser sensor for precise and reproducible results
- Variable measurement mode (single and cyclic measurements) through internal programmable timer control, manual control or remote control via an electrical connection
- Output of the cleanliness classes via the illuminated, 180° swivelling display
- Evaluation to ISO 4406: 1999 and SAE AS 4059 E
- Measurement range 4 µm(c), 6 µm(c), 14 µm(c), 21 µm(c)
- Programmable alarm (exceeding or underrunning of the cleanliness classes) for control of external units
- Internal operating hourmeter and measurement value memory with capacity for 3000 measurement cycles each with 6 measured values for trend tracking of historical measurement data
- Includes "Count&Log 1500" measurement and evaluation software for evaluation and display of the measurement results on PC or notebook
- Data polling and control of the PiC 1500 via RS232 or CANopen
- Extensive accessories available

2. Technical data

Pressure connection:	2x G¼, Minimess M16x2
Nominal pressure:	420 bar (6000 psi)
Operating temperature:	-20 to +80 °C
Relative humidity:	0 to 95 %
Wetted materials:	stainless steel, sapphire glass, NBR
Seal material:	NBR
Monitored media:	mineral and ester fluids, polyalphaolefins
Permissible flow rate:	50 to 400 ml/min
Measurement range to ISO 4406: 1999:	0 to 24
Calibrated measurement range to ISO 4406: 1999:	10 to 22
Measurement precision:	± 1
Electrical connection:	8-pin plug M12x1
Power supply:	9 to 36 V DC
Power consumption max.:	300 mA
Power outputs:	4 to 20 mA
Protection class:	IP67 in plugged and secured state
Interfaces:	RS 232, CANopen
Weight:	approx. 850 g

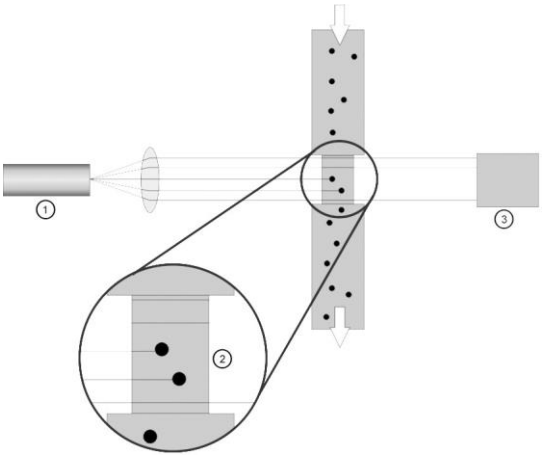
Subject to technical alteration without prior notice.

4. Characteristics curve



y = Differential pressure Δp [bar]
x = Volume flow Q [l/min]

3. Configuration

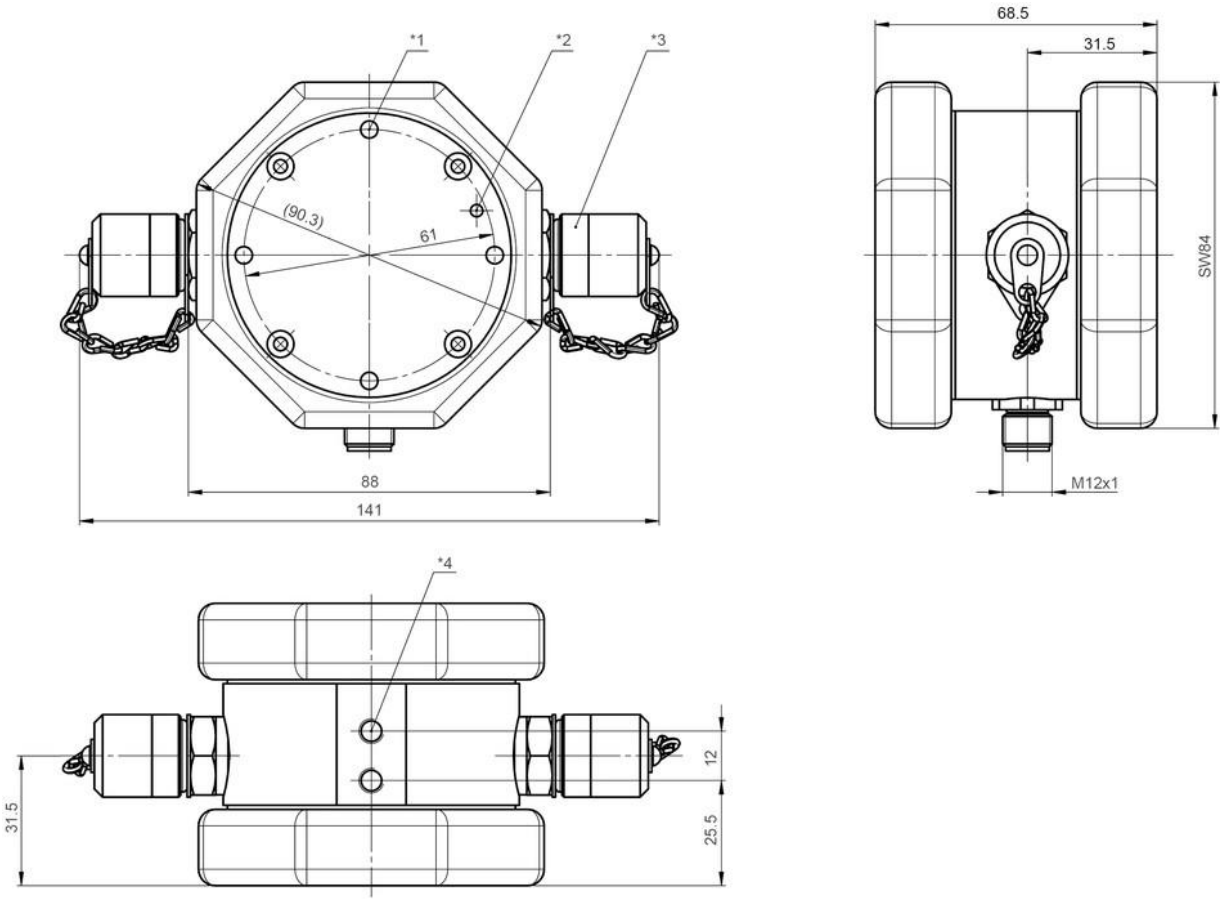


The unit is an optical particle monitor that operates on the principle of light extinction. It consists of a measurement cell (2) through which the fluid flows, a laser (1) and a photodiode (3). The particle monitor continuously measures the number of particles in a system and can trigger an alarm if the oil contamination exceeds a preset cleanliness class. The system operator is warned and can initiate corrective measures before faults or serious damage are caused by the contamination of the fluid. The PiC 1500 Particle Monitor allows condition-oriented maintenance and continuous monitoring of hydraulic oils.

The menu-prompted operation of the unit is via 4 sensor buttons. The cleanliness classes (ordinal numbers) > 4 µm(c), > 6 µm(c), > 14 µm(c), > 21 µm(c) to ISO 4406:99 or SAE AS 4059 E are displayed on the unit. The measurement mode of the PiC 1500 can be set to single or cyclic measurements. The measurement and pause times can be set for the cyclic measurements. The single measurements can be started manually or by remote control. The compact PiC 1500 Particle Monitor is normally connected to the fluid circuit via two MINIMESS® connections. The flow direction can be freely selected. The volume flow rate can be regulated between 50 and 400 ml/min by means of 3 separately available orifices. The flow rate can be read off at the display of the sensor. The particle monitor can be used as a stand-alone sensor or as a permanently installed detector for monitoring a machine or system. The PiC 1500 can be easily installed to suit the operating situation thanks to the different mounting points and the pivoting display.

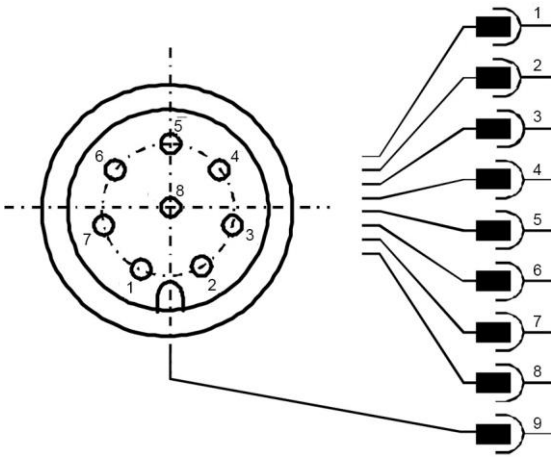
An 8-pin M12 plug is provided on the PiC 1500 for the electrical connection and communication. A selected cleanliness class can be transmitted continuously or all the cleanliness classes sequentially thanks to the integrated power outlet port (4 to 20 mA). The electric alarm contact allows external units to be activated if the fluid infringes set limits. Via the serial interface it is possible to upload the data from the memory of the PiC 1500 or to transmit commands via the RS 232 interface or the CANopen protocol. The Count&Log 1500 software included in the scope of supply allows the particle monitor to be controlled and monitored online from notebook or PC and the measurement values to be read out from the internal memory. The recorded data can be evaluated and presented in various forms, e.g. as tables and curves.

