

Technical information

Demo kit PVED-CLS



Revision history

Table of revisions

Date	Changed	Rev
November 2019	First edition	0101

Contents

General information

Demo kit components and ordering.....	4
PVED-CLS demo kit warranty.....	4
Glossary.....	5
PVED-CLS literature references.....	5
Demo kit purpose.....	6

Modes and features demonstration

On-road and off-road modes.....	7
Steering wheel and auxiliary programs.....	7
Safe state.....	8

Button interface and modes

Buttons and icons.....	9
------------------------	---

CAN messaging

Configuring CAN message communication.....	11
Messages coming from DM430E display controller.....	11

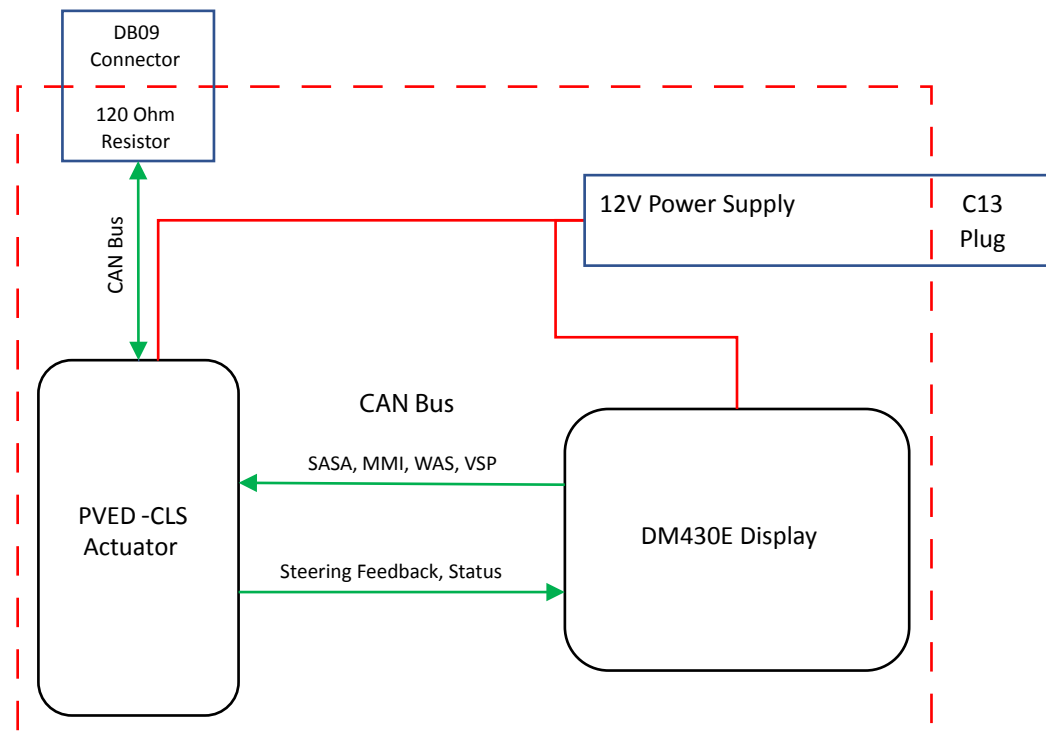
General information

Demo kit components and ordering

Included in the kit:

- PVED-CLS actuator
- DM430E display (with Steering Simulation PLUS+1® program)
- 3D printed case
- DB09 9 pin CAN port access with 120 ohm resistor
- Internal 12V, 5.0A power supply (C13 power cable not included)

Block diagram



Ordering information

Description	Material number
PVED-CLS demo kit	11235004

PVED-CLS demo kit warranty

The PVED-CLS demo kit is not covered by warranty. Danfoss is not liable for any damages to any component in the PVED-CLS demo kit.

For more information, contact your Danfoss representative.

General information

Glossary

AUX	Auxiliary
CAN	Controller Area Network
DM430E	A Danfoss Display Controller
EH	Electro-hydraulic
FMI	Failure Mode Identifier
GPS	Global Positioning System (auto-guidance command)
HMI/MMI	Human Machine Interface/Man Machine Interface
PVED-CLS	Proportional Valve Electronic Digital - Closed Loop Steering (CLS for short)
SASA	Steering Angle Sensor - Absolute
SPN	Suspect Parameter Number
VSP	Vehicle Speed
WAS	Wheel Angle Sensor

PVED-CLS literature references

For other PVED-CLS documentation (including certificates), please visit the product's webpage: [PVED-CLS](#).

For more information, please contact your Danfoss representative.

General information

Demo kit purpose

The PVED-CLS demo kit provides tools that serve a variety of purposes.

