PPU 300

Parallelling and Protection Unit

Operator's manual

4189341099P

DEIF Improve Tomorrow

1. About the Operator's manual

2. Getting started

3. Operating the system

1. About the Operator's manual

1.1 Symbols for general notes

NOTE This shows general information.

More information
This shows where you can find more information.

Example

This shows an example.

How to ...
This shows a link to a video for help and guidance.

1.2 Symbols for hazard statements

DANGER!

This shows dangerous situations.

If the guidelines are not followed, these situations will result in death, serious personal injury, and equipment damage or destruction.

WARNING

This shows potentially dangerous situations.

If the guidelines are not followed, these situations could result in death, serious personal injury, and equipment damage or destruction.

CAUTION

This shows low level risk situation.

If the guidelines are not followed, these situations could result in minor or moderate injury.

NOTICE

This shows an important notice

Make sure to read this information.

1.3 Symbols for LEDs

LEDs in this document are noted by the following symbols:

Symbol	Colour	State		Notes
	Grey	Off	Static	• The LED is not active. • The feature or indication is not active.
	Any	On	Static	The feature or indication is active.
	Any	On	Flashing	The feature or indication is active.

NOTE Some products do not support all LED colours.

1.4 Intended users of the Operator's manual

CAUTION

Read this manual

Read this manual before you operate the system. Failure to do this may result in personal injury and damage to the equipment.

The Operator's manual is for the operator that completes daily operations with the controller. The manual includes information about the LEDs, buttons and screens, and general operator tasks, alarms, and logs.

1.5 Software versions

The information in this document relates to software versions:

Software	Details	Version
PCM APPL	Controller application	1.0.21.x
DU APPL	Display unit application	1.0.20.x
PICUS	PC software	1.0.20.x

1.6 Technical support

Technical documentation

Download the technical documentation from the DEIF website: www.deif.com/documentation/

Service and support

DEIF is committed to being available to our customers and partners 24 hours a day, seven days a week, to guarantee the highest levels of service and support.

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www.deif.com/training

Additional service

DEIF offers **service** with design, commissioning, operating and optimisation.

www.deif.com/support/local-office

1.7 Warnings and safety

Safety during installation and operation

When you install and operate the equipment, you may have to work with dangerous currents and voltages. The installation must only be carried out by authorised personnel who understand the risks involved in working with electrical equipment.

DANGER!

Hazardous live currents and voltages

Do not touch any terminals, especially the AC measurement inputs and the relay terminals, as this could lead to injury or death.

Automatic and remote-controlled starts

CAUTION

Automatic genset start

The power management system automatically starts gensets when more power is needed. It can be difficult for an inexperienced operator to predict which gensets will start. In addition, gensets can be started remotely (for example, via an Ethernet connection, or a digital input).

To avoid personal injury, the genset design, the layout, and maintenance procedures must take this into account.

Switchboard control

In *Switchboard control*, the operator operates the equipment from the switchboard. When *Switchboard control* is activate:

- The controller trips the breaker and/or shuts down the engine, if an alarm situation arises that requires a trip and/or shutdown.
- The controller **does not** accept operator commands.
- The controller cannot and **does not** prevent manual operator actions.

The switchboard design must protect the system when the controller is in *Switchboard control*.

DANGER!

Manual override of alarm action

Do not use switchboard or manual control to override the alarm action of an active alarm.

An alarm may be active because it is latched, or because the alarm condition is still active. If the alarm action is manually overridden, the latched alarm provides no protection.

Do not manually override active alarm actions

DANGER!

Manual override of latched alarm action

If the alarm action is manually overridden, a latched alarm does NOT provide any protection.

Do not override the alarm action of an active alarm. An alarm may be active because it is latched, or because the alarm condition is still present.

Latched *Over-current* alarm example

The controller trips a breaker because of over-current. The operator then manually (that is, not using the controller) closes the breaker while the *Over-current* alarm is still latched.

If another over-current situation arises, the controller **does not trip the breaker again**. The controller regards the original *Over-current* latched alarm as still active, and it does not provide protection.

1.8 Legal information

Warranty

The rack may only be opened to remove, replace, and/or add a hardware module or the internal battery on PCM3.1. The procedure in the **Installation instructions** must be followed. If the rack is opened for any other reason, and/or the procedure is not followed, then the warranty is void.

If the display unit is opened, then the warranty is void.

Open source software

This product contains open source software licensed under, for example, the GNU General Public License (GNU GPL) and GNU Lesser General Public License (GNU LGPL). The source code for this software can be obtained by contacting DEIF at support@deif.com. DEIF reserves the right to charge for the cost of the service.

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Copyright

2. Getting started

2.1 About controller operation

The PPU 300 controllers make sure that the system is protected for typical maritime applications.

Local or Remote mode

LOCAL mode uses command start sequences from the display push-buttons. Remote commands for sequences are ignored.

REMOTE mode uses command start sequences from digital input, PICUS, Modbus, and/or CustomLogic or CODESYS. Display push-buttons for sequences are ignored.

Switchboard control

Each controller can operate in switchboard control. You can manually operate the genset speed and open and close the breakers. Use Switchboard control for troubleshooting, or to manually override the system..

In Switchboard control, all the controller functions are not available, but the controller protections stay active. The controller monitors the operation for alarm conditions, and activates alarm actions if necessary.

Buttons and LEDs

You can use the push-buttons to operate the system. You can change modes, start pre-programmed sequences, and silence alarms. The buttons to start or stop the genset, or close or open the breakers, are only active in LOCAL mode.

Some push-buttons may not be used, subject to the design of the system. Check with the designer of the system.

Push-buttons that can be enabled or not enabled for use:

- Mode change
- Mute alarms
- Start/stop engine
- Open/close breaker

The display LEDs show the status of the system.

Display screen

Use the display screen to:

- Monitor system operation.
- Log on to the controller.
- See alarm lists and logs.
- Acknowledge and unlatch alarms.
- Configure the controller settings.

NOTE Features are protected by user level permissions.

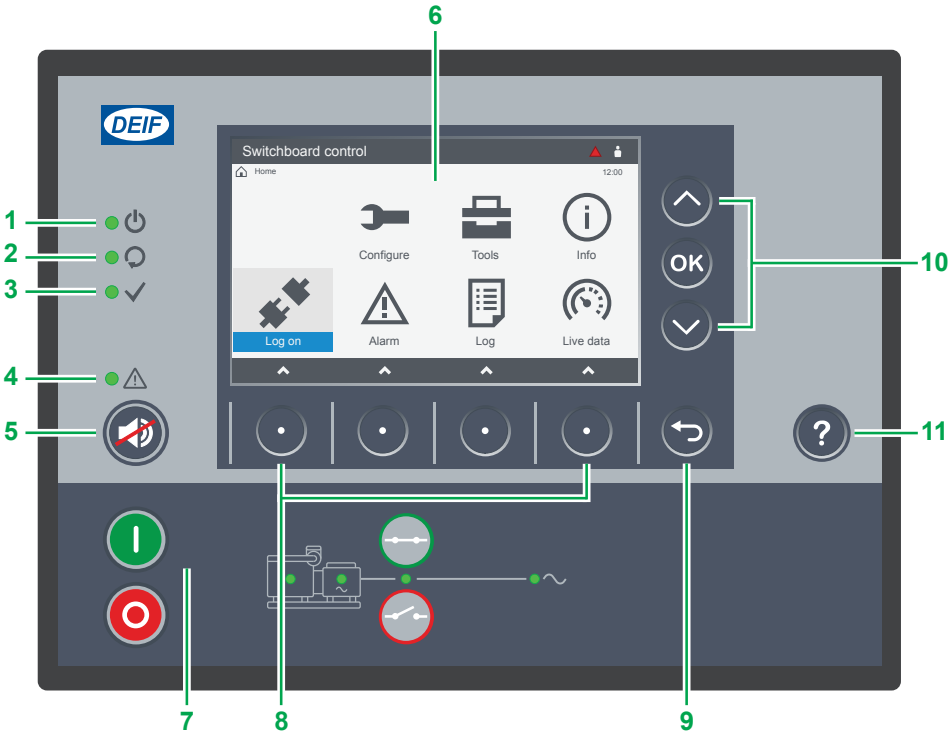
PICUS

Power In Control Utility Software (PICUS) is the computer software to configure and monitor the controllers. You can connect a computer with PICUS to the controller (direct connection). You can now configure, supervise, send commands and more.

More information
See https://www.deif.com/products/picus/ for the latest software download and information.

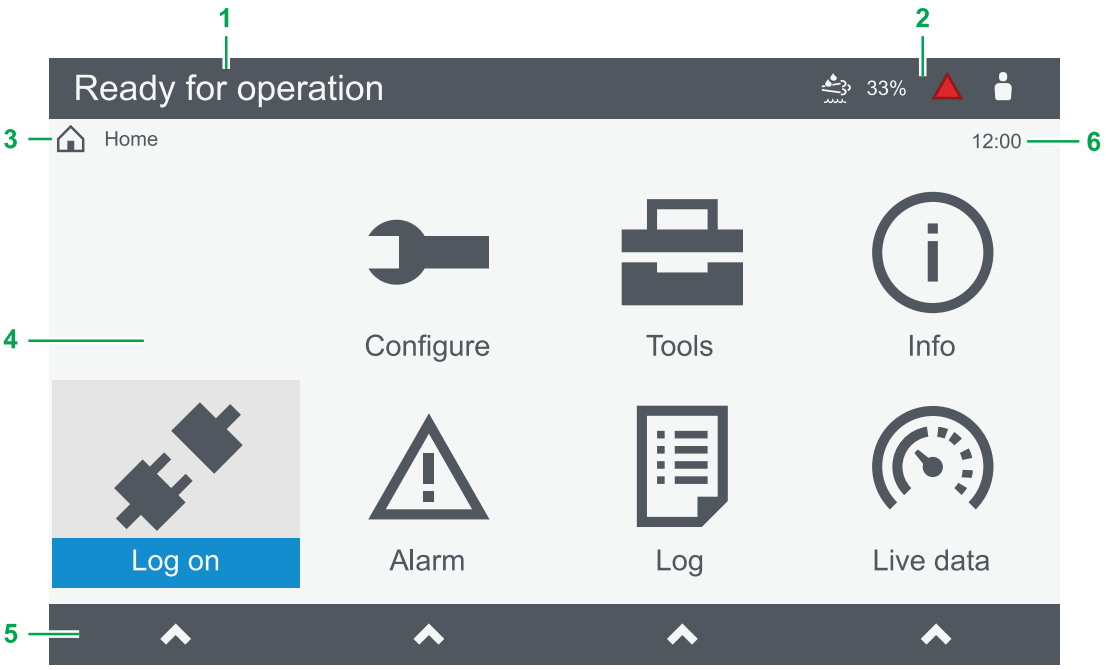
2.2 About the display unit (DU 300)

2.2.1 Display, LEDs, and buttons



No.	Item	Notes	
1	Display unit power	**Off** : Unit not powered.	**Green** : Unit powered.
2	Self-check OK	**Off** : Controller self-check not OK, or no connection to the controller.	**Green** : Controller self-check OK.
3	Ready for operation	**Off** : The controller is in manual regulation, or an alarm action prevents the source from supplying power.	**Green** : The controller is not in manual regulation and no alarm action prevents the source from supplying power.
4	Alarm	**Green** : No alarms. **Yellow** : Unlatched alarms can be reset. **Red** : All active alarms acknowledged.	**Green flash** : Only cleared unacknowledged alarms. **Yellow flash** : Unacknowledged latched alarms **Red flash** : Unacknowledged alarms.
5	Horn silence	Stop the horn output.	Hold: Change to alarms page.
6	Screen	Shows the feature or page.	
7	Bottom strip	LEDs and buttons for the controller type.	
8	Soft key	Move selection to a column, or select the soft key shown on screen.	
9	Back	Change to previous page.	Hold: Change to home page.
10	Selection on screen	**Up** : Move selection up on the screen. **OK** : confirm selection on screen.	**Down** : Move selection down on the screen.
11	Help	Change to help page.	Hold: Change to Live data page.

2.2.2 Screen layout

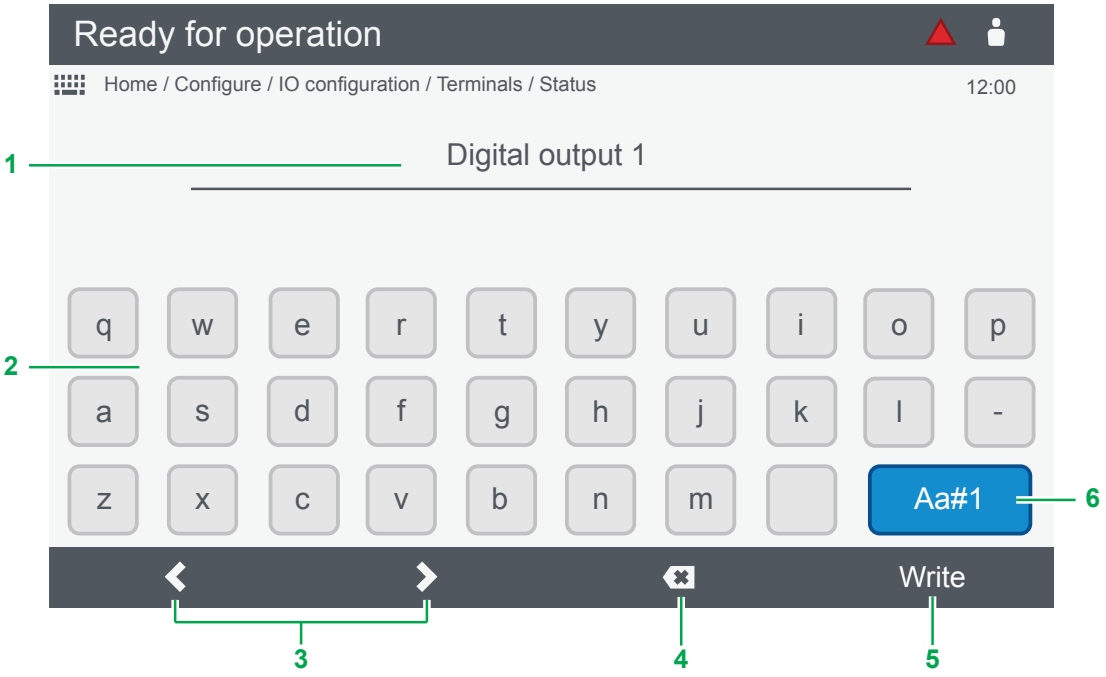


No.	Item	Notes	
1	Status text	Shows the current controller status text. This varies depending on the operation of the controller.	
2	Symbols	Shows information as symbols:	
		Diesel Exhaust Fluid (DEF) level. *	**Active alarms** in system.
		Logged on user.	
3	Path	Shows the path for the selected page.	
4	Page	Shows the menu or page.	
5	Soft keys	Shows the soft keys for the page viewed.	
6	Time	Shows the time from the controller.	

NOTE * Diesel Exhaust Fluid (DEF) percentage level is only shown if data is available.

2.2.3 About the virtual keyboard

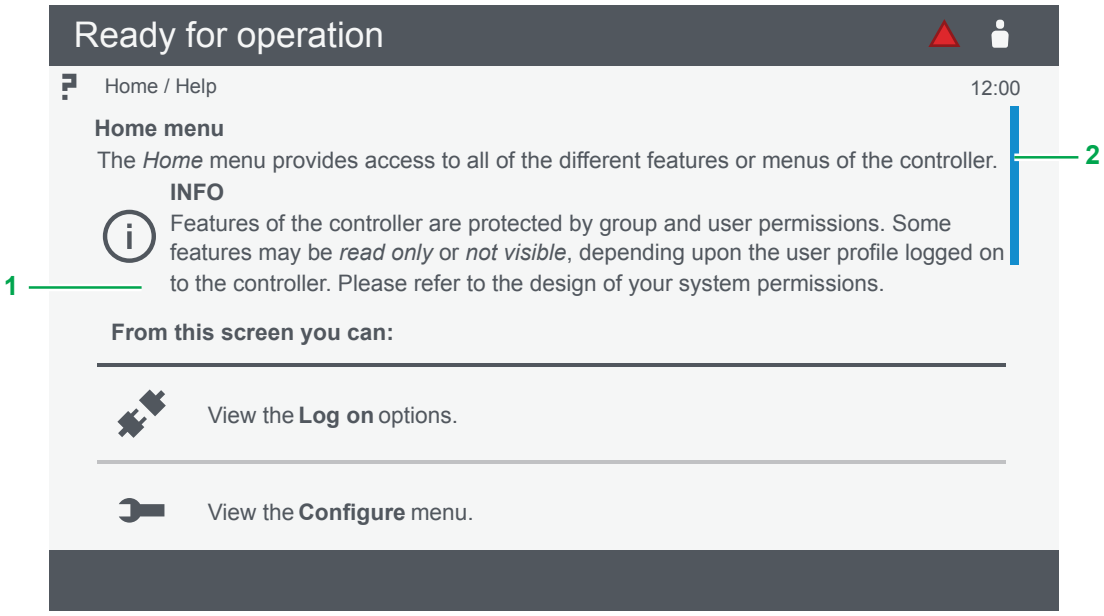
The display unit features several virtual keyboards to enter information or settings.



No.	Item	Notes
1	Text input	Shows the text, numbers, or value entered.
2	Virtual keyboard	Shows keyboard layout selected.
3	Cursor selection	**Move left** cursor selection. **Move right** cursor selection. Or use **Up** or **Down** .
4	Delete	**Delete** character at selection.
5	Soft key confirm	Soft key function varies by page selected.
6	Change keyboard	Changes layout to a different virtual keyboard.

2.2.4 About the help

View help for any page by selecting **Help** button



No.	Item	Notes	
1	Help information	Shows help information for the page you were viewing. The default help is shown if not help is available for the page.	
2	Scroll	**Scroll up** the page.	**Scroll down** the page.

Select **Back** to close the help page and return to the previous page.

3. Operating the system

3.1 GENSET controller basic actions

3.1.1 About operation of the GENSET controller

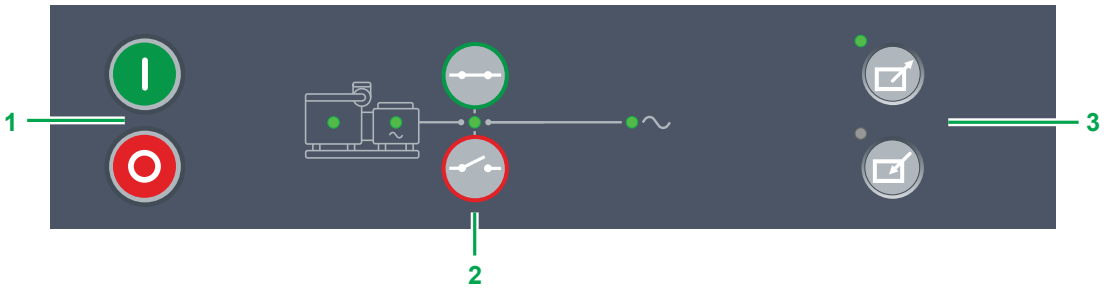
A system can include a number of **GENSET** controllers that work together to ensure effective power management. Each controller can control up to three non-essential load groups (NEL).

Normal operation

The **GENSET** controller is usually in LOCAL mode.

The controller can operate in REMOTE mode or LOCAL mode, and in Switchboard control.

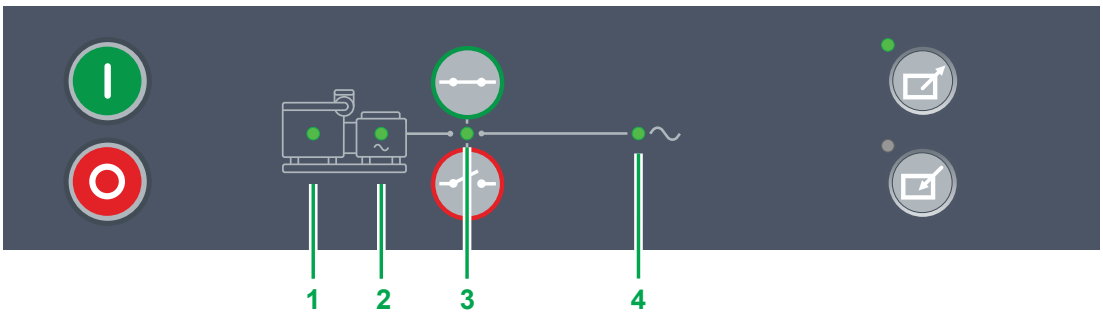
3.1.2 GENSET controller buttons



No.	Item	Notes	
1	Genset	**Start** genset and start sequence. *	**Stop** genset and stop sequence. *
2	Breaker	**Close** breaker : Starts close sequence. *	**Open** breaker : Starts open sequence. *
3	Options	**REMOTE mode** : Change to REMOTE if possible. *	**Off** : Controller not in REMOTE. **Green** : Controller in REMOTE.
		LOCAL mode : Change to LOCAL if possible.	**Off** : Controller not in LOCAL. **Green** : Controller in LOCAL.

NOTE * Only in LOCAL mode. In REMOTE or Switchboard control the controller ignores the input.

3.1.3 GENSET controller LEDs



No.	Item	Notes
1	Engine	**Off** : Engine not running or no running feedback. **Green flash** : Engine start sequence initiated. **Green** : Running feedback. Oil pressure, RPM, frequency within configured limits.
2	Generator	**Off** : Generator voltage too low to measure. **Yellow** : Generator voltage and frequency not OK. Cannot close breaker. **Green flash** : Generator voltage and frequency OK, V&Hz OK timer still running. Cannot close breaker. **Green** : Generator voltage and frequency OK, and controller can synchronise and close breaker.
3	Breaker	**Off** : Breaker open **Green** : Breaker closed. **Yellow** : Breaker spring charging (only compact breaker). **Yellow flash** : Synchronising or de-loading breaker. **Red flash** : Any generator breaker trip alarm active. **Red** : Tripped breaker, and trip alarm unacknowledged and/or alarm condition present.
4	Busbar	**Green** : Voltage and frequency OK, and controller can synchronise and close breaker. **Green flash** : Voltage and frequency OK, but V&Hz OK timer running. Controller cannot close breaker. **Yellow** : Voltage and frequency are measurable, but not OK. **Red** : Voltage too low to measure. Controller can close breaker. **Red flash**: Blackout detection timer running and controller checking the busbar.

3.1.4 Change modes

Mode	Procedure
REMOTE *	To change to REMOTE mode from LOCAL mode: 1. Push . • The LED next to is green when the controller is in REMOTE mode.
LOCAL *	To change to LOCAL mode from REMOTE mode: 1. Push . • The LED next to is green when the controller is in LOCAL mode.
Switchboard control	To change to Switchboard control from REMOTE or LOCAL mode: 1. Change the selector on the switchboard to Switchboard control. • The controller changes to Switchboard control. • If the engine was running, it continues to run • If the breaker was closed, it remains closed. • The controller will trip the breaker and/or stop the engine if the operating conditions activate an alarm that trips the breaker and/or stops the genset.

NOTE * You cannot change from Switchboard control with the display push-buttons. The Switchboard control selector must be set to LOCAL or REMOTE, before you can change mode.

The switchboard equipment is third-party equipment. The Switchboard control selector labels could be different from the names used above.

3.1.5 Start the genset

Mode	Procedure
REMOTE	When the controller is in REMOTE mode, the engine start is based on a remote signal, for example, from a PLC.
LOCAL	To start the genset: 1. Push once. 2. The controller runs the start sequence. • If everything is OK, the genset starts. • If the genset does not start, the display shows an info message. 3. If **Idle run start** is configured: * • The controller runs the **Idle run start** sequence. ◦ If needed, to override the **Idle run start** push again.
Switchboard control	When the controller is in Switchboard control, the display push-buttons are not available. The genset can only be started locally and/or from the switchboard.

NOTE * Idle run may not be permitted or approved by certain maritime classification societies.

The switchboard equipment is third-party equipment. The switchboard might not include a button to start the genset.