5. Dimensions



*1 = 4x mounting points M5x5.5
*2 = Vent opening with pressure balance element (fixed from the inside)
*3 = 2x G¼, Minimess M16x2
*4 = 2x mounting points M6x8

6. Electrical connections



Pin	Assignment	Standard cable colour
1	L+	white
2	L-	brown
3	TxD, CANL	green
4	RxD, CANH	yellow
5	Digital input	grey
6	IOut1	pink
7	Open collector alarm out	blue
8	SGND	red
9	Housing/screen	-

7. Order numbers and scope of supply

7.1 Scope of supply PiC 1500 Particle Monitor	
Designation	**Order number**
Particle Monitor, power pack, calibration protocol, Count&Log 1500 software (on CD-ROM), operating manual	70560658

7.2 Description of the software

- Operation of the PiC 1500 Particle Monitor via PC or laptop computer
- Presentation of the current measurement values to ISO 4406: 1999 and SAE AS 4059 E on the notebook/PC
- Readout of the internal memory and creation of a data backup on PC/laptop
- Readout of the internal memory and creation of a data backup on PC/laptop
- Printout of measurement protocols
- Clear presentation of the technical parameters of the laser, measurement cell and volumetric flow rate

7.3 Options/accessories/spare parts

Designation	Description	Order number
Power pack	AC/DC adapter, input 100~240 VAC, output 24 VDC, 625mA, IP41	70570292
Measurement cable	Measurement cable L = 5 m, M12 jack - open end 8-pin	70570294
USB/Can adapter cable	CAN/USB adapter, 8-pin M12 jack - USB Type A	70573094
Y adapter	Distributor 3 connections M12 - 8-pin jack - jack - plug	70573114
0.18 orifice	Minimess screw-in coupling 1620 - G1/4" NBR with orifice diameter 0.18 for reducing the volume flow	70570295
0.22 orifice	Minimess screw-in coupling 1620 - G1/4" NBR with orifice diameter 0.22 for reducing the volume flow	70570296
0.30 orifice	Minimess screw-in coupling 1620 - G1/4" NBR with orifice diameter 0.30 for reducing the volume flow	70570297

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Portable Particle Counter
PiC 9300

max. nominal pressure 315 bar (4480 psi)

1. Features

- Rugged portable unit for quick and simple particle analysis on site
- Simple menu-driven operation via touch screen
- Laser sensor with for exact and reproducible results
- Demountable tank for the measured fluid with overflow safety device
- Suitable for suction side- and pressure side operation
- Integrated suction pump patented double pump system, viscosity and pressure independent flow control
- Prior to each measurement automatic flushing of the gauge head
- Long term measurements
- Adjustable measuring mode (single and cyclic measurements)
- Manual flush valve for quick internal hose flushing
- Calibration according to ISO 11171: 1999 (NIST)
- Analysis according to ISO 4406: 1999
- Measuring range 4 µm(c), 6 µm(c), 14 µm(c)
- Analysis according to SAE AS 4059
- Measuring range 4 µm(c) – 70 µm(c) in 6 channels
- Analysis according to NAS 1638
- Indication of the absolute numbers of particles in all channels
- Timer
- Definable measuring series
- USB and serial interface for further data processing via PC
- Integrated large printer (114 mm) for printing of clearly presented measuring data
- With evaluation software for PC

2. Technical specifications

Pressure connection:	Measuring connection M16, max. 315 bar (Minimess)
Suction connection:	Screw connection 6 L, max. 10 bar (140 psi)
Return line:	Screw connection 6 L
Pressure fluctuation:	permissible
Medium:	hydraulic fluids, fuels, water precondition of no second phase
Seals:	FKM, optinally FFKM
Viscosity range:	max. 500 mm², on suction side max. 68 mm²/s
Temperature range ambience:	0 to +50 °C
Temperature range fluid:	0 to 80 °C
Sensor flow rate:	30 ml/min
Flushing volume flow:	30 ml/min
Measuring volume:	10 to 100 ml, adjustable (10 ml steps)
Volume prior to counting:	10 to 100 ml, adjustable in (10 ml steps)
Counting time:	30 s
Cycling time:	1 to 99 min
Sensor:	Laser diode sensor
Tank volume:	1 l
Indication acc. SAE AS 4059:	>4/>6/>14/>21/>38/>70 µm(c)
Measuring range acc. SAE classes:	000 to 12
Indication acc. ISO 4406: 1999	>4/>6/>14 µm(c)
Measuring range ISO classes:	1 to 24
Indication acc. NAS 1638	2-5/5-15/25-50/50-100 µm
Indication NAS class	1 to 12
Calibration:	acc. ISO 11171: 1999
Power supply:	100 to 230 VAC; 50/60 Hz; or integrated accumulator
Dimensions:	320x450x300 mm (HxWxD)
Weight:	approx. 12 kg

Subject to technical alteration without prior notice.

3. Technical manual

The portable particle counter PiC 9300 consists of a sensor with pump/volume regulation unit and tank with overflow safety device. The counted results are displayed on a touch screen monitor and can be printed with the integrated thermal printer. Thanks to the strengthened polyamide plastic moulding material, the housing has an optimal compatibility against all common pressure fluids. The electrical connections are placed at the backside of the unit and are therefore properly protected. For the electrical connecting cable, accumulator and hoses is a separate compartment available. Due to the removable cover is an optimal access to all control elements, a safe storage and transport ensured. For data transfer to a PC is an USB and a serial interface available. Also, it is possible to store the data via a second USB interface in an Excel compatible format. Monitoring available in languages German, English and French.

4. Order numbers and scope of supply

4.1 Scope of supply	
Designation	**Order number**
PiC 9300 VP Particle counter with power pack, external mains charger, Measuring and analysing Software "Log and Show" Seals in FKM	72443213
PiC 9300 FFKM VP Particle counter with power pack, external mains charger, Measuring and analysing Software "Log and Show" Seals in in FFKM	70529640

4.2 Software description

- Reading out of measurement values from PiC 9300
- Monitoring of measurement values in schedule or graphic, time profile monitoring
- Monitoring selection acc. ISO 4406 (1999) or SAE AS 4059
- Indication of the absolute numbers of particles in all channels
- Data saving, commantary and printer control
- Remote control function of PiC 9300 and adjusting of all parameters
- Export of values to spreadsheet programs (e.g. Excel)
- PC configuration: Pentium processor, USB or COM-interface

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Fluid sampling - and adapter kit for PiC 9100 and PiC 9300

1.Features

The fluid sampling kit enables the correct sampling of fluids from a hydraulic system for subsequent analysis in a laboratory.
The kit contains glas-sampling bottles cleaned according DIN-ISO 5884 and the necessary accessories for taking a correct fluid sample.
Furthermore the kit contains all important adapters to connect the contamination measurement devices PiC 9100 or PiC 9300 to a hydraulic system.

- Sampling of hydraulic fluids by means of measurement connections M16x2 (Minimess)
- Sampling on all Filtration Group inline filters by means of screw-in adaptors into the maintenance indicator cavity.
- Sampling of fluid before and after the filter element
- Sampling from hydraulic tanks by means of a vacuum hand pump
- Adapters to connect the contamination measurement device PiC 9100 and PiC 9300 to Filtration Group inline filters and measurement connections
  M16x2 (Minimess)

Type	Order number
Fluid sampling and adapter kit, complete	79392994
Spare sampling bottles, cleaned, break-proof packed (5 pcs)	77875065

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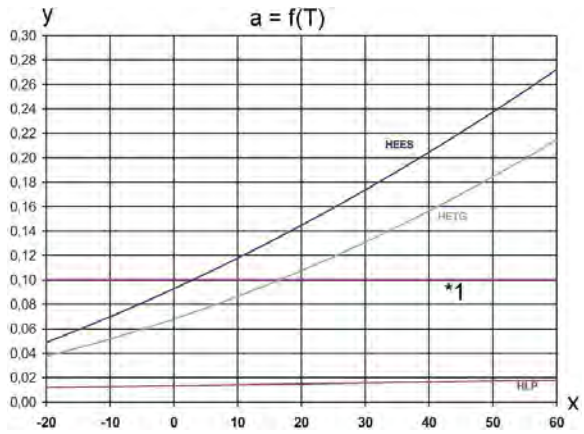
Turbidity Sensor
PiT 400

1. Description

The Filtration Group Turbidity Sensor PiT 400 was developed to reliably identify turbidity in hydraulic fluids.
Ingress of water into the hydraulic system causes turbidity in the hydraulic fluid:
Water in hydraulic fluids can harm the function of the entire system and reduce the life span of the pressure fluid and the system´s components.
Turbidity in the fluid is quickly recognised by the sensor, so that precautionary measures can be taken before a failure of the system occurs. Therefore the sensor offers great security for the entire system. The sensor should be installed in all fluid systems that are at risk of being contaminated by water, e.g. by defect coolers, broken seals or condensed water.
The sensor should preferably be installed in the return line, the tank or the bypassing oil cooling. It can be easily calibrated to the normal condition of the fluid by the push of a button.
The sensor measures the reduction of emitted IR-light caused by turbidity.
The range of applications covers all HLP-, HEES- and HETG - fluids.

2. Water solubility



Water solubility of different hydraulic fluids determined by the temperature.

*1 VDMA-threshold

x = temperature T [°C]
y = water content [%]

4. Specifications

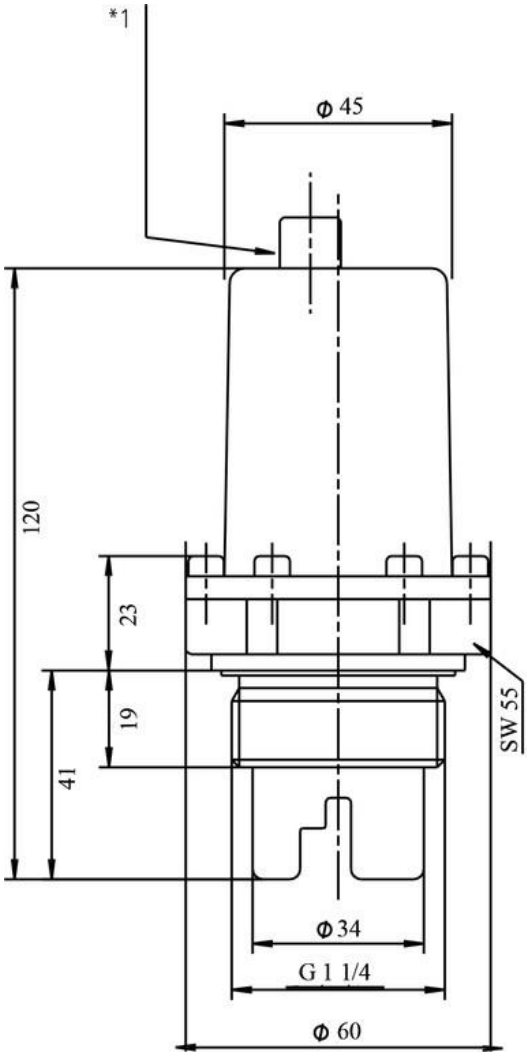
Materials:	CuZn, PA
Type of protection:	IP 65
Connection:	G 1¼
Nominal pressure:	10 bar
Operating temperature:	-25 °C to 85 °C
Signal supression:	< 0 °C
Connection plug:	M12x1plug, 4pole
Power supply:	24 V DC 20 %
Switching outlet:	PNP, 200 mA
Signal delay:	60 s

5. Order number

Type number	Order number
PiT 400	76322598

Subject to technical alteration without prior notice.

