

ENGINEERING
TOMORROW

Danfoss

Using **technology** to drive **productivity**

Series 45 axial piston pumps with electronic torque limiting control

Maximize efficiency
while increasing
productivity with

ETL



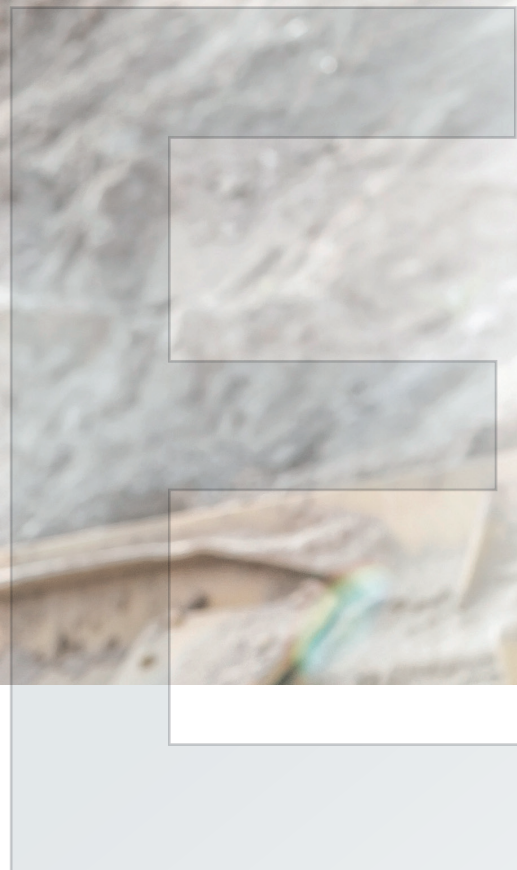
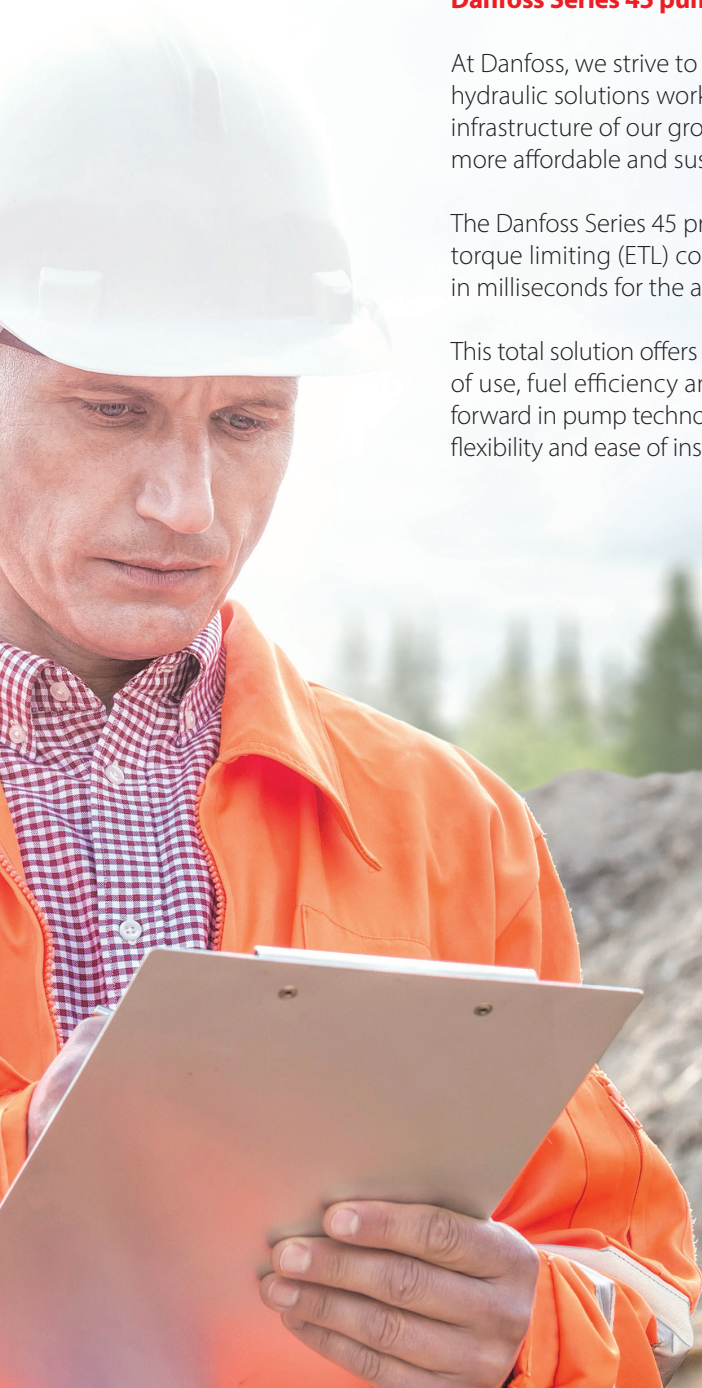
Engineering more profit

