

ENGINEERING
TOMORROW

Danfoss

Danfoss PLUS+1® Control Platform

Save programming time
and cost with the
Danfoss PLUS+1® Toolbox

**Proven
control
systems**

bring your machine
faster to market

powersolutions.danfoss.com





Fast track your machines to a competitive edge

Expectations to the electronic control features on mobile machines are becoming increasingly sophisticated in today's age of smart communication. The pressure is on to deliver intelligent, operator-friendly technology that makes machines stand out for their smooth and efficient performance. And you need to be able to do it fast.

A major challenge OEMs is the risk involved when introducing the latest technology to machine control systems. Speed must never be at the expense of safety and reliability, but thorough performance testing requires a lot of one thing – time. Not to mention investment in R&D resources.

The Danfoss PLUS+1® Toolbox is designed to help you speed up the development phase and bring proven electronic connect and control solutions fast to market without any quality compromises along the way.

Three reasons to choose PLUS+1®

- » A comprehensive portfolio of compliant components
- » Fully tested and easy to customize system development software
- » Efficient integration of machine control, work and propel functions

Altogether, they make the whole process of designing new, smart machines, simpler, faster, and more cost-competitive.

What's more, you can use the PLUS+1® Toolbox for all types of mobile machinery. Including pavers, rollers, aerial lifters, truck-mounted cranes, telehandlers, wheel loaders, mini excavators and skid steer loaders.

Everything you need to **maximize your mobile potential**

The PLUS+1® Toolbox unleashes the full potential of mobile hydraulics. Within our portfolio, you'll find a scalable service offering, ranging from single components, to software blocks to full system integration – all built using our application know-how and responsive engineering.

Including PLUS+1® GUIDE software and PLUS+1® Compliant components, it's the most complete and flexible electronic control toolbox on the market, enabling you to meet your customers' needs fast and easily :

- » Optimal vehicle performance
- » Operator comfort and productivity
- » Vehicle productivity and uptime
- » Functional safety
- » Simpler machine designs
- » Site and fleet management

Become a PLUS+1® expert – in just a few weeks

From an OEM perspective, PLUS+1® is easy to implement and learn. In PLUS+1® GUIDE you'll find all our components are delivered with preprogrammed software blocks, ready to perform. Within a few weeks of training, you can build your own team of PLUS+1® programming experts. Our PLUS+1® training courses give you the in-house capability to customize innovative electronic control systems for your machine.

Read on for an overview of the components, software and system integration opportunities that the total PLUS+1® Toolbox provides.







PLUS+1[®] microcontrollers

– for a robust control
center you can rely on

Product family

MC012

MC024

MC038

MC050

MC088

Using Danfoss PLUS+1[®] microcontrollers, you can bring intelligent control to every node of your machine's hydraulic system or to a single, stand-alone function. Our broad microcontroller portfolio has a modular, stackable design – just what you need for optimum robustness, reliability and total flexibility in mind.

PLUS+1[®] microcontrollers offer many software-configurable hardware features, making it easy to match the input and output requirements of your application. Some modules even include high-output current capabilities for other parts of the electrical system, such as lighting, small DC electric motors, high-current solenoids and linear actuators.

Main features and benefits

- » High-speed 32 bit microcontroller for processing even the most complex applications
- » Stackable design for high mounting flexibility
- » CAN-based communication for state-of-the-art control performance
- » Software configurable I/O for multiple control options

Set a new benchmark for safe control

When building mobile machines for the off-highway market, you can settle for nothing less than impeccable functional safety. Our award-winning PLUS+1[®] Safety Controllers with modular safety kernel are designed to help you set a new safety benchmark.

Managing and monitoring the safety functions on your machine is much easier with our safety controllers on board. In many cases, you'll find your machine can continue to operate safely even in the event of a safety-related fault. This is because only the affected microcontroller pin will shut down, leaving the others functional.

Dual microprocessors provide enhanced performance, more memory and redundant control of outputs for safety function applications.

Up to

70%

less programming
time for functional
safety systems



A faster route to **functional safety**

PLUS+1® Safety Controllers are one of the most recent additions to our range of SIL 2 certified components and software. SIL 2 certification is your guarantee of compliance with today's functional safety standards – saving you considerable time and effort in the machine programming phase.

Danfoss functional safety experts also offer safety training and advice for conducting hazard and risk analyses, designing safe machines, and validating the system to prove conformity with the EU Machinery Directive.

PLUS+1[®] displays – the all-in-one overview that keeps you informed

A programmable display gives operators the all-in-one overview that enables continuous monitoring, control and diagnostics of every hydraulically-controlled detail on the machine.