3. Dimensions



*1 M12x1 plug, 4 pole

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Coalescer Filter
PiW 1975

1. Description

The Coalescer filter has been specially designed to separate water from hydraulic fluids.

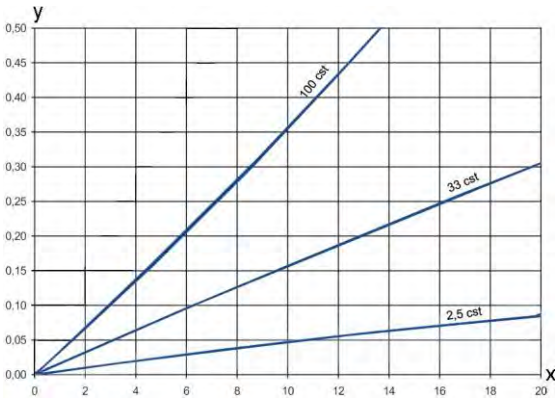
According to VDMA standard sheet 24568, the amount of water in HE pressure fluids has to be kept below 1000 ppm (0.1 %). HLP fluids should not contain any free water at all. Free water always causes turbidity which can be seen by the human eye. Physically, turbidity is a two-phase mixture (emulsion) in which small droplets of water are present in the pressure fluid. For this reason, it is advisable to carry out a mechanical separation of these water droplets; this technique is based on the coalescer - principle. The droplets are collected in various layers and brought together into larger units. The water drops thus formed are several milimetres in diameter.

After leaving the coalescer layer, the drops come in contact with a special hydrophobic fabric, where the separation from the pressure fluid takes place. The water is removed from the circuit by means of sedimentation. It is important that a certain differential pressure is not exceeded during the process. The viscosity also needs to be taken into account to ensure proper operation. The maximum viscosity for effective water separation is approx. 68 mm²/s. The coalescer works best if the pressure fluids contain a minimal amount of emulsifying additives. The bottom line: in systems that are frequently at risk for water ingression, expensive special oils can be replaced by simple, cost-effective pressure fluids.

Characteristics:

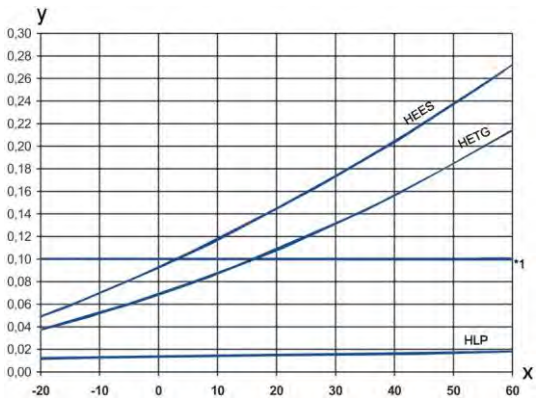
- Mechanical separation of water droplets - coalescer principle
- Water removing by means of sedimentation
- Expensive special oils can be replaced by simple, cost-effective pressure fluids
- Worldwide distribution

2. Flow rate



y = differential pressure in bar
x = flow rate in l/min

3. Water solubility



X = temperature [°C]
y = water solubility (%)

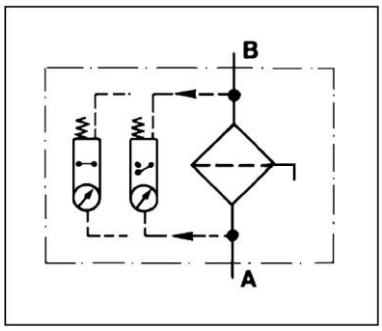
1* VDMA-threshold

4. Quality assurance

Filtration Group filters and filter elements are produced according to the following international standards:

Norm	Designation
DIN ISO 2941	Hydraulic fluid power filter elements; verification of collapse/burst resistance
DIN ISO 2942	Hydraulic fluid power filter elements; verification of fabrication integrity
DIN ISO 2943	Hydraulic fluid power filter elements; verification of material compatibility with fluids
DIN ISO 3723	Hydraulic fluid power filter elements; method for end load test
DIN ISO 3724	Hydraulic fluid power filter elements; verification of flow fatigue characteristics
ISO 3968	Hydraulic fluid power filters; evaluation of pressure drop versus flow characteristics
ISO 10771.1	Fatigue pressure testing of metal containing envelopes in hydraulic fluid applications
ISO 16889	Hydraulic fluid power filters; multipass method for evaluation filtration performance of a filter element

5. Symbols



6. Order number

Housing Design	Spare parts
complete with visual/electrical indicator, demister and coalescer element Type: PiW 1975/E-Coalescer Order number: 76334031	Type: 853 275 Coalescer Order number: 76345300

7. Technical specifications

Design:	line mounting filter
Nominal pressure:	6 bar (90 psi)
Test pressure:	8 bar (110 psi)
Temperature range:	-10 °C to +80 °C
	(other temperature ranges on request)
Filter housing material:	St
Sealing material:	NBR/Cu
Maintenance indicator setting:	Δp 1.2 bar ± 0.2 bar
Electrical data of maintenance indicator:	
Maximum voltage:	250 V AC/200 V DC
Maximum current:	1 A
Contact load:	70 W
Type of protection:	IP 65 in inserted and secured status
Contact:	normally open/closed
Cable sleave:	M 20 x 1.5

The switching function can be changed by turning the electric upper part by 180° (normally closed contact or normally open contact). The state on delivery is a normally closed contact. By inductivity in the direct current circuit the use of suitable protection circuit should be considered. Further maintenance indicator details and designs are available in the maintenance indicator data sheet.

We draw attention to the fact that all values indicated are average values which do not always occur in specific cases of application. Our products are continually being further developed. Values, dimensions and weights can change as a result of this. Our specialized department will be pleased to offer you advice.

We recommend you to contact us concerning applications of our filters in areas governed by the EU Directive 94/9 EC (ATEX 95). The standard version can be used for liquids based on mineral oil (corresponding to the fluids in Group 2 of Directive 97/23 EC Article 9). If you consider to use other fluids please contact us for additional support.

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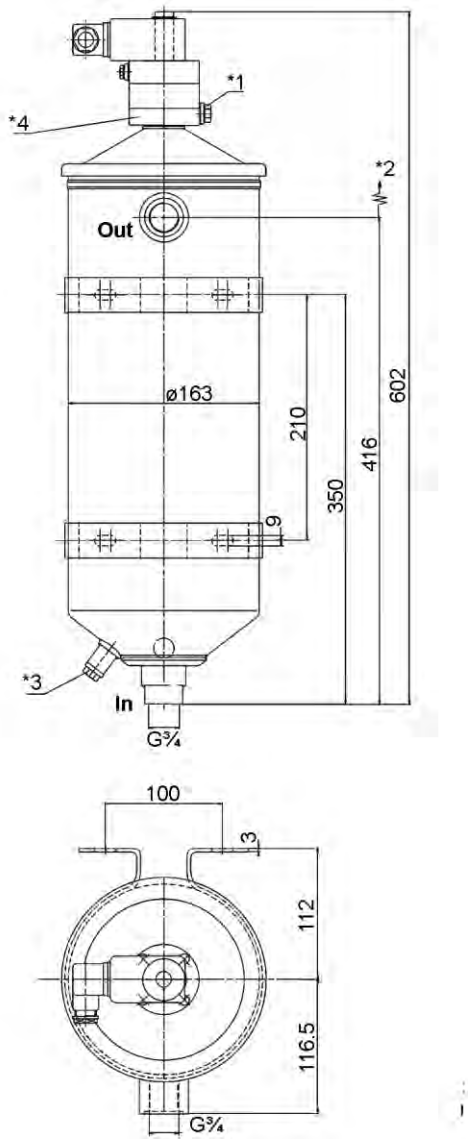


In = Inlet
Out = Outlet
*1 vent screw
*2 extension degree 400
*3 drain screw G½ drawn 90° shifted
*4 SW 36 for filter maintenance

Weight 8 kg

8. Installation, operating and maintenance instructions

8.1 Filter installation

When installing filter make sure that sufficient space is available to remove filter element.
Install filter vertical so that the separated water can flow down and can be discharged.

8.2 Connecting the electrical maintenance indicator

The electrical indicator is connected via a 2-pole appliance plug according to DIN EN 175301-803, with poles marked 1 and 2. The electrical section can be inverted to change from normally open to normally closed position and vice versa.

8.3 Operating instruction

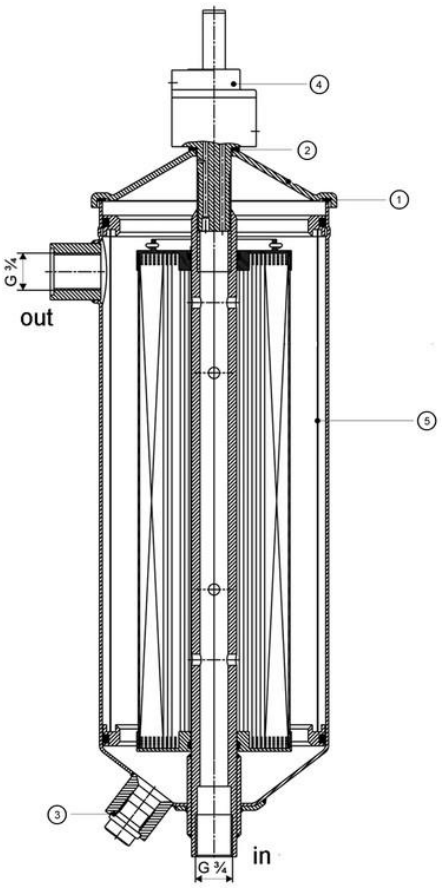
The max. viscosity for an effective water separation should not exceed 68 mm²/s. The coalescer should run with a differential pressure of approx. 0.3 bar, that means that the volumetic flow is determined by the viscosity of the oil. To prevent premature contamination of the coalescer, a protective filter with a retension rate of $\beta_{7(C)} \geq 200$ should be installed before the coalescer, because the coalescer element is so fine and therefore very sensitive to dirt. In order to recognise the separated water, a transparent water-detection device with a tap should be mounted to the cone of the filter housing.