The demo kit allows the user to:

- Simulate steering behaviors
- Demonstrate functional safety features of PVED-CLS
- Troubleshoot
- Train

Steering simulation in action



Modes and features demonstration

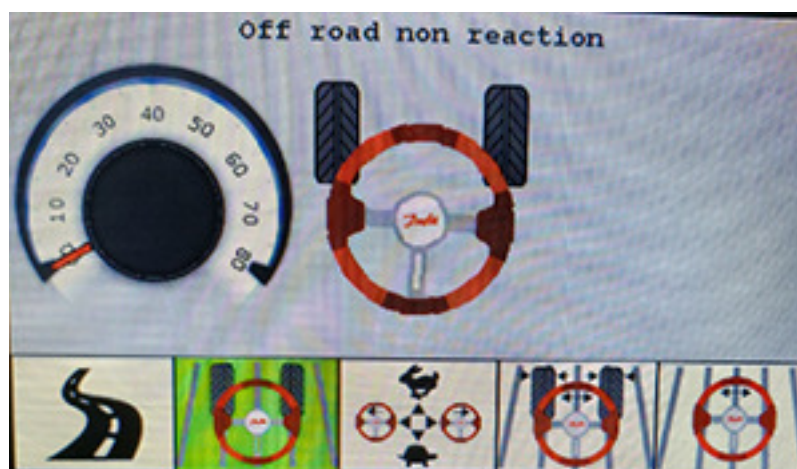
On-road and off-road modes

The on-road and off-road modes represent specific operating conditions.

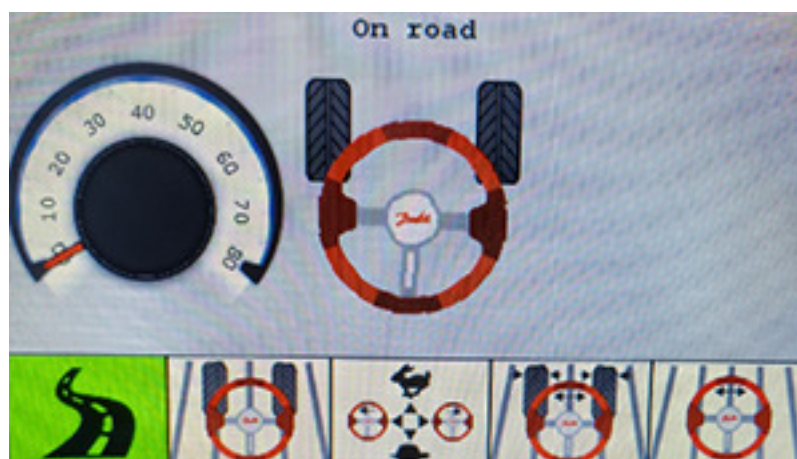
Off-road mode Operating condition when the PVED-CLS allows to transition electrical steering inputs (such as GPS or joystick command).

On-road mode Operating condition when only the hydraulic input from the steering column will be allowed to control steering.

Off-road mode



On-road mode



Steering wheel and auxiliary programs

The PVED-CLS can store steering wheel and auxiliary programs in its memory. These are profiles that determine the sensitivity of steering devices at different vehicle speeds.

These profiles adjust the number of turns it takes to steer from left end-stop to right end-stop (or lock to lock). This safety feature allows faster wheel turning at slow vehicle speed and limit wheel turning speed at high vehicle speed. Changing the speed value (up and down arrows) will change the lock to lock value shown on the right side of the screen when in this mode.