3.1.6 Stop the genset

Mode	Procedure
REMOTE	When the controller is in REMOTE mode, the engine stop is based on a remote signal, for example, from a PLC.
LOCAL	The genset breaker must be open to stop the genset. If the genset breaker is not open, press to open the breaker before stopping the genset. **More information** See Open the genset breaker for more information. To stop the genset: 1. Push once. 2. The controller runs the cooldown period. • If necessary, to override the cooldown time, push again. ◦ **Note:** A genset stop without cooldown time increases the mechanical wear of the genset. The genset may also have problems if it needs to restart immediately. The genset should only be stopped without cooldown time in emergencies. Contact the genset manufacturer for more information. 3. If **Idle run stop** is configured: * • The controller runs the **Idle run stop** sequence. ◦ If needed, to override the **Idle run stop** , push again. 4. If the genset does not stop, the controller activates an alarm.
Switchboard control	When the controller is in Switchboard control, the display push-buttons are not available. The genset can only be stopped locally and/or from the switchboard.

NOTE * Idle run may not be permitted or approved by certain maritime classification societies.

The switchboard equipment is third-party equipment. The switchboard might not include a button to stop the genset.

3.1.7 Close the genset breaker

Mode	Procedure
REMOTE	When the controller is in REMOTE mode, the generator breaker is closed based on a remote signal, for example, from a PLC.
LOCAL	The genset must be running to close the genset breaker. If the genset is not running, push to start the genset. **More information** See Start the genset for more information. To close the breaker: 1. Push to close the genset breaker. a. The controller synchronises the genset with the busbar. (the breaker LED flashes yellow). b. When the genset and busbar synchronise, the controller closes the breaker. c. When the breaker is closed, the breaker LED is green . • If the genset and busbar are not synchronised before the synchronisation timer expires, the breaker does not close. The synchronisation failure alarm is activated.
Switchboard control	When the controller is in Switchboard control, the display push-buttons are not available. The genset breaker can only be closed from the switchboard.

3.1.8 Open the genset breaker

Mode	Procedure
REMOTE	When the controller is in REMOTE mode, the generator breaker is opened based on a remote signal, for example, from a PLC.
LOCAL	To open the genset breaker: 1. Push to open the genset breaker. * a. If load sharing is present, the controller de-loads the breaker until the load is less than the de-load open point (the breaker LED flashes yellow). b. The controller then opens the generator breaker. The breaker LED is OFF when the breaker is open. c. If load sharing is not present or not possible, the controller immediately opens the generator breaker. d. The breaker LED is OFF when the breaker is open.
Switchboard control	When the controller is in Switchboard control, the display push-buttons are not available. The breaker can only be opened from the switchboard.

NOTE * If there is a position failure for the breaker, you can still attempt to try and open the breaker and push .

3.2 HYBRID controller basic actions

3.2.1 About operation of the HYBRID controller

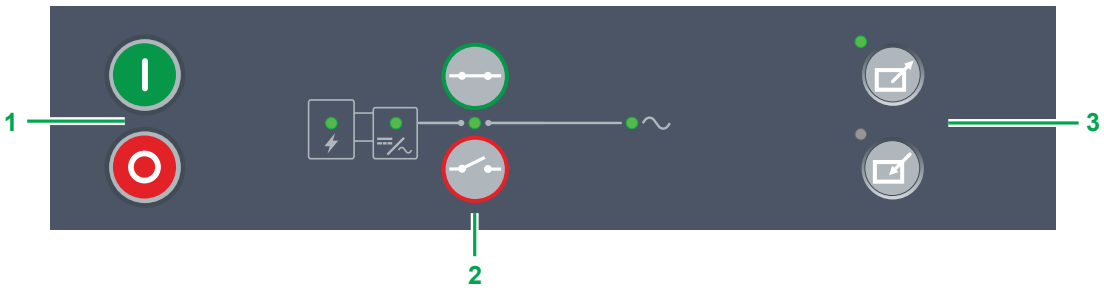
A **HYBRID** controller controls an inverter with a power source, and the inverter breaker. A system can include a number of **HYBRID** controllers. Each **HYBRID** controller can connect up to three non-essential load groups (NEL).

Normal operation

The HYBRID controller usually operates in LOCAL mode.

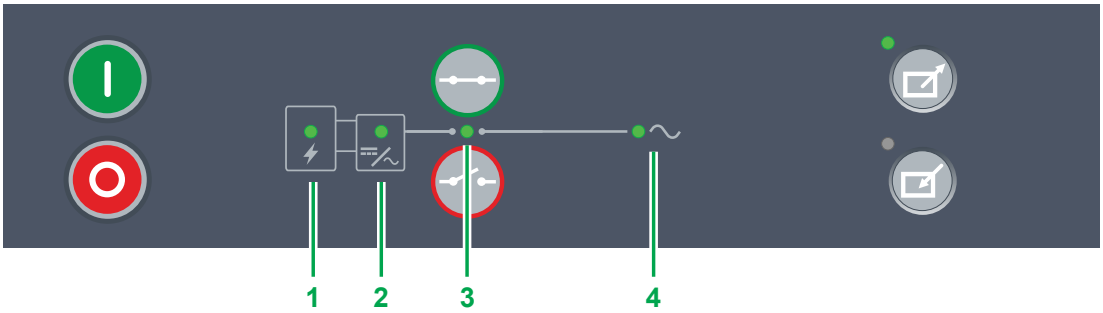
The controller can operate in REMOTE or LOCAL mode, and in Switchboard control.

3.2.2 HYBRID controller buttons



No.	Item	Notes	
1	Inverter	**Start** inverter start sequence. *	**Stop** inverter stop sequence. *
2	Breaker	**Close** breaker : Starts close sequence. *	**Open** breaker : Starts open sequence. *
3	Options	**REMOTE mode** : Change to REMOTE if possible. *	**Off** : Controller not in REMOTE. **Green** : Controller in REMOTE.
		LOCAL mode : Change to LOCAL if possible.	**Off** : Controller not in LOCAL. **Green** : Controller in LOCAL.

3.2.3 HYBRID controller LEDs



No.	Item	Notes
1	Power source	**Off** : Power source is not ready or no running feedback. **Green** : Power source ready.
2	Inverter	**Off** : Inverter voltage too low to measure. **Yellow** : Inverter voltage and frequency not OK. Cannot close breaker. **Green flash** : Inverter voltage and frequency OK, V&Hz OK timer still running. Cannot close breaker. **Green** : Inverter voltage and frequency OK, and controller can synchronise and close breaker.
3	Breaker	**Off** : Breaker open **Green** : Breaker closed. **Yellow** : Breaker spring charging (only compact breaker). **Yellow flash** : Synchronising or de-loading breaker. **Red flash** : Any inverter breaker trip alarm active. **Red** : Tripped breaker, and trip alarm unacknowledged and/or alarm condition present.
4	Busbar	**Green** : Voltage and frequency OK, and controller can synchronise and close breaker. **Green flash** : Voltage and frequency OK, but V&Hz OK timer running. Controller cannot close breaker. **Yellow** : Voltage and frequency are measurable, but not OK. **Red** : Voltage too low to measure. Controller can close breaker. **Red flash**: Blackout detection timer running and controller checking the busbar.

3.2.4 Change modes

Mode	Procedure
REMOTE *	To change to REMOTE mode from LOCAL mode: 1. Push to select REMOTE mode. • The LED next to is green when the controller is in REMOTE mode.
LOCAL *	To change to LOCAL mode from REMOTE mode: 1. Push to select LOCAL mode. • The LED next to is green when the controller is in LOCAL mode.
Switchboard control	To change to switchboard control, the controller can be in either REMOTE or LOCAL mode: 1. Change the selector on the switchboard to switchboard control. • The controller changes to switchboard control. • If the inverter was running, it continues to run, if the breaker was closed, it remains closed. • The controller will trip the breaker and/or stop the inverter if the operating conditions activate an alarm that trips the breaker and/or stops the inverter.

NOTE * You cannot change from Switchboard control with the display push-buttons. The Switchboard control selector must be set to LOCAL or REMOTE, before you can change mode.

The switchboard equipment is third-party equipment. The switchboard control selector labels may therefore be different from the names used above.

3.2.5 Start the inverter

Mode	Procedure
REMOTE	When the controller is in REMOTE mode, the inverter start is based on a remote signal, for example, from a PLC.
LOCAL	To start the inverter: 1. Push . • The controller runs the start sequence. ◦ If everything is OK, the inverter starts. ◦ If the inverter does not start, the display shows an information message.
Switchboard control	When the controller is in Switchboard control, the display push-buttons are not available. The inverter can only be started locally and/or from the switchboard.

The switchboard equipment is third-party equipment. The switchboard might not include a button to start the inverter.

3.2.6 Stop the inverter

Mode	Procedure
REMOTE	When the controller is in REMOTE mode, the inverter stop is based on a remote signal, for example, from a PLC.
LOCAL	The inverter breaker must be in the state configured in the setting for the inverter stop sequence. If the inverter breaker is not in the correct state, an information message is shown. To stop the inverter: 1. Push once. • The controller runs the stop inverter sequence.

Mode	Procedure
	◦ If everything is OK, the inverter stops. ◦ If the inverter does not stop, the display shows an information message.
Switchboard control	When the controller is in Switchboard control, the display push-buttons are not available. The inverter can only be stopped locally and/or from the switchboard.

The switchboard equipment is third-party equipment. The switchboard might not include a button to stop the genset.

3.2.7 Close the inverter breaker

Mode	Procedure
REMOTE	When the controller is in REMOTE mode, the generator breaker is closed based on a remote signal, for example, from a PLC.
LOCAL	The inverter must be in the state configured in the setting for the inverter breaker close sequence. If the inverter is not in the correct state, an information message is shown. To close the inverter breaker: 1. Press  to close the inverter breaker. • The controller checks the inverter breaker close sequence. ◦ If the conditions are OK: a. The controller synchronises the inverter with the busbar (the breaker LED flashes yellow ). b. When the inverter and busbar are synchronised, the controller closes the breaker. c. When the breaker is closed, the breaker LED is green . d. If the inverter and busbar are not synchronised before the synchronisation timer expires, the breaker does not close. A synchronisation failure alarm activates. ◦ If the inverter breaker close sequence conditions are not OK a. An information message is shown.
Switchboard control	When the controller is in Switchboard control, the display push-buttons are not available. The inverter breaker can only be closed from the switchboard.

3.2.8 Open the inverter breaker

Mode	Procedure
REMOTE	When the controller is in REMOTE mode, the generator breaker is opened based on a remote signal, for example, from a PLC.
LOCAL	The inverter must be in the state configured in the setting for the inverter breaker open sequence. If the inverter is not in the correct state, an information message is shown. To open the inverter breaker: 1. Push . * • The controller checks the inverter breaker open sequence. ◦ If the conditions are OK: a. If load sharing is present, the controller de-loads the breaker until the load is less than the de-load open point(the breaker LED flashes yellow). b. The controller then opens the inverter breaker. c. The breaker LED is OFF when the breaker is open. d. If load sharing is not present or not possible, the controller opens the inverter breaker. The breaker LED is OFF when the breaker is open. ◦ If the inverter breaker close sequence conditions are not OK

Mode	Procedure
	a. An information message is shown.
Switchboard control	When the controller is in Switchboard control, the display push-buttons are not available. The breaker can only be opened from the switchboard.

NOTE * Even if there is a position failure for the breaker, you can still attempt to try and open the breaker by pressing  .

3.3 SHAFT generator controller basic actions

3.3.1 About operation of the SHAFT generator controller

When the shaft generator is connected, it is normally the ship's only power source. However, it is possible for the shaft generator to run in parallel with the gensets and supply a base load for an extended period (long-time parallel).

Normal operation

The **SHAFT generator** controller usually operates in LOCAL mode.

The controller can operate in REMOTE or LOCAL mode, and in Switchboard control.

Parallel operation

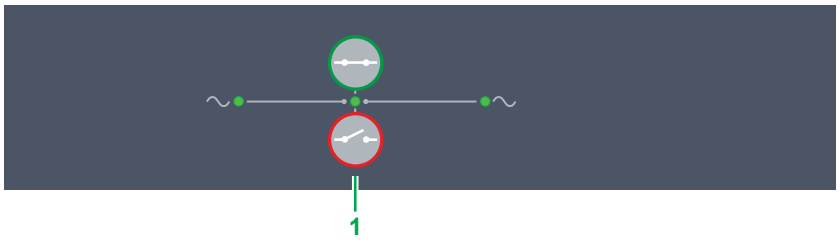
The shaft generator can run in parallel with the diesel gensets to transfer the load, but this is not the normal type of operation.

Power take home function

When the power take home function is active, the diesel gensets supply the power, and the shaft generator is used as a motor.

3.3.2 SHAFT generator controller LEDs and buttons

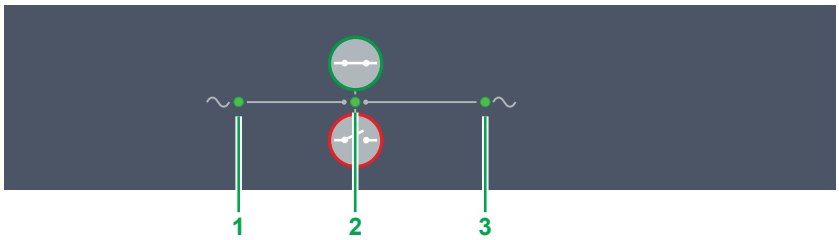
SHAFT generator buttons



No.	Item	Notes	
1	Breaker	**Close** breaker : Starts close sequence. *	**Open** breaker : Starts open sequence. *

NOTE * In Switchboard control the controller ignores the input.

SHAFT generator LEDs



No.	Item	Notes
1	Shaft Generator	**Off** : Generator voltage too low to measure. **Yellow** : Generator voltage and frequency not OK. Cannot close breaker. **Green flash** : Generator voltage and frequency OK, V&Hz OK timer still running. Cannot close breaker. **Green** : Generator voltage and frequency OK, and controller can synchronise and close breaker.
2	Breaker	**Off** : Breaker open **Green** : Breaker closed. **Yellow flash** : Synchronising or de-loading breaker. **Red flash** : Breaker configuration failure, or a position failure. **Red** : Tripped breaker, and trip alarm unacknowledged and/or alarm condition present.
3	Busbar	**Green** : Busbar voltage and frequency OK, and controller can close breaker. **Green flash** : Busbar voltage and frequency OK, but V&Hz OK timer running. Controller cannot close breaker. **Yellow** : Busbar voltage and frequency are measurable, but not OK. **Red** : Busbar voltage too low to measure. Controller can close breaker. **Red flash**: Blackout detection timer running and controller checking the busbar.

3.3.3 Close the shaft generator breaker

When you close the shaft generator breaker, the shaft generator must be running and have enough capacity to take over the genset load.

Control	Procedure
REMOTE	When the controller is in REMOTE mode, the shaft generator breaker is closed based on a remote signal, for example, from a PLC.
LOCAL	To close the shaft generator breaker: 1. Push . a. The controller synchronises the shaft generator with the busbar (the breaker LED flashes yellow). b. When the shaft generator and busbar are synchronised, the controller closes the breaker. c. When the breaker is closed, the breaker LED is green . • If the shaft generator and busbar are not synchronised before the synchronisation timer expires, the breaker does not close. A synchronisation failure alarm activates. • If the shaft generator does not have the capacity to take over the genset load, the controller does not close the shaft generator breaker, and displays an information message.
Switchboard control	When the controller is in Switchboard control, the display unit push-buttons are not available. The shaft generator breaker can only be closed from the switchboard.

3.3.4 Open the shaft generator breaker

When you open the shaft generator breaker, the controller transfers the load from the shaft generator to the gensets. There must be enough gensets available, with enough capacity to take over the shaft generator load.

Control	Procedure
REMOTE	When the controller is in REMOTE mode, the shaft generator breaker is opened based on a remote signal, for example, from a PLC.
LOCAL	To open the shaft generator breaker: 1. Push . * a. The controller calculates if the available power is sufficient after the shaft generator breaker opens. b. If not, the controller prevents the shaft generator breaker to open, and the controller display shows an information message. c. The controller de-loads the shaft generator breaker (the breaker LED flashes yellow). d. When the shaft generator breaker is de-loaded, the controller opens the shaft generator breaker. e. When the breaker is open, the breaker LED is OFF. • If the shaft generator breaker is not de-loaded, the breaker does not open. A de-load failure alarm activates when the de-load timer expires.
Switchboard control	When the controller is in Switchboard control, the display push-buttons are not available. The shaft generator breaker can only be opened from the switchboard.

NOTE * Even if there is a position failure for the breaker, you can still attempt to try and open the breaker by pressing .

3.4 SHORE connection controller basic actions

3.4.1 About operation of the SHORE connection controller

When the shore connection is in use, it is normally the ship's only power source. However, the gensets may run in parallel with the shore connection for a limited time.

Normal operation

The **SHORE connection** controller is usually in LOCAL mode.

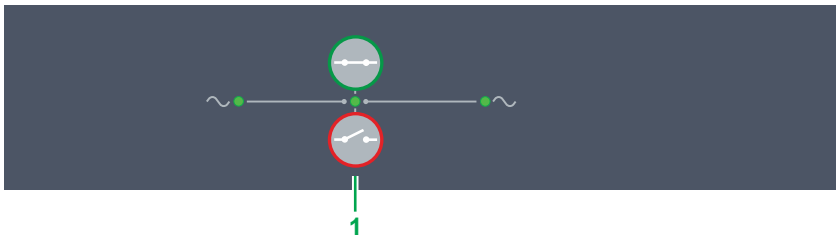
The controller can also operate in REMOTE or LOCAL mode, and in Switchboard control.

Parallel operation

The shore connection can run in parallel with the diesel gensets to transfer the load, but this is not the normal type of operation.

3.4.2 SHORE connection controller LEDs and buttons

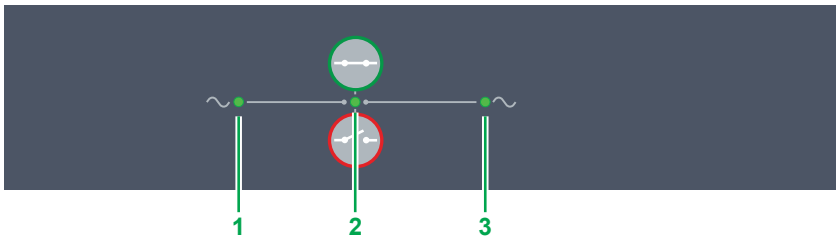
SHORE connection buttons



No.	Item	Notes	
1	Breaker	**Close** breaker : Starts close sequence. *	**Open** breaker : Starts open sequence. *

NOTE * In Switchboard control the controller ignores the input.

SHORE connection LEDs



No.	Item	Notes
1	Shore connection	**Off** : Connection voltage too low to measure. **Yellow** : Connection voltage and frequency not OK. Cannot close breaker. **Green flash** : Connection voltage and frequency OK, V&Hz OK timer still running. Cannot close breaker. **Green** : Connection voltage and frequency OK, and controller can synchronise and close breaker.
2	Breaker	**Off** : Breaker open **Green** : Breaker closed. **Yellow flash** : Synchronising or de-loading breaker. **Red flash** : Breaker configuration failure, or a position failure. **Red** : Tripped breaker, and trip alarm unacknowledged and/or alarm condition present.
3	Busbar	**Green** : Busbar voltage and frequency OK, and controller can close breaker. **Green flash** : Busbar voltage and frequency OK, but V&Hz OK timer running. Controller cannot close breaker. **Yellow** : Busbar voltage and frequency are measurable, but not OK. **Red** : Busbar voltage too low to measure. Controller can close breaker. **Red flash**: Blackout detection timer running and controller checking the busbar.

3.4.3 Close the shore connection breaker

When you close the shore connection breaker, the controller transfers the load from the gensets to the shore connection. The shore connection must therefore be live and have enough capacity to take over the genset load.

Control	Procedure
REMOTE	When the controller is in REMOTE mode, the shore connection breaker is closed based on a remote signal, for example, from a PLC.
LOCAL	To close the shore connection breaker: 1. Press to close the shore connection breaker. a. The controller synchronises the busbar with the shore connection (the breaker LED flashes yellow). b. When the shore connection and busbar are synchronised, the controller closes the breaker. c. When the breaker is closed, the breaker LED is green . • If the shore connection and busbar are not synchronised before the synchronisation timer expires, the breaker does not close. A synchronisation failure alarm activates. • If the shore connection does not have the capacity to take over the genset load, the controller does not close the shore connection breaker, and displays an information message.
Switchboard control	When the controller is in Switchboard control, the display push-buttons are not available. The shore connection breaker can only be closed from the switchboard.

3.4.4 Open the shore connection breaker

When you open the shore connection breaker, the controller transfers the load from the shore connection to the gensets. There must be enough gensets available, with enough capacity to take over the shore connection load.

Control	Procedure
REMOTE	When the controller is in REMOTE mode, the shore connection breaker is opened based on a remote signal, for example, from a PLC.
LOCAL	To open the shore connection breaker: 1. Push . * a. The controller calculates if there is enough power available after the shore connection breaker opens: • If there is not enough power available: ◦ The controller does not open the shore connection breaker. ◦ The controller display shows an information message. b. The controller checks the *Breaker action* parameter value. • **Open shore connection breaker:** ◦ The controller de-loads the shore connection breaker (the breaker LED flashes yellow). • **Trip shore connection breaker:** ◦ The controller checks if the breaker can be opened without de-loading. ◦ If the conditions are met, the breaker opens. ◦ If the conditions are not met, the controller displays an information message. • **Operator select:** ◦ The operator must select to open, trip or cancel the open breaker sequence: ◦ **Open:** ◦ The controller de-loads and opens the shore connection breaker. ◦ **Trip:**

Control	Procedure
	◦ The controller checks if the breaker can be opened without de-loading. ◦ If the conditions are met, the breaker opens. ◦ If the conditions are not met, the controller displays an information message. ◦ **Cancel:** ◦ The sequence stops and the controller does not attempt to open the shore connection breaker. c. When the shore connection breaker is de-loaded, the controller opens the shore connection breaker. When the breaker is open, the breaker LED is OFF. • If the shore connection breaker is not de-loaded, the breaker does not open. • A de-load failure alarm activates when the de-load timer expires.
Switchboard control	When the controller is in Switchboard control, the display push-buttons are not available. The shore connection breaker can only be opened from the switchboard.

NOTE * Even if there is a position failure for the breaker, you can still attempt to try and open the breaker and push  .

3.5 BUS TIE breaker controller basic actions

3.5.1 About operation of the BUS TIE breaker controller

There is no restriction on the number of **BUS TIE breaker** controllers. Ring busbar connection is possible.

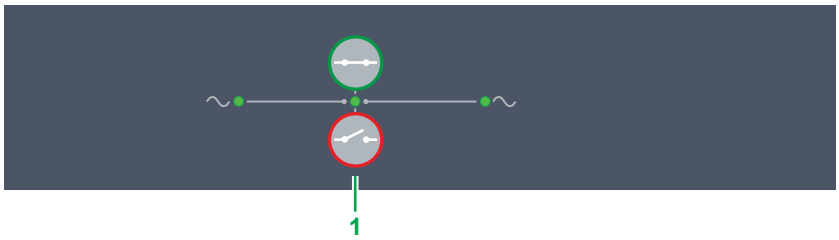
Normal operation

The **BUS TIE breaker** controller is usually operate in LOCAL mode.

The controller can also operate in REMOTE or LOCAL mode, and in Switchboard control.

3.5.2 BUS TIE breaker controller LEDs and buttons

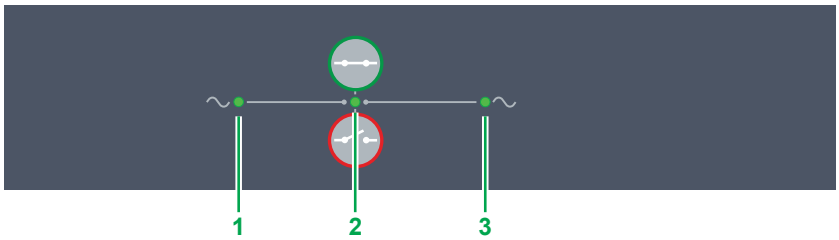
BUS TIE breaker buttons



No.	Item	Notes	
1	Breaker	**Close** breaker : Starts close sequence. *	**Open** breaker : Starts open sequence. *

NOTE * In Switchboard control the controller ignores the input.