8.4 When does the coalescer element need to be replaced?

A differential pressure indicator with a switching level of Δp 1.2 bar is mounted at the top of the filter housing. As already mentioned above, the filter should run at Δp of approx. 0.3 bar. During cold starts, the indicator may give a warning signal. Press the red button of the visual indicator once again only after operating temperature has been reached. If the red button immediately pops up again and/or the electrical signal has not switched off after reaching operating temperature, the coalescer must be replaced after the end of the shift.
Remark: Please note permissible operating pressure of the housing.

8.5 Replacing the coalescer element

Before an element can be replaced, the entire system needs to be shut down and the filter released from the pressure. Use the water tap to empty the housing. The differential pressure indicator (1) also serves as a cover screw which needs to be removed to take off the cover (2). Remove the coalescer element (3) from the housing. The separator only needs to be replaced, if it is damaged.
Push a new coalescer element over the centre pipe in the housing. Check seals in the lid-cover for possible damages, replace if necessary.
Place the top cover back on top of the housing and tighten it together with the differential pressure indicator.
Close the water tap.
The venting of the filter will be accomplished by the vent screw on the Δp indicator. Please unscrew the vent screw 1-2 turn until fluid emerge. Tight vent screw.



9. Spare parts list

Order number for spare parts		
Pos.	**Type**	**Order number**
① - ③	Seal kit for housing	
	NBR	76375364
④	Maintenance indicator	
	Visual PiS 3503/1,2	76375372
	Electrical PiS 3304/1,2	76375380
	Electrical upper section only	77536550
	Seal kit for maintenance indicator	
	NBR	78389280
⑤	Demister	76333876

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Coalescer Filter
PiW 2175

1. Features

The Coalescer filter has been specially designed to separate water from hydraulic fluids, diesel and marine diesel oil.

According to VDMA standard sheet 24568, the amount of water in HE pressure fluids has to be kept below 1000 ppm (0.1 %). HLP fluids should not contain any free water at all. Free water always causes turbidity which can be seen by the human eye. Physically, turbidity is a two-phase mixture (emulsion) in which small droplets of water are present in the pressure fluid. For this reason, it is advisable to carry out a mechanical separation of these water droplets; this technique is based on the coalescer - principle. The droplets are collected in various layers and brought together into larger units. The water drops thus formed are several milimetres in diameter.

After leaving the coalescer layer, the drops come in contact with a special hydrophobic fabric, where the separation from the pressure fluid takes place. The water is removed from the circuit by means of sedimentation. It is important that a certain differential pressure is not exceeded during the process. The viscosity also needs to be taken into account to ensure proper operation. The maximum viscosity for effective water separation is approx. 68 mm²/s. The coalescer works best if the pressure fluids contain a minimal amount of emulsifying additives. The bottom line: in systems that are frequently at risk for water ingression, expensive special oils can be replaced by simple, cost-effective pressure fluids.

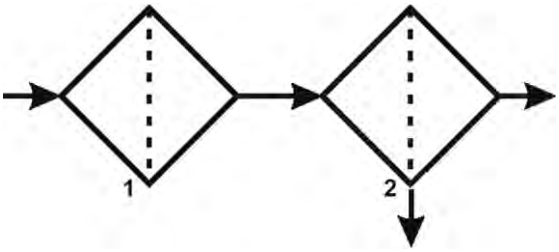
Characteristics:

- Mechanical separation of water droplets - coalescer principle
- Water removing by means of sedimentation
- Expensive special oils can be replaced by simple, cost-effective pressure fluids
- Worldwide distribution

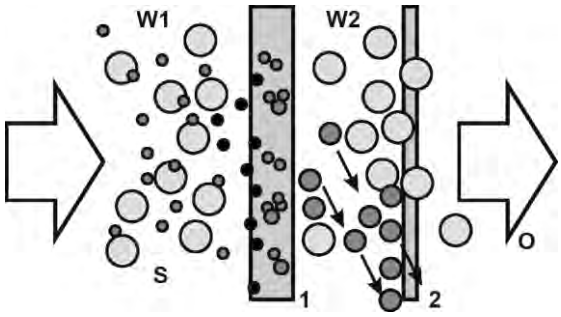
2. Functional description

2.1 Principle of the process

Liquid flows through the coalescer element. Minute water droplets "coalesce" there to form larger drops and any impurities are retained. These large drops then sink to the bottom and are guided to the water drain by a hydrophobic cloth.

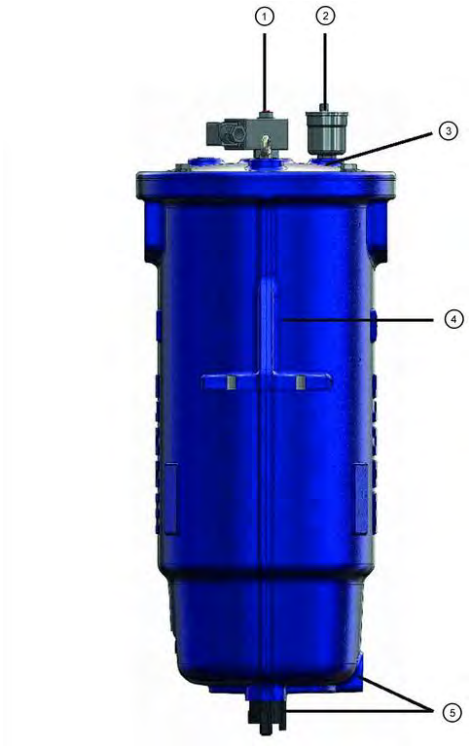


1 = Coalescer
2 = Droplet separator



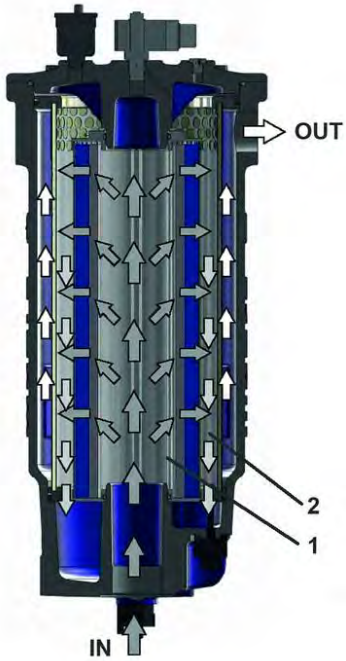
W1 = little droplets
W2 = large droplets
1 = Coalescer
2 = Droplet separator
O = Öl

2.2 Main components



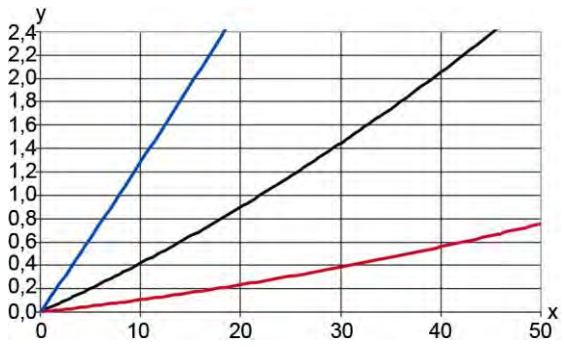
① Maintenance indicator
② Vent screw / air release valve (optional)
③ Cover
④ Housing
⑤ 2 water level sensors

2.3 Functional description



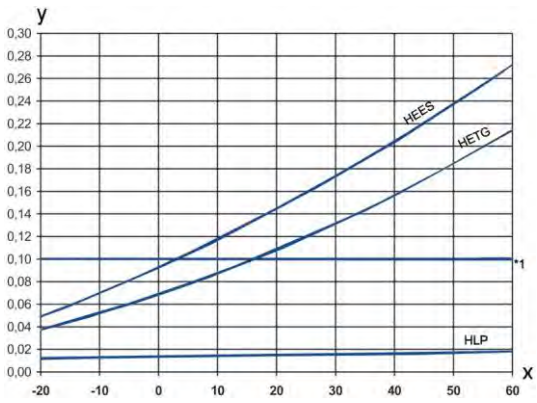
- Dirty liquid flows into the housing (IN).
- The water droplets coalesce to form larger drops and any impurities are retained by the coalescer element (depth filter).
- Water is separated by the hydrophobic cloth and collects in a reservoir at the bottom of the filter housing.
- Clean liquid flows through the outlet (OUT).