At Danfoss, we have developed a comprehensive range of PLUS+1[®] displays to meet all needs. Options range from plug and play units to customized operator interfaces with external camera.

All of them have one thing in common: they provide an integrated operating network that brings the entire hydraulic system on your vehicle together.

Main features and benefits

- » Transmissive TFT LCD with high resolution color display for high legibility in the dark or bright sunshine
- » IP 67 rating, ensuring suitability for outdoor use
- » Keyboards with automatic backlight for low light and night use
- » Best in class screen editors and seamless integration into PLUS+1 GUIDE application
- » Up to two video inputs that support both PAL and NTSC signals

Stay in control in the toughest conditions

For the toughest and most extreme working environments, the PLUS+1[®] DP730 is the display of choice. The water and dirt-resisting front is rated at IP69K, and the touch screen is designed to work through mud, water and the operator's gloves. It's also fitted with an optically bonded LCD screen that improves visibility in sunlight and prevents fogging – ideal for applications outside the cab.

Display Family



DP200 / DP211

DP250

DP570

DP600TM /
DP610TM

DP700 / DP710 /
DP720

DP730

Size & Screen	3.8" LCD Monochrome	3.5" TFT Color	5.7" TFT Color	6.5" TFT Color	7" TFT Color, Touch screen w/ Glove (DP720)	7" TFT Color, Touch-screen-Only w/ Glove
IP Rating (Front/Back)	IP67 / IP67	IP67 / IP67	IP67 / IP67	IP67 / IP67	IP67 / IP67	IP69K / IP67
Operating Temperatures	-40° to 70°C	-30° to 70°C	-20° to 60°C	-30° to 70°C	-30° to +60°C	-30° to +60°C
Storage Temperatures	-40° to 85°C	-40° to 85°C	-30° to 80°C	-40° to 85°C	-30° to 80°C	-30° to 80°C
Screen Development Tools	PLUS+1 GUIDE Classic Screen Editor (CSE) & EIC (Engine Information Center) Tool		PLUS+1 GUIDE contains two screen editors: <ul style="list-style-type: none"> • Vector-Based Screen Editor (VBSE) & Image library in SVG format used by the DP7xx series and DP570 • Classic Screen Editor (CSE) & Image library in Bitmap format used by the DP2xx series and DP6xx TM series 			

Danfoss **DP720 & DP730** Ruggedized Touchscreen Display

Engineered for extreme environments

Up to
IP69K

level protection
keeps your display
working in outdoor
extremes

Integrated Light
Sensor

Enable automatic
backlight adjustment

LED light Bar

Software configurable



Projective Capacitive
Touch Screen

Works through mud, water
and with gloves

Optically
Bonded LCD

Improves sunlight
visibility

Prevents fogging

Three different LCD options to
meet your application needs

PLUS+1[®] Compliant joysticks

– giving you a modular approach to comfort and control

Operators are looking for supreme comfort and precision control when they climb into your machine cab. With a PLUS+1[®] Compliant joystick, that's exactly what they get.

The JS1 joysticks provides endless possibilities to configure the right joystick for your application. Ergonomic designs ensure a firm grip and a comfortable drive.

Main features and benefits

- » Modular designs for intelligent mobile control. Including single and dual-axis configurations and multiple mechanical and electrical interface options

» Wide selection of joystick bases, customizable to your needs. Options include detents, friction locks, redundant outputs, switch functions and hall effect and potentiometric sensing technologies

» Easy-to-use grips that match our joystick bases and can be customized as required

has a modular design that makes it easier than ever to develop a customized joystick fast and at reduced cost.

The platform offers three types of joystick base, with five grip types for each and numerous options for button and switch placement. Specially designed PLUS+1[®] software blocks enable seamless integration in the overall machine control system.

New joystick platform with a modular design

Our JS1 joystick platform provides a new opportunity for you to speed up your time to market. Led by the release of the JS1-H family for heavy-duty machines, this innovative series

The JS1-H family is well-suited to wheel loaders, dozers, dumpers, trenchers and haulers for the construction industry and pavers, graders, rollers and milling machines for road-building.



Finger Duty

Light Duty

Heavy Duty Hydraulic

Heavy Duty



JS120



JS1000 Pro



JS1000 Rocker



PVRH



JS1-H PR2



JS1-H ST7



JS1-H ST2



JS1-H HR1



JS1-H PR7

FLEXIBILITY

ROBUSTNESS

SUPREME PERFORMANCE

Danfoss **JS1-H Joystick** for heavy-duty machines



Wide selection
of grip functions

Wide selection
of grip types

Wide selection
of electrical
interfaces

0

Engineering hours
with modular JS1-H
Joysticks

Wide selection of
base behaviours



Imagine if you could take key data from your machine and turn it into profit. That's what you get when you choose Danfoss Telematics Solutions. Offering the simplicity of plug-and-perform, they are easily integrated in your product line-up – enabling you to boost efficiency, extend machine lifespan, minimize downtime and provide a real-time overview of an entire machine fleet.

