PVG Load-Independent Proportional Valves

Outstanding Control – Precise Operation
- Modular valve design for flexible system configuration
- Easy system set-up and installation using proven PVE technology
- Load-sensing technology for high efficiency and low energy consumption
- Precision operation with load-independent flow control
- SIL 2 certified digital actuator (PVED-CX)
Today, OEMs are faced with two compelling events that challenge vehicle design and development: increasingly stringent engine emissions regulations (Tier IV/Stage IV), and new vehicle safety legislation.

To compensate for the reduced power levels of emissions-compliant engines, overall vehicle efficiency must be optimized. Intelligent system solutions are also needed to comply with the new safety standards and help speed up vehicle design and qualification.

With electronic control, load-sensing and a flexible, modular design, our PVG load-independent proportional valves enable our customers to meet these challenges.

**Flexible System Design**

Our portfolio of PVG valves provide customers with exceptional flexibility in system design. The modular design of PVG accommodates future control variations and gives you an almost infinite number of configurations. Load-sensing technology also means that wear and tear on other components in the system is reduced, which helps extend vehicle life. Providing outstanding control, day in and day out, our high-quality valves are built to last.

**Advanced Electronic Actuators**

We offer a full range of electronic actuators, from simple on/off solutions, to state-of-the-art CAN bus communication. Our advanced PVED-CC and PVED-CX digital actuators are specifically designed for J1939/ISOBUS Protocol and CANopen systems. PVED-CX is also SIL 2 certified (Safety Integrity Level 2 according to IEC 61508), to help comply with the demands of the European Machinery Directive 2006/42/EC and reduce the time and costs associated with system qualification and vehicle certification.

**Global Manufacturing and Support**

Our worldwide network of sales companies, distributors, and authorized service centers is ready with after-sales support and product service when you need it. Contact your local Sauer-Danfoss representative to find out how we can help increase overall vehicle efficiency, reduce costs and improve productivity.

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Our PVED-CX actuator is SIL 2 certified (Safety Integrity Level 2 according to IEC 61508), to help comply with the demands of the European Machinery Directive 2006/42/EC.
Our PVG 32 range of load-independent proportional valves operate with compensated flow up to 130 l/min [34.4 gal/min] and work port pressure up to 400 bar [5800 psi]. Designed for maximum flexibility, PVG 32 valves reduce heat generation and increase efficiency and power density, which helps to meet the challenges posed by new engine emissions legislation.

From simple load-sensing, to advanced electrically controlled load-independent proportional valves, the modular design of PVG 32 makes it possible to design a valve group that precisely meets all of your application requirements. No matter which combination of valves is specified, the compact, external dimensions of the valve remain unchanged.

**General PVG 32 Features:**

- Load-independent flow control for precise operation and improved productivity
- Load-sensing technology for higher efficiency, safety, reduced energy consumption, and longer system life
- Configurable as advanced electrically controlled proportional valve as well as load-sensing directional control valve
- Modular design, providing a wide range of configuration possibilities
- Up to twelve basic sections per valve group (maximum flow per section: 130 l/min [34.4 gal/min])
- Prevention against work port pressure build up in neutral
- Individual work port pressure setting
- Open spool-ends for mechanical actuation
- Zero-leakage work modules
- Meter-out compensation for negative load control
- Can be configured in combination with our PVG 100 and PVG 120 valves for maximum flexibility
- Mechanical, hydraulic, and electrical actuation options
PVG 100

Our highly efficient post-compensated proportional valve PVG 100 provides compensated flow up to 180 l/min [47.6 gal/min] and work port pressure up to 350 bar [5076 psi]. Post-compensated flow sharing valves are able to decrease oil flow to all basic work functions in case of reduced supply from the pump. Flow sharing enables design engineers to decrease pump size, while still maintaining optimal machine performance. Downsizing the pump provides incremental power and cost savings when using a variable displacement pump and substantial power savings when using a fixed displacement pump.