3. Flow rate



y = differential pressure in bar
x = flow rate in l/min

4. Water solubility



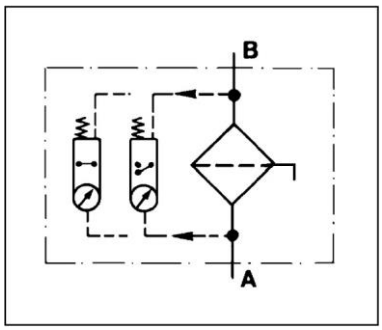
x = temperature in °C
y = water solubility (%)
*1 VDMA-threshold

5. Quality assurance

Filtration Group filters and filter elements are produced according to the following international standards:

Norm	Designation
DIN ISO 2941	Hydraulic fluid power filter elements; verification of collapse/burst resistance
DIN ISO 2942	Hydraulic fluid power filter elements; verification of fabrication integrity
DIN ISO 2943	Hydraulic fluid power filter elements; verification of material compatibility with fluids
DIN ISO 3723	Hydraulic fluid power filter elements; method for end load test
DIN ISO 3724	Hydraulic fluid power filter elements; verification of flow fatigue characteristics
ISO 3968	Hydraulic fluid power filters; evaluation of pressure drop versus flow characteristics
ISO 10771.1	Fatigue pressure testing of metal containing envelopes in hydraulic fluid applications
ISO 16889	Hydraulic fluid power filters; multipass method for evaluation filtration performance of a filter element

6. Symbol



7. Order numbers

Example for ordering filters:

1. Filter housing	2. Filter element
complete with visual/electrical maintenance indicator, droplet separator and coalescer element Type: PiW 2175 Order number: 72356609	 Type: KE 2629 E1 COA Order number: 76361281

8. Technical specifications

Design:	in-line filter
Nominal pressure:	16 bar (230 psi)
Test pressure:	24 bar (340 psi)
Temperature range:	+5 °C to +90 °C
	(other temperature ranges on request)
Filter housing material:	nodular cast iron
Sealing material:	NBR
Water collection chamber:	approx. 2 l
Maintenance indicator setting:	Δ p 2.2 bar ± 0,2 bar
Electrical data of maintenance indicator:	
Max. voltage:	250 V AC/200 V DC
Max. current:	1 A
Contact load:	70 W
Type of protection:	IP 65 in inserted and secured status
Contact:	normally open/closed
Cable sleave:	M20x1.5

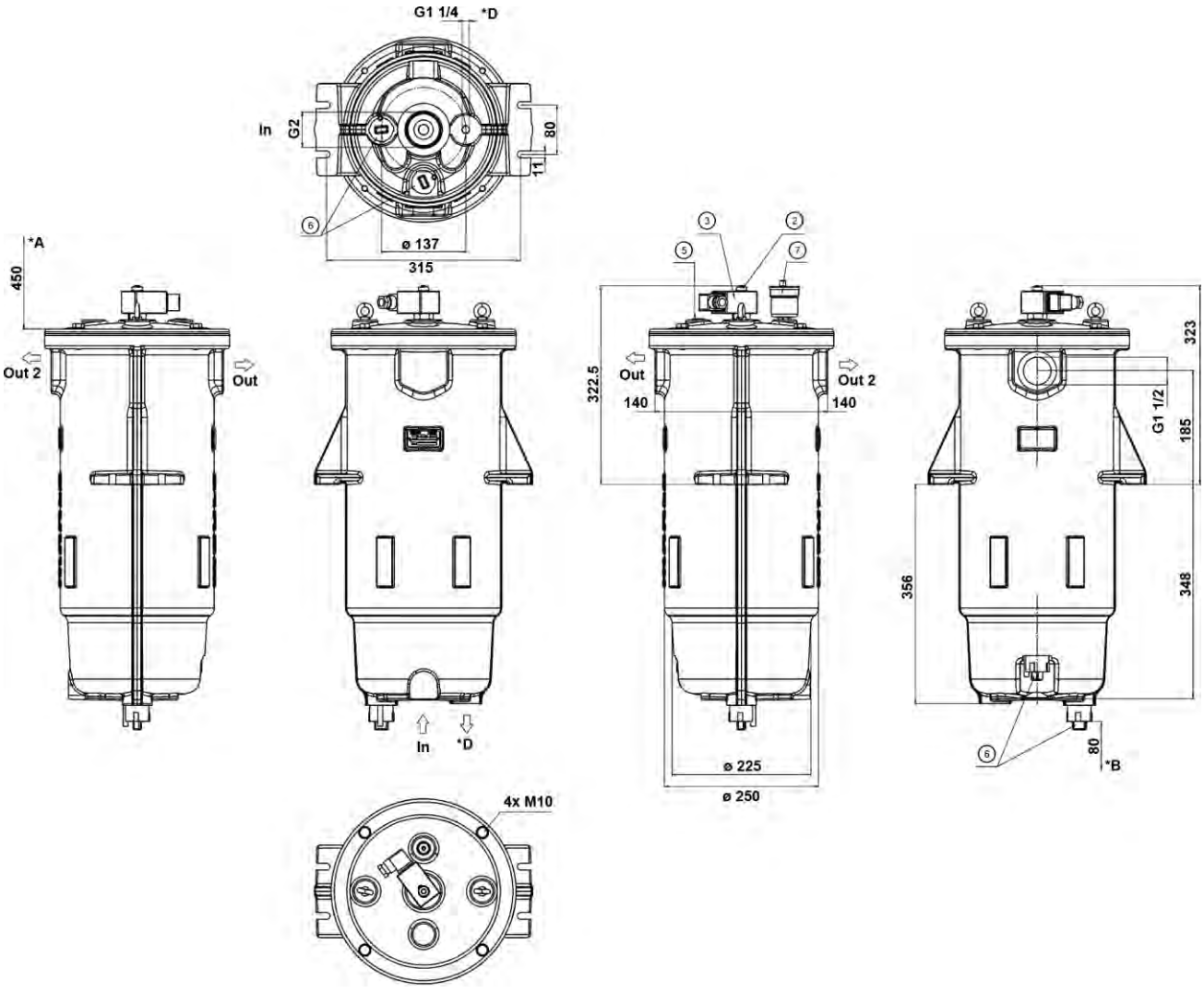
The switching function can be changed by turning the electric upper part by 180° (normally closed contact or normally open contact). The state on delivery is a normally closed contact. By inductivity in the direct current circuit the use of suitable protection circuit should be considered. Further maintenance indicator details and designs are available in the maintenance indicator data sheet.

We draw attention to the fact that all values indicated are average values and do not always occur in specific cases of application. Our products are continually being further developed. Values, dimensions and weights can change as a result of this. Our specialized department will be pleased to offer you advice.

We recommend you to contact us concerning applications of our filters in areas governed by the EU Directive 94/9 EC (ATEX 95). The standard version can be used for liquids based on mineral oil (corresponding to the fluids in Group 2 of Directive 97/23 EC Article 9). If you consider to use other fluids please contact us for additional spport.

Subject to technical alteration without prior notice.

9. Dimensions



9.1 Caption for dimensions

In	Inlet	②	Maintenance indicator visual
Out	Outlet	③	Maintenance indicator electrical upper section
Out 2	Outlet optional	⑤	Vent screw (30 Nm)
*A	Clearance required for filter element	⑥	Water level sensors
*B	Clearance required for wires	⑦	Air release valve optional
*D	Water drain		

10. Installation, operating and maintenance instructions

10.1 Filter installation

When installing the filter make sure that sufficient space is available to remove filter element and filter housing. Install filter vertical so that the separated water can flow down and can be discharged.

10.2 Connecting the electrical maintenance indicator

The electrical indicator is connected via a 2-pole appliance plug according to DIN EN 175301-803 with poles marked 1 and 2. The electrical section can be inverted to change from normally open position to normally closed position or vice versa.

10.3 Operating instruction

The max. viscosity for an effective water separation should not exceed 68 mm²/s. The coalescer should run with a differential pressure of approx. 0.3 bar, that means that the volumetic flow is determined by the viscosity of the oil. The separated water will be collected in the PiW 2175 (max. 2 l). The Water can be discharged automatically by using the water level sensor. In order to recognize the separated water, a transparent water-detection device with a tap or so called warning indicator should be mounted.

Remark: Please note permissible operating pressure of the housing.

10.4 When should the coalescer element be replaced?

A differential pressure indicator with a switching level of Δp 2.2 bar is mounted at the top of the filter housing. During cold starts, the indicator may give a warning signal. Press the red button of the visual indicator once again only after operating temperature has been reached. If the red button immediately pops up again and/or the electrical signal has not switched off after reaching operating temperature, the coalescer must be replaced after the end of the shift.

As already mentioned above, the filter should run at Δp of approx. 0.3 bar. The flow rate/pressure drop curves show the flow rates according to the viscosity. If the indicator may give a warning signal, the coalescer element have to be changed.

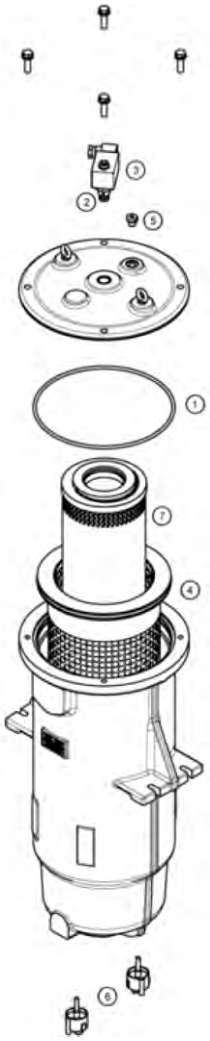
10.5 Element replacement

Stop system and relieve filter from pressure. Use the water tap to empty the housing. Unscrew the cover and change the coalescer element. Check seals in the lid-cover for possible damages, replace if necessary. Place the top cover back on top of the housing and tighten it. Close the water tap.

The venting occures by a venting screw. Tighten the venting screw when the fluid flows out of the venting bore.

11. Spare parts list

Order numbers of spare parts		
Posi-tion	**Type**	**Order number**
① ② ⑤	Seal kit for filter housing incl. visual maintenance indicator and venting screw	72348122
	Maintenance indicator	
③	Electrical PiS 3092/2.2	77669856
	Electrical upper section only	77536550
④	Droplet separator	72356964
⑥	Water level sensor	72348133
⑦	Coalescer element	76361281



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72356396.06/2019

Air Filter Systems
Series 7000

Nominal volume flow 4.5 to 12 m³/min

1. Features

High performance air filter series for tractors, commercial vehicles, construction machines and compressors

- Flexible mounting possibilities due to the snap fasteners
- Flexible bracket concept
- Support rings for dirt and clean air connection optional
- Minimal strength required due to the radial sealing of the element
- Small dimensions for simple, easy maintenance
- Filter housing consist of reinforced polypropylene
- Pre separation due to the tangential arrangement of the air inlet nozzle
- Non-metallic eco-air filter element
- Safety element for difficult operation conditions
- Worldwide distribution

2. Rating criteria for air filters

Separation grade

The separation grade defines the particle retention ability of the air filter. The higher the separation grade, the better the engine is protected from wear.
The overall separation grade indicates the ratio of all particles filtered out by the filter to all particles sucked in by the filter.
FGC dry air filters reach the following overall separation grades using standardised test dusts SAE coarse and SAE fine:

SAE coarse	≥ 99.9 %
SAE fine	≥ 99.5 %

Filter size

The filter size is determined by the air requirement of the engine or compressor. This is usually stated by the manufacturer.

