

# PLUS ™

*Customizing Control  
For Your Mobile Machinery*



 **SAUER  
DANFOSS**

*What really matters is inside®*

[www.sauer-danfoss.com](http://www.sauer-danfoss.com)

# Meeting Control And Performance Challenges Head On

**It's no secret that the OEM design environment continues to become more challenging, every day, every year. As design engineers face increasing demands from tighter emission controls to enhanced operating efficiencies, the mobile machinery market has also become intensely competitive. Engineers are expected to accomplish more in less time and with fewer internal resources. As expectations rise and the demands increase, Sauer-Danfoss has been relentlessly pursuing innovative solutions in mobile hydraulics and control systems. We are pleased to announce that the next level of machine control has arrived. It's called PLUS 1.**

## **Customizing Control for Your Mobile Machinery**

PLUS 1™ takes mobile machine control to the next level of performance and reliability. Using CAN-based communication, this flexible development system makes true customization and intelligent control a reality for small to large OEMs – resulting in higher performance machines, longer service life and lower costs. With over 25 years of experience in mobile electronics, Sauer-Danfoss is committed to meeting the industry's most demanding design standards.

Since both hardware and software are designed in modules, PLUS 1 is easily configured and endlessly expandable. The foundation of PLUS 1 is a powerful line of durable, stackable microcontrollers and I/O modules. These components serve as the building blocks for nearly any function and can be scaled to meet machine requirements.

Using the powerful PLUS 1 GUIDE (Graphical User Integrated Development Environment), you can quickly build customized applications from the Sauer-Danfoss library of software control objects. The "ready-to-fit" platform reduces the cost and development time normally associated with programming. The PLUS 1 GUIDE also offers diagnostic tools and customizable service interfaces.

PLUS 1 compliant, easy-to-read displays and multiple joystick options integrate right into the custom network architecture, creating a seamless interface between operator and machine.

You can quickly and cost-effectively put your ideas into motion with the *powerful, flexible, expandable* and *reliable* PLUS 1 tools and components. PLUS 1 offers true customized control for your mobile machinery.

# PLUS 1™ by SAUER-DANFOSS

## Powerful, Flexible, Expandable, Reliable, Cost-Effective

### Microcontrollers & I/O Modules

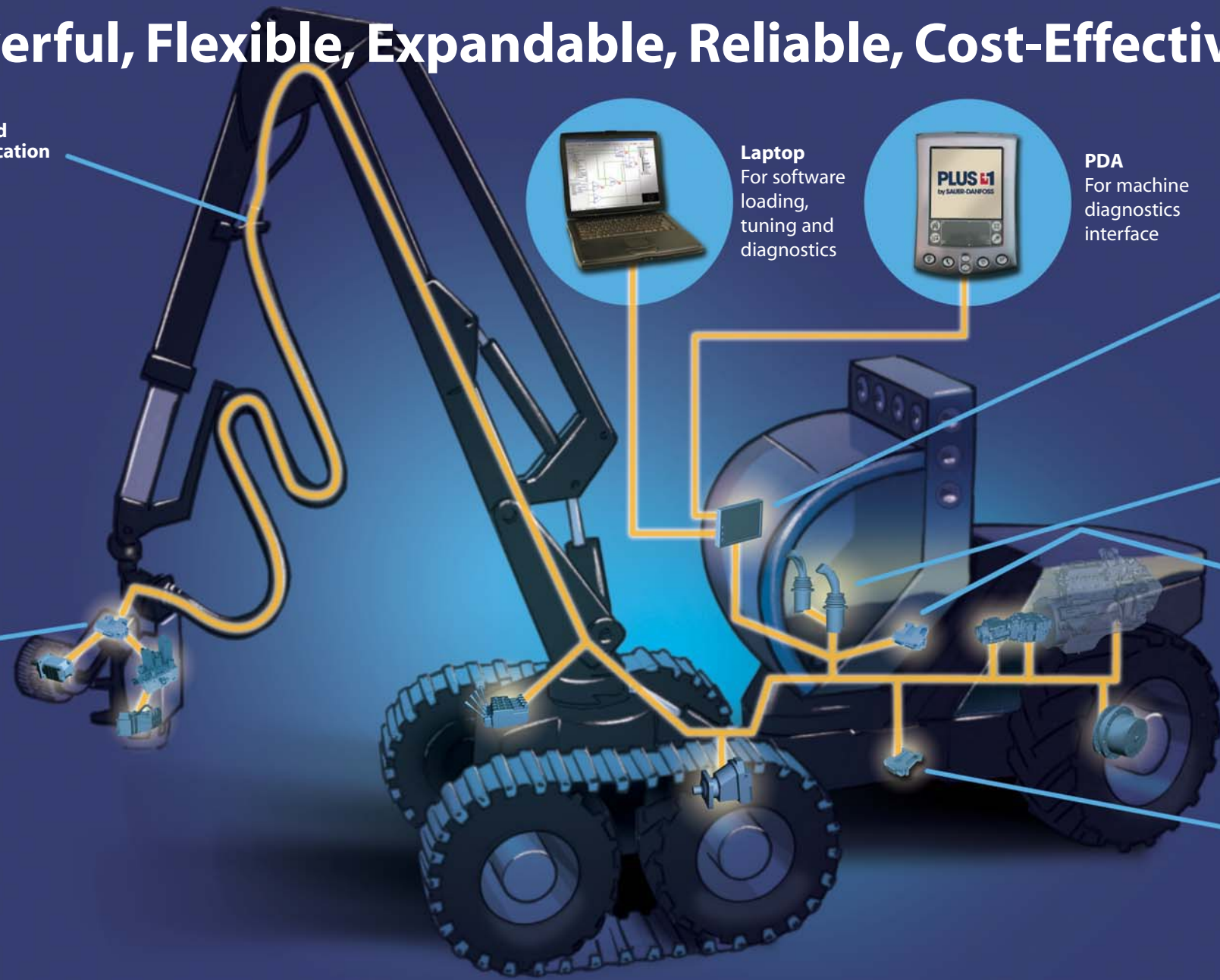
- Easily scaled to machine requirements
- Stackable in a small space