BUS TIE breaker LEDs



No.	Item	Notes
1	Busbar A	**Green** : Busbar A voltage and frequency OK, and controller can close breaker. **Green flash** : Busbar A voltage and frequency OK, but V&Hz OK timer running. Controller cannot close breaker. **Yellow** : Busbar A voltage and frequency are measurable, but not OK. **Red** : Busbar A voltage too low to measure. Controller can close breaker. **Red flash**: Blackout detection timer running and controller checking busbar A.
2	Bus tie Breaker	**Off** : Bus tie breaker open **Green** : Bus tie breaker closed. **Yellow flash** : Synchronising or de-loading bus tie breaker. **Red flash** : Bus tie breaker configuration failure, or a position failure. **Red** : Tripped bus tie breaker, and trip alarm unacknowledged and/or alarm condition present.
3	Busbar B	**Green** : Busbar A voltage and frequency OK, and controller can close breaker. **Green flash** : Busbar A voltage and frequency OK, but V&Hz OK timer running. Controller cannot close breaker. **Yellow** : Busbar A voltage and frequency are measurable, but not OK. **Red** : Busbar A voltage too low to measure. Controller can close breaker. **Red flash**: Blackout detection timer running and controller checking busbar A.

3.5.3 Close the bus tie breaker

When the bus tie breaker closes, the busbar reconnects. The busbar acts as one busbar, and not as two independent busbars.

Control	Procedure
REMOTE	When the controller is in REMOTE mode, the bus tie breaker is closed based on a remote signal, for example, from a PLC.
LOCAL	To close the bus tie breaker: 1. Push . a. The controller synchronises busbar A and busbar B (the breaker LED flashes yellow). b. When the bus tie breaker is synchronised, the controller closes the bus tie breaker. c. When the breaker is closed, the breaker LED is green . • If the bus tie breaker is not synchronised before the synchronisation timer expires, the breaker does not close. A synchronisation failure alarm activates.
Switchboard control	When the controller is in Switchboard control, the display push-buttons are not available. The bus tie breaker can only be closed from the switchboard.

3.5.4 Open the bus tie breaker

When a bus tie breaker opens, the busbar divides in to two independent busbars (busbar A and busbar B). Each busbar must have enough gensets to supply the load required, before you can open the bus tie breaker.

Control	Procedure
REMOTE	When the controller is in REMOTE mode, the bus tie breaker is opened based on a remote signal, for example, from a PLC.
LOCAL	To open the bus tie breaker: 1. Push . * a. The controller calculates if there is enough power available on each busbar after the bus tie breaker opens: • If there is not enough power available: ◦ The controller does not open the bus tie breaker. ◦ The controller display shows an information message. b. The controller de-loads the bus tie breaker (the breaker LED flashes yellow). c. When the bus tie breaker is de-loaded, the controller opens the bus tie breaker. d. When the breaker is open, the breaker LED is OFF. • If the bus tie breaker is not de-loaded before the de-load timer expires, the breaker does not open. The de-load failure alarm is activated.
Switchboard control	When the controller is in Switchboard control, the display push-buttons are not available. The bus tie breaker can only be opened from the switchboard.

NOTE * Even if there is a position failure for the breaker, you can still attempt to try and open the breaker and push .

3.6 Operator messages

3.6.1 Controller status texts

The controller status texts are shown at the top of the display. The status text shown depends on the type of controller. Not all texts apply for all controller types.

Status text *	Description
-	Cannot read the controller status.
Alarm testing	The alarm test parameter is enabled.
BTB in operation	The bus tie breaker is closed.
Cooldown # s	The remaining time (in seconds) for the genset cooldown.
Crank off	There is no running detection of the genset during the genset start procedure, and the crank is turned off.
Crank on	The crank is activated in order to start the genset.
De-loading GB / TB / SGB / SCB	The controller is de-loading the breaker.
Dividing section	The controller is de-loading the bus tie breaker.
Engine stopping	The genset is being stopped.
Fixed power	The genset is running and is regulated to a fixed power.
Fixed frequency	The genset is running and is regulated using frequency regulation.
Frequency droop	The genset is running and is being regulated using frequency droop regulation.
Frequency too high	The genset frequency is too high and must be adjusted to a lower value.
Frequency too low	The genset frequency is too low and must be adjusted to a higher value.
Load sharing	The gensets connected to the busbar shares the load symmetrically.
Not ready for operation	The controller is not in Switchboard control, but it is not ready for operation. For gensets "Start enable" might not be activated, or there are alarms (latched or unacknowledged) blocking the ready status.
Ready for operation	All operation conditions are met. Gensets are ready to start and/or breakers are ready to close.
SC in operation	A power supply from the shore connection is available, and the shore connection breaker is closed.
SC not ready	The shore connection is not ready to provide power to the busbar. There may be alarms blocking the shore connection breaker from closing.
SC ready	A power supply from the shore connection is available, and the shore connection breaker is open.
SG in operation	The shaft generator is producing power, and the shaft generator breaker is closed.
SG not ready	The shaft generator is not ready to provide power to the busbar. There may be alarms blocking the shaft generator breaker from closing.
SG ready	A power supply from the shaft generator is available, and shaft generator breaker is open.
Start prepare - # s	The timer (in seconds) for the genset start prepare.
Stop coil activated - # s	The remaining time (in seconds) before the genset shuts down.
Switchboard control	The controller is in Switchboard control and can only receive commands from the switchboard.
Synchronising SGB / SCB	The controller is busy synchronising the busbar frequency and voltage to close the breaker.

Status text *	Description
Synchronising sections	The two sections to be connected by a bus tie breaker are being synchronised to close the bus tie breaker.
Waiting for software	A software update is in progress.

NOTE * "# s" represents a timer countdown.

3.6.2 Operator information messages

During operation some operator information messages may be shown. The information shown depends on the type of controller. Not all texts apply for all controller types.

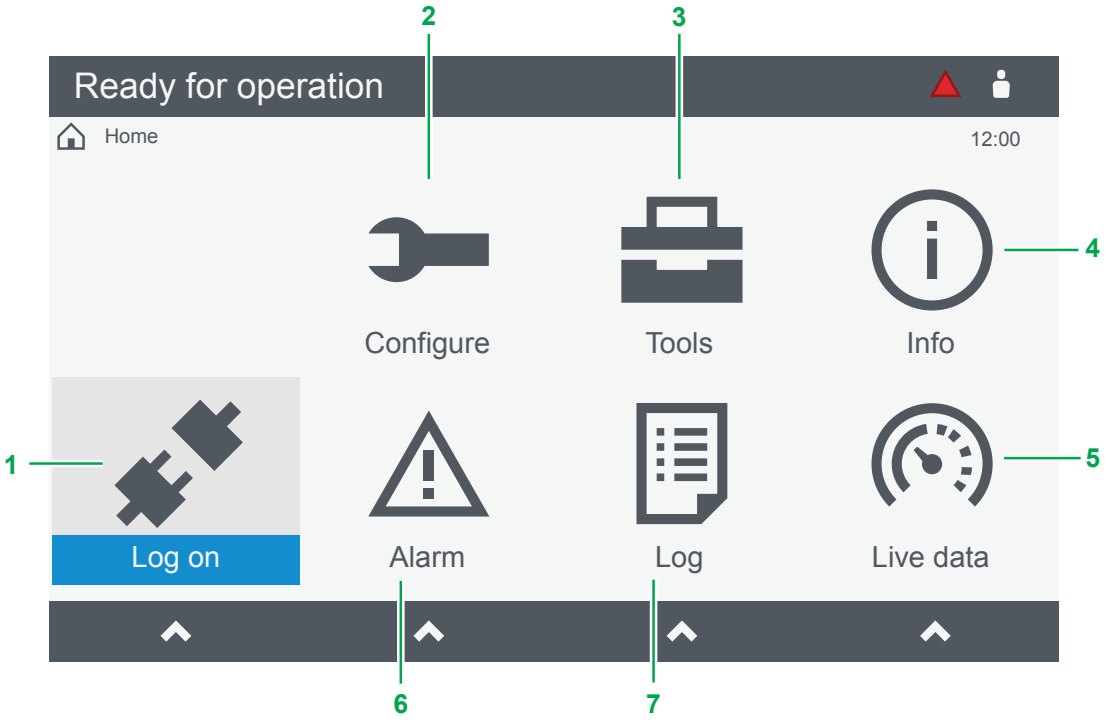
Operator info	Additional information
Alarm blocking engine start	A block alarm is active. Clear the alarm before you try to start the genset.
Alarm blocking GB close	A block alarm is active. Clear the alarm before you try to close the generator breaker.
Alarm blocking SCB close	A block alarm is active. Clear the alarm before you try to close the shore connection breaker.
Alarm blocking SGB close	A block alarm is active. Clear the alarm before you try to close the shaft generator breaker.
Alarm blocking BTB close	A block alarm is active. Clear the alarm before you to close the bus tie breaker.
Breaker already closed	The breaker is already closed and cannot be closed again.
Breaker already opened	The breaker is already open and cannot be opened again.
BTB close blocked	The *Block bus tie breaker close* function is active. An open breaker cannot be closed.
BTB close cancelled	The *BTB close* was cancelled by a *BTB open* command.
BTB close not possible in SWBD	In switchboard control, operator actions cannot be performed from the controller interfaces.
BTB close unblocked	The *Block bus tie breaker close* function is not active.
BTB open cancelled	The *BTB open* was cancelled by a *BTB close* command.
BTB open not possible in SWBD	In switchboard control, operator actions cannot be performed from the controller interfaces.
Change of synchronisation settings not possible in SWBD	The input from the static synchronisation or dynamic synchronisation digital input is ignored when the controller is in switchboard control.
Dynamic synchronisation activated	The digital input is activated. The controller will use dynamic synchronisation.
Dynamic synchronisation deactivated	The digital input is deactivated. The controller will use the synchronisation type configured in the parameter.
Engine already running	The engine is already running and cannot be started again.
Engine already stopped	The engine has already stopped and cannot be stopped again.
Engine stopping ...	The command has already been received. The controller is executing the engine stop procedure.
Engine not ready	The genset cannot start. There might be alarms blocking the ready status.
Engine start and breaker close not possible in SWBD	In switchboard control, operator actions cannot be performed from the controller interfaces.
Engine start blocked	The *Block engine start* function is active. A stopped genset cannot be started.
Engine start not possible in SWBD	In switchboard control, operator actions cannot be performed from the controller interfaces.

Operator info	Additional information
Engine start unblocked	The *Block engine start* function is not active.
Engine stop not possible in SWBD	In switchboard control, operator actions cannot be performed from the controller interfaces.
GB close blocked	The *Block GB close* function is active. An open breaker cannot be closed.
GB close not possible in SWBD	In switchboard control, operator actions cannot be performed from the controller interfaces.
GB close cancelled	The *GB close* was cancelled by a *GB open* command.
GB close unblocked	The *Block generator breaker close* function is not active.
GB is closed	The *Generator breaker* is closed.
GB is de-loading	The *Generator breaker* is currently de-loading.
GB is open	The *Generator breaker* is open.
GB is synchronising	The *Generator breaker* is synchronising.
GB open and stop not possible in SWBD	In switchboard control, operator actions cannot be performed from the controller interfaces.
GB open cancelled	The *GB open* was cancelled by a *GB close* command.
GB open not possible in SWBD	In switchboard control, operator actions cannot be performed from the controller interfaces.
Mode change locked	It is not possible to change to REMOTE or LOCAL mode while the controller is in switchboard control.
Not under local control	The action cannot be performed unless the controller is in LOCAL mode.
You can remove latches	There are acknowledged latched alarms in the alarm list that can be reset.
SCB close blocked	The *Block shore connection breaker close* function is active. An open breaker cannot be closed.
SCB close cancelled	The *SCB close* was cancelled by an *SCB open* command.
SCB close not possible in SWBD	In switchboard control, operator actions cannot be performed from the controller interfaces.
SCB close unblocked	The *Block shore connection breaker close* function is not active.
SCB open cancelled	The *SCB open* was cancelled by an *SCB close* command.
SCB open not possible in SWBD	In switchboard control, operator actions cannot be performed from the controller interfaces.
SGB close blocked	The *Block shaft generator breaker close* function is active. An open breaker cannot be closed.
SGB close cancelled	The *SGB close* was cancelled by an *SGB open* command.
SGB close not possible in SWBD	In switchboard control, operator actions cannot be performed from the controller interfaces.
SGB close unblocked	The *Block shaft generator breaker close* function is not active.
SGB open cancelled	The *SGB open* was cancelled by an *SGB close* command.
SGB open not possible in SWBD	In switchboard control, operator actions cannot be performed from the controller interfaces.
Start enable not activated	The genset cannot start, because *Start enable* is not activated.
Static synchronisation activated	The digital input is activated. The controller will use static synchronisation.

Operator info	Additional information
Static synchronisation deactivated	The digital input is deactivated. The controller will use the synchronisation type configured in the parameter.
Synchronisation cancelled	The controller has cancelled the synchronisation (for example, if there is a blackout during synchronisation)

4. Home

4.1 Home page

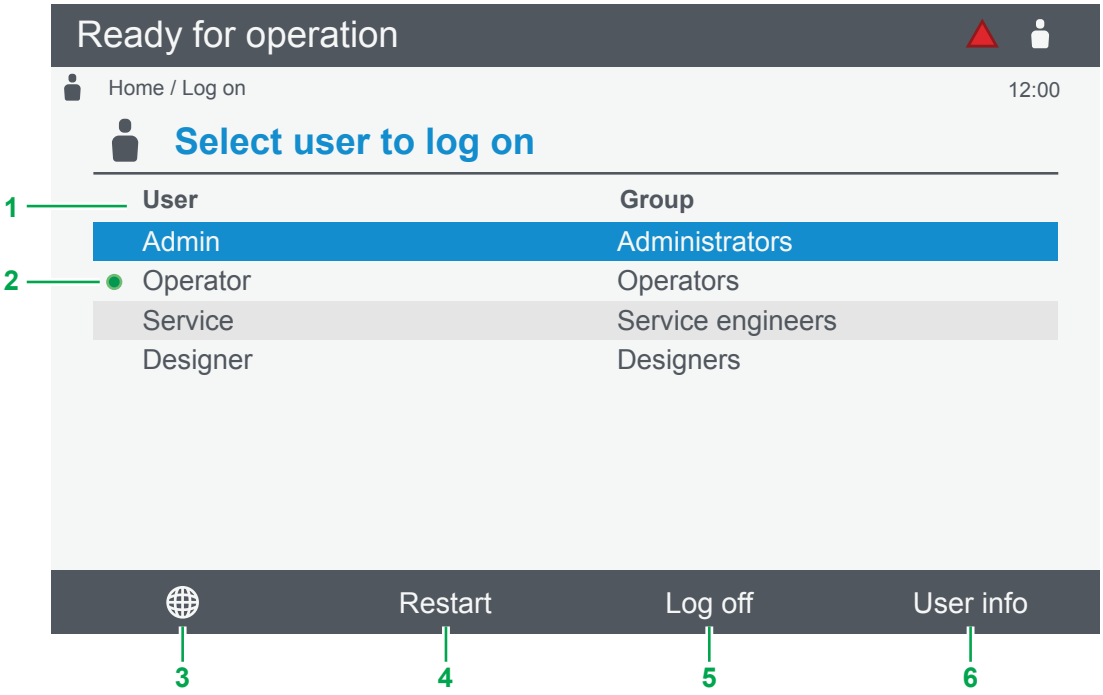


No.	Item	Notes
1	Log on page	Log on as a user or change the logged on user.
2	Configure menu	Shows the configure menu.
3	Tools menu	Shows the tools menu.
4	Info menu	Shows the information menu.
5	Live data page	Shows live information from the system.
6	Alarms page	Shows action alarms present in the system.
7	Log page	Shows a list of events recorded during operation.

NOTE Pages and menus can be restricted by group and user permissions.

5. Log on

5.1 Log on page

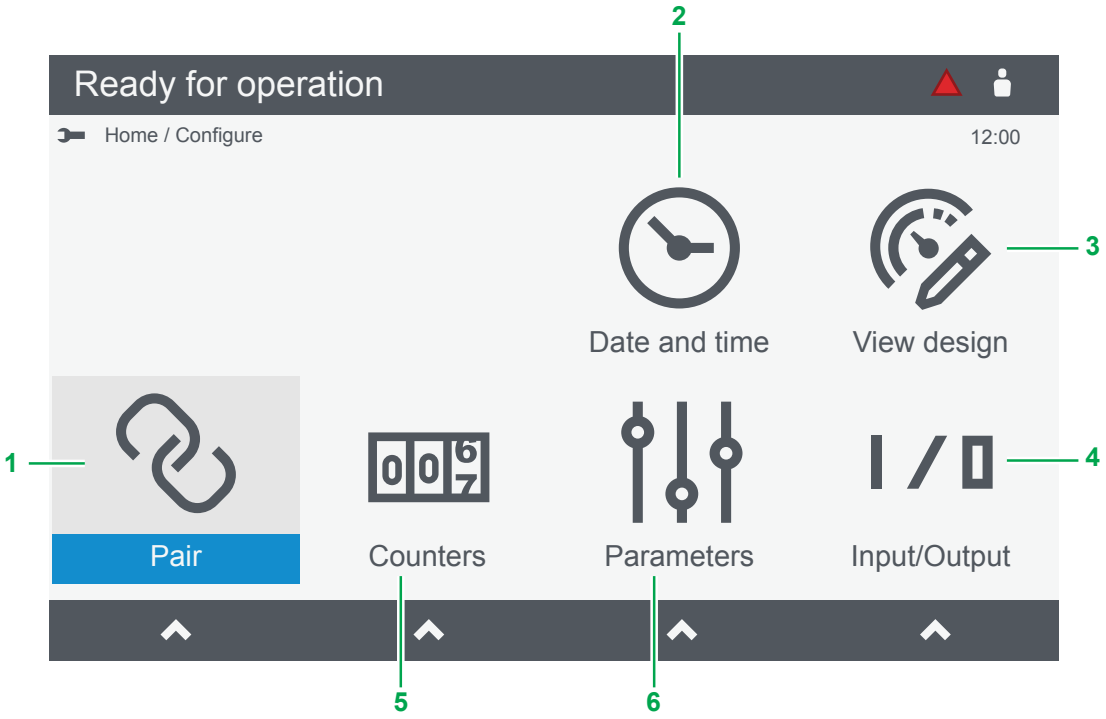


No.	Item	Notes
1	User list	Shows a list of available users on the controller.
2	Logged on user	: Shows the user is currently logged on.
3	Language page	Shows the language page. *
4	Restart	Restarts the display unit.
5	Log off	Logs off the user and changes to the home page. A user is automatically logged off after 3 minutes of inactivity.
6	User info	Shows further information for the selected user.

NOTE * This feature is only available if both the controller and the display unit have the necessary language software installed.

6. Configure

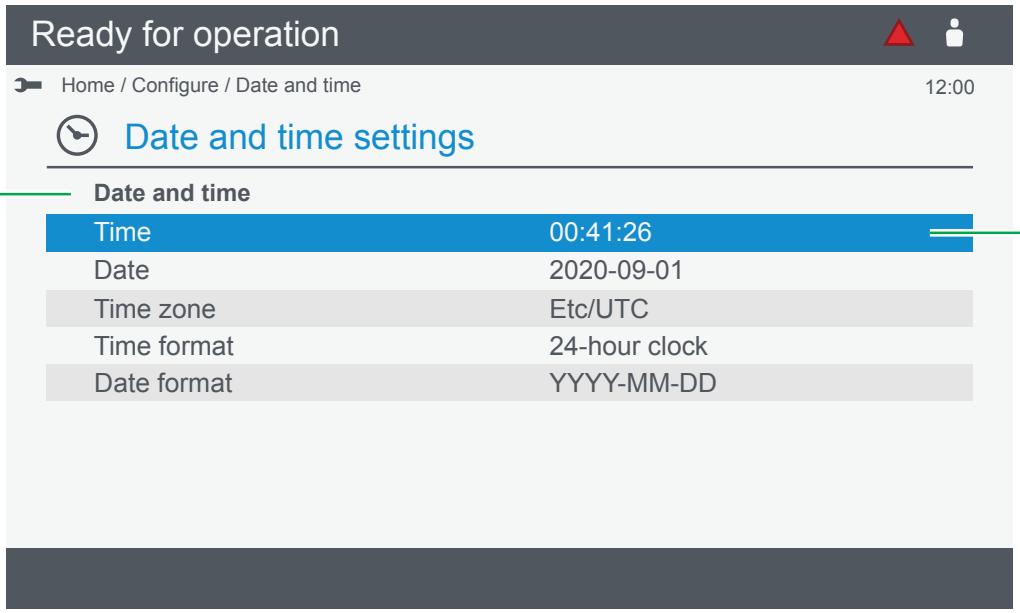
6.1 Configure page



No.	Item	Notes
1	Pair page	Change the controller connected to this display.
2	Date and time page	Configure the date and time settings.
3	View design page	Configure the views shown on the Live data page.
4	Input/Output page	Configure the hardware modules functions and alarms.
5	Counters page	Configure, view, or reset the counters in the system.
6	Parameters page	Configure controller settings and alarms.

6.2 Date and time page

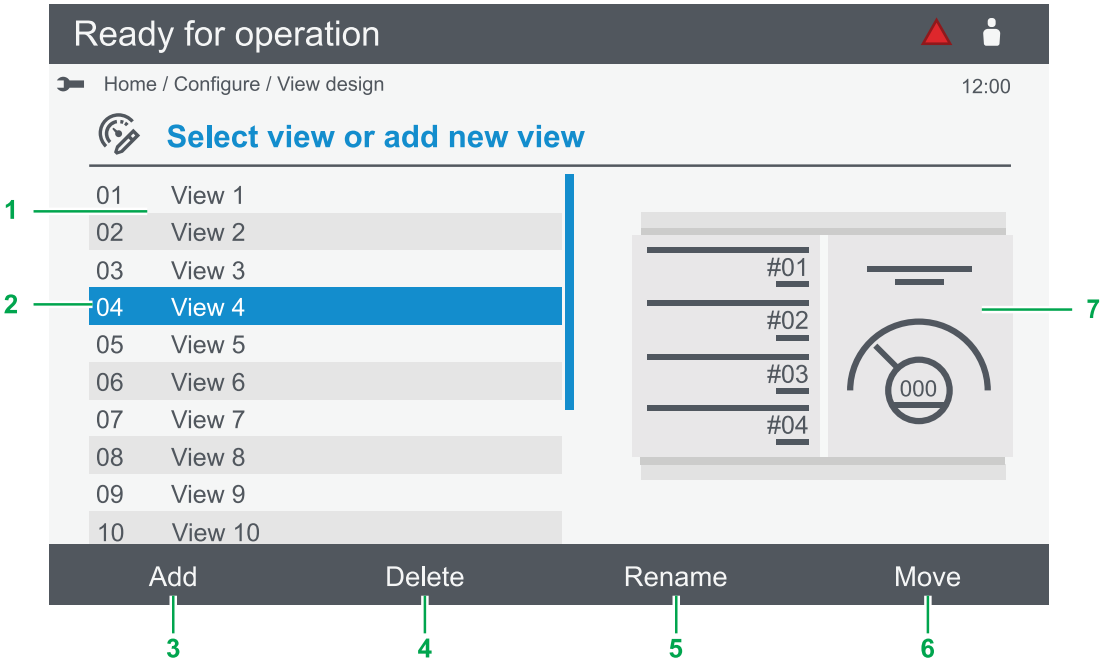
Date and time settings cannot be changed if a network time server (NTP) is configured.



No.	Item	Notes
1	Date and time settings	Shows date, time, time zone, time format, and date format settings. The screen only updates when it is reloaded or the selection is moved.
2	Selected setting	Select OK **OK** to configure the selected setting (requires the correct permissions).