For suction engines, the air requirement can be calculated from the engine data as follows:

$V = V_H * n_{nenn} * \lambda / a * 1000$

V	Engine air requirement in m³/min
V_H	Capacity in l
n_{nenn}	Nominal speed in rpm
λ	Filling degree 0.9 for 4-stroke engines 0.7 for 2-stroke engines
a	2 for 4-stroke engines 1 for 2-stroke engines

When selecting the filter size, in engines with 1 to 4 cylinders it is also important to take account of the changing flow speeds with pulsation factor:

	Pulsation factor	
No. of cylinders	**4-stroke engine**	**2-stroke engine**
1	2.0	1.5
2	1.4	1.2
3	1.3	1.1
4	1.1	1.0
5 and more	1.0	1.0

Resulting in:

Rated air flow = V ⋆ p

V	Engine air requirement in m³/min
p	Pulsation factor

The filter size should be selected so that the rated size is the same as or larger than the rated air flow.
For diesel engines, the air requirement can be approximately estimated as follows:

Suction engines:	approx. 0.08 m³/min per 1 kW
Supercharged engines:	approx. 0.09 m³/min per 1 kW

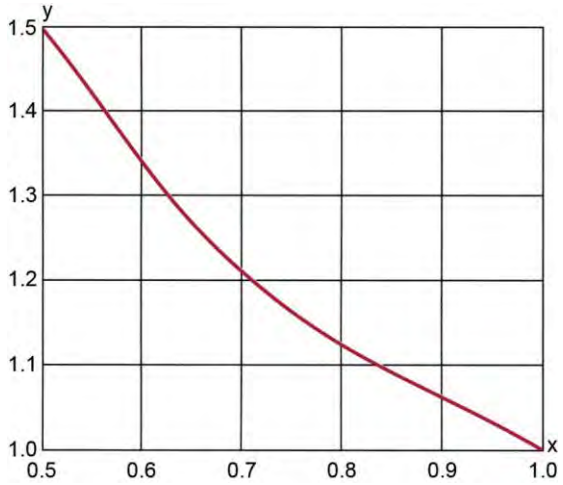
Service life

The service life of an air filter is defined by the dust absorption capacity of the air filter until a maximum flow resistance Δp_{max}, is reached, as indicated by the engine or machine manufacturer. As a rule, this is between 50 and 60 mbar.
In order to achieve maximum dust capacity, knobs are pressed into the filter paper to keep the paper folds at the correct distance (filter pockets).

Laboratory dust capacity

The laboratory dust capacity at nominal air flow is ascertained on the test stand. A defined quantity of the test dust SAE-coarse is continuously added to the sucked in air. The increase in differential pressure is then evaluated depending on the dust quantity sucked in by the filter.
Any air quantities which differ from the nominal air flow are catered to using a correction factor. If the actual air requirement is lower than the nominal air flow through the defined filter, the dust capacity increases on account of the lower filter load. The filter load is the ratio between air requirement and filter nominal flow. However, from about half the nominal air flow, the pre-filtration function integrated in the filter is no longer fully effective. In this case, the next smaller filter size should be selected.

Correction curve



x = Filter load
y = Correction factor

Filter load = Air requirement / Nominal air flow

Dust levels in the air in practice

The filter service life in operating hours or mileage can be estimated on the basis of the laboratory dust capacity ascertained on the test stand, together with the dust concentrations in practical operating conditions.

The following table provides a guide line for dust concentrations in practical conditions:

Dust concentration [g/m³]	Location
... 0.001	Motorways, top class roads
0.001 - 0.003	Normal European road traffic, stationary machines in low-dust rooms
0.003 - 0.015	Neglected country roads, trucks on building sites, tractors in Central Europe, stationary machines at open air
0.010 - 0.050	Visible clouding of the air, field work on dry ground, individual travel on unpaved field tracks
0.050 - 0.200	Column travel on unpaved field tracks, stationary machines in very dusty conditions (quarries, threshing work)

The laboratory dust capacity can be converted into operating hours using the following formula:

Operating hours = Laboratory dust capacity / Dust concentration * Air requirement * 60

Laboratory dust capacity in g
Dust concentration in g/m³
Air requirement in m³/min

Calculation example

The following data are known:

Vehicle:	agricultural tractor
Engine:	4-stroke diesel engine
Capacity:	4.15 l
Cylinders:	4
Nominal speed:	4800 rpm
Max. tol. Δ p	60 mbar

Air requirement:

V = 4.15 * 4800 * 0.9 / 2 * 1000 = 8.96 m³/min

Rated air flow:

The rated air flow works with a pulsation factor of 1.1.

V = 8.96 * 1.1 = 9.86 m³/min

Filter size:

Always select the next largest filter size, i.e. a filter with nominal size 12. Safety elements are recommended for agricultural tractors.

Our suggestion: LPO 7120S/2

Laboratory dust capacity:

Indicated in the laboratory dust capacity diagram and correction curve.

Flow resistance for a new filter for 9.86 m³/min (see page 2) Δ p = 17 mbar.
This produces a flow resistance increase of 43 mbar up to the max. tolerable flow resistance of 60 mbar.
A filter nominal load of 12 m³/min results in a laboratory dust capacity of 5900 g (see page 2).

The filter load is calculated from:

Air requirement / Nominal air flow = 8.96 / 12 = 0.75

The correction curve indicates a correction factor of 1.16 for filter load 0.75.
A filter requirement of 8.96 m³/min results in a laboratory dust capacity of 5900 g * 1.16 = 6844 g

Service life:

Based on a dust concentration of 0.02 g/m³ and laboratory dust capacity of 6844 g, the service life amounts to:

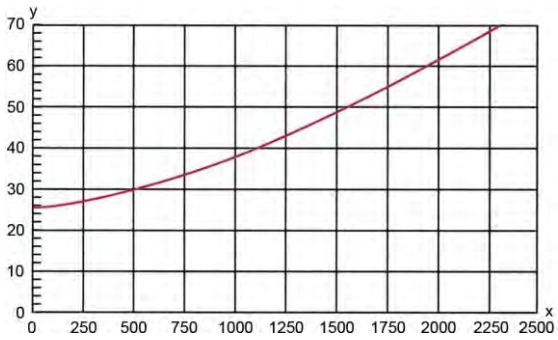
Operating hours = 6844 / 0.02 * 8.96 * 60 = 637 h

3.1 Performance features without safety element

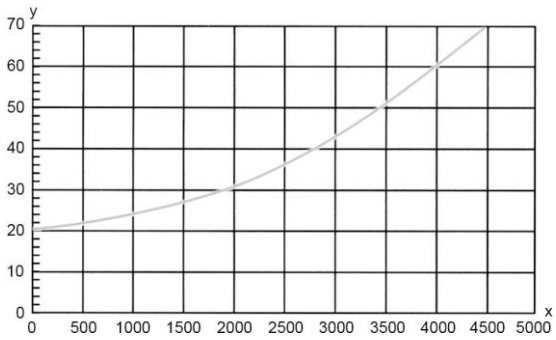
Flow resistance acc. to ISO 5011

x = Volume flow in m³/min
y = Pressure loss in mbar

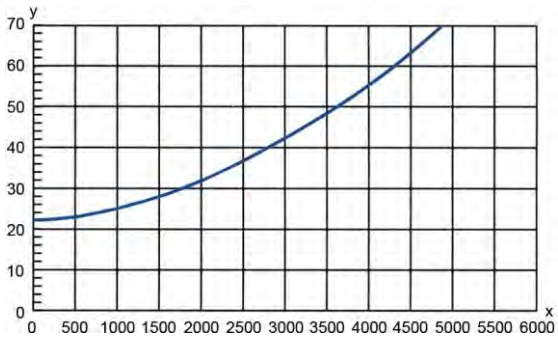
Dust absorption acc. to ISO-5011
Test dust: SAE coarse



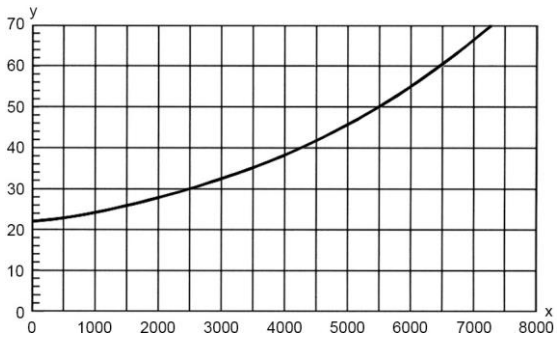
LPO 7045



LPO 7060



LPO 7080



LPO 7120

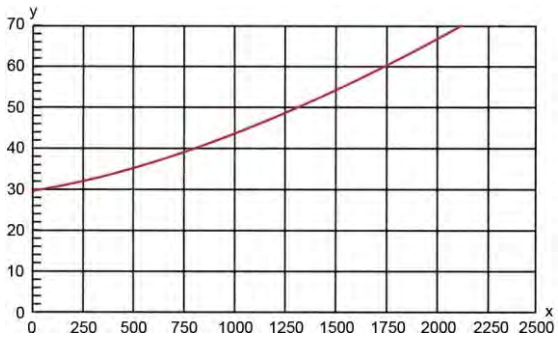
x = Dust absorption in g
y = Pressure loss in mbar