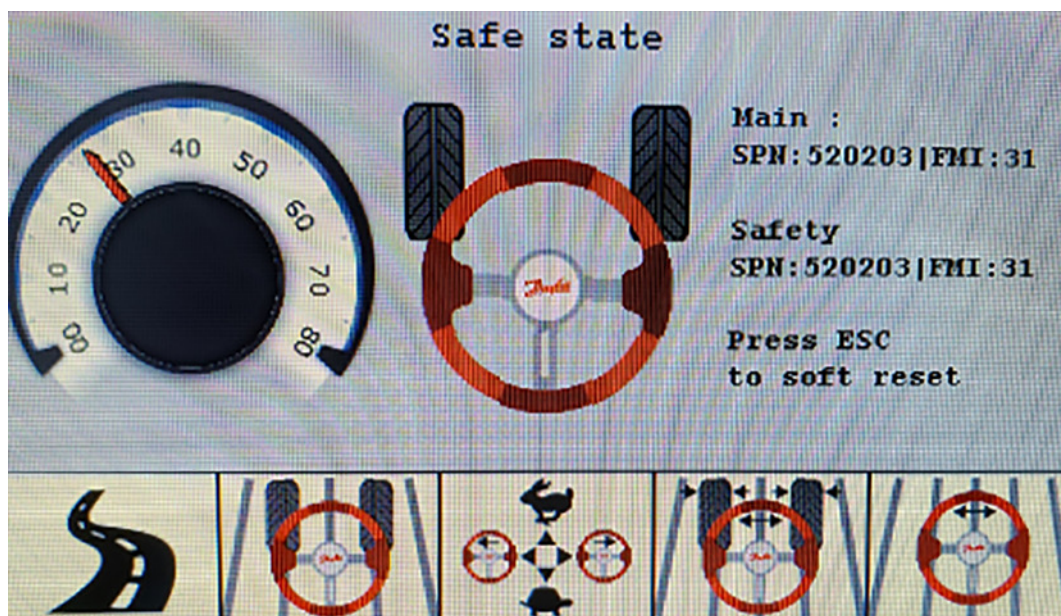
Modes and features demonstration

Safe state

This mode will appear if necessary CAN messaging is lost, or vehicle speed exceeds safety limits set in the CLS.

The display will read out the SPN (suspect parameter number) and FMI (Failure mode identifier) for the given error. These error codes are described in detail in the [PVED-CLS user manual](#) found in each firmware release package.

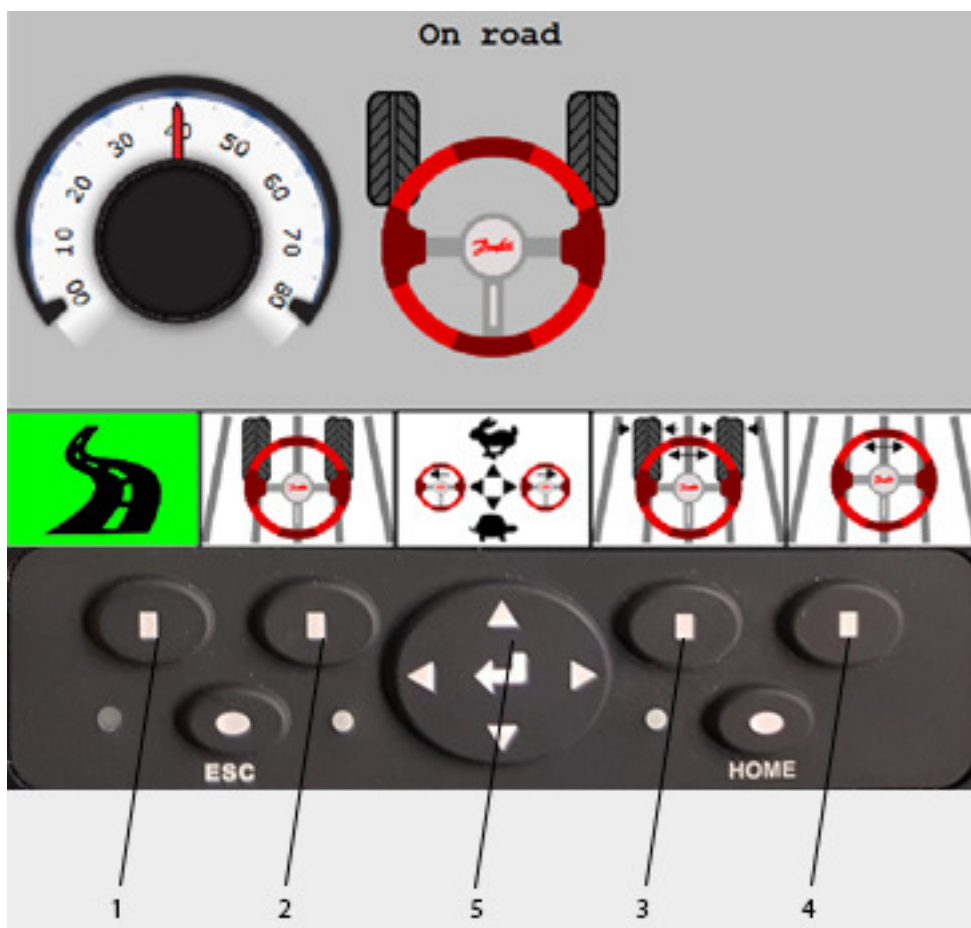
Safe state and error reporting



For more information on the CLS modes and transitions, refer to the state machine diagrams in the [PVED-CLS user manual](#) found in each firmware release package.



Button interface and modes

Buttons and icons






The selected mode will be highlighted in green.