### 12-Pin I/O Module

- Expandable network architecture
- Cost-effective control solutions

### CAN-Based Communication



**Laptop**  
For software loading, tuning and diagnostics

**PDA**  
For machine diagnostics interface

**DP600 Graphical Terminal**  
■ Customizable user displays  
■ Highly visible day or night

**Joysticks**  
■ Customizable interface solutions  
■ Multiple grip & actuation options

**24-Pin Microcontroller**  
■ Flexible mounting options  
■ Reliable design

**50-Pin Microcontroller**  
■ Powerful DSP-based  
■ Flexible I/O circuitry

### Powerful

- PLUS 1 hardware utilizes the latest DSP technology to create a powerful foundation for your machine control network.
- CAN communications capture all machine information for total machine management capabilities.
- PLUS 1 user programming tools combined with Sauer-Danfoss' proven software object library give you the power to create well-differentiated custom solutions.

### Flexible

- I/Os and software are configurable to match your unique input and output requirements without the need for additional or specialized hardware.
- You control your software application with an easy-to-use graphical programming interface.
- Hardware and software flexibility means less "one-off" custom developments and reduced development costs.

### Expandable

- The PLUS 1 family of CAN-based microcontrollers gives you the ability to combine modules into a cost effective configuration that can be easily expanded with additional modules.
- Mix and match modules to meet each machine's special requirements.

### Reliable

- Sauer-Danfoss' mobile electronics experience spans 25 years — meeting rigorous industry standards.

### Cost Effective

- Utilizing advanced components and design tools, PLUS 1 has been developed by a global design team to optimize cost and manufacturing efficiency in order to bring all of the benefits of a powerful, flexible and expandable system to you at a cost-effective price.

### Monitoring and Control Possibilities

#### Monitoring Machine Functions:

- Engine RPM
- Vehicle speed
- Oil pressures
- Hydraulic pressures

- Battery voltage
- Fuel levels
- Temperatures
- Machine angles
- Many others...

#### PLUS 1 Control Solutions:

- Speed control
- Acceleration/deceleration control
- Position control
- Dual path propel
- Pressure control
- Engine anti-stall
- Engine over-speed control
- Automotive propel control
- Fan speed control
- Anti-slip control

- Work function automation
- Fault monitoring
- Many others...

### Applications for a Variety of Markets

While the flexibility and versatility of PLUS 1 suits it for nearly any machinery, this control network is ideal for:

- Agriculture
- Construction
- Forestry
- Material handling
- Municipal/utility vehicles
- Road building

# PLUS 1™

## Modular Components

### Powerful Microcontrollers & I/O Modules

Sauer-Danfoss has designed this control system hardware to be extremely flexible as well as cost effective. Stackable microcontrollers and I/O modules are available in three housing sizes and nine total I/O configurations for multiple control options – providing the building blocks for nearly any function. DSP technology and CAN-based communications assure state-of-the-art control performance. Mounting flexibility and durable design give you more options in machine design – even for the harshest operating environments.