Our solutions are a combination of machine-integrated technology, satellite, cellular and wi-fi network connectivity and a customizable, intuitive interface that gives fleet owners an at-a-glance overview of how, when and where their equipment is being used.

Whether introducing Danfoss Telematics Solutions to new machines or retrofitting your customers' existing machines, you can do so without changing a single line of software code.

Main features and benefits

- » Data analysis that keeps you up-to-date with machine maintenance needs
- » Remote diagnostics for reduced machine downtime, labor and travel costs
- » Location and tracking of individual machines
- » Automated reports for faster fleet administration
- » Real-time monitoring and optimization of machine efficiency
- » Efficient allocation of equipment resources according to frequency and duration of use

Calculate your savings

Identifying your potential savings and benefits with Danfoss Telematics Solutions is easy. Find our value calculator at www.telematicssolutions.danfoss.com and contact your Danfoss representative to learn more.





24/7

tracking of every
machine in your
fleet

Danfoss Telematics Solutions

– profit from
the power
of data

Easy

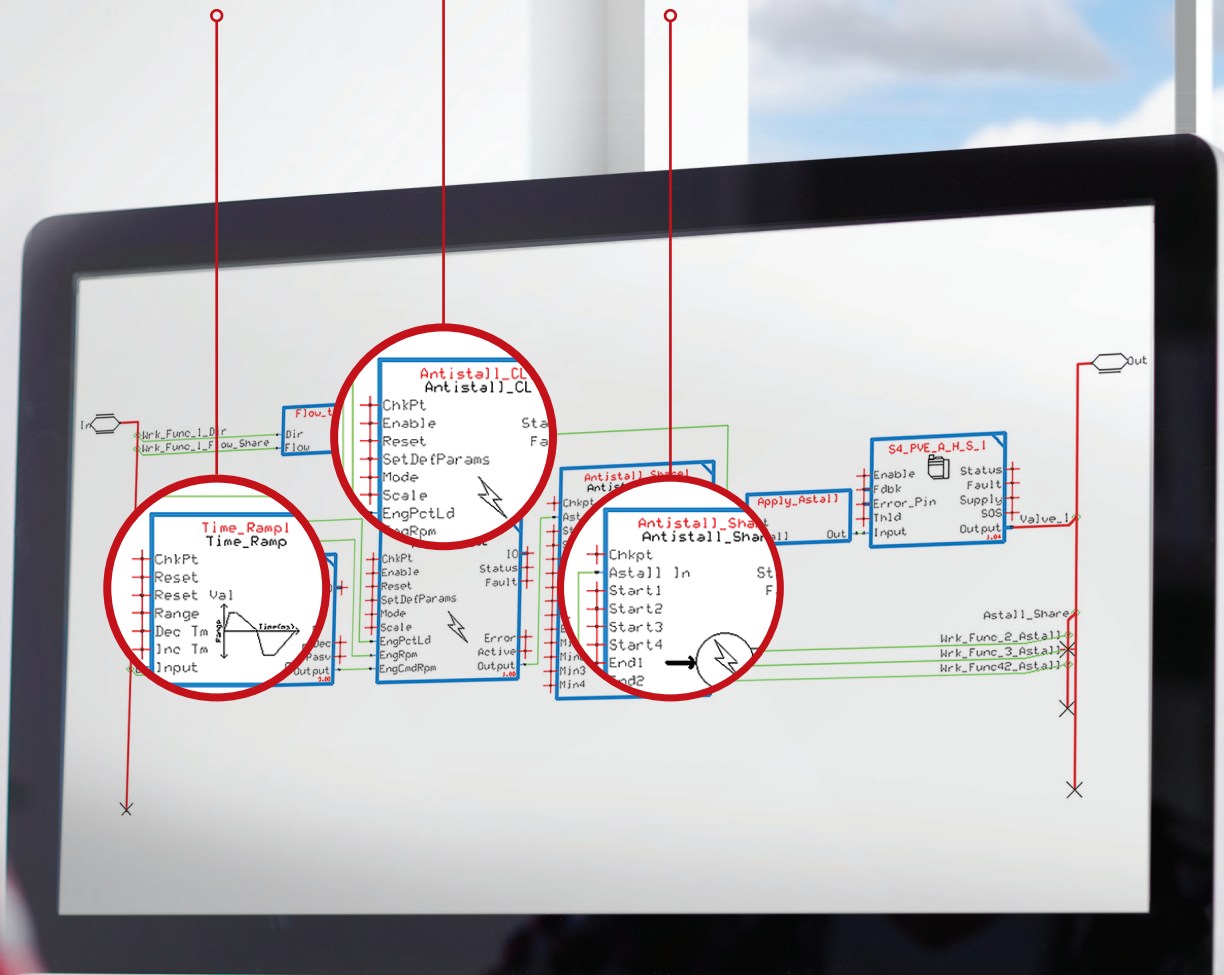
Start simple and build to sophisticated systems with PLUS+1® Compliance and Application Libraries