New engine emissions regulations (Tier IV/Stage IV) create a number of challenges for vehicle designers. These include additional heat rejection, net vehicle power reduction and reduced hydraulic flow. To help meet these challenges, flow sharing can be used to help improve overall vehicle efficiency – reducing wasted power – while increasing vehicle productivity.

General PVG 100 Features:

- Flow sharing for maximum controllability and safety
- Load-independent flow control for precise operation and improved productivity
- Load-sensing technology for higher efficiency, safety, reduced energy consumption, and longer system lifetime
- Configurable as advanced electrically, or mechanically operated proportional load-sensing valve
- Modular design providing a wide range of configuration possibilities
- Up to eight different sections per valve group (maximum flow per section: 180 l/min [47.6 gal/min])
- Can be configured in combination with PVG 32 valves for maximum flexibility
- Open spool-ends for mechanical actuation
- Mechanical, hydraulic, and electrical actuation options
- Optimized return flow characteristics, which minimizes pressure loss
Our PVG 120 load-independent proportional valve has been designed for the toughest applications with compensated flow up to 240 l/min (63.4 gal/min) and work port pressure up to 400 bar (5800 psi).

The PVG 120 load-sensing proportional valve is a robust solution that combines both directional and flow control. Supplied as a complete valve group, PVG 120 can be tailored to meet specific customer requirements. This exceptionally high level of flexibility enables easy modification of existing valve groups to suit a range of vehicle operating requirements.

General PVG 120 Features:
- Load-independent flow control for precise operation and improved productivity
- Load-sensing technology for higher efficiency, safety, reduced energy consumption, and longer system life
- Modular design providing a wide range of configuration possibilities
- Up to eight basic sections per valve group (maximum flow per section: 240 l/min [63.4 gal/min]).
- Mechanical, hydraulic, and electrical actuation options
- Work section pressure limiter
- Flange port
- Can be configured in combination with our PVG 32 valves for maximum flexibility
PVG Valves Selection Guide

Use our selection guide to identify the valve options that suit your specific application requirements. For further information about our valves portfolio, please contact your Sauer-Danfoss representative.

For further information visit at [www.sauer-danfoss.com]/Valves.

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For further information visit at [www.sauer-danfoss.com]/Valves.
When it comes to the design, manufacture, and application of intelligent, electronically controlled valve solutions, Sauer-Danfoss leads the way. We introduced the market’s first electrical actuators more than three decades ago and our portfolio now includes more than 50 different versions of our PVE actuator. We have the experience and flexibility to meet any application requirement. Our electrical actuators make valve control easy.

**General PVE Features:**
- Compensates for system induced flow forces
- Work area ambient temperatures from -30°C to +60°C [-22°F to +140°F] and oil temperatures from -30°C to +90°C [-22°F to 194°F].
- No temperature drift
- PLUS+1™ Compliant
- Low hysteresis
- Immune to changes with viscosity limits of 4 mm²/s to 460 mm²/s
- Immune to supply voltage variations
- Voltage control
- IP 65, 66 and 67 rated
- Fault monitoring that monitors valve operation
- Full plug and perform capability
- Easy setup and installation speeds up time to market
- Available with a wide range of different connectors
- Multi voltage supply range from 11-32 VDC
- Current control option available, both with and without spool position feedback
Our portfolio of high-performance PVE actuators features PVED-CC and PVED-CX, advanced digital actuators specifically designed for J1939/ISOBUS Protocol and CANopen systems. Along with analogue position control circuits, PVED-CC and CX also contain a digital circuit that enables flow control via CAN communication. The result is cutting-edge digital control, advanced diagnostic functions and the ability to provide a very high level of safety.

The ISO 11783 compliant PVED-CC has been specifically designed for off-highway vehicles, from agriculture, construction and road building, to materials handling, forestry and turf care.

Our PVED-CX actuator is also SIL 2 certified. This helps reduce the time and cost associated with system qualification and vehicle certification, required to meet the demands of Machinery Directive 2006/42/EC and related safety standards.