Daylight savings are automatically applied to a selected time zone. Etc/UTC does not apply daylight savings.

6.3 View design page

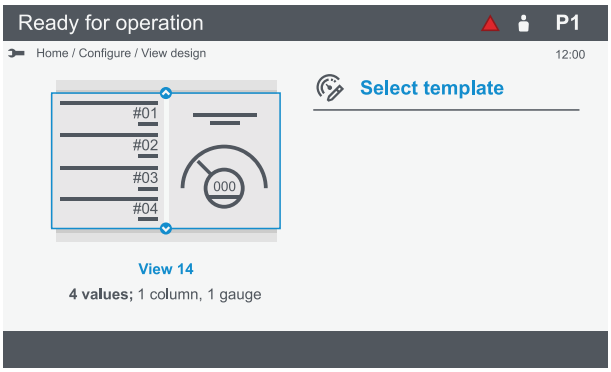


No.	Item	Notes
1	List of views	A list of the views shown on the Live data page for the paired controller.
2	Selected view	Select OK **OK** to configure the selected view.
3	Add	Adds a new view based on a template and configured with measurements.
4	Delete	Deletes the selected view after confirmation.
5	Rename	Renames the selected view. To restore the default name: Delete all characters and write to the controller.
6	Move	Select and move a view in the list.
7	View outline	Shows the selected type of view.

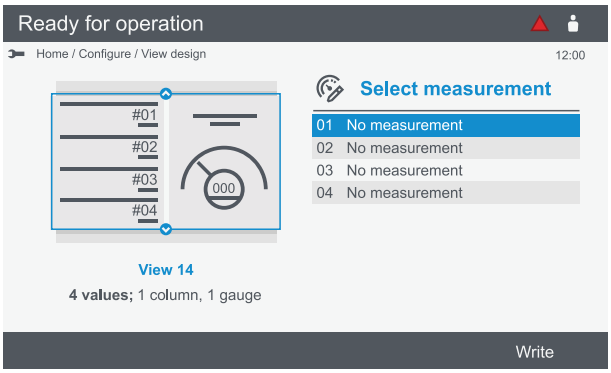
6.3.1 Add or configure a view

Add a view

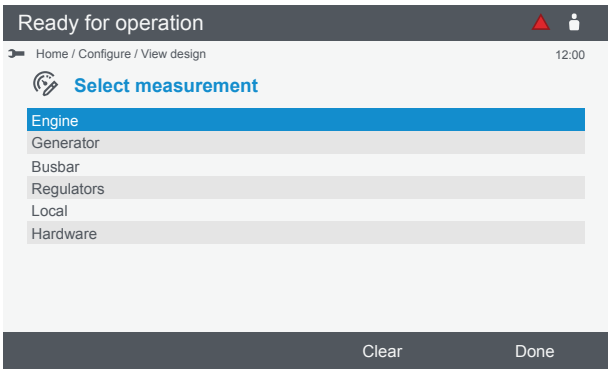
1. Select **Add**.
2. Select the template:
   - Summary information is shown under the preview:



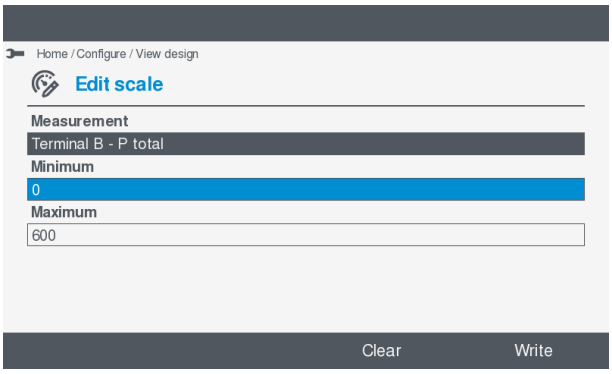
3. Select OK **OK** to display the measurements:



4. Select a measurement to configure.



   - Select **Clear** to remove the selected measurement.
   - Select **Done** to confirm the measurement selected.
5. Add further measurements as needed.
6. Select Scale to configure the displayed range if needed.



7. Select **Write** to add the view.

Delete a view

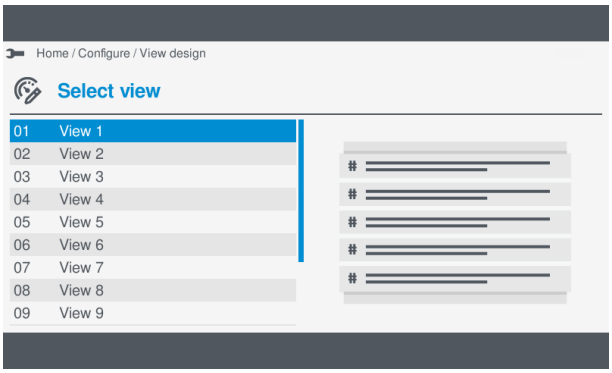
1. Highlight the view to delete.
2. Select **Delete**.
3. Confirm deletion of the view.

Rename view

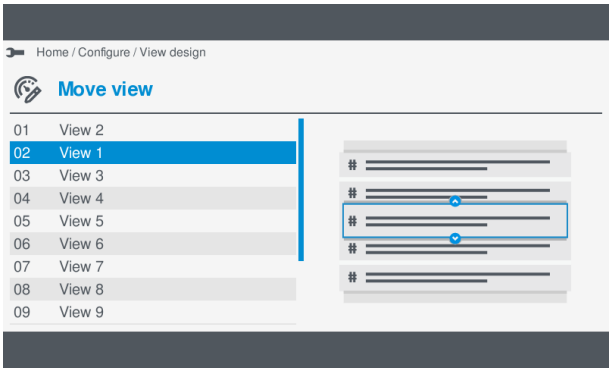
1. Highlight the view to rename.
2. Select **Rename**.
3. Rename the view as required.
4. Select **Write** to update the view.

Move view

1. Select **Move**.



2. Highlight the view to move.
3. Select the view.
4. Move the view up or down.

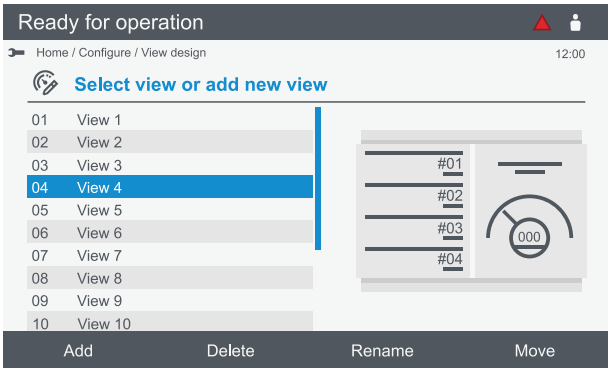


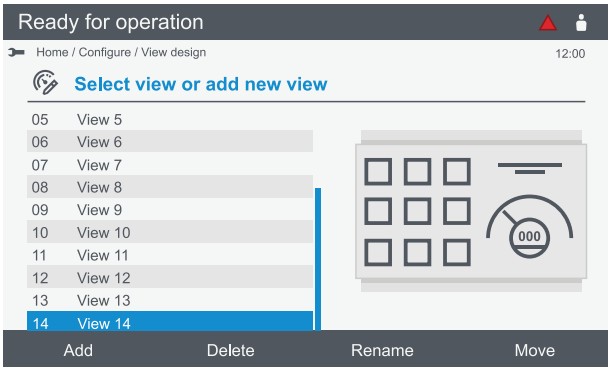
5. Confirm the new position with OK **OK**.
6. Select **Write** to confirm.

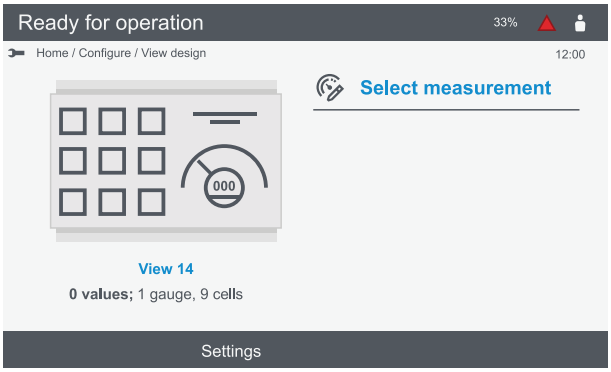
6.3.2 Configure Exhaust aftertreatment dashboard view

The Exhaust aftertreatment dashboard can be shown automatically if any of the data changes. You can additionally configure an automatic return to the last page viewed prior to the dashboard being shown.

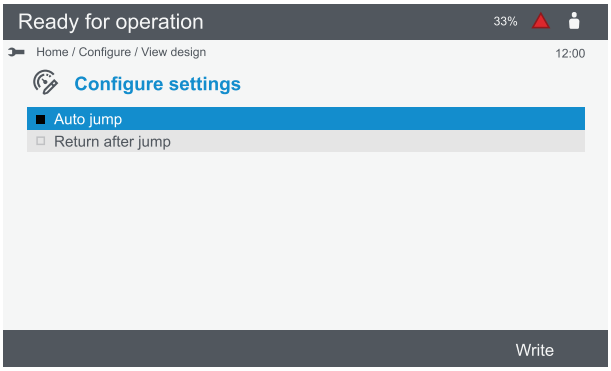
Configure automatic display of dashboard

1. Open **View design**.
   - `Configure > View design`
   - 

2. Scroll and highlight the **Exhaust aftertreatment dashboard**:
   - 

3. Select OK **OK** to display the **Exhaust aftertreatment dashboard**:
   - 

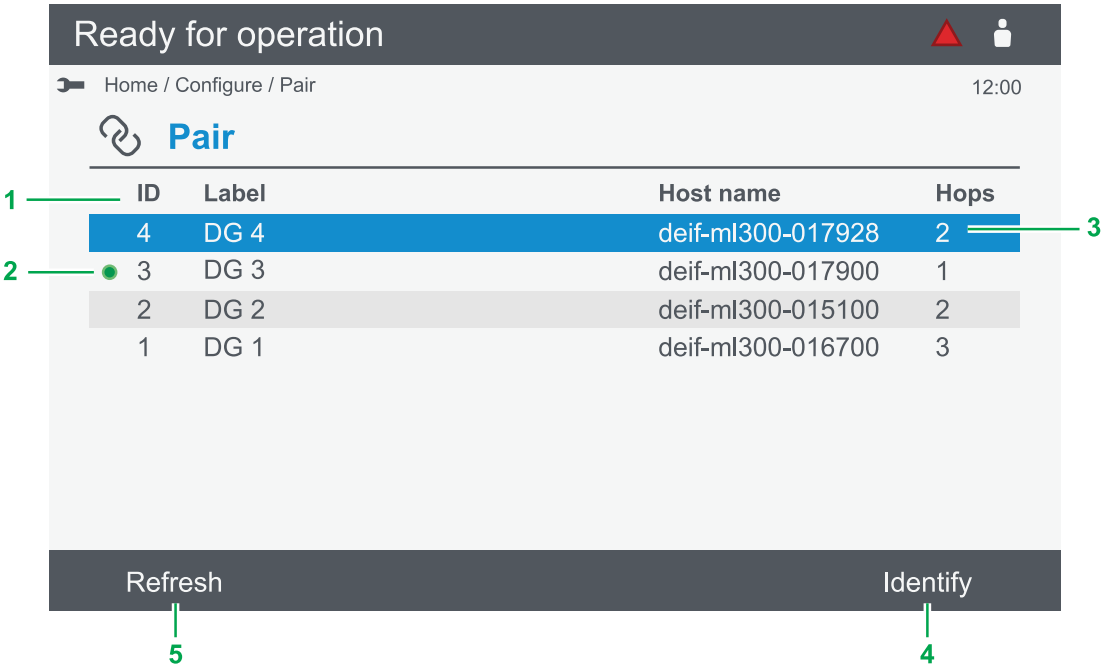
4. Select **Settings**.
5. Select OK on the settings to enable them:



- **Auto jump** : Shows the **Exhaust aftertreatment dashboard** if any data changes.
- **Return after jump** : Returns back to the previous display after displaying the **Exhaust aftertreatment dashboard**.

6. Select **Write** to update the configuration.

6.4 Pair page

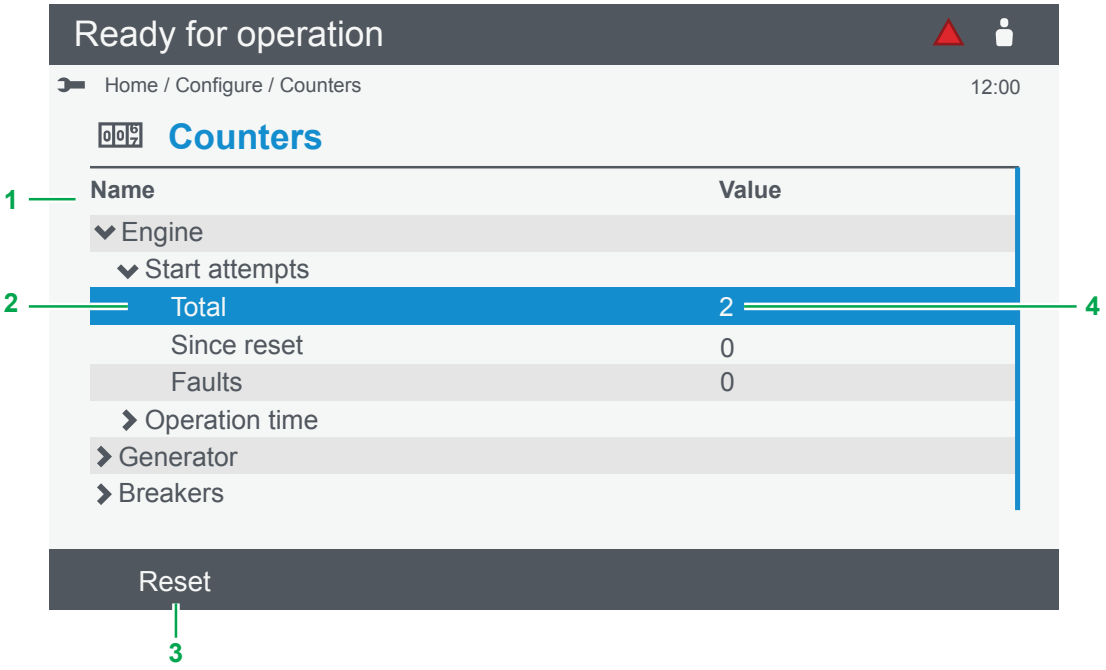


No.	Item	Notes
1	List of available controllers	Shows the list of available controllers you can connect. Select OK **OK** to pair to the controller.
2	Connected controller	: Shows the controller currently connected.
3	Hops	Number of hops (between controllers) from the display. 1 hop: The controller is connected directly to the display.
4	Identify	Starts the identification cycle for the highlighted controller.
5	Refresh	Refresh the list of controllers.

6.4.1 Identify controller

1. Select the controller from the controller list.
2. Select **Identify**.
   - The Power LED on the PSM flashes on the controller rack.
   - The LED repeats a cycle of fast, medium, and slow flashing.
   - The cycle ends after 30 seconds.

6.5 Counters page

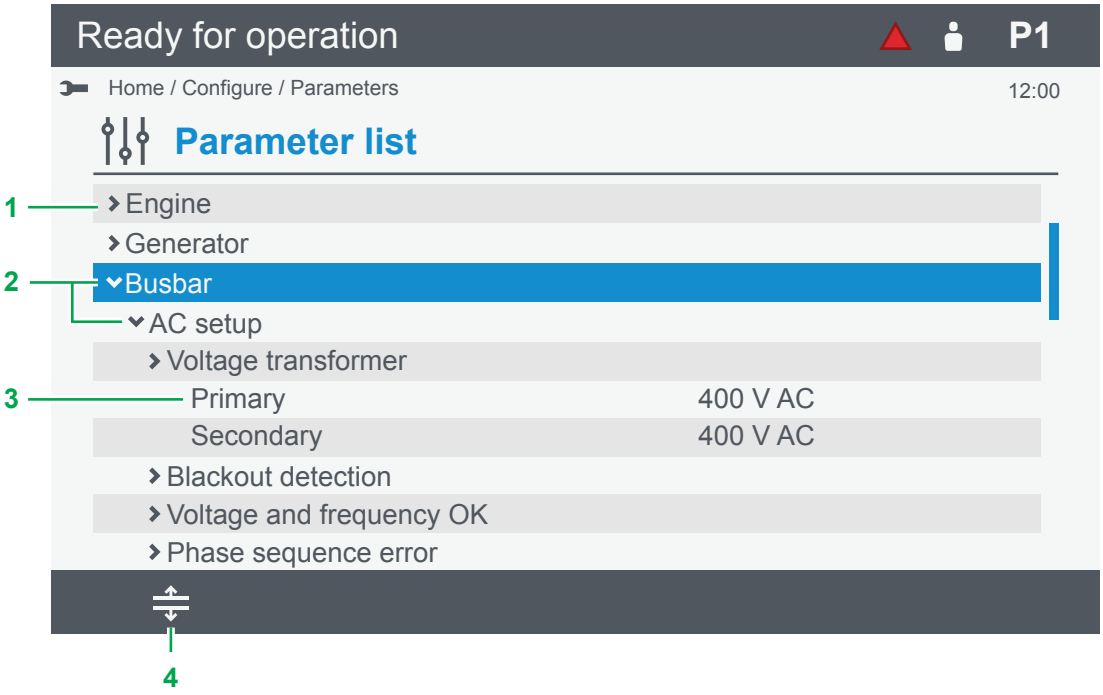


No.	Item	Notes
1	Counters list	Shows the list groups and counters.
2	Highlighted counter	Shows the highlighted counter to view, edit, or reset.
		Select OK **OK** to edit the counter value.
3	Reset	Resets the counter value to 0 (zero).
4	Counter value	Shows the counter value.

6.6 Parameters

6.6.1 Parameters list page

Parameter settings are organised in groups and sub-groups. Open a group or sub-group to select a parameter to configure.



No.	Item	Notes	
1	Parameter list	Shows a list of groups and sub-groups.	
2	Parameter group or sub-group	Select OK **OK** to open the group or sub-group.	
3	Parameter and value	Select OK **OK** to edit value.	
4	Expand all/Collapse all groups	Select **Expand all** to open all groups.	Select **Collapse all** to close all groups.

6.6.2 Configure a curve

Curves can only be configured if the curve function is assigned in the input/output configuration. When a curve function is assigned, the parameter is shown in the parameter list.

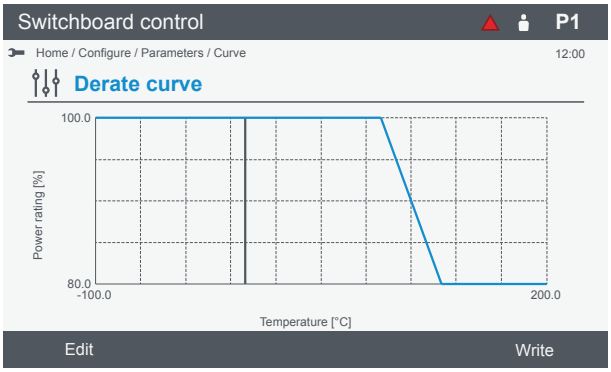
Example

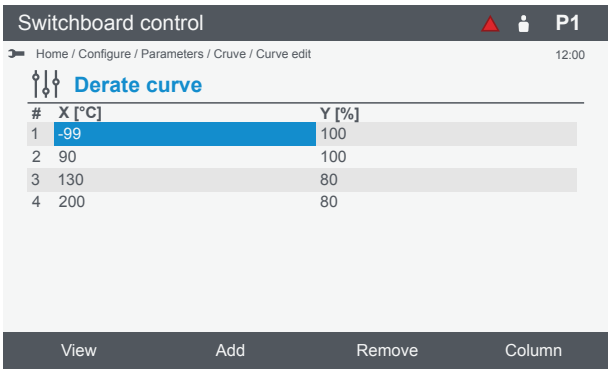
Function assigned to an analogue input (AI):

```
Engine > Power derate > Temperature > Derate 1 temperature
```

Parameter now available under:

```
Engine > Power derate > Temperature > Derate 1
```

1. Select Setup from the parameter page.
   - The curve is shown:
   - 

2. Select Edit to configure the curve settings:
   - 

3. Configure the curve settings:
   - View to display the curve or write the settings.
   - Add a new empty set of coordinates (X,Y), max. 10 sets per curve.
   - Remove a set of coordinates, min. of four sets is required.
   - Column to change between X or Y settings.
   - Select OK **OK** to edit the value.
4. Select View and then Write to save the curve settings.

6.7 Input/output

6.7.1 About input/output

The controller inputs and outputs are configurable but depend on the single-line diagram, parameters, functions and alarms. You can configure digital or analogue inputs and outputs, custom alarms, and use functions.

More information
See the **Data sheet**, or **Hardware characteristics and configuration** in the **Designer's handbook** for more information about the hardware modules and terminals.

Input/output restrictions

Digital input (DI)	
Functions allowed	One or more different functions on same input terminal.
Restrictions	• You cannot use a function already assigned to another digital input (DI). • You cannot use a function assigned and used in CustomLogic.

Digital output (DO)	
Functions allowed	One function on the same terminal.
Restrictions	• Only one function or multiple alarms are allowed to be configured. • You cannot use a function assigned and used in CustomLogic.
Notes	The same function can be assigned to other digital output (DO) terminals.

Analogue input (AI)	
Functions allowed	One or more different functions on the same input terminal.
Restrictions	• Functions must use the same unit of measure. • You cannot use a function already assigned to another analogue input (AI). • The selected functions type can be Analogue input functions (**Analogue functions** or Digital input functions (**Supervised binary input**). • You cannot use both analogue and digital functions on the same terminal.

Analogue output (AO)	
Functions allowed	One function on the same input terminal.
Restrictions	The function must be selected before the Output setup is configured.
Notes	The same function can be assigned to other analogue output (AO) terminals.

Pulse width modulation (PWM)	
Functions allowed	One function on the same input terminal.
Restrictions	The function must be selected before the Output setup is configured.
Notes	The same function can be assigned to other Pulse width modulation (PWM) terminals.

About Analogue inputs

You can use an analogue input:

- As an input for one or more controller **analogue functions**.
- As a supervised input for one or more controller **digital functions**.
- To detect **sensor failure**.
- As the basis for one or more **alarms**.

For each analogue input use, the table below shows which **pages** in the analogue input view you must configure.

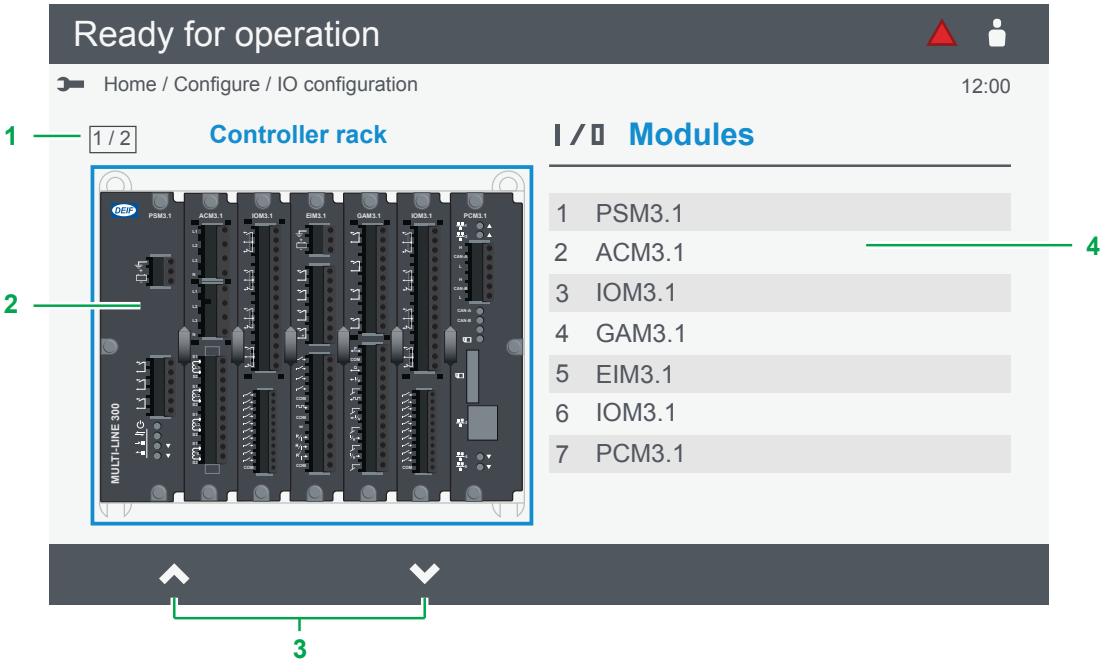
Table 6.1 Configuration for the uses of an analogue input

Use	Functions	Sensor setup	Alarms
Analogue functions	Required	Required	Optional
Digital functions	Required	Required	Optional
Sensor failure	Optional	Required	Optional
Alarms	Optional	Required	Required

More information
See the **Designer's handbook** for more information on specific functions and hardware characteristics.

