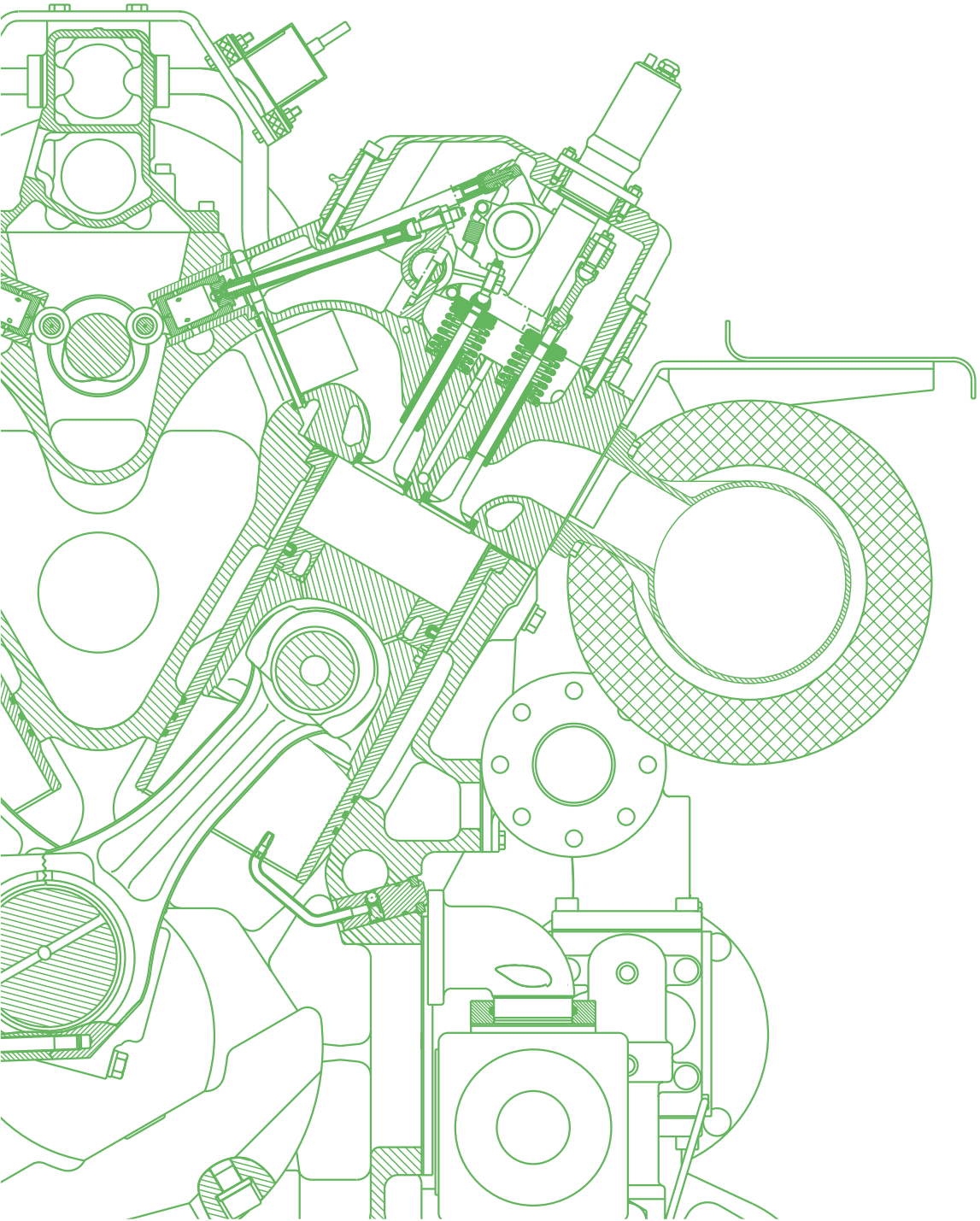
JENBACHER

DIA.NE XT4 4.08

DIA.NE XT4 CTR 4.08 HMI 2.9 R5



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INNIO

1 Brief description of Industrial PC 041

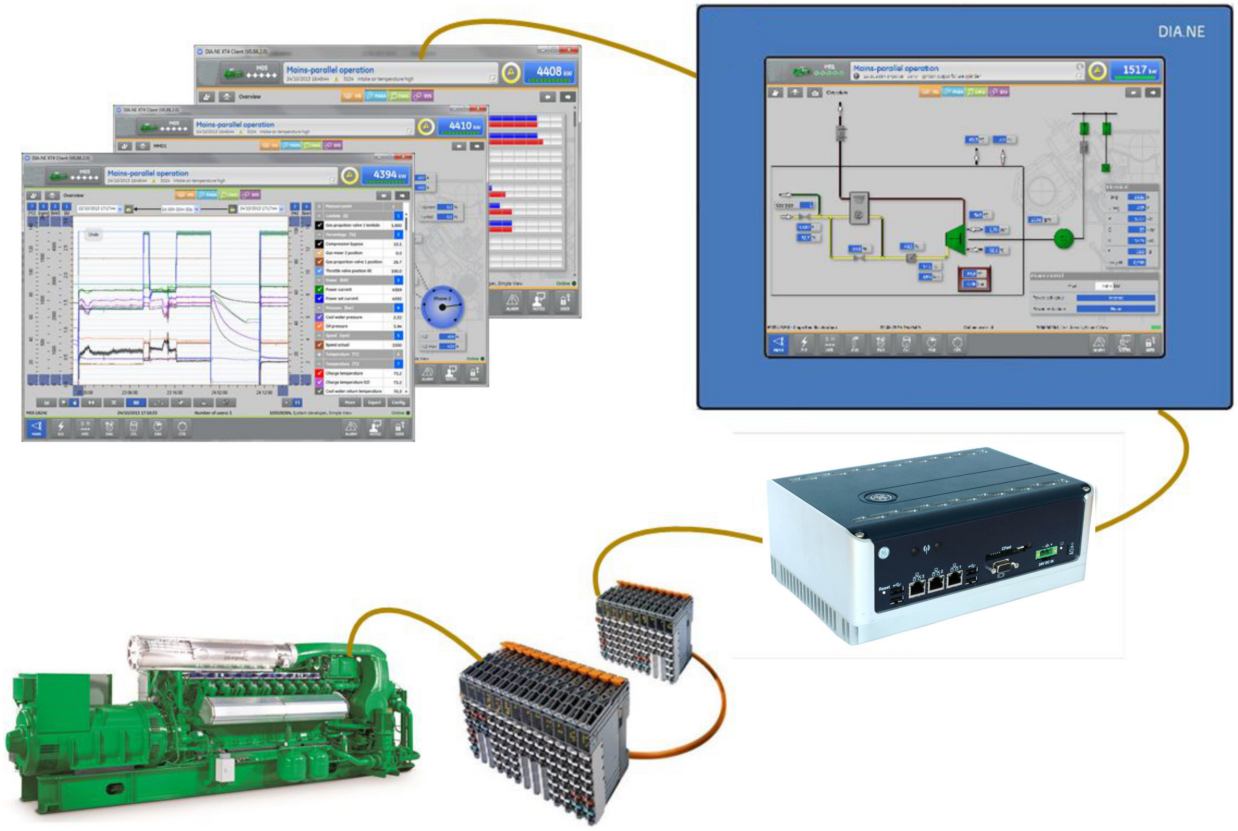
DIA.NE XT4* – the new generation of engine control and visualisation systems for Jenbacher gas engines from INNIO.

The system consists of the I/O modules, a sturdy industrial PC (controller) and a 15" touch display, all built into the local control cabinet. For remote control, a software program "DIA.NE XT4 HMI Client" is provided for installation on any PC (including tablets running Windows 8®).

The system constitutes the human-machine interface for commissioning, operation, maintenance and troubleshooting of the gas engines. This means you have the Jenbacher gas engine firmly under control at all times – directly on site or via a remote connection.

A real-time multitasking operating system ensures the time-critical and safety-relevant tasks as part of engine regulation, engine monitoring and engine control. The Windows operating system "Windows® 7 Embedded" from Microsoft provides the ideal platform for visualisation and data recording.

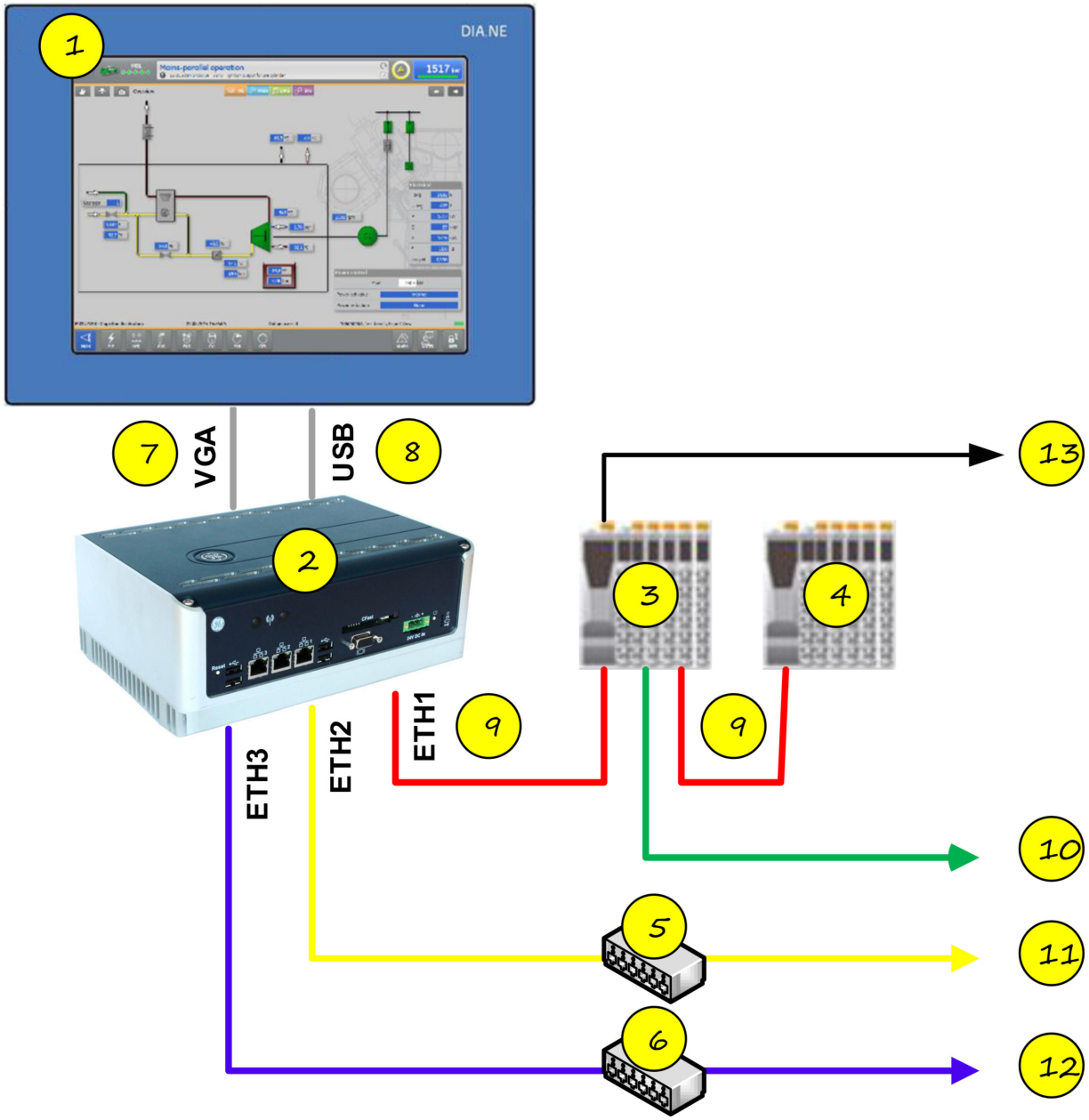
Combined with the myPlant™ online plant management tool from INNIO, it assures reliable remote control of the plant over the internet.



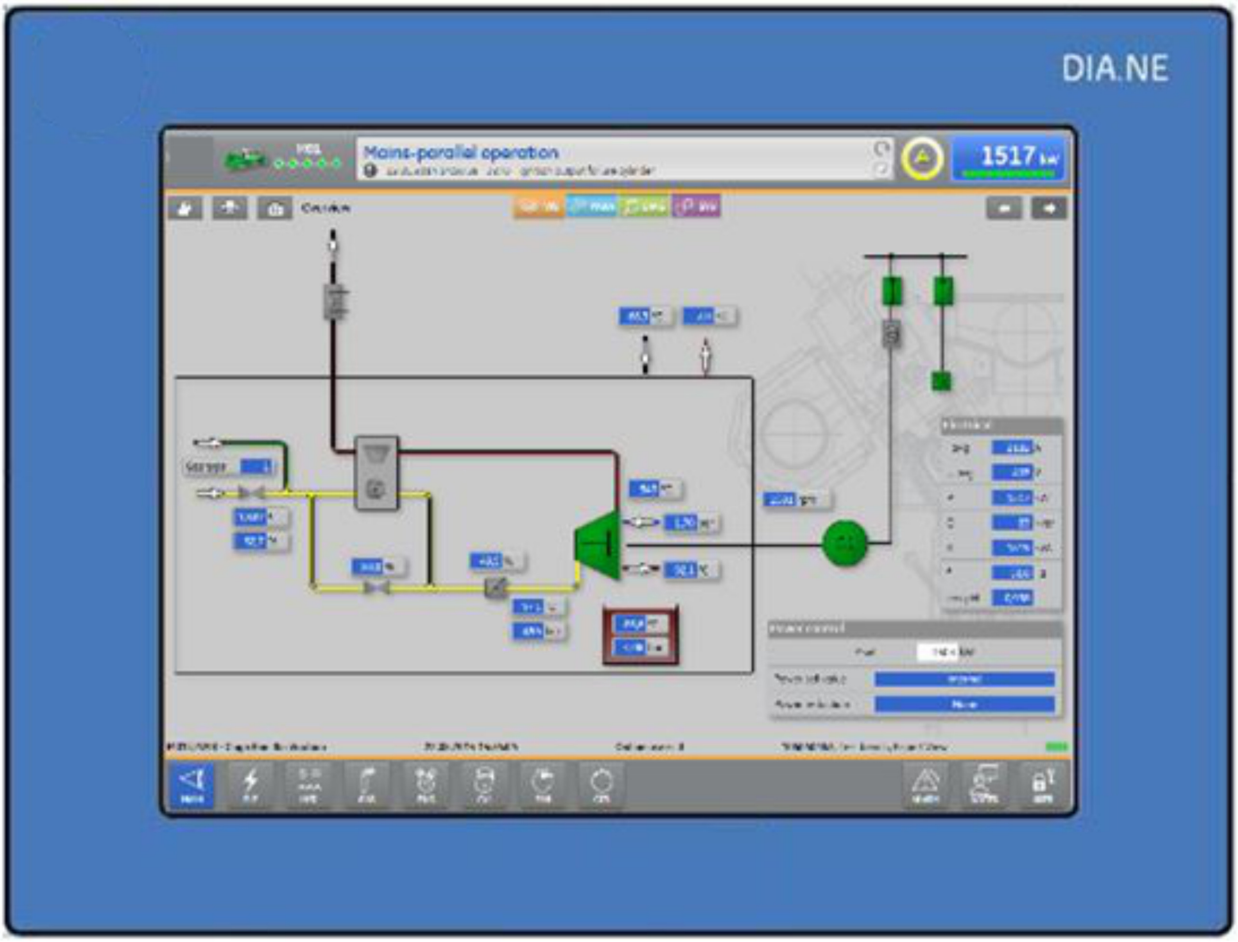
*Trademark der INNIO Jenbacher GmbH & Co OG

2 System overview of the PC 041

2.1 Hardware and interfaces

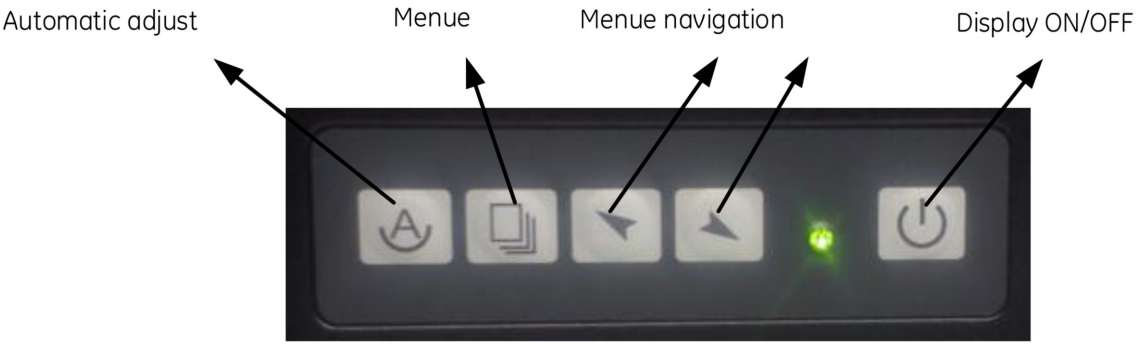


1 Touch Display



- 15" TFT LCD with 1024 x 768 (XGA) resolution
- Resistive touch
- Splash-proof (front IP65, rear IP20)
- Luminosity 400 cd/m²

Buttons at the rear:

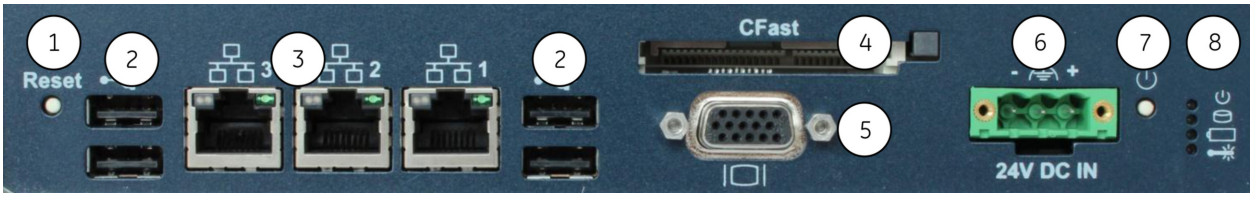


If the image is not centred in the display (displaced), press the **[Automatic adjust]** button to align the display automatically.

2 **Controller**

Industrial PC (IPC), built in into the back of the front door of the module control cabinet All the software components for engine regulation, monitoring, control and visualisation are executed in this unit, as is the data recording.

- Fanless sturdy industrial PC (no rotating parts)
- Intel® core™ 2 processor 2.26 GHz
- 100 GB SSD (Solid State Disc)
- 4 GB RAM
- 4 GB CFAST storage medium for application data



① *Reset Button*

Pressing this button switches off the unit abruptly (= power supply on/off).

Never press this button while the plant is in operation!

② *4 x USB 2.0 ports*

Intended for INNIO internal use only. Do not connect any third-party devices such as USB memory chips here!

③ *3 x Ethernet ports*

④ *Slot for CFast memory card*

Intended for INNIO internal use only. Only DIA.NE XT4 CFast cards provided by INNIO may be plugged in here.

⑤ *VGA port*

⑥ *Power supply*

⑦ *Power ON/OFF*

Pressing this briefly when the unit is switched on will switch it off. Pressing it for longer (more than 5 secs.) will switch off the unit abruptly.

Pressing it when the unit is switched off will boot up the unit.

Never press this button while the plant is in operation!

⑧ *Status LEDs*

 ... overtemperature display

Stays off	➔ normal operation
Lights up RED	➔ temperature above the limit value

 ... battery charge display

Lights up GREEN	➔ normal operation
Lights up RED	➔ charge below the limit value, replace the battery.

 ... SSD or CFast card activity display

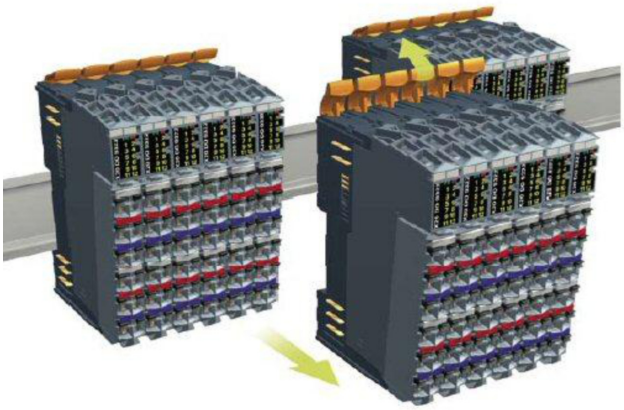
Stays off	➔ not active
Flashes yellow	➔ active

 ... power

Stays off	➔ no power supply
Lights up RED	➔ power supply connected
Flashes YELLOW	➔ power supply connected OK, CPU in standby mode or off
Lights up GREEN	➔ power supply connected OK, CPU on (normal load)

3 Decentralised I/O module in the module control cabinet

Decentralised I/O module fitted in the module control cabinet to connect sensors and actuators.



The I/O hardware is a modular industrial automation system. The control philosophy is based on universal scalability and full compatibility. In this way it is possible to achieve response times of less than 1 ms. The I/O bus system allows the system to be expanded without problems. Modular system design permits flexible configurations at a granularity of 1 - 32 channels per module and the direct connection of sensors and actuators.

4 Decentralised I/O module at the engine

Decentralised I/O module fitted in the control cabinet at the engine to connect sensors and actuators.

5 11 DIA.NE XT4 plant network Ethernet switch

- 5 RJ45 ports
- ETHERNET 100/1000Base-T
- YELLOW cabling
- Mounted in the module control cabinet

This industrial-grade network switch is used to connect the controllers in multi-engine plants and as a connection for service technicians' notebooks.

Intended for INNIO internal use only. No customer devices may be connected to this network.

6 12 DIA.NE XT4 customer network Ethernet switch

- 5 RJ45 ports
- ETHERNET 100/1000Base-T
- BLUE cabling
- Mounted in the module control cabinet

This industrial-grade network switch integrates the controller in the customer network, allowing the customer to operate and observe the engine "remotely" using his computers in the network or from a control room.

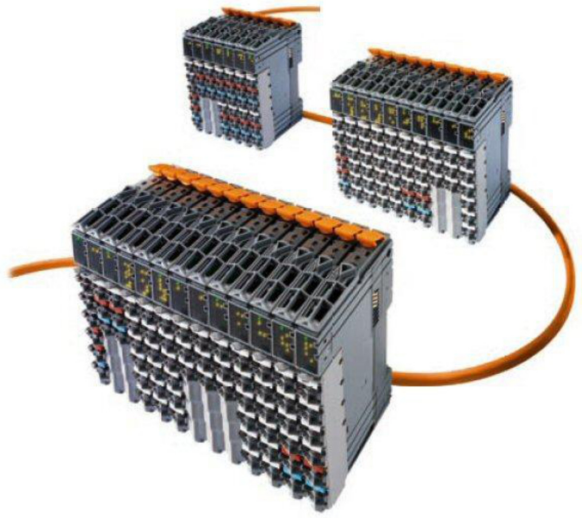
The **DIA.NE XT4 OPC Server** (optional) can also be accessed over this interface. OPC is a standardised data interface for exchanging process data.

7 VGA connection from the display unit to the IPC for the video signal

8 USB connection from the display unit to the IPC for the touch control

9 I/O bus connection

Real-time Ethernet-based bus connection for connecting the IO modules with the controller.



Intended for INNIO internal use only. No customer devices may be connected to this network.

10 Data interface for customer (plant management system)

The DIA.NE XT4 system offers the capability of providing data for a higher-order plant management system belonging to the customer.

Several protocols are available. For example, serial protocols such as Modbus RTU (Slave) and Profibus DP (Slave) are possible options.

13 Interface with the decentralised control components

Decentralised control components are activated via a CAN bus connection.

Devices can be connected for:

Control system	➔ ignition, gas proportioning valve (optional)
Monitoring	➔ KLS 98, SAFI (optional)

Intended for INNIO internal use only. No customer devices may be connected to this network.

3 Brief description – DIAN.NE XT 4 Panel PC910

DIA.NE XT4* – the new generation of engine control and visualisation systems for Jenbacher gas engines from INNIO.

The system consists of the I/O modules, a sturdy industrial PC (controller) and a 15" touch display, all built into the local control cabinet. For remote control, a software program "DIA.NE XT4 HMI Client" is provided for installation on any PC (including tablets running Windows 8®).

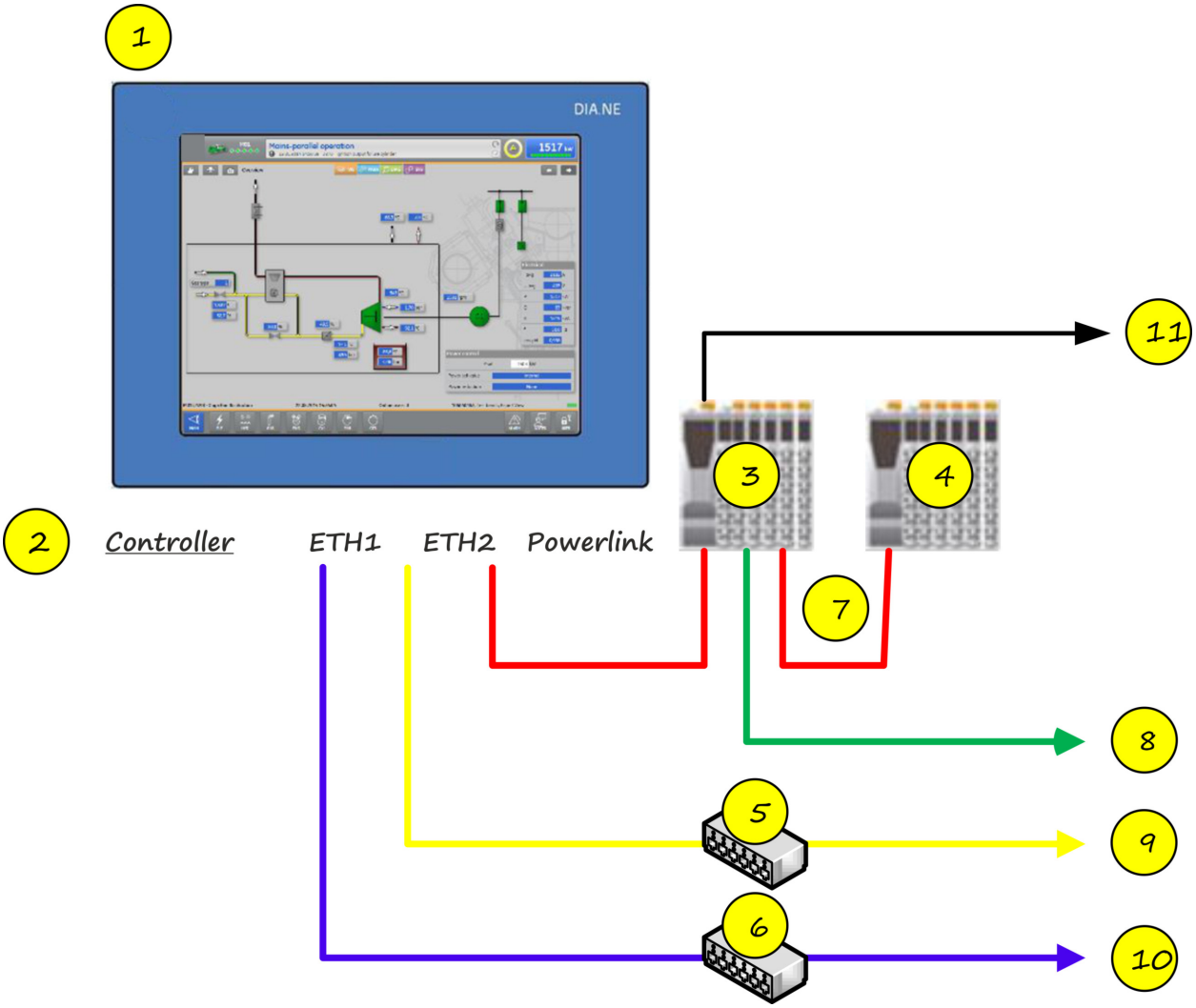
The system constitutes the human-machine interface for commissioning, operation, maintenance and troubleshooting of the gas engines. This means you have the Jenbacher gas engine firmly under control at all times – directly on site or via a remote connection.

A real-time multitasking operating system ensures the time-critical and safety-relevant tasks as part of engine regulation, engine monitoring and