**General PVED Features:**
- ISOBUS CAN control
- Flow control
- Advanced performance settings
- Detailed status feedback
- User selectable, progressive flow characteristics
- Advanced built-in diagnostic functions
- Environmental robustness identical to analog PVE
- PVED-CX is SIL 2 certified according to IEC 61508
- CANopen protocol (CiA 3.01 and CiA 4.08)
- Power consumption <9 W
PVG load-independent proportional valves enable our customers to improve overall vehicle efficiency and save energy. While load-sensing technology itself is not new, PVG valves can help meet the demands of the Tier IV/Stage IV engine emissions regulations by minimizing power losses in the hydraulic system.

**Improve Hydraulic System Efficiency**

Energy losses in a hydraulic system can be greatly reduced depending on system design. For example, the difference in efficiency between load-sensing and conventional hydraulic systems can be seen in the four graphs below. By using PVG load-sensing technology in combination with a variable displacement pump, it’s possible to achieve a significant reduction in energy loss. This increases overall vehicle efficiency and performance, improves productivity and helps reduce total cost of ownership.

**Additional load-sensing benefits include:**
- Longer hydraulic component life, especially for pumps, due to reduced load
- Faster and more accurate control, independent of load
- Often a reduced size of pump
- Smaller cooler or no cooler at all, due to reduced heat load
- Reduced noise levels as the hydraulic components are only subjected to the oil flow and pressure necessary in a given load situation.

New Standards in Safety

A high level of safety has always been a priority when it comes to PVG valves. Anticipating the demands of new safety legislation, we have been developing products that help OEMs comply with the requirements of the revised European Machinery Directive (2006/42/EC) and related standards. These include our SIL 2 certified (Safety Integrity Level 2 according to IEC 61508) digital actuator, PVED-CX, and oil supply cut-off module, PVSK.

**SIL 2 Certified Electronic Actuator**

Based on proven PVE technology, PVED-CX operates using a self- and neighbor-monitoring process, combined with the ability to shut down all neighbor modules. Spool movement, internal electronics, and software processes are monitored redundantly.

When using PVED-CX together with PVG valves and PVSK, oil flow is controlled locally by the valve group. This shuts down work function oil flow without influencing any other vehicle functions.

PVED-CX is also able to perform independent system monitoring and diagnostics. This means that it does not require input from a microcontroller in order to determine whether a system malfunction has occurred. In the event of a signal loss or interruption, oil flow is cut-off and the valve is brought to a safe state – fast.

**New Safety Regulations and Related Standards**

European safety legislation has revised Machinery Directive 2006/42/EC and applies to all vehicles built in or shipped to Europe after December 29, 2009. This revision means that OEMs must perform and document a hazard and risk analysis for all vehicle functions.

Risk analysis must follow a functional safety standard, for example, ISO 13849 or ISO 25119. The outcome of the analysis is a SIL rating (Safety Integrity Level) or PL (Performance Level), which is used to identify the minimum safety requirements for each vehicle function.

Based on the derived SIL or PL, a system architecture (category) is chosen for the safety function, and then verified. The challenge for OEMs is to design and verify vehicle functions in order to meet a specific SIL or PL identified by the hazard and risk analysis.

To help our customers meet this challenge, Sauer-Danfoss is developing new products, in some cases pre-qualified, to help comply with the new safety standards and European law. We are working closely with our customers, to help speed up system development and qualification, reduce total costs, and bring vehicles to market faster.

Learn more at [www.sauer-danfoss.com](http://www.sauer-danfoss.com)/FunctionalSafety.
Wherever off-highway vehicles are at work, so is Sauer-Danfoss. We offer expert worldwide support for our customers, ensuring the best possible solutions for outstanding performance. And with an extensive network of Global Service Partners, we also provide comprehensive global service for all of our components.

Go to www.sauer-danfoss.com for further product information.

Please contact the Sauer-Danfoss representative nearest you.