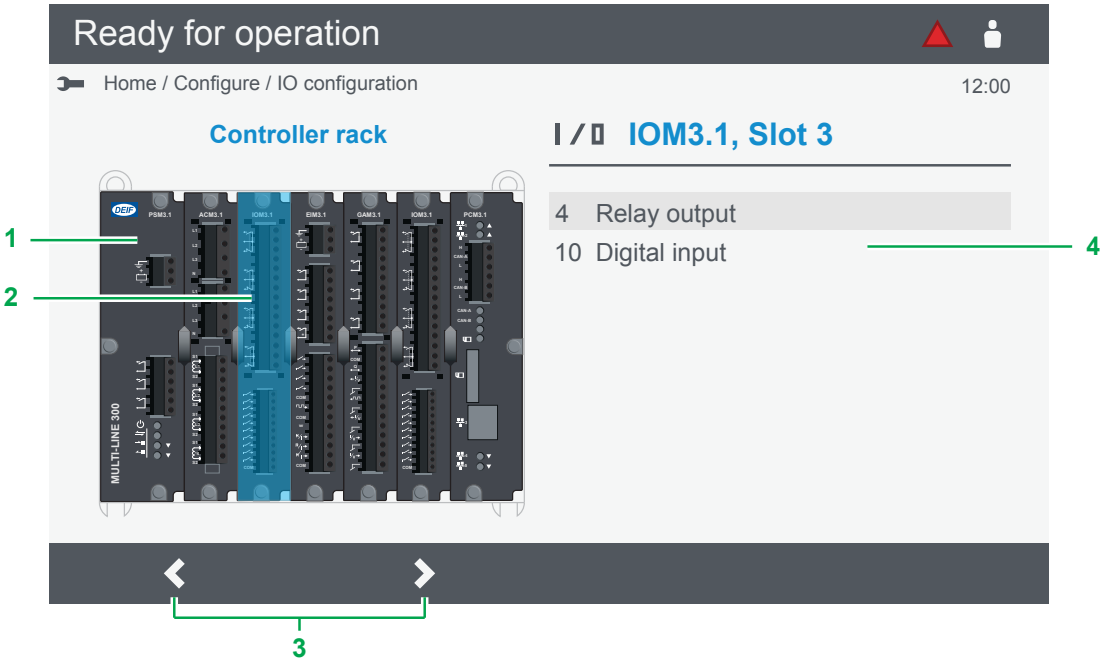
6.7.2 Rack or ECU selection page

The selection is only shown if the system has extension racks or an ECU configured.



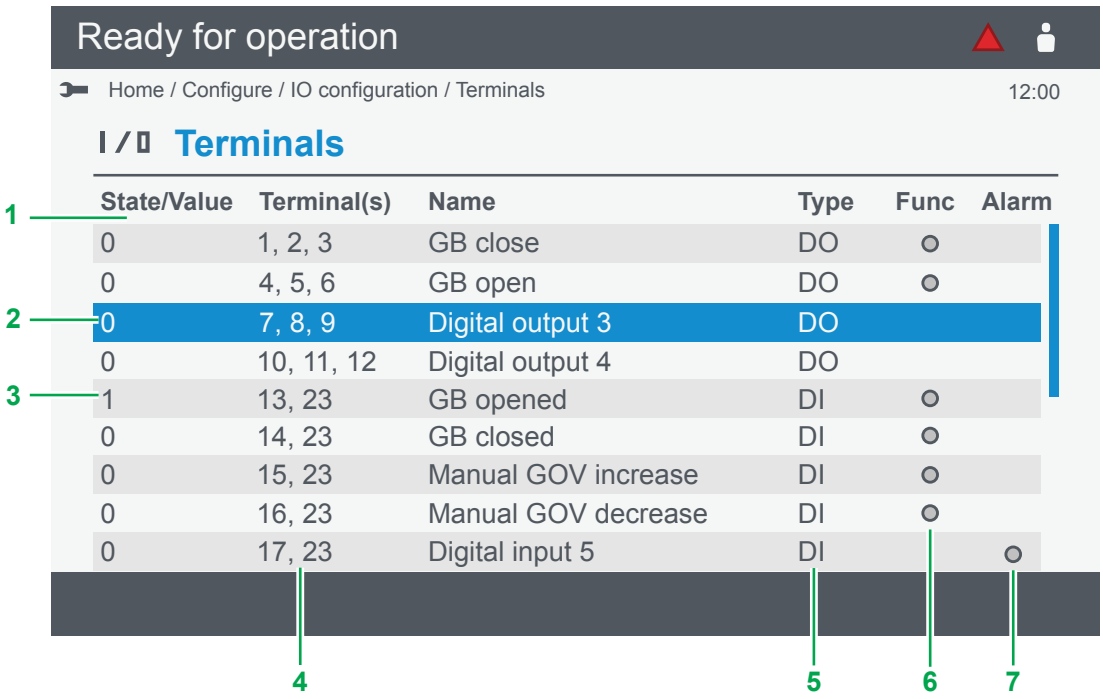
No.	Item	Notes
1	Rack number	Shows the selected rack number.
2	Rack or ECU	Shows the selected rack or ECU. Select OK **OK** to confirm the selection.
3	Rack or ECU selection	**Up**: move selection up. **Down**: move selection down.
4	I/O modules	Shows the I/O modules installed in the selected rack or the ECU image.

6.7.3 Module selection page



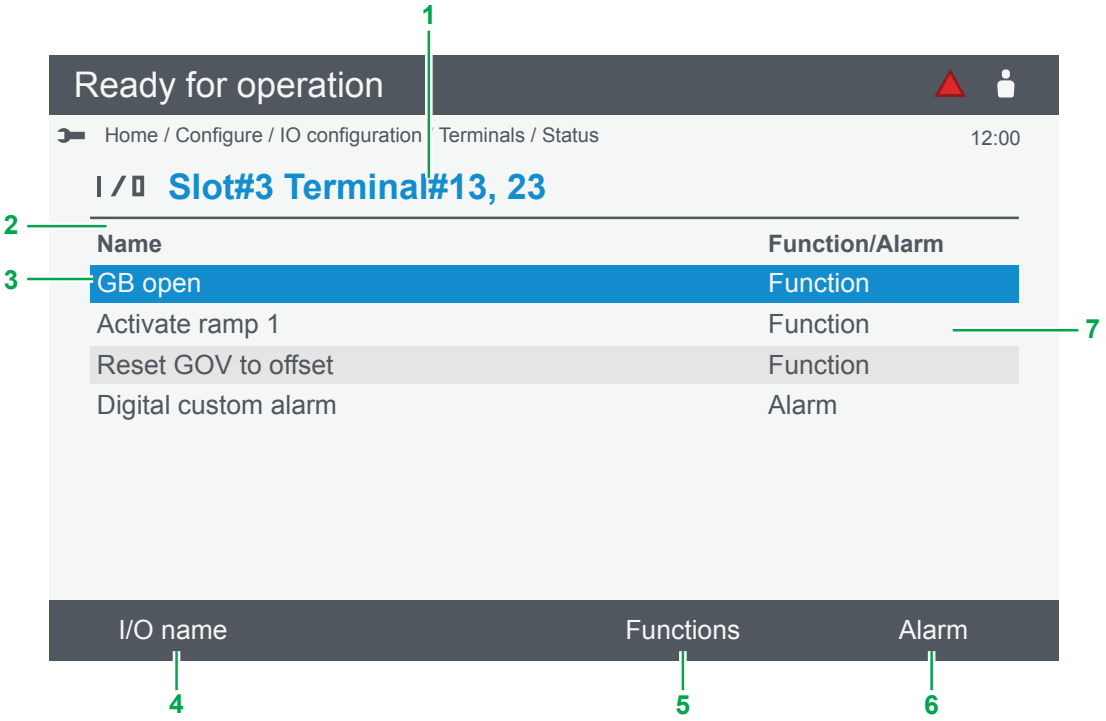
No.	Item	Notes
1	Rack	Shows the selected rack.
2	Selected module	Shows the selected module. Select OK **OK** to configure the terminals.
3	Module selection	**Left**: move module selection left. **Right**: move module selection right.
4	Terminals	Shows the available terminals in the selected module.

6.7.4 Terminal selection page



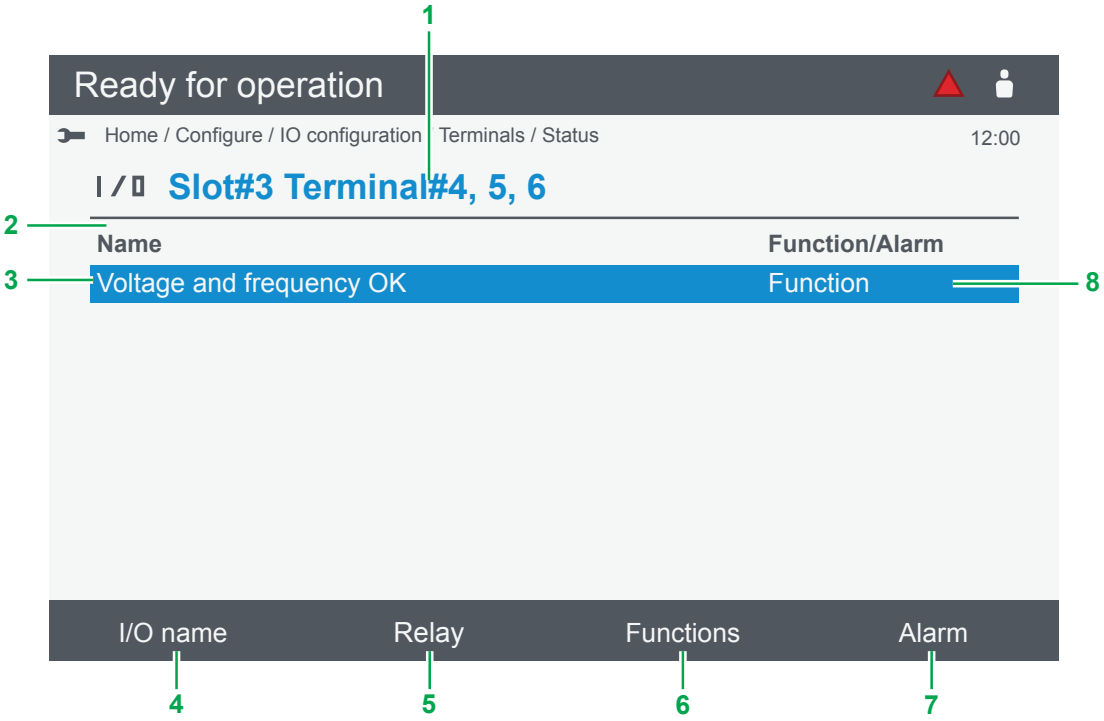
No.	Item	Notes	
1	List of terminals	Shows the terminals for the selected module.	
2	Selected terminal	Shows the terminal selected.	
		Select OK **OK** to configure the terminal.	
3	Terminal state	Shows the state or value for the terminal.	
4	Terminal numbers	Shows the terminal numbers for the connector.	
5	Type	Shows the type of terminal.	
		DI: Digital input	DO: Digital output
		AI: Analogue input	AO: Analogue input
		PWM: Pulse width modulation	
6	Function	○ : Shows there is 1 or more functions assigned.	
7	Alarm	○ : Shows there is 1 or more alarms assigned.	

6.7.5 Digital input (DI) page



No.	Item	Notes
1	Module and terminal selected	Shows the slot number and terminal numbers.
2	Function or alarm list	Shows a list of all configured functions or alarms on this terminal.
3	Selected function or alarm	Select OK **OK** to configure existing setting.
4	I/O name	Views or configures the terminal name.
5	Functions	Views or configures the functions on this terminal.
6	Alarm	Views or configures the alarms on this terminal.
7	Function or alarm	Shows if it is a function or an alarm configured.

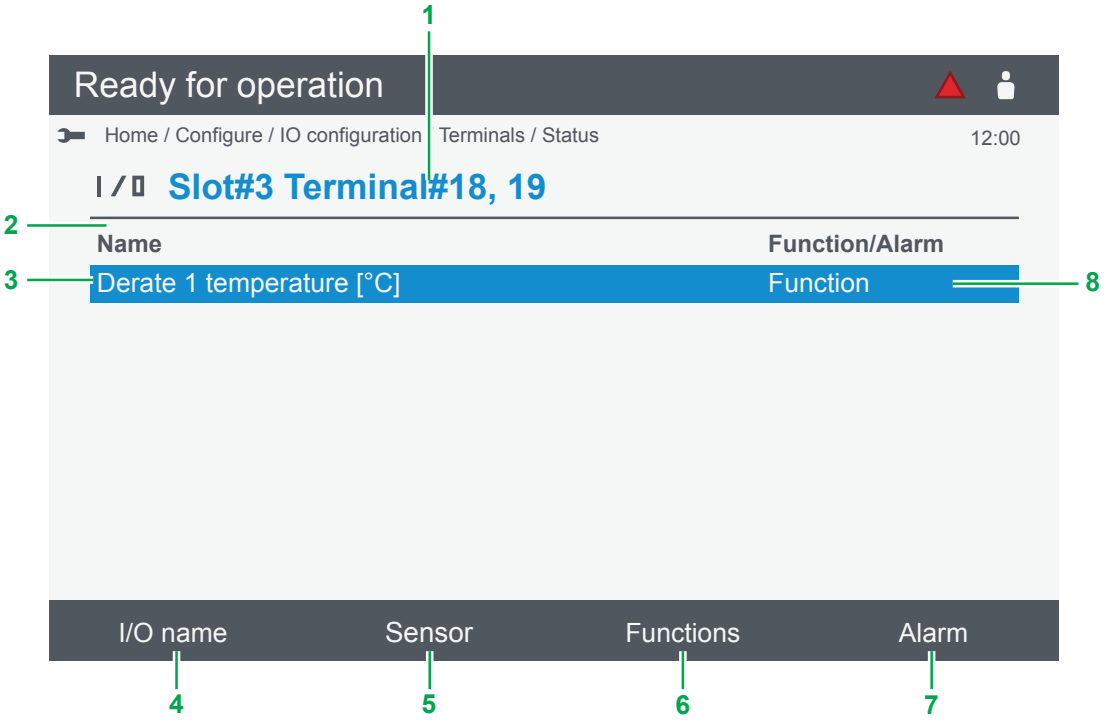
6.7.6 Digital output (DO) page



No.	Item	Notes
1	Module and terminal selected	Shows the slot number and terminal numbers.
2	Function or alarm list *	Shows a list of configured function or alarms on this terminal.
3	Selected function or alarm	Select OK **OK** to configure existing setting.
4	I/O name	Views or configures the terminal name.
5	Relay	Views or configures the relay setting.
6	Functions	View or configure a function on this terminal.
7	Alarm	Views or configures the alarms on this terminal.
8	Function or alarm	Shows if it is a function or an alarm configured.

NOTE * A digital output can only have a function or alarms. You can not configure both a function and alarms on the same terminal.

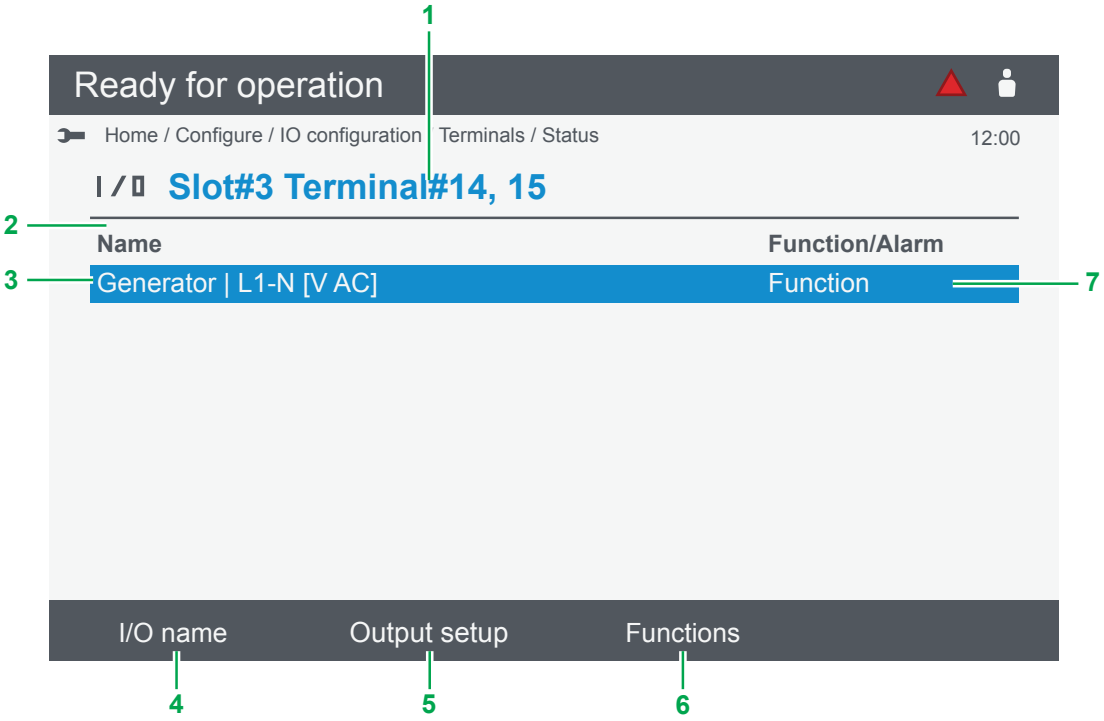
6.7.7 Analogue input (AI) page



No.	Item	Notes
1	Module and terminal selected	Shows the slot number and terminal numbers.
2	Functions or alarms list	Shows a list of all configured functions or alarms on this terminal.
3	Selected function or alarm	Select OK **OK** to configure existing setting.
4	I/O name	Views or configures the terminal name.
5	Sensor *	Views or configures the sensor settings.
6	Functions	Views or configures the functions on this terminal.
7	Alarm	Views or configures the alarms on this terminal.
8	Function or alarm	Shows if it is a function or an alarm configured.

NOTE * Configure any required functions before configuring the sensor settings.

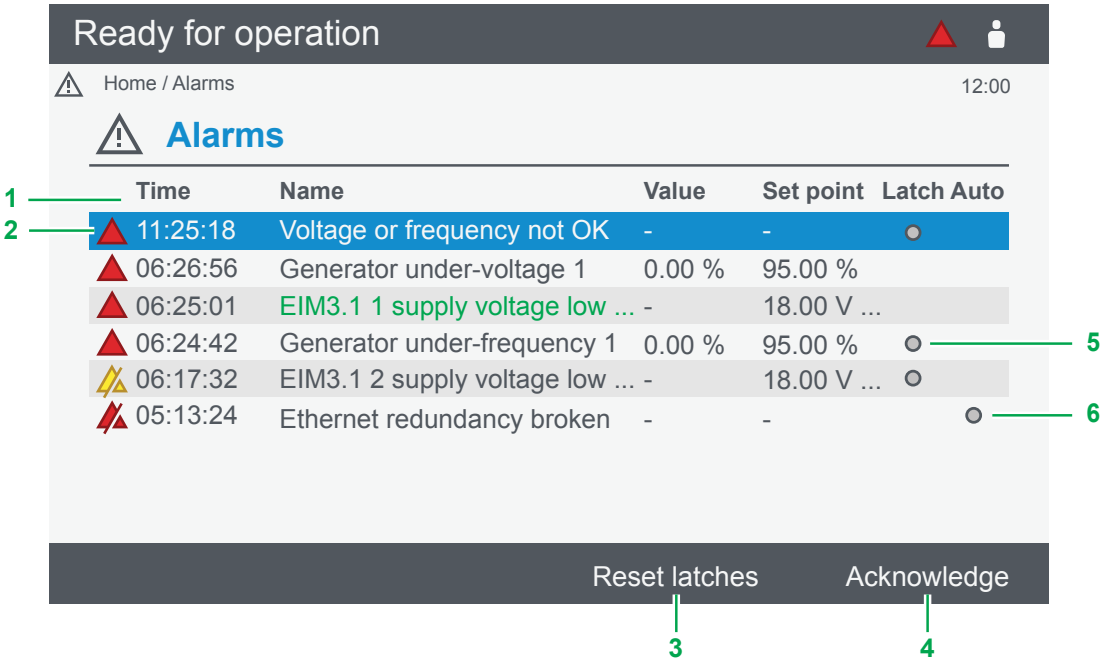
6.7.8 Analogue output (AO or PWM) page



No.	Item	Notes
1	Module and terminal selected	Shows the slot number and terminal numbers.
2	Function list	Shows a list of all configured functions on this terminal.
3	Selected function	Select OK **OK** to configure existing setting.
4	I/O name	Views or configures the terminal name.
5	Output setup	Views or configures the output setup.
6	Functions	Views or configures the functions on this terminal.
7	Function	Shows if a function is configured.

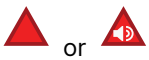
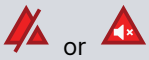
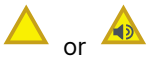
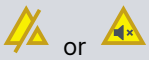
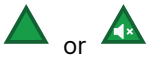
7. Alarms

7.1 Alarms page



No.	Item	Notes
1	List of alarms	Alarm state is shown by the symbol. Test alarms are shown in green.
2	Selected alarm	Select OK **OK** to show further information about the alarm or use the service options. If enabled you can view the Tag value for the alarm.
3	Reset latches	Resets all cleared alarm latches (requires the alarm is acknowledged and the alarm condition has cleared)
4	Acknowledge	Acknowledges an unacknowledged alarm. Acknowledging an alarm does not stop the alarm action (protection) if the alarm condition remains active or the alarm has a latch enabled.
5	Latch	○ : Shows the alarm has a latch enabled. .
6	Auto	○ : Shows the alarm has automatic acknowledge enabled.

7.1.1 Alarm state

Symbol	Alarm condition *	Alarm action **	Acknowledge	Notes
	Active	Active	Unacknowledged	• An alarm condition occurred. • An alarm action is active. • An alarm requires acknowledgement. • An alarm requires action to clear the alarm condition.
	Active	Active	Acknowledged	• An alarm condition occurred. • An alarm action is active. • An alarm is acknowledged. • An alarm requires action to clear the alarm condition.
	Inactive	Active	Unacknowledged	• An alarm condition has cleared. • An alarm action is active. • An alarm requires acknowledgement. • An alarm latch requires reset.
	Inactive	Active	Acknowledged	• An alarm condition has cleared. • An alarm action is active. • An alarm is acknowledged. • An alarm latch requires reset.
	Inactive	Inactive	Unacknowledged	• An alarm condition occurred, but was cleared. • An alarm action is inactive. • An alarm requires acknowledgement.
	Active or Inactive	Inactive	-	• An alarm is shelved for a period of time. • An alarm returns automatically after the period has expired.
	Active or Inactive	Inactive	-	• An alarm is marked *out of service* for an indefinite period. • An alarm does not return automatically and must be returned to service manually.
	Active or inactive	Inactive	-	An alarm is inhibited to occur.