3.2 Performance features with safety element

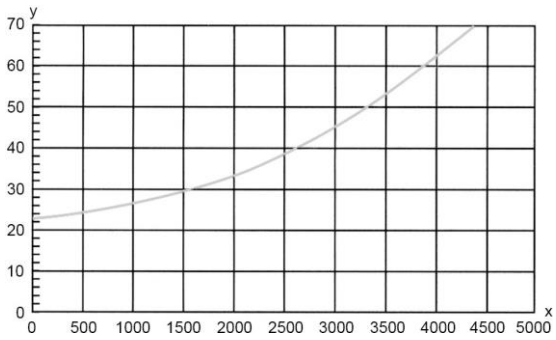
Flow resistance acc. to ISO 5011

x = Volume flow in m³/min
y = Pressure loss in mbar

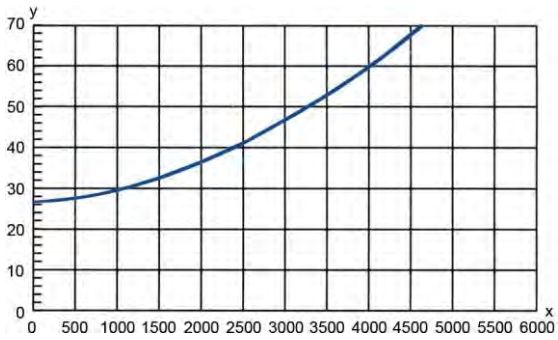
Dust absorption acc. to ISO-5011
Test dust: SAE coarse



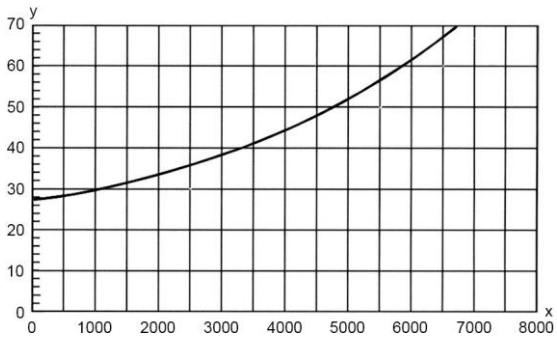
LPO 7045 S



LPO 7060 S



LPO 7080 S



LPO 7120 S

x = Dust absorption in g
y = Pressure loss in mbar

4. Order numbers

4.1 Complete filter					
Nominal size [m³/min]	**Order number**	**Type designation without safety element**	**Order number**	**Type designation with safety element**	**Figure**
4,5	79754920	LPO 7045/1	79754938	LPO 7045 S/1	1
	79754995	LPO 7045/2	79755000	LPO 7045 S/2	2
	79755059	LPO 7045/3	79755067	LPO 7045 S/3	3
6	79755117	LPO 7060/1	79755125	LPO 7060 S/1	1
	79755174	LPO 7060/2	79755182	LPO 7060 S/2	2
	79755232	LPO 7060/3	79755240	LPO 7060 S/3	3
8	79755299	LPO 7080/1	79755307	LPO 7080 S/1	1
	79755356	LPO 7080/2	79755364	LPO 7080 S/2	2
	79755414	LPO 7080/3	79755422	LPO 7080 S/3	3
12	79755471	LPO 7120/1	79755489	LPO 7120 S/1	1
	79755539	LPO 7120/2	79755547	LPO 7120 S/2	2
	79755596	LPO 7120/3	79755604	LPO 7120 S/3	3

Figures see chapter 6

4.2 Filter elements				
Nominal size [m³/min]	**Order number**	**Filter element**	**Order number**	**Safety element**
4,5	78796807	LX 7045	78796849	LXS 7045
6	78796815	LX 7060	78796856	LXS 7060
8	78796823	LX 7080	78796864	LXS 7080
12	78796831	LX 7120	78796872	LXS 7120

4.3 Brackets		
Nominal size [m³/min]	**Order number**	**Type designation**
4,5	78796880	LH 7045
6	78796898	LH 7060
8	78792020	LH 7080
12	78796906	LH 7120

4.4 Rain caps		
Nominal size [m³/min]	**Order number**	**Type designation**
4,5	79601162	LK 7045
6	79601170	LK 7060
8	79601188	LK 7080
12	79601196	LK 7120

4.5 Connection tubes		
Nominal size [m³/min]	**Order number**	**Type designation**
4,5	79601808	LVS 7045
6	79601816	LVS 7060
8	79601824	LVS 7080
12	79601832	LVS 7120

4.6 Elbows		
Nominal size [m³/min]	**Order number**	**Type designation**
4,5	79601840	LKR 7045
6	79601857	LKR 7060
8	79601865	LKR 7080
12	79601873	LKR 7120

4.7 Maintenance switch	
Order number	**Type designation**
79603101	LES 7250 ID

5. Technical specifications

Temperature range:	-40 °C to +80 °C (briefly to +100 °C) (with mounted maintenance switch -30 °C to +80 °C)
Filter housing material:	reinforced PP
Rain cap material:	PP
Bracket material:	fibreglass reinforced PA (console) steel (clamping strap)
Connection tube material:	TPO
Elbow material:	TPO
Maintenance switch setting:	
LES 7250 ID	50 mbar ± 3
Electrical data of maintenance switch LES 72.. ID:	
Contact load:	24 W
Type of protection:	IP65 in inserted and secured status
Contact:	normally open

Subject to technical alteration without prior notice!

6. Dimensions

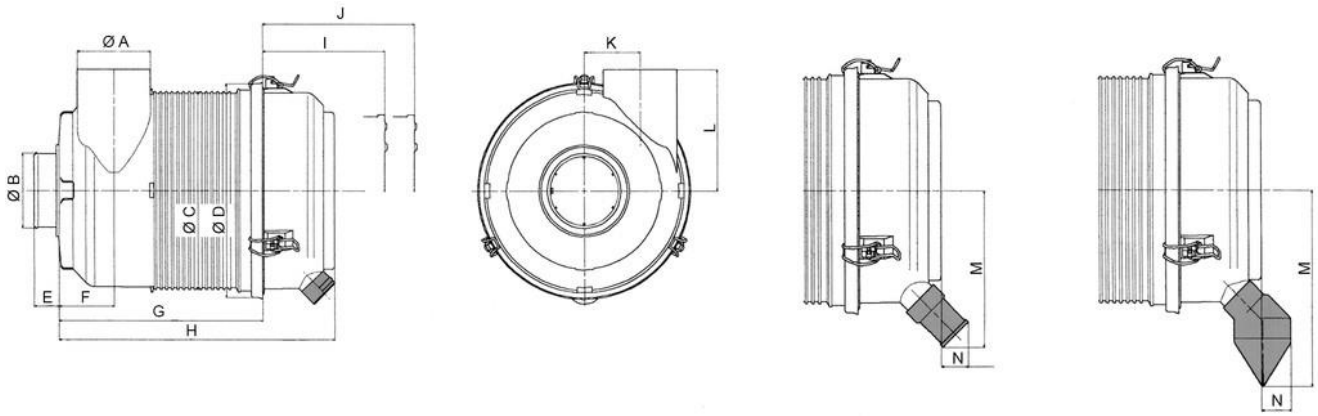


Fig. 1 with mushroom-headed dust ejection valve for pulsating suction air and little clearance

Fig. 2 with small dust ejection valve for pulsating suction air, ≤ 4 cylinders

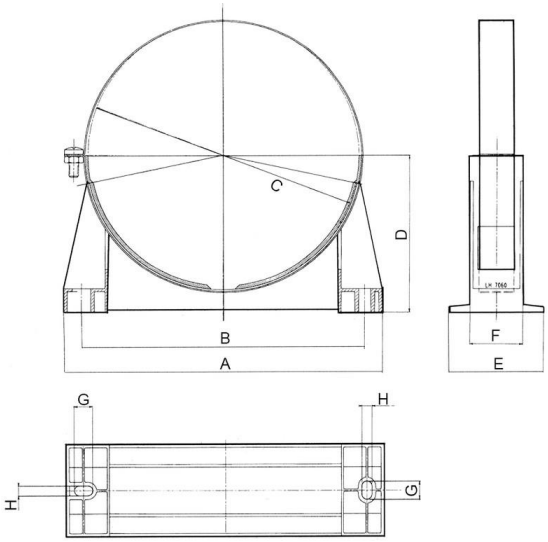
Fig. 3 with large dust ejection valve for slightly pulsating suction air, ≥ 4 cylinders

I = Minimum clearance required for element removal without safety element

J = Minimum clearance required for element removal with safety element

All dimensions in mm.

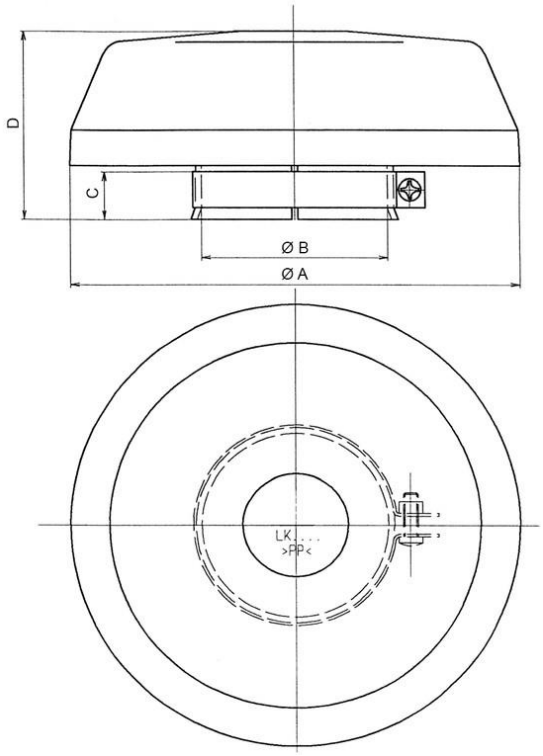
Type without safety element	Type with safety element	øA	øB	øC	øD	E	F	G	H	I	J	K	L	M	N	Fig.
LPO 7045/1	LPO 7045 S/1													-	-	1
LPO 7045/2	LPO 7045 S/2	62	60	180	205	25	52	225	300	295	355	55	120	148	30	2
LPO 7045/3	LPO 7045 S/3													197	33	3
LPO 7060/1	LPO 7060 S/1													-	-	1
LPO 7060/2	LPO 7060 S/2	70	70	205	230	30	57	255	345	340	416	63	130	161	30	2
LPO 7060/3	LPO 7060 S/3													209	33	3
LPO 7080/1	LPO 7080 S/1													-	-	1
LPO 7080/2	LPO 7080 S/2	82	80	236	255	30	65	265	355	350	425	65	145	173	30	2
LPO 7080/3	LPO 7080 S/3													220	33	3
LPO 7120/1	LPO 7120 S/1													-	-	1
LPO 7120/2	LPO 7120 S/2	102	100	270	295	35	77	285	385	380	465	78	165	187	33	2
LPO 7120/3	LPO 7120 S/3													234	36	3



Brackets

All dimensions in mm.