Button reference

Button	Icon	Function
1	<p><i>On-road</i></p> 	The CLS is powered on but is locked out of EH (electrohydraulic) steering functions. Only the hydraulic simulation will take place, via steering wheel SASA input. AUX, GPS, and Variable Rate Steering are disabled.
2	<p><i>Off-road non reaction</i></p> 	The CLS will allow EH steering functions and the wheels are prevented from straightening due to reaction forces.

Button interface and modes

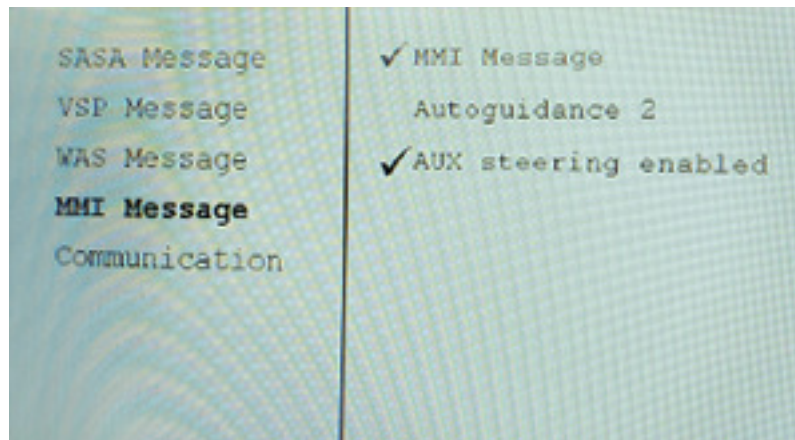
Button reference (continued)

Button	Icon	Function
3	<p>Off-road reaction/auxiliary program cycle</p> 	<p>Off-road reaction: The CLS will allow EH steering functions and wheels will try to straighten due to reaction forces.</p> <p>Auxiliary program cycle: If an auxiliary steering device is enabled (via HMI message) and activated by its use, the CLS will change to the most recent Aux program it accessed; additional button 3 presses will cycle through the 5 auxiliary steering programs stored in the CLS parameters.</p>
4	<p>Steering wheel programs cycle</p> 	<p>Pressing button 4 consecutively will cycle through the 5 variable rate steering wheel programs stored in the CLS parameters.</p>
5	<p>Navigation keys</p> 	<p>Up and down arrows: Increases (up) or decreases (down) vehicle speed per speedometer on main screen; navigate up or down menu items on the HOME menu.</p> <p>Right and left arrows: Turns steering wheel to the right or left on the main screen; navigate right or left on the HOME menu.</p> <p>Enter: Toggles HOME menu items on or off via check mark symbol.</p>
Escape	ESC	Issues a soft reset command to the PVED-CLS; soft reset works similarly to a power cycle and may be needed after correcting an error condition.
Home	HOME	Navigates user to a menu that controls the CAN messaging from the display controller to the PVED-CLS.

CAN messaging

Configuring CAN message communication

Home button menu controlling CAN messaging



All CAN messages sent from the display controller to the PVED-CLS can be toggled on and off. This allows for other devices sending equivalent messages to be placed on CAN.

[Pressing enter on the "communication" option causes the display controller to read the relevant parameters from the CLS to apply to the simulation. This should be used after making parameter changes within the PVED-CLS.](#)

Messages coming from DM430E display controller

Message	Description
Steering Wheel Angle and Velocity (SASA)	Pressing the left and right arrow keys rotates the on-screen steering wheel.
Vehicle Speed (VSP)	Pressing the up and down arrow keys adjusts the speedometer on left side of the screen.
Human-Machine Interface (HMI/MMI)	Requests the steering mode and enables/disables eSteering devices.
CAN based wheel angle (WAS)	Wheel Angle simulated based on SASA, AUX (auxiliary), or GPS (curvature command) steering input. The on-screen wheels represent the value generated.

[For more information, please see the CAN message content in the *PVED-CLS communication protocol* document found in each firmware release package.](#)

Contact your Danfoss representative to access and update the PLUS+1® display program.

Products we offer:

- DCV directional control valves
- Electric converters
- Electric machines
- Electric motors
- Gear motors
- Gear pumps
- 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
- PLUS+1® software services, support and training
- Position controls and sensors
- PVG proportional valves
- Steering components and systems
- Telematics

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.

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

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

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.

Hydro-Gear

www.hydro-gear.com

Daikin-Sauer-Danfoss

www.daikin-sauer-danfoss.com

Local address:

**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 2080 6201

Danfoss can accept no responsibility for possible errors in catalogues, brochures and other printed material. Danfoss reserves the right to alter its products without notice. This also applies to products already on order provided that such alterations can be made without subsequent changes being necessary in specifications already agreed. All trademarks in this material are property of the respective companies. Danfoss and the Danfoss logotype are trademarks of Danfoss A/S. All rights reserved.