NOTE * Alarm condition is usually where the Set point is exceeded.
** Alarm action (the protection) is the configured action taken to protect the situation. When active, the controller activates the action.

More information
See **Alarms** in the **Designer's handbook** for more information about how to handle alarms in the system.

7.1.2 Shelved alarms

An alarm that is shelved is no longer active. Shelved alarms automatically become unshelved when the shelve period expires. You can also unshelve the alarm manually.

Shelve an alarm

1. Select the alarm.
2. On the details page, select Service.
3. Select Shelve.
4. Select the period to shelve the alarm.

5. The alarm is now shelved for the selected period.
   - The alarm is marked as shelved (or) in the alarm list.
   - The alarm action (protection) is inactive until the alarm is unshelved.

Unshelve an alarm

1. Select the shelved alarm.
2. On the details page, select Service.
3. Select Unshelve.

7.1.3 Remove from service

CAUTION

Alarm action not active

An alarm that is removed from service is no longer active.

The alarm remains out of service until it is returned back to service.

Remove an alarm from service

You can only remove certain types of alarms from service.

1. Select the alarm.
2. On the details page, select Service.
3. Select Remove from service.
4. The alarm is now removed from service.
   - The alarm is marked as out of service (or) in the alarm list.

Return an alarm to service

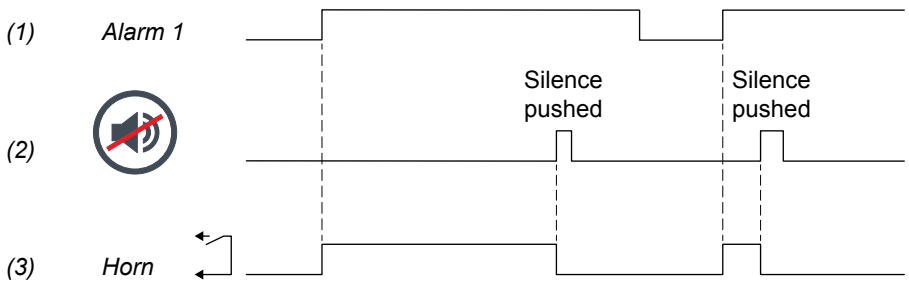
1. Select the alarm.
2. On the details page, select Service.
3. Select Return to service.
4. The alarm is now returned to service.
   - If the alarm condition is still present, the alarm is activated again.

7.1.4 Silence horn

The controller must be configured with horn outputs for the silence horn push-button to work. When an alarm occurs the horn output activates.

Push **Silence horn** to deactivate all horn outputs. The push-button does not have any other effect on the alarm system. If a new alarm occurs after the button is pushed, the horn output restarts.

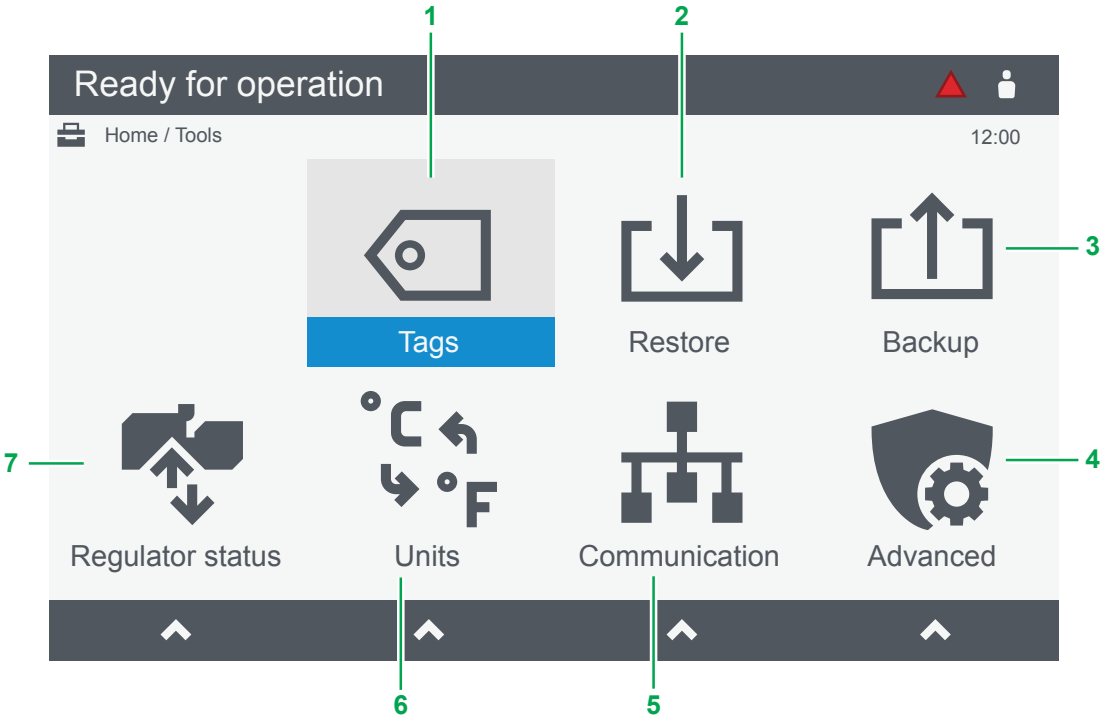
Example of the Silence horn button



More information
See **Alarms**, **Horn outputs** in the **Designer's handbook** for more information about these outputs.

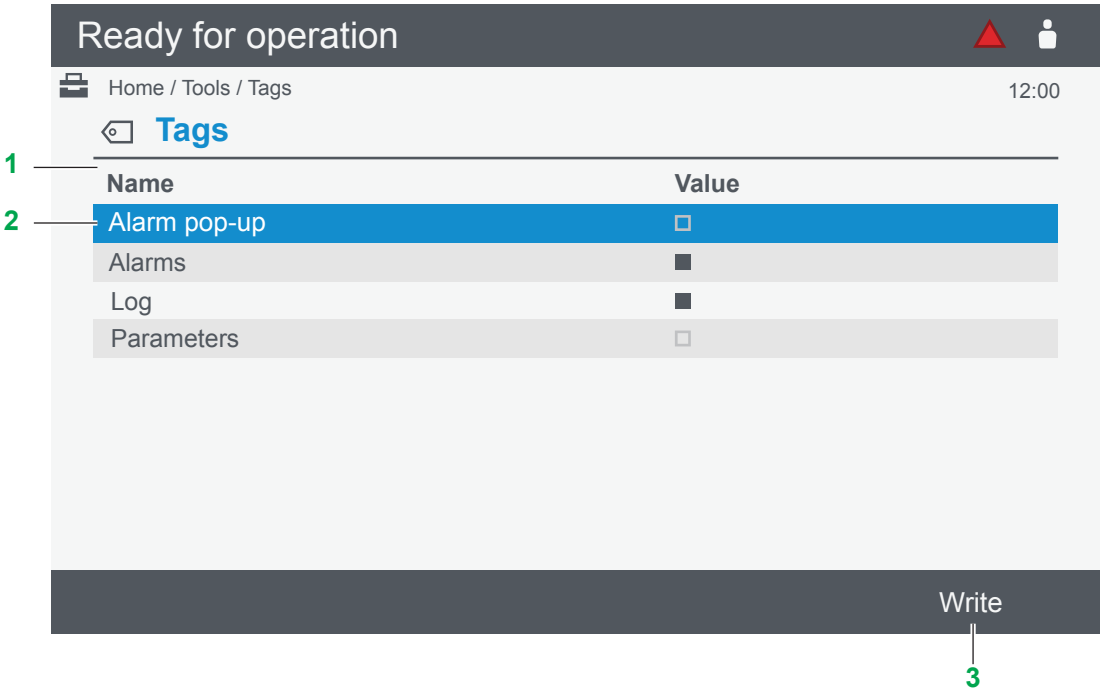
8. Tools

8.1 Tools page



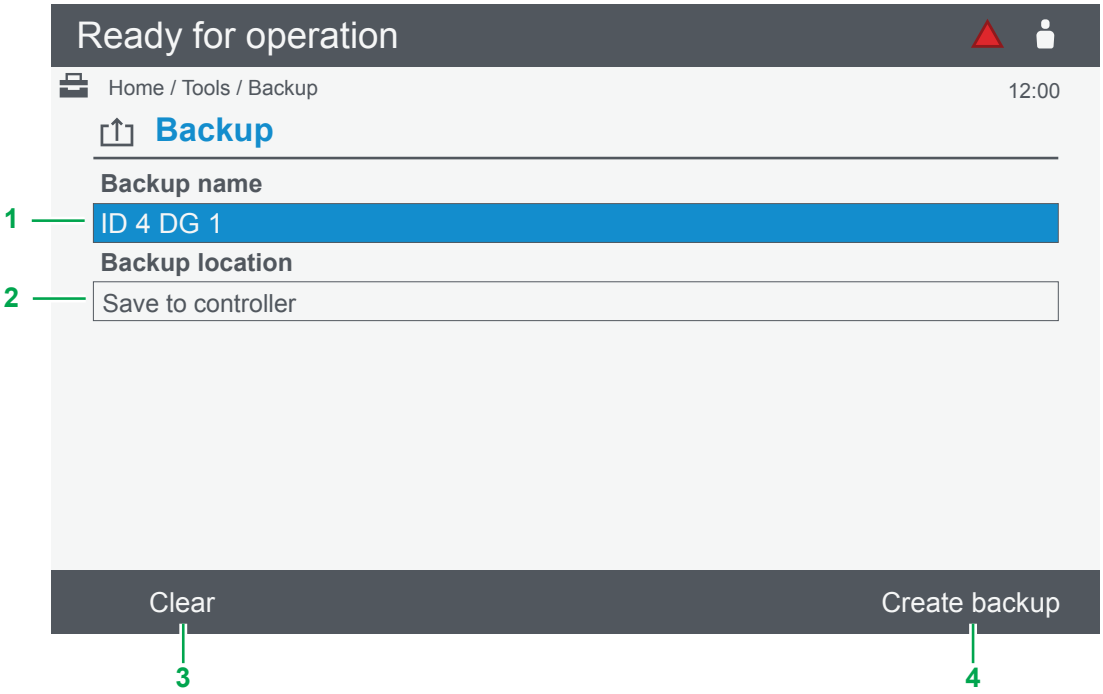
No.	Item	Notes
1	Tags page	Show or hide Tags.
2	Restore page	Restore a backup to the controller.
3	Backup page	Create a backup of the controller.
4	Advanced menu	Shows the Advanced menu.
5	Communication page	Configure network settings.
6	Units page	Configure the units of measure shown.
7	Regulator status page	View the GOV and AVR status.

8.2 Tags page



No.	Item	Notes
1	List of tags	Shows a list of areas that tags can be displayed on.
2	Tag selection	Select OK **OK** to toggle selection.
		☐ **Not selected** : The tag is not shown. ■ **Selected** : The tag is shown.
3	Write	Write the settings to the controller.

8.3 Backup page



No.	Item	Notes
1	Backup name	Shows the slot number and terminal numbers. Highlight and select OK **OK** to configure the name.
2	Backup location	Shows the location where the backup is created. Highlight and select OK **OK** to choose the location.
3	Clear	Clears and restores the default Backup name.
4	Create backup	Creates a backup in the selected location (max. 20 backups).

8.4 Restore

8.4.1 Restore restrictions

Controller prerequisites

Before you restore a backup to a controller, the controller must meet these prerequisites:

Controller type	Prerequisites
GENSET controller	1. The breaker must be opened. 2. The engine must be stopped. 3. The controller must be in Switchboard control.
HYBRID controller	1. The breaker must be opened. 2. The inverter must be stopped. 3. The controller must be in Switchboard control.
SHAFT generator controller	1. The breaker must be opened. 2. The controller must be in Switchboard control.
SHORE connection controller	
BUS TIE breaker controller	

Not compatible backup files

Backup files or folders are not compatible with the current controller configuration if:

- The backup is from a different product type.
- The backup is from a different controller type.
- The backup is from a different controller configuration.
- The backup is from a controller with a different hardware configuration.
- The backup is not supported by the current controller software.

Restore network settings

If you use **Restore IP address (IPv4) and controller ID**, the controller **must** be powered off and powered on before the network settings are restored.

CAUTION

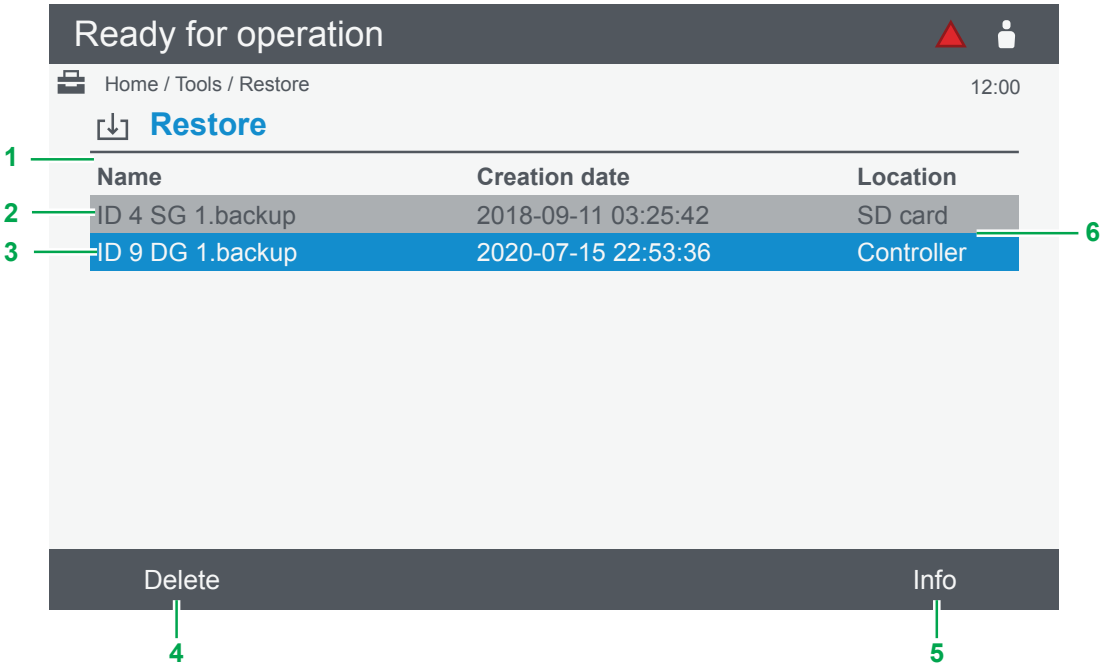
Controller part of system

If the controller is part of the network communication between units, the processor and communication module is also powered off. Make sure this does not affect your system before you power the controller off.

Data not restored

When you restore a backup file or folder to a controller, the event log and alarms are **not** restored.

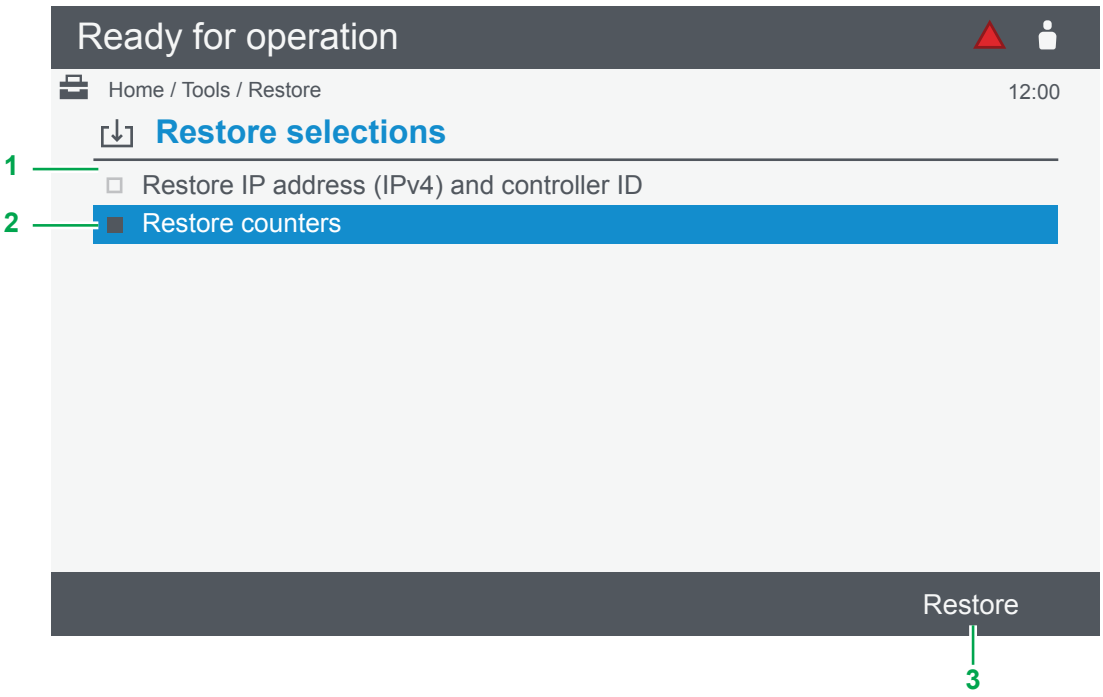
8.4.2 Restore page



No.	Item	Notes
1	List of backups	Shows the backups on the controller or SD card.
2	Not compatible backup *	Shows a not compatible backup in dark grey.
3	Selected backup	Select OK **OK** to choose the restore selections.
4	Delete	Deletes the selected backup.
5	Info	Shows information about the backup.
6	Location	Shows the location where the backup is stored.

NOTE * Backups are not compatible if they are a different product, controller type, controller configuration, hardware, or not supported by the current firmware.

8.4.3 Restore selection page



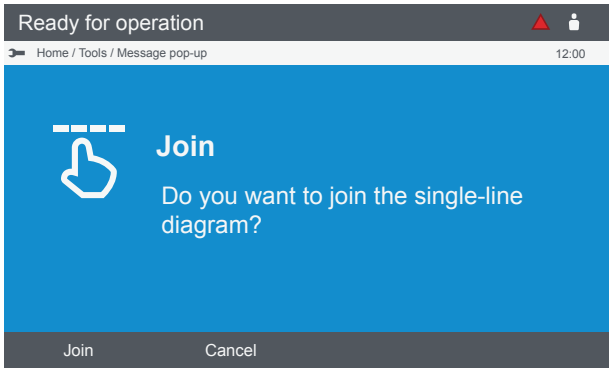
No.	Item	Notes
1	List of features	Shows a list of features you can restored.
2	Feature selection	Select OK **OK** to choose the restore selections.
		☐ **Not selected** : The feature is not restored. ■ **Selected** : The feature is restored.
3	Restore	Restore the selected features.

8.5 Quick connect

You can use Quick connect to join the controller to the single-line diagram, even if the controller is not part of the application drawing.

To join the controller to the application single-line diagram, select:

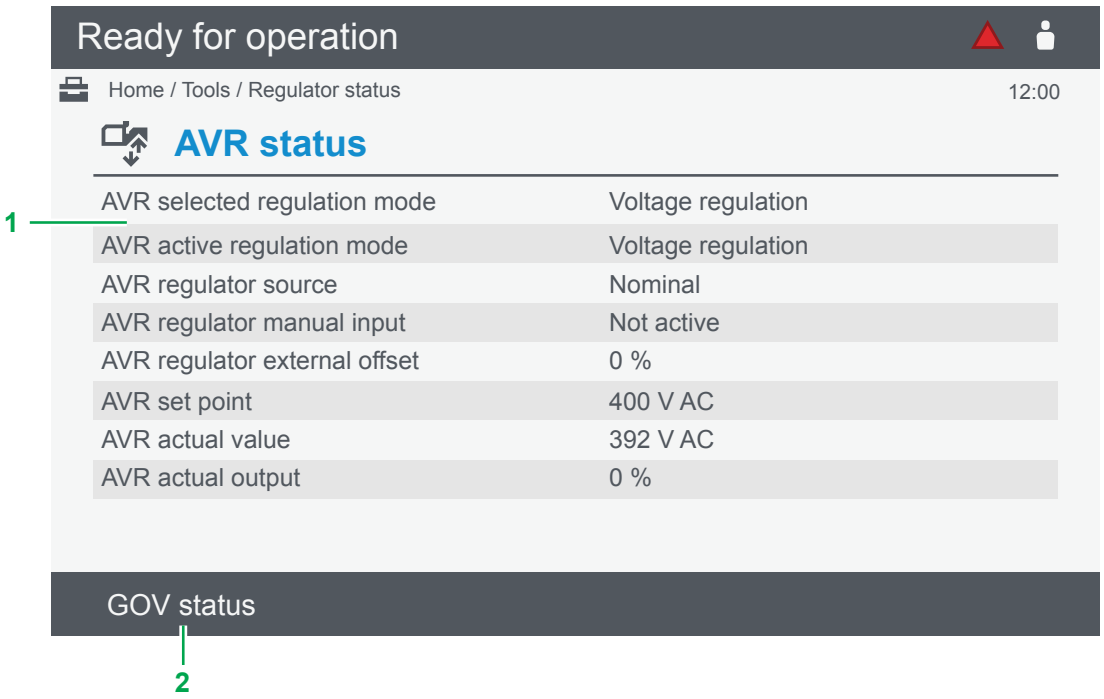
`Tools > Quick connect`



Select **Join** to add the controller to the application single-line diagram.

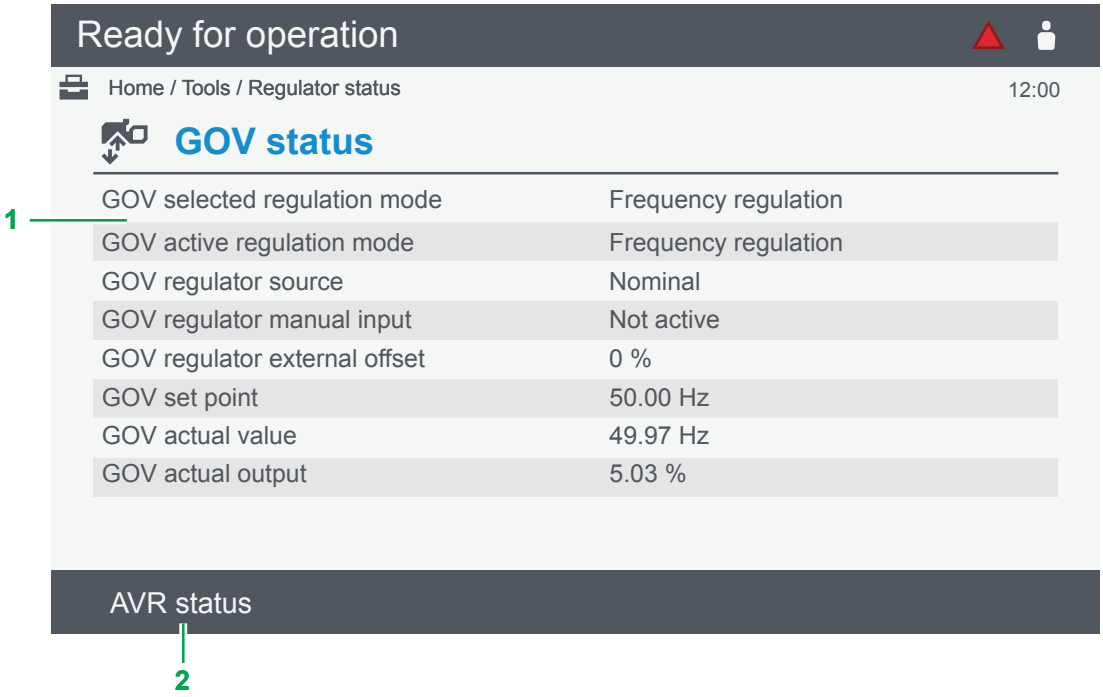
8.6 Regulator status

8.6.1 Regulator status AVR page



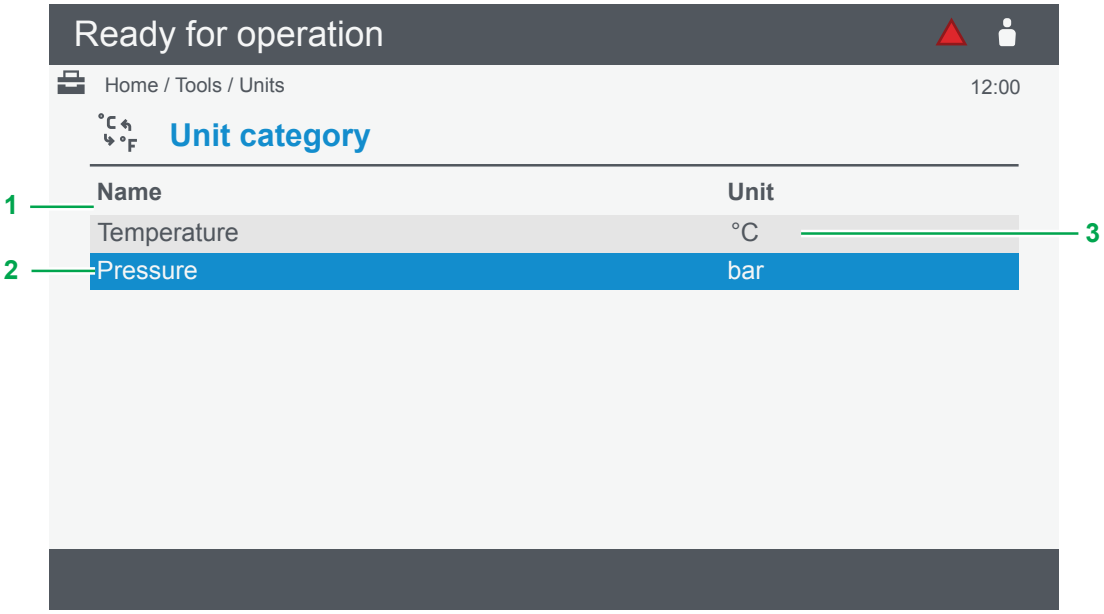
No.	Item	Notes
1	AVR regulation	Shows the status of the AVR regulation.
2	GOV status page	Select to go to the GOV status page.