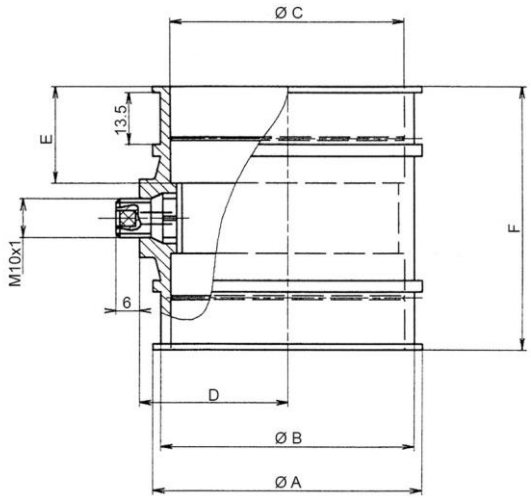
Type	A	B	C	D	E	F	G	H
LH 7045	220	190	180	110	70	45	15.5	8.5
LH 7060	250	220	205	125				
LH 7080	270	240	236	135	80			
LH 7120	310	280	270	155				



Rain caps

All dimensions in mm.

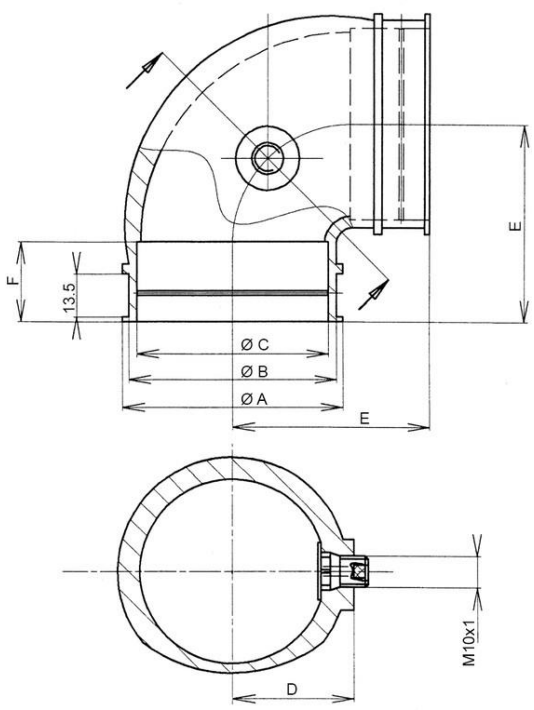
Type	øA	øB	C	D
LK 7045	150	62.2	22	63
LK 7060	200	68.2	30	85
LK 7080	200	82.2	30	85
LK 7120	270	102.2	40	115



Connection tubes

All dimensions in mm.

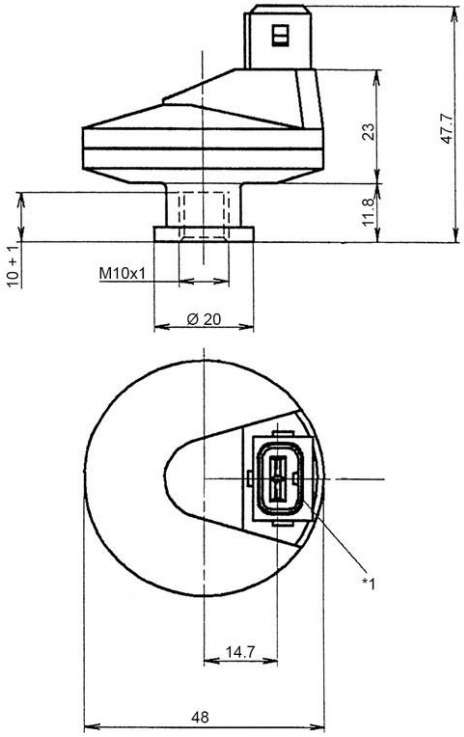
Type	øA	øB	øC	D	E	F
LVS 7045	69	65	60	38	25	68
LVS 7060	79	75	70	43	28	75
LVS 7060	89	85	80	48	30	78
LVS 7120	109	105	100	58	35	88



Elbows

All dimensions in mm.

Type	øA	øB	øC	D	E	F
LKR 7045	69	65	60	38	62	25
LKR 7060	79	75	70	43	72	29
LKR 7060	89	85	80	48	77	30
LKR 7120	109	105	100	58	92	35



Maintenance switch
*1 = Takes AMP connector 963040-3

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ATEX recommendation fluid technology
Fluid filters in hazardous zones

1. Short description

Recommendation for the use of fluid filters and maintenance indicators in hazardous zones acc. to Directive 94/9EG (ATEX).

2. Fluidfilter

Filters (hydraulic-, lubrication-oil-, air breather-) in fluid systems are not subject to this directive.

Fluid filters do not require a CE- marking.

For fluid filters to be used in hazardous zones, the ignition sources have to be analysed by the operator, considering the complete installation. Filtration Group GmbH as manufacturer of the fluid filter may assist.

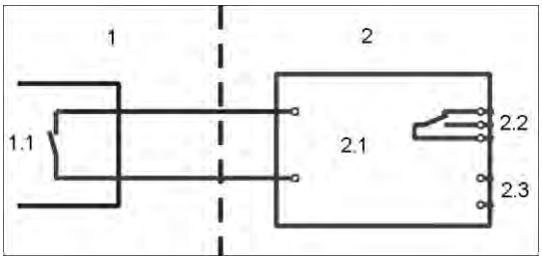
During filtration of fluids and gases electrostatic charge may occur on the filter element, the filter housing and the fluid - especially when glass fibre filter elements are used.

For use in hazardous zones, Filtration Group GmbH recommends to use only metal filter housings and to connect the housing electrically to ground.

These filters do not possess any external ignition source.

The earthing is realised by using the clamping bolts. The maximum content of magnesium is less than 7,5 %.
The size of the largest projected nonconducting areas are smaller than 100 sqcm (400 sqcm if a conducting framing is provided).
According to DIN EN 13463 the FGC fluid filters are suitable for the use in appliance group II category 2 G/D up to 120 Deg C.

The function of the electrical maintenance indicator is described in the right column.



Subject to technical alteration without prior notice.

3. Wartungsanzeiger

The electrical maintenance indicators, which are mentioned in the
FGC list of released products, are simple electrical devices according to DIN EN 60079-11, without own supply voltage

The electrical components consists of reed-contacts, bimetal switches, plug connections and terminal clamps.

For equipment group II, category 2 G (zone 1) and category 2 D (zone 21), these simple electrical components can be used acc. EN 60079-14 and EN241-11 in intrinsically safe circuits [EEX ib] without making and certification.
The EN 60079-12 (gas) and EN 61241-14 (dust) Installation regulations have to be observed as well as the national security terms and accident prevention regulations.

The electrical utilities are attributed to category ib and temperature
class T5.
If the electrical upper part is used conventional (intrinsically safe circuit) it will not present itself as a heat source.

Usage in EX- zones is possible when the indicators are connected intrinsically safe (EX-i).

For that purpose a switch-amplifier with an intrinsically safe input is required. The switch amplifier must be installed outside the EX- zone, leaving only the intrinsically safe wires in contact with the hazardous zone.

1	EX-zones
1.1	Maintenance indicator
2	Intrinsically safe input
2.1	Switch-amplifier with PTB-approval
2.2	Output cast
2.3	Power-supply

The required switch-amplifiers are offered by manufacturers of Ex-control equipment.
A two-step indicator requires a switch amplifier with two intrinsically safe inputs.

4. List of released electrical upper sections for maintenance indicators

These electrical upper sections are released for application in potential explosive atmosphere if they are used in an intrinsically safe circuit. The requirements of the FGC-information "ATEX-advice fluid technology" and also the released EX-category must be complied.

Electr. upper section	Contact type*	Number of setting points	Contact type acc. DB WA**	Signal surpression	Connection	Used for	Order number expansion kit
77599996	S/O	1	1	-	wiring box DIN EN 175301-803	PiS 3085/3086/ 3092/3097/3192	77536550
77970379	O	2	2	-	wiring box DIN EN 175301-803	PiS 3105/3106/ 3119	77970627
78308009	W	1	3	-	wiring box DIN EN 175301-803	PiS 3115/3116/ 3125	78308017
79763251	W	1	10	-	plug connection M12x1	PiS 3115-M12x1 PiS 3116-M12x1 PiS 3125-M12x1	79764036
77833957	O	1	-	x	wiring box DIN EN 175301-803	PiS 3003	77765357
77805427	S	1	-	x	wiring box DIN EN 175301-803	PiS 3002	77765365
70389154	O	2	-	-	plug connection M12x1	PiS 3109/3505/3512	72379019
78383622	O	2	-	x	wiring box DIN EN 175201-804	PiS 3122/3123/3124	70562666
77762933	S	2	-	-	wiring box DIN EN 175301-803	PiS 3001/3005/3011	76390264
77755960	S	2	-	x	wiring box DIN EN 175301-803	PiS 3004/3014/3088	

*
S Normally open
O Normally closed
W Change-over contact
** according to data sheet maintenance indicators

All other electrical upper sections are not released for application in potential explosive atmosphere, even if the are used within an intrinsically safe circuit.

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