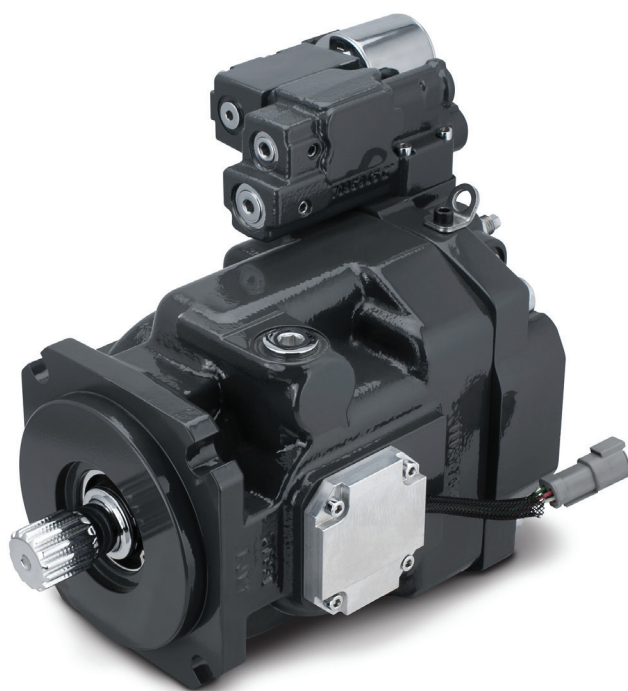
Danfoss Series 45 pumps with electronic torque limiting maximize performance

At Danfoss, we strive to make an impact where it matters most. Our off-highway mobile hydraulic solutions work more efficiently to maximize performance. As we build out the infrastructure of our growing cities, we're also conserving resources — making projects more affordable and sustainable.

The Danfoss Series 45 pressure compensated/load sensing (PCLS) pump with electronic torque limiting (ETL) control proactively and automatically maximizes system pressure in milliseconds for the available engine torque while preventing stalls.

This total solution offers a way to differentiate your product through improved ease of use, fuel efficiency and productivity. Plus, we've engineered this great leap forward in pump technology in a way that allows rapid prototyping, exceptional flexibility and ease of installation that can dramatically reduce time to market.





Up to

22%

more productivity vs.
traditional mechanical
torque controls.

Stay ahead of customer expectations

The rate of technological change is increasing quickly. The user of today's heavy equipment demands more intelligent machines that use technology to improve productivity and efficiency.

Not only does the Danfoss Series 45 PCLS pump with ETL control meet the trends of today and tomorrow, it offers unsurpassed flexibility and speed to market that can give your products a competitive advantage as others scramble to play catch-up.

To learn more about Danfoss ETL technology, visit www.danfoss.com/powersolutions

A yellow excavator is shown in a demolition site, with its arm raised and bucket open. The background shows a partially demolished building with exposed brick and concrete. The excavator has a yellow cab and a black body. A large red number '45' is overlaid on the right side of the image. The word 'SERIES' is written in white on a red rectangular background. The word 'EFFICIENCY' is written in large white letters at the bottom, with a large grey ampersand to its right.

SERIES

EFFICIENCY



By using technology to maximize pressure within the available torque curve, the Danfoss ETL control delivers these proven benefits:

► **Increases productivity up to 22% over alternative torque controls**

Through super-efficient use of engine power, the ETL control helps operators do more work per hour by eliminating engine stalls and bogging.

► **Moves up to 34% more material per gallon/liter of fuel**

ETL enables innovative operating features such as ECO modes and allows risk-free operation at the lowest brake specific fuel consumption (BSFC).

This can eliminate excessive noise resulting in peak efficiency, while promoting minimal environmental impact.

► **Increase fuel efficiency by up to 16%**

ETL can reduce fuel consumption without any loss in productivity. The gains of running the engine at the lowest brake specific fuel consumption (BSFC) is offset by the increased flow of a larger pump that can operate without the risk of stalling an engine — something traditional torque controls cannot match.

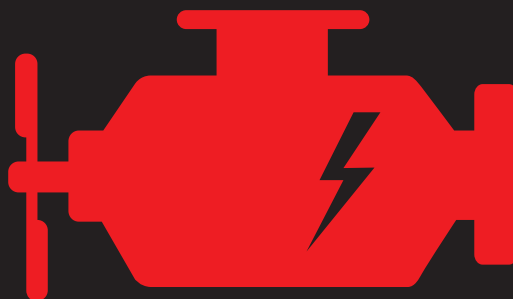
PRODUCTIVITY

Find out how Danfoss ETL can make your business more productive at www.danfoss.com/powersolutions

SYSTEM

FUNCTIONALITY

Engine speed signal sent to PLUS+1® microcontroller. Plug and perform technology allows the CAN bus signal to be used for engine speed monitoring.