8.6.2 Regulator status GOV page



No.	Item	Notes
1	GOV regulation	Shows the status of the GOV regulation.
2	AVR status page	Select to go to the AVR status page.

8.7 Units page



No.	Item	Notes
1	Units list	Shows the units you can configure.
2	Selected unit	Select OK **OK** to configure the unit setting.
3	Unit setting	Shows the current unit of measure.

8.8 Communication

8.8.1 About communication

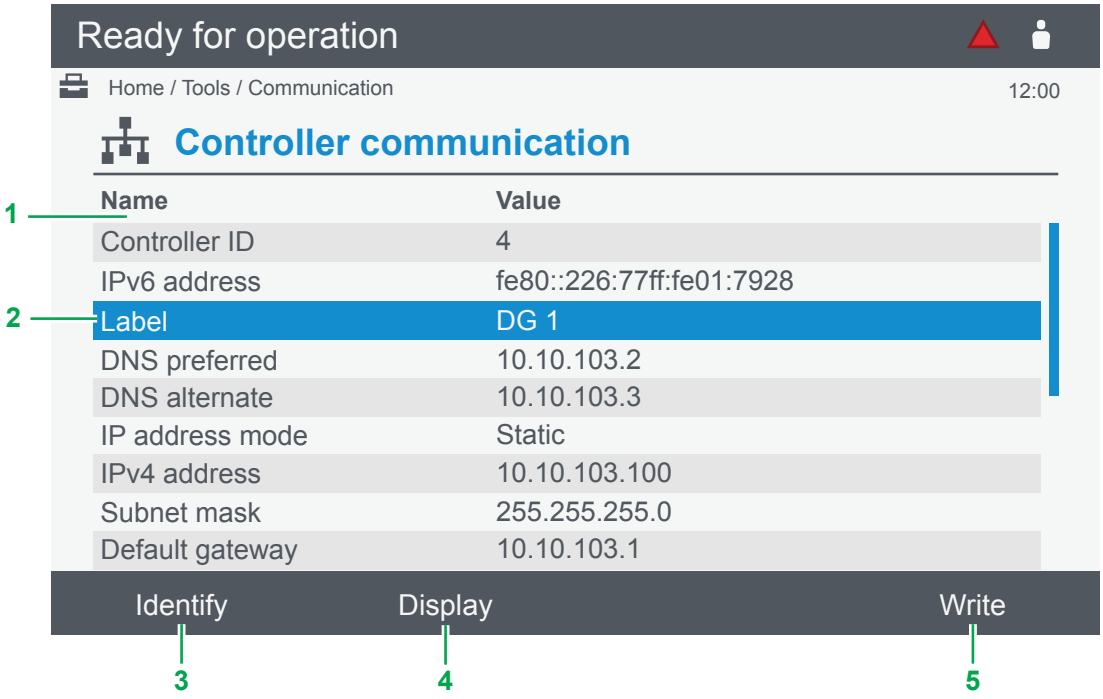
The controller or display must be powered off and powered on for communication changes to apply.

DANGER!

Power off and on

This must be done by authorised personnel who understand the risks involved in accessing the power supply or installation design. Take extreme care in the enclosure next to the ACM terminals. The controllers must not be in operation and the controlled breakers must be open.

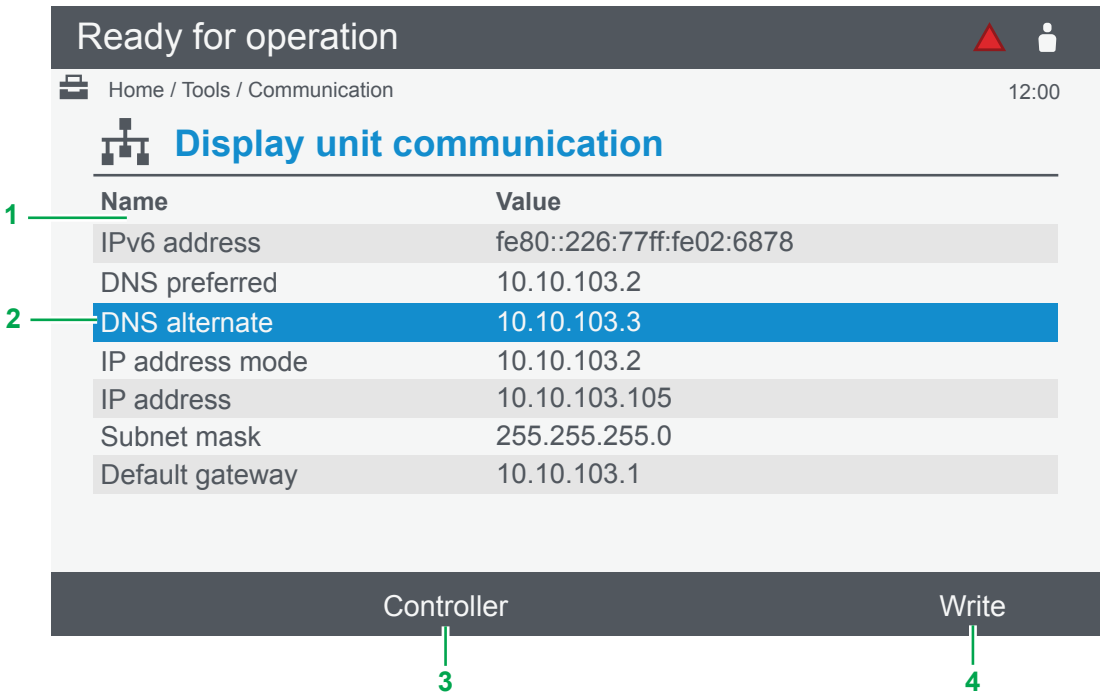
8.8.2 Controller communication page



No.	Item	Notes
1	Controller communication list	Shows the controller communication settings.
2	Selected setting	Select OK **OK** to configure the settings (not all settings are configurable).
3	Identify	Runs the controller rack identification feature. The ⏻ Power status LED on the paired controller flashes.
4	Display page	Select to go to the display communication settings.
5	Write *	Writes the settings to the controller.

NOTE * For changes to communication settings to take effect, all controllers and displays in the same system **must** be powered off and powered on.

8.8.3 Display communication page

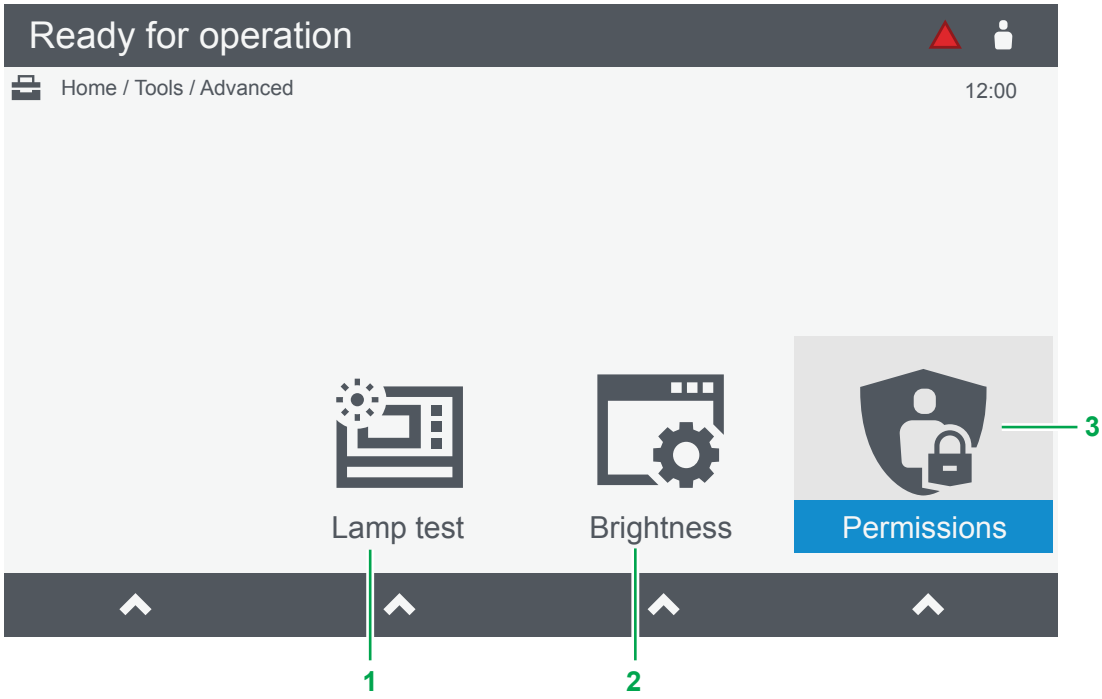


No.	Item	Notes
1	Display communication list	Shows the display communication settings.
2	Selected setting	Select OK **OK** to configure the settings (not all settings are configurable).
3	Controller page	Select to go to the controller communication settings.
4	Write *	Writes the settings to the controller.

NOTE * For changes to communication settings to take effect, all controllers and displays in a system **must** be powered off and powered on.

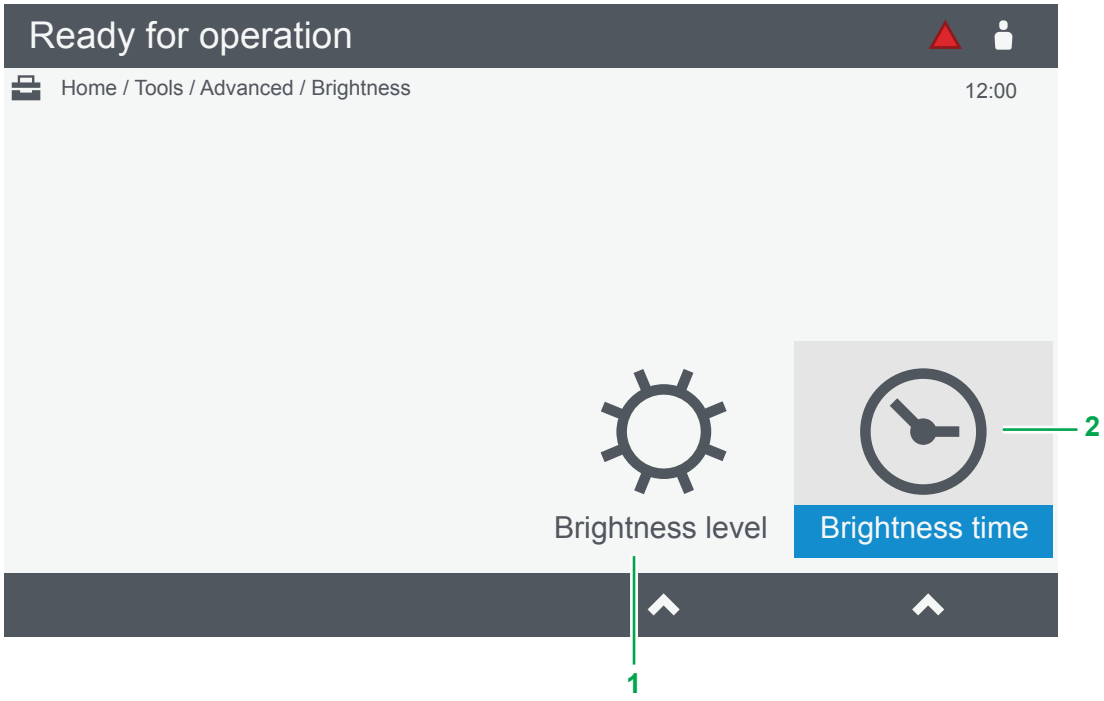
9. Tools - Advanced

9.1 Tools advanced page



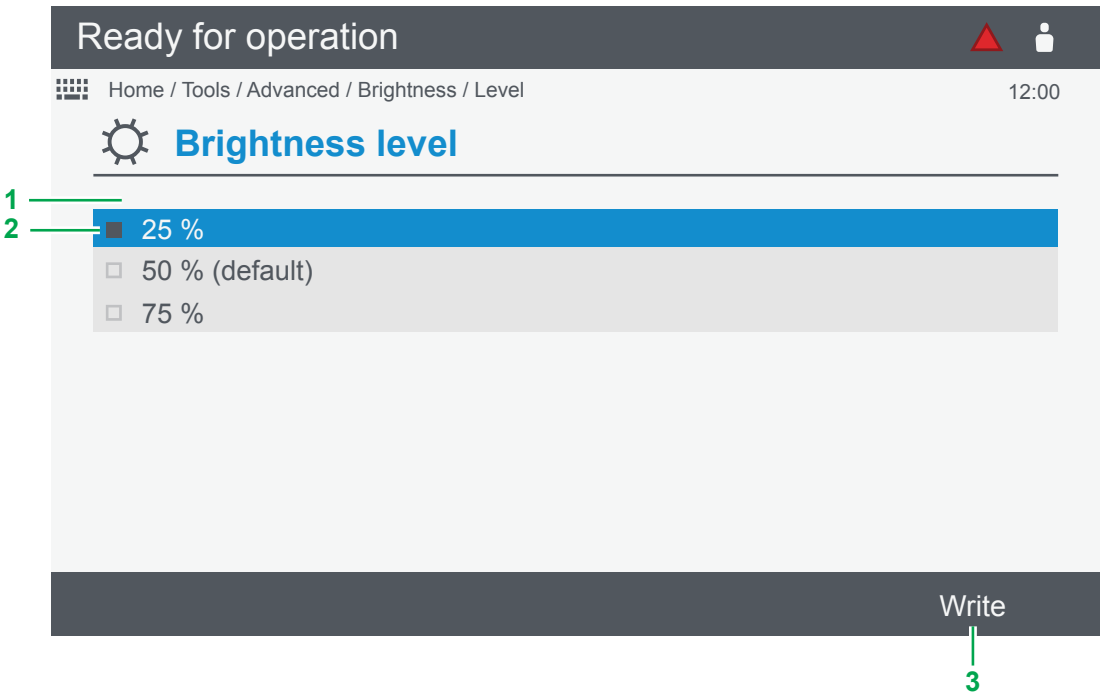
No.	Item	Notes
1	Lamp test page	Run a lamp test of the display LEDs.
2	Brightness menu	Shows the brightness menu.
3	Permissions menu	Shows the permissions menu.

9.2 Brightness page



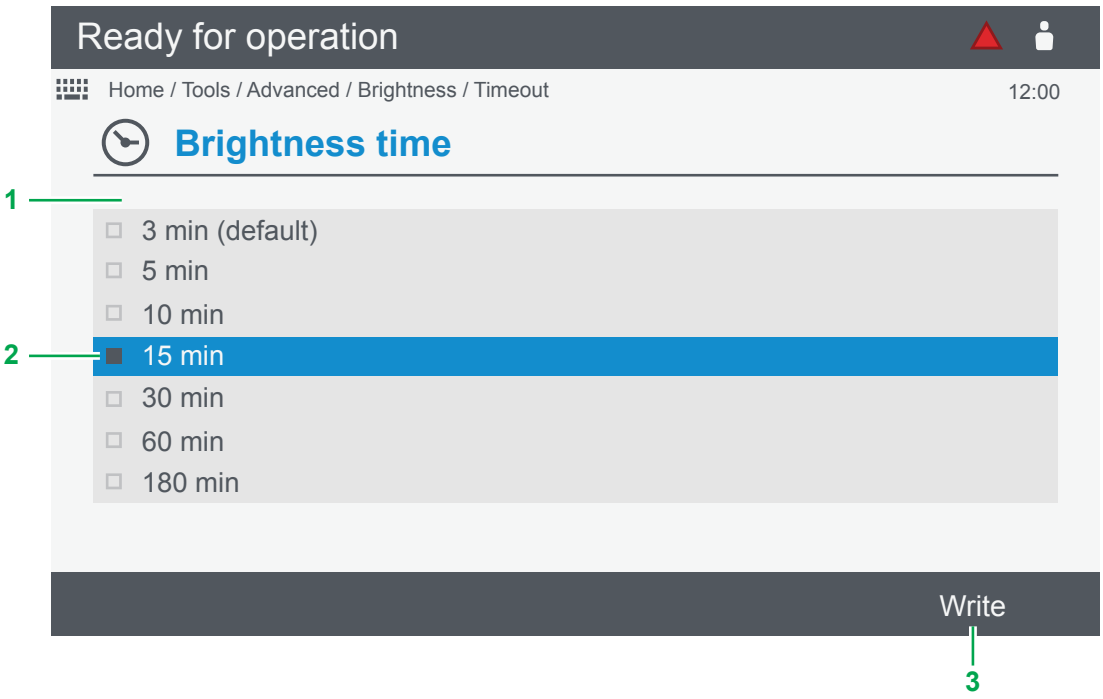
No.	Item	Notes
1	Brightness level page	Change the brightness level settings.
2	Brightness time page	Change the brightness time settings.

9.2.1 Brightness level page



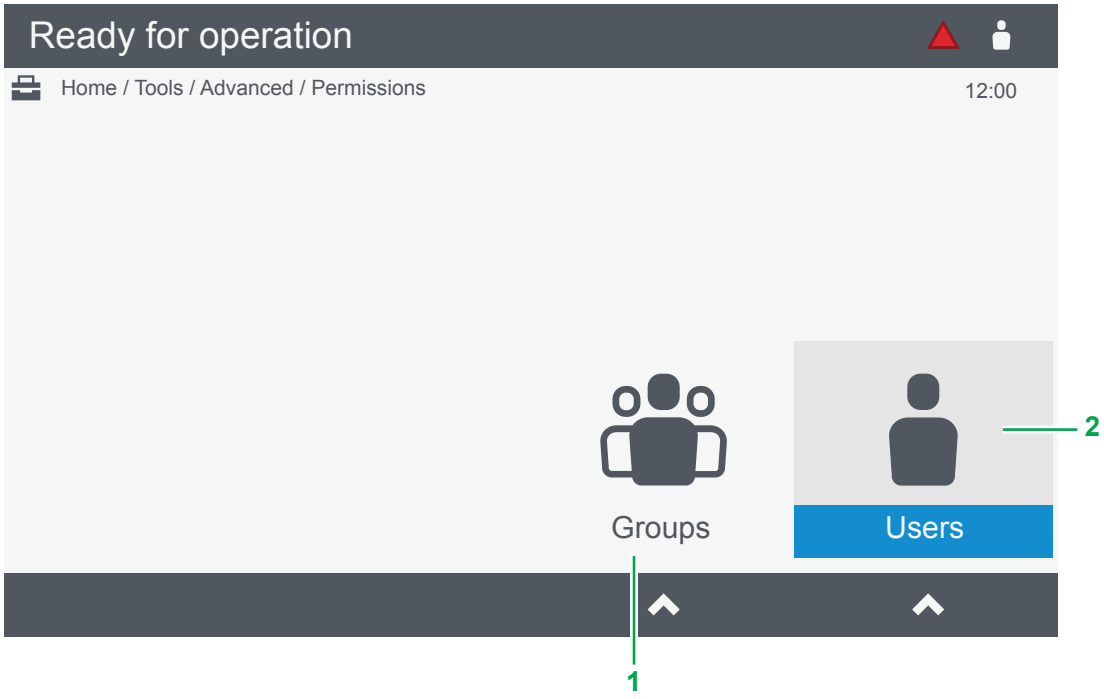
No.	Item	Notes
1	Brightness level list	Shows a list of the brightness levels in % the display is adjusted to.
2	Selected level	Select OK **OK** to choose the brightness level:
		☐ **Not selected** . ■ **Selected** .
3	Write	Writes the setting to the controller.

9.2.2 Brightness time page



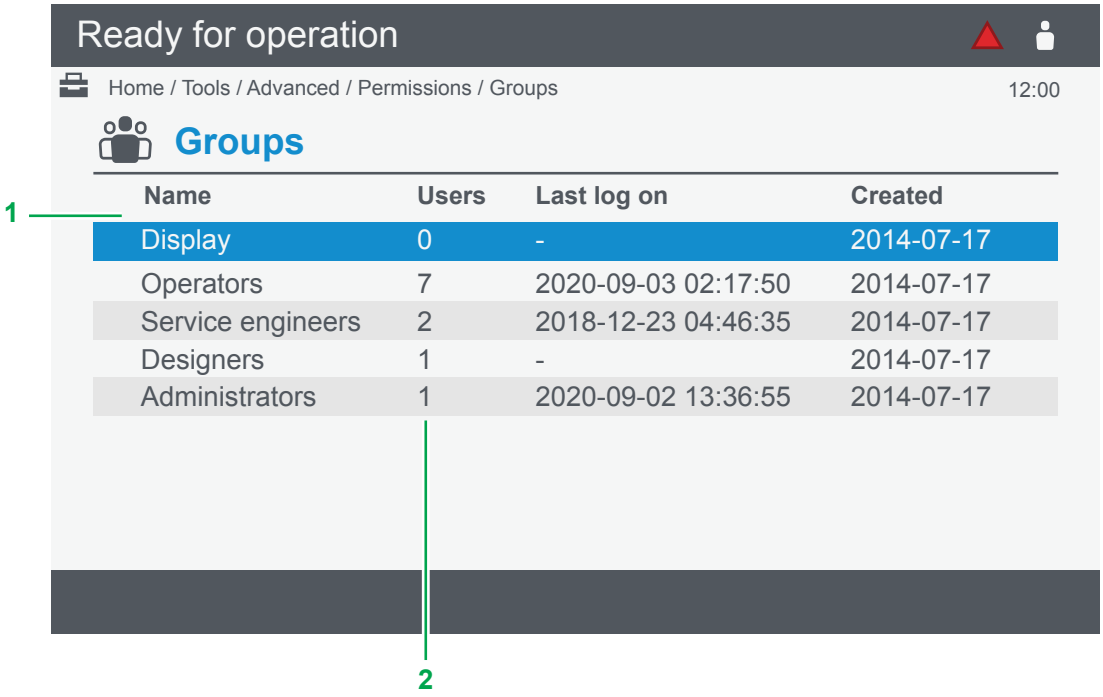
No.	Item	Notes
1	Brightness time list	Shows a list of times in minutes before the display automatically adjusts the brightness level.
2	Selected time	Select OK **OK** to choose the brightness time:
		☐ **Not selected** . ■ **Selected** .
3	Write	Writes the setting to the controller.