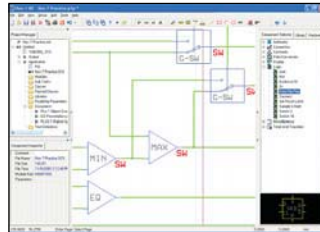
### Flexible Graphical Terminals

Built to perform reliably in your operating conditions, Sauer-Danfoss graphical terminals are easy to read – day or night. All PLUS 1 compliant terminals offer great flexibility in functionality. You can take advantage of external device inputs for cameras and multiple CAN buses for a wide range of vehicle and environment monitoring. USB and RS232 connections allow laptop and PDA interfaces with a buzzer alarm output providing audible feedback. Monitor everything from the basics such as oil pressure to machine angles.



### Powerful Software Environment

The PLUS 1 GUIDE (Graphical User Integrated Development Environment) offers a powerful programming environment in an easy-to-use graphical format. Applications can be built from the Sauer-Danfoss library of control objects. This ever-expanding set of building blocks allows you to complete applications in a fraction of the time that it takes when starting from scratch or when using other programming methodologies. Operating parameters can be fine tuned for optimal machine performance. The PLUS 1 GUIDE also offers system diagnostic tools, downloading utilities and customizable service interfaces. You'll have the power to create well-differentiated custom solutions.



### Flexible Joysticks

PLUS 1 modularity and versatility continues through the Sauer-Danfoss family of PLUS 1 compliant joysticks. You select from a family of joystick bases that can match your application, from light duty to heavy duty service.



Multiple and almost endless options can be specified into the joysticks' physical configuration – including detents, friction locks, redundant outputs and switch functions. Both Hall effect and potentiometric sensing technologies are available. Match this base with one of our wide range of joystick grips to complete the system. Or, let us help with custom grip development if your needs are unique.

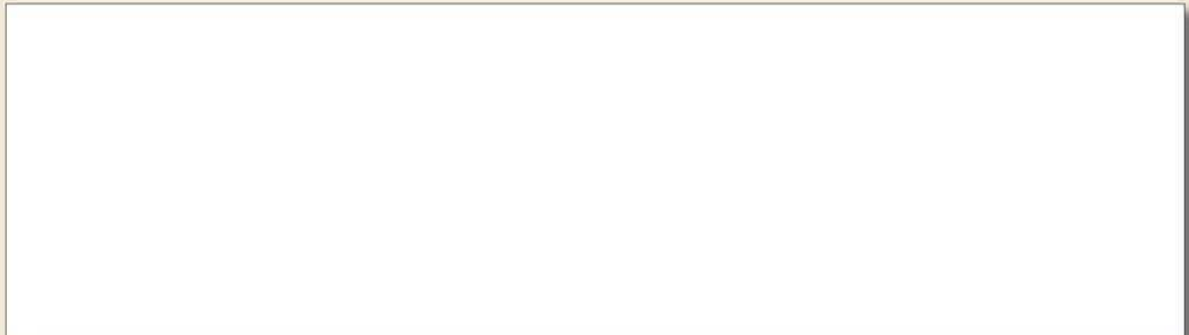
Full technical literature specifications and application guidelines are available for PLUS 1 and PLUS 1 compliant products at [www.sauer-danfoss.com](http://www.sauer-danfoss.com).

**Sauer-Danfoss** is a comprehensive supplier providing complete systems to the global mobile market. We offer our customers optimum solutions for their needs and develop new products and systems in close cooperation and partnership with them. Sauer-Danfoss specializes in integrating a full range of system components to provide vehicle designers with the most advanced total system design.

- Hydrostatic transmissions
- Hydraulic power steering
- Electric power steering
- Electrohydraulic power steering
- Closed and open circuit axial piston pumps and motors
- Gear pumps and motors
- Bent axis motors
- Orbital motors
- Transit mixer drives
- Planetary compact gears
- Proportional valves
- Directional spool valves
- Cartridge valves
- Hydraulic integrated circuits
- Hydrostatic transaxles
- Integrated systems
- Fan drive systems
- Electrohydraulics
- Microcontrollers and software
- Electric motors and inverters
- Joysticks and control handles
- Displays
- Sensors

**Sauer-Danfoss** provides comprehensive worldwide service for its products through an extensive network of Authorized Service Centers strategically located in all parts of the world.

Please contact the Sauer-Danfoss representative nearest you.



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