Simple integration means immediate value

Easy software integration

- Pre-programmed hardware for easy system setup
- Prove out, demo, and fine-tune your solution with ease
- GUIDE blocks are easily integrated into PLUS+1 systems
- A flexible solution that readily integrates into existing on-board electronics

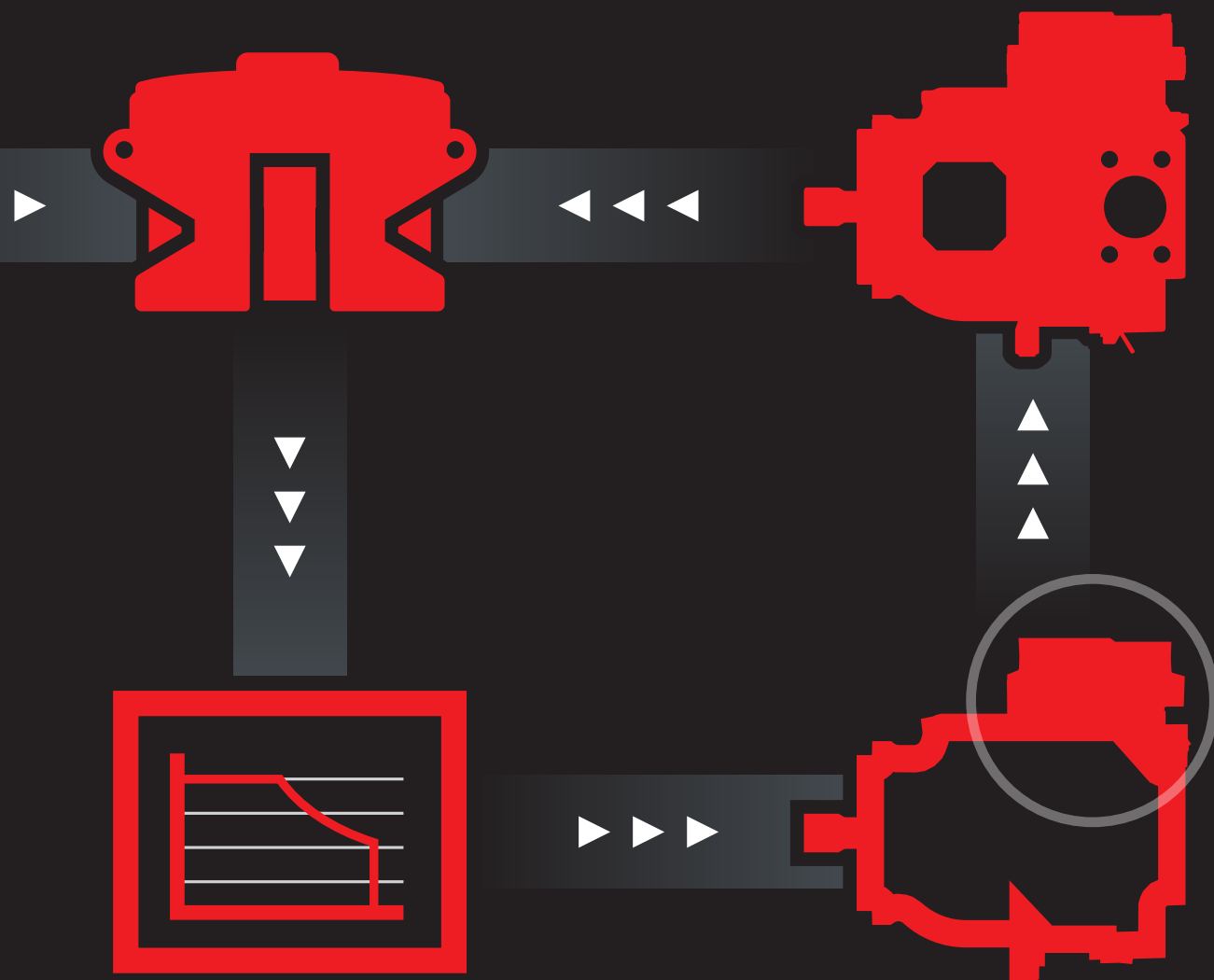
Electrical hardware

- 12 V and 24 V configurations
- Angle sensor and proven PCLS control with integrated proportional relief valve (PRV)
- Continues to operate the work function system as a PCLS pump, even if the electrical signal is lost

ETL is available on 45 cc – 147 cc pumps in 12 V and 24 V configurations

Your engine torque vs. speed curve is programmed into a PLUS+1 microcontroller. Pre-keyed MC-12 hardware is also available and software can be adopted for your proprietary control systems.