Fast

Use intuitive drag and drop components and library blocks to accelerate mobile systems and service tool development

Open

Develop flexibly using Structured Text, Ladder Diagrams, Function Block Diagrams, C-code, Simulink®, web-based Scripting – and share openly using PLCOpen XML



1

simple platform for integrating smart control in your mobile machine

PLUS+1[®] GUIDE & Service Tool

– the fast route to programming smarter machines

Programming can be the most challenging and time-consuming part of building intelligent control systems into your machine. That's why we launched PLUS+1[®] GUIDE & Service Tool. Using the powerful, intuitive, drag-and-drop PLUS+1[®] GUIDE & Service Tool, you can easily and efficiently integrate control, work and propel functions in a smart electrohydraulic network.

By choosing from the pre-tested software blocks in the PLUS+1[®] GUIDE library, you can build the functionality you require – at all levels of complexity. Power is at your fingertips to create customized solutions that help you bring better machines to market faster. Once there, the PLUS+1[®] Service Tool makes it easy for field technicians to update and service your machine so it keeps doing its job.

Make the most of our PLUS+1[®] GUIDE training opportunities, and you can soon have your own in-house team of programming experts.

Main features and benefits

- » Reduced time to market and development costs
- » High performance based on pre-tested software blocks
- » Faster functional safety validation and certification process

Power and flexibility – the revolution continues

Since the launch of the first version of PLUS+1[®] GUIDE, our programming environment has undergone continuous development to refine and improve it and stay ahead of changing market needs. Today, our latest PLUS+1[®] GUIDE & Service Tool is made to speed up the development of more advanced, higher performing and better quality machines than ever before.

Benefit from the latest new features:

- » Save hours by importing existing programs written in Structured Text, Ladder Diagrams, Function Block Diagrams and other software development languages
- » Raise the quality of your system design by configuring design rules and standards
- » Extend the flexibility and power of your service tool by using standard web scripting tool languages

Interested in putting PLUS+1[®] GUIDE & Service Tool to the test?

Download PLUS+1 Guide and unlock the power using our free, 90-day trial license with full save and deploy capabilities.

You can find PLUS+1 GUIDE at: powersolutions.danfoss.com/products/plus-1-software

PLUS+1[®] GUIDE

Powerful system design tool suite to increase your engineering productivity and help you bring high-performing, intelligent vehicles to market faster

PLUS+1[®] Service Tool

Fully-integrated and customizable service tool application that makes it easy for field technicians to update, service, and troubleshoot machines

Open, Flexible, and Powerful Tool Chain

Program using multiple software languages like the IEC 61131-3 languages (Structured Text, Ladder Diagrams, Function Block Diagrams) and C-code. Customize using Service Tool DLLs and web scripting languages. Generate S-functions in Simulink[®]. Share data utilizing PLCOpen XML

About Danfoss Power Solutions

Danfoss Power Solutions is a global manufacturer and supplier of high-quality hydraulic and electronic components. We specialize in providing state-of-the-art technology and solutions that excel in the harsh operating conditions of the mobile off-highway market. Building on our extensive applications expertise, we work closely with you to ensure exceptional performance for a broad range of off-highway vehicles. We help OEMs around the world speed up system development, reduce costs and bring vehicles to market faster.

Danfoss Power Solutions – your strongest partner in mobile hydraulics.

Products we offer:

- Bent Axis Motors
- Closed Circuit Axial Piston Pumps and Motors
- Displays
- Electrohydraulic Power Steering
- Electrohydraulics
- Hydraulic Power Steering
- Integrated Systems
- Joysticks and Control Handles
- Microcontrollers and Software
- Open Circuit Axial Piston Pumps
- Orbital Motors
- PLUS+1® GUIDE
- Proportional Valves
- Sensors
- Steering
- Transit Mixer Drives

Wherever off-highway vehicles are at work, so is Danfoss Power Solutions. We offer you expert worldwide support for ensuring the best possible solutions for outstanding performance. And with an extensive network of Global Service Partners, we also provide you with comprehensive global service for all of our components.

Go to www.powersolutions.danfoss.com for further product information.

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