9.3 Permissions page



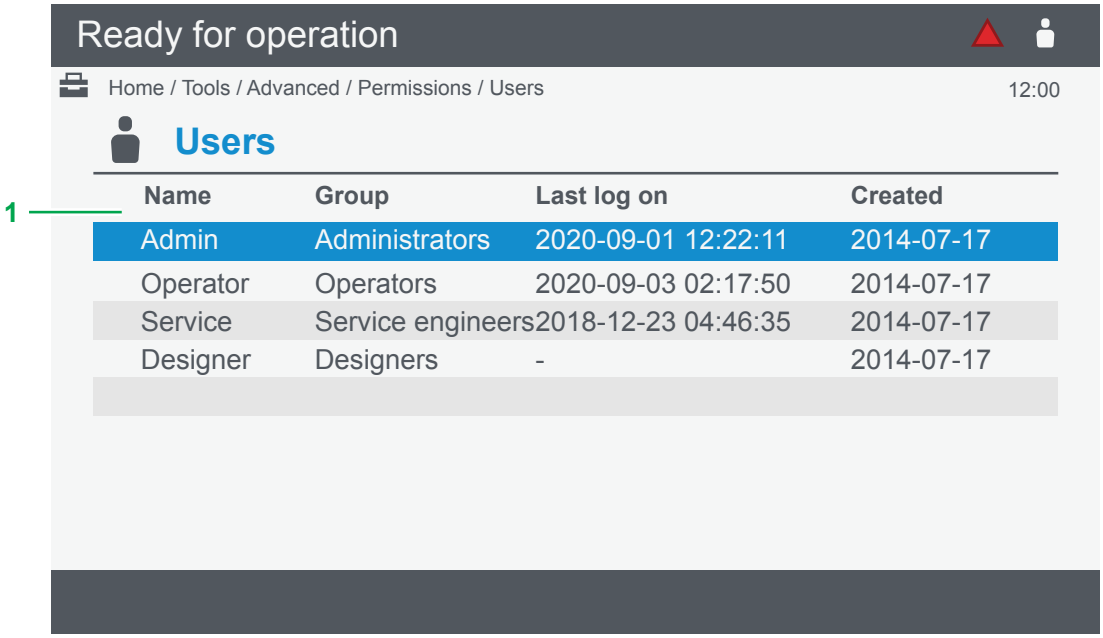
No.	Item	Notes
1	Groups page	Shows the groups page.
2	Users page	Shows the users page.

9.3.1 Groups page



No.	Item	Notes
1	Groups list	Shows the permission groups. Highlight and select OK **OK** to show more information.
2	Users	Shows how many users are in the group.

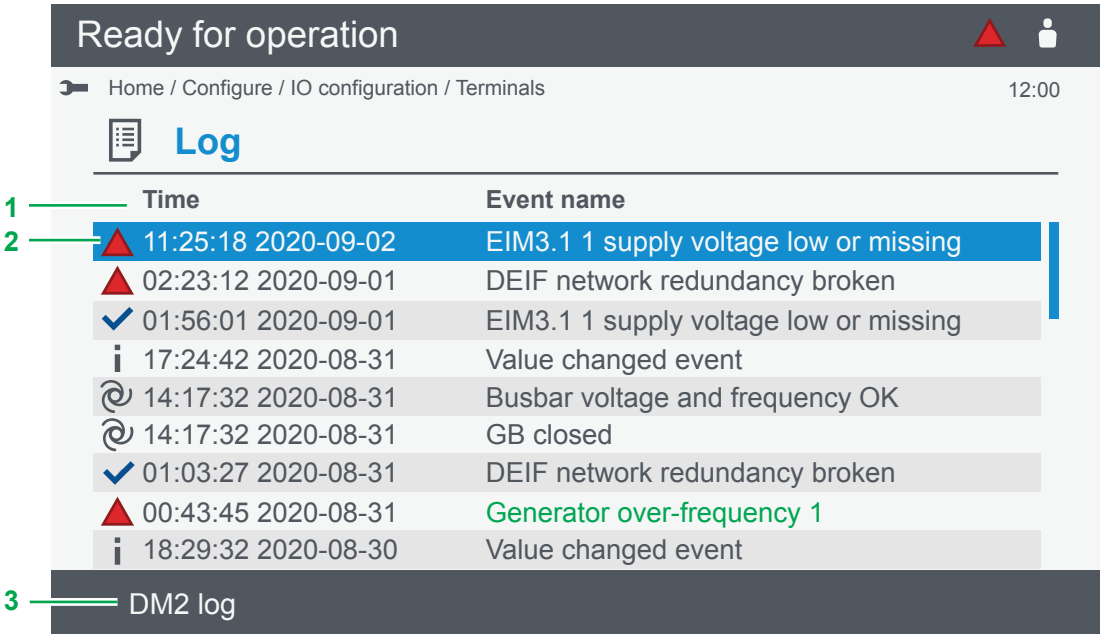
9.3.2 Users page



No.	Item	Notes
1	User list	Shows the users and their group permissions. Highlight and select OK **OK** to show more information.

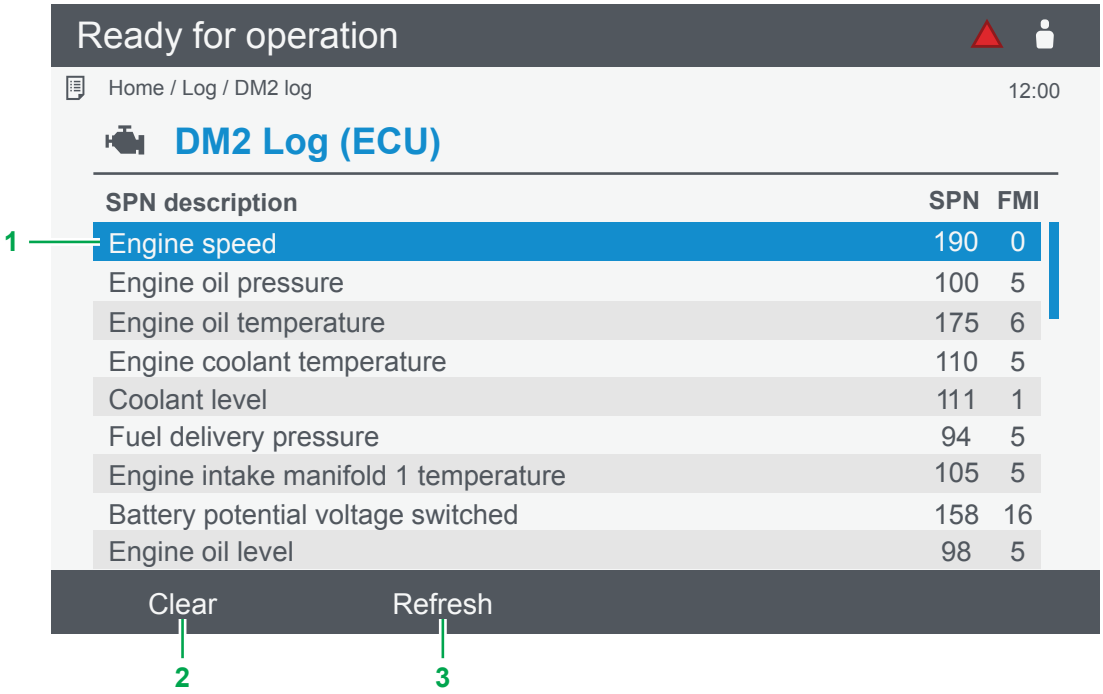
10. Log

10.1 Log page



No.	Item	Notes
1	List of log events	Shows all recorded events in the system. Test alarms are shown in green.
2	Selected event	Select OK **OK** to show further information about the event.
3	DM2 log page	Shows the DM2 log of events if an ECU has been configured.

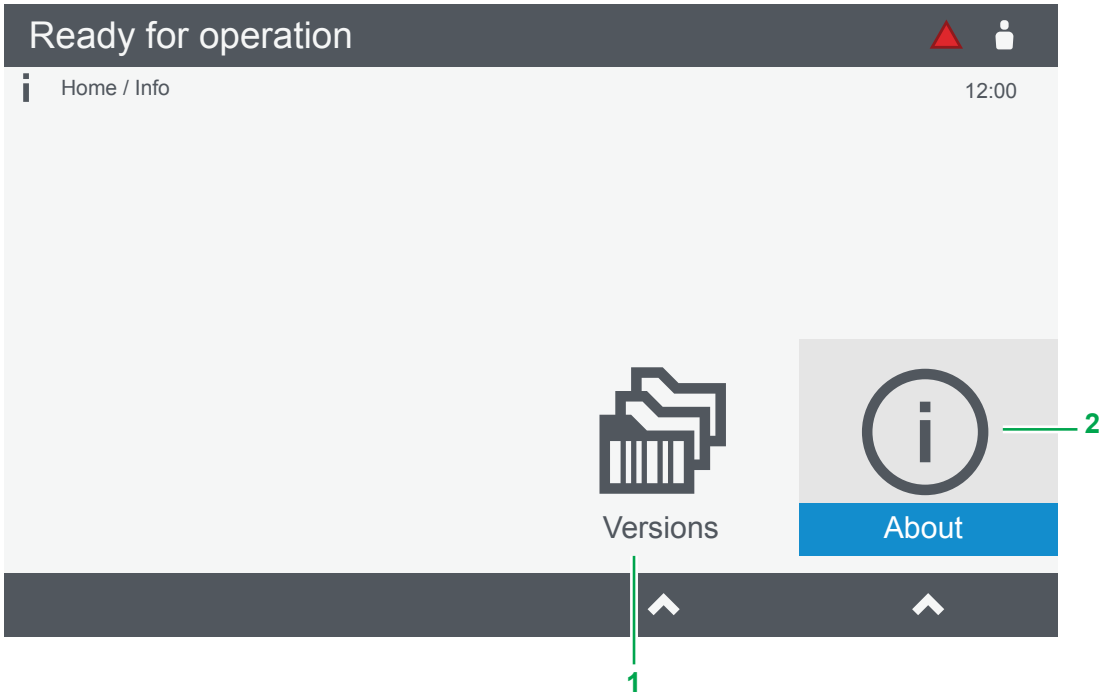
10.2 DM2 Log page



No.	Item	Notes
1	List of DM2 log events	Shows all DM2 events from the ECU.
2	Clear	Clears the log list.
3	Refresh	Reloads the log list.

11. Info

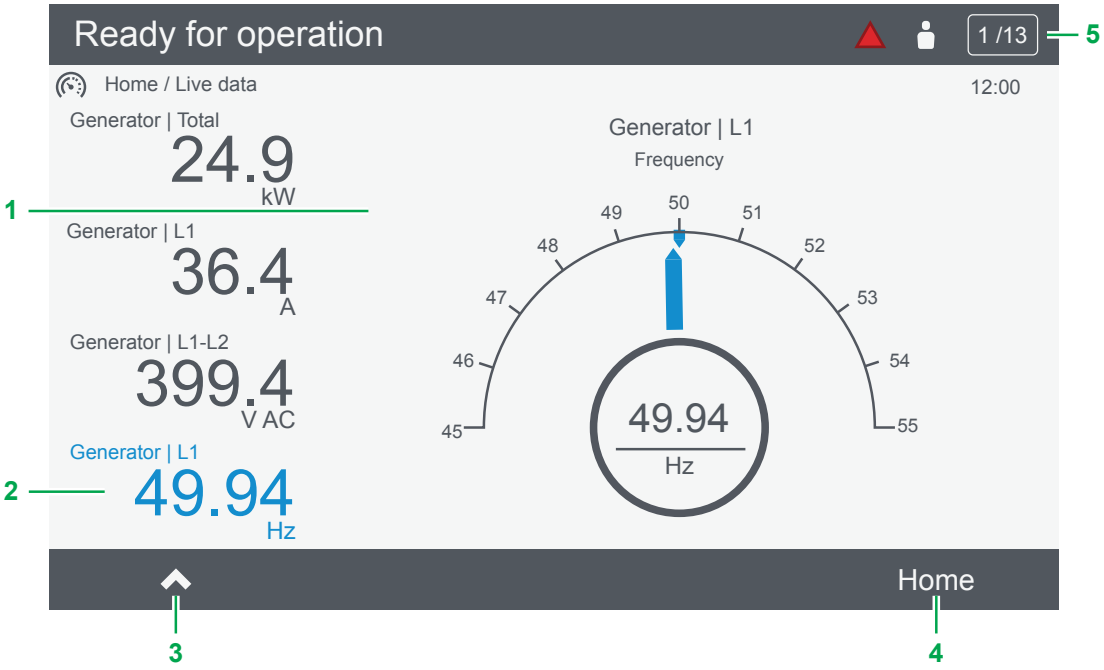
11.1 Info page



No.	Item	Notes
1	Versions page	Shows version information for controller and display, including firmware versions. This information can be helpful for technical support.
2	About page	Shows information about the controller, including IP address information.

12. Live data

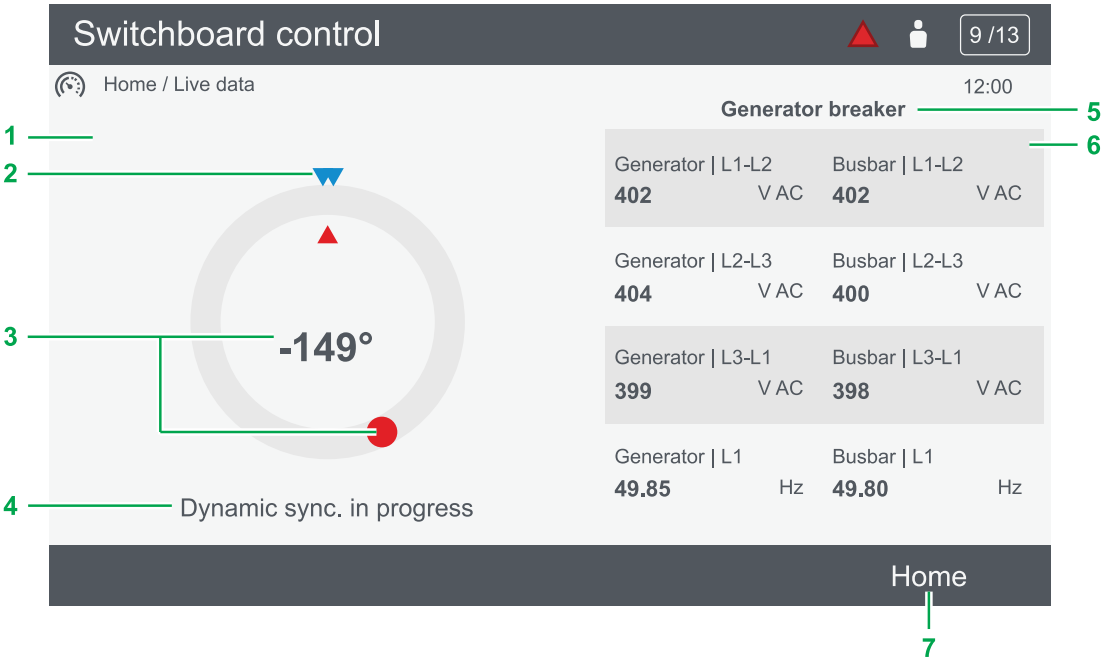
12.1 Live data page



No.	Item	Notes
1	Live data information page	Shows the live data information. *
2	Selected measurement	Shows in blue the selected measurement (only available on some pages).
3	Select measurement	^ : Changes the selected measurement (only available on some pages).
4	Home page	Returns to the home page.
5	Page number	Shows the current page number.

NOTE * Values shown with "--" indicates the values are not available.
Values shown with "Err" indicates there are errors loading the values.

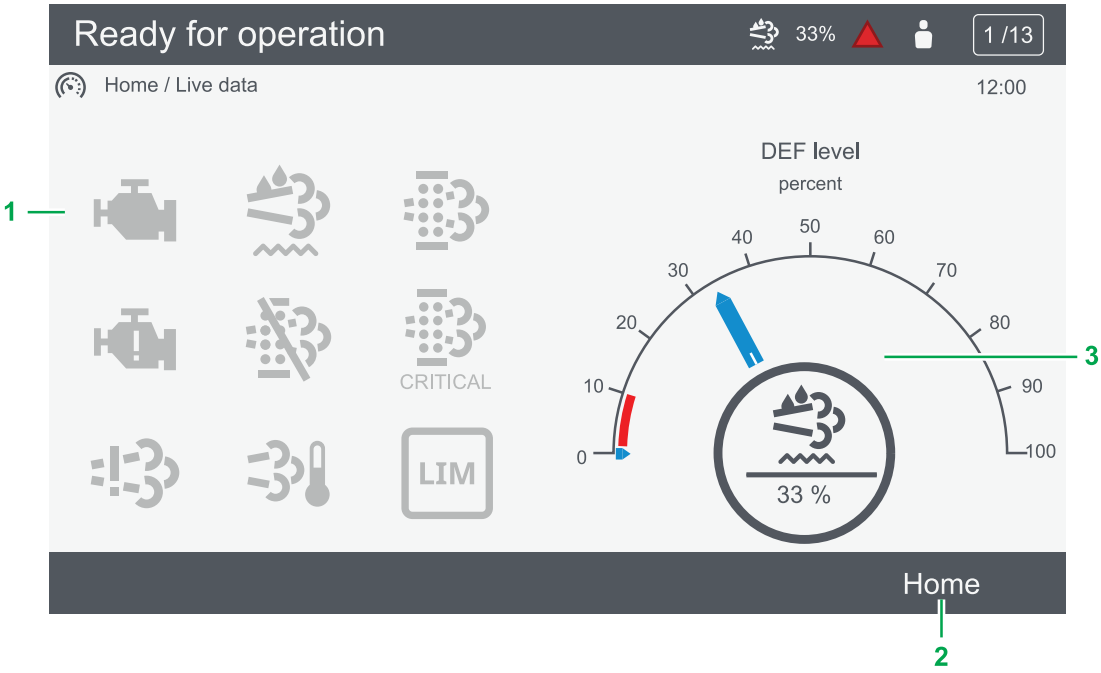
12.2 Visual synchronisation page



No.	Item	Notes
1	Visual synchronisation page	Shows the synchronisation progress and state.
2	Range	Shows the synchronisation window (minimum and maximum).
3	Phase difference	Shows the phase difference between the source and busbar.
4	Synchronisation status	Shows the status of the synchronisation.
5	Breaker	Shows which breaker is being synchronised.
6	Source and busbar values	Shows the phase values for the source and busbar.
7	Home page	Returns to the home page.

12.3 Exhaust aftertreatment dashboard (Tier4)

Exhaust aftertreatment dashboard is only visible if engine data is available. Not all engines support all the items shown. This page can be configured to automatically display on changes to the data with the View designer.



No.	Item	Notes	
1	Aftertreatment dashboard	: Shows an engine warning.	: Shows an engine shutdown.
		: Shows the DEF level is too low.	: Shows an emission failure or malfunction.
		: Shows that regeneration is needed.	: Shows that regeneration is inhibited.
		: Shows a high temperature and regeneration.	: Shows LIMIT lamp.
		: Shows HIGH severity failure level.	: Shows VHIGH severity failure level.
		: Shows CRITICAL severity failure level.	
2	Home page	Returns to the home page.	
3	Diesel Exhaust Fluid (DEF) % level	Shows the level (%) of the Diesel Exhaust Fluid. Red mark shows the minimum low level for the Diesel Exhaust Fluid.	

NOTE Grey symbols show normal operation. Amber symbols show an item needs attention. Red symbols show a potentially serious problem or malfunction, refer to your engine manufacturer's manual.

13. Troubleshooting

13.1 Troubleshooting the system in Switchboard control

The exact procedure for operating the system in Switchboard control depends on your switchboard design. Follow the guidelines from the switchboard supplier.

Class societies require a certain amount of protections included in the switchboard. For example, there must be a synchronisation check before closing a breaker.

CAUTION

Operate system in Switchboard control

You should only operate the system in Switchboard control, if you are a trained and experienced operator. Even though the controller protections are active, you can create undesirable conditions during switchboard control. Your actions can also disrupt the power supply.

General information about switchboard control

When you place a controller in Switchboard control, it no longer controls the GOV and AVR regulators. All logic for the genset (start and stop) and breaker (open and close) is deactivated. The controller's protections remain active.

CAUTION

Controller protections during switchboard control

During switchboard control, the controller protections respond to alarm situations. However, the controller does not prevent you from creating alarm situations.

How to troubleshoot in Switchboard control

1. Make sure there is enough power available for the system. You might need to have extra gensets running.
2. Move the *Switchboard control* switch (on the switchboard) to change the controller to Switchboard control.
3. Depending on the problem, you can use the switchboard to do a series of actions:
   a. Start the genset.
   b. Use the GOV up and GOV down inputs on the switchboard to control the frequency from the genset.
   c. Do a manual synchronisation and close the breaker.
   d. Manually regulate the load to de-load the breaker, and then open the breaker.
   e. Stop the genset.
4. If you cannot do these actions with the switchboard, the controller can not do them either. You must continue your troubleshooting to find the source of the problem.

13.2 Troubleshooting alarms

The system has many pre-configured and configurable alarm protections. An active alarm has an active alarm protection to protect the system and equipment. Activated alarms require action to resolve the problem in the system.

More information
See Alarms for more information about how to handle alarms.

13.3 Troubleshooting analogue input sensor failures

Alarm range	Analogue input type	Possible root cause
Below range alarm	Current	Wire break High resistance
	Voltage	Wire break Short circuit to ground
	Resistance	Short circuit
Above range alarm	Current	Short circuit
	Voltage	Short circuit to supply
	Resistance	Wire break

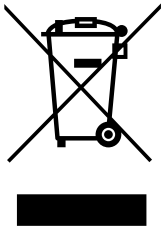
13.4 Troubleshooting communication

Problem	Cause	Solution
DEIF network redundancy broken	The system never had a redundant **DEIF Ethernet network** connection.	1. Install a redundant **DEIF Ethernet network** connection (see **Wiring the communication** in the **Installation instructions**). 2. Configure the DEIF network redundancy to **Not enabled** in the parameter: `Configure > Parameters > Communication > DEIF network > DEIF network redundancy broken` .
	The existing redundant DEIF network connection is unplugged or damaged.	1. Plug in the Ethernet cable correctly. 2. Replace the Ethernet cable. 3. Make sure the Ethernet cable meets the specifications (see **Hardware, Accessories, Ethernet cable** in the **Data sheet**).
The display unit is stuck on the start screen, displaying the text **DL mode**	• The power supply is too small to fully power the display unit, resulting in an incomplete start up. • The Ethernet cable is loose. • The display unit software is corrupt after an incomplete start up.	1. Check the Ethernet cable. 2. Update the display unit software. 3. Remove the power, wait for at least 10 seconds, then restart the display unit. 4. Ensure that the power supply is sufficient. 5. If the problem persists, contact DEIF.
Pair to controller is lost	Display unit power was disconnected and reconnected.	A pairing section screen is automatically shown on the display unit: 1. Select the controller you wish to pair, and press **OK** . 2. You are now prompted to confirm your selection. • Press **OK** to confirm. • Press **Back**  to cancel.

14. End-of-life

14.1 Disposal of waste electrical and electronic equipment

WEEE symbol



All products that are marked with the crossed-out wheeled bin (the WEEE symbol) are electrical and electronic equipment (EEE). EEE contains materials, components and substances that can be dangerous and harmful to people's health and to the environment. Waste electrical and electronic equipment (WEEE) must therefore be disposed of properly. In Europe, the disposal of WEEE is governed by the WEEE directive issued by the European Parliament. DEIF complies with this directive.

You must not dispose of WEEE as unsorted municipal waste. Instead, WEEE must be collected separately, to minimise the load on the environment, and to improve the opportunities to recycle, reuse and/or recover the WEEE. In Europe, local governments are responsible for facilities to receive WEEE. If you need more information on how to dispose of DEIF WEEE, please contact DEIF.