Pump displacement information is continuously fed to the PLUS+1 microcontroller via the angle sensor — allowing for proactive torque limiting protection.



PLUS+1 GUIDE software adjusts the pump's proportional relief valve (PRV) setting for each respective displacement at a given engine speed. GUIDE software blocks are available — allowing for easy integration into existing GUIDE software applications.

The pump's response is regulated by a standard PCLS control with integrated PRV. If electrical power is lost, the pump automatically defaults to normal PCLS functionality.

Learn more about the Series 45 PCLS pump with ETL control — including everything we can do to integrate the technology into your existing and future machines at www.danfoss.com/powersolutions

Engineered for use in both new and existing equipment

Bring enhanced, state-of-the-art electronics to pumps of any size with the Danfoss ETL control. You won't need to resize, reroute or rework any other part or system when you take advantage of our pre-keyed microcontrollers. Just drop it in, fine-tune the parameters — a process that Danfoss has reduced from days to just hours — and you're ready to start experiencing impressive benefits.



Full system integration can be achieved quickly and easily with the Danfoss ETL GUIDE block and pre-programmed controllers giving you a significant time-to-market advantage. The solution is also PLUS+1® compliant.



The Danfoss ETL control can be fitted into any existing pressure compensated/load sensing or mechanical torque control (MTC) system. Unlike other PCLS or MTC systems, the Danfoss solution is not limited by traditional sizing or engine torque constraints, but can operate in a full range of pump displacement and engine torque curves.

F U L L S Y S T E M I N T E G R A T I O N



The power of flexibility

Telematics enabled, Danfoss Series 45 axial piston pumps with electronic torque limiting (ETL) technology allow for vital data collection and greater connectivity to your machines. Lower maintenance costs and increase uptime with predictive maintenance and remote service. These are information-driven capabilities unavailable in many competing pumps.

Danfoss Telematics offers easy-to-develop custom applications. Our PLUS+1 GUIDE (graphical user integrated development environment) system uses drag-and-drop editing making application development simple — even for programmers lacking formal development training. Now OEMs of any size have the ability to compete and win with superior product benefits that enhance their brand through built-in telematics capabilities.



Danfoss ETL control is easy to integrate into new or existing systems. To find out how easy it can be for you, contact your Danfoss representative at www.danfoss.com/powersolutions.





DANFOSS

APPLICATION DEVELOPMENT CENTERS

See ETL control in action

Danfoss developed the ETL control at one of our three global Application Development Centers (ADCs). Danfoss ADCs are also a great place to experience the ETL difference firsthand by using similar machines with and without ETL control and comparing performance.

A Danfoss system application engineer (SAE) can work with you to install ETL on one of your machines, which can be tested at the ADC under real-world conditions. Danfoss has committed all the expertise and capabilities of our ADCs to helping customers drive more revenue by capitalizing on many Danfoss solutions, including ETL control.

Contact your Danfoss representative and see how our ADC facilities can work for you.

About Danfoss Power Solutions

Danfoss Power Solutions is a global manufacturer and supplier of high-quality hydraulic and electric 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 as well as the marine sector. Building on our extensive applications expertise, we work closely with you to ensure exceptional performance for a broad range of applications. We help you and other customers around the world speed up system development, reduce costs and bring vehicles and vessels to market faster.

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.

Danfoss Power Solutions – your strongest partner in mobile hydraulics and mobile electrification.

Products we offer:

- DCV directional control valves
- Electric converters
- Electric machines
- Electric motors
- Hydrostatic motors
- Hydrostatic pumps
- Orbital motors
- PLUS+1® controllers
- PLUS+1® displays
- PLUS+1® joysticks and pedals
- PLUS+1® operator interfaces
- PLUS+1® sensors
- PLUS+1® software services, support and training
- PLUS+1® software
- Position controls and sensors
- PVG proportional valves
- Steering components and systems
- Telematics

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

Danfoss Power Solutions (US) Company

2800 East 13th Street
Ames, IA 50010, USA
Phone: +1 515 239 6000

Danfoss Power Solutions GmbH & Co. OHG

Krokamp 35
D-24539 Neumünster, Germany
Phone: +49 4321 871 0

Danfoss Power Solutions ApS

Nordborgvej 81
DK-6430 Nordborg, Denmark
Phone: +45 7488 2222

Danfoss Power Solutions Trading (Shanghai) Co. Ltd.

Building #22, No. 1000 Jin Hai Rd
Jin Qiao, Pudong New District
Shanghai, China 201206
Phone: +86 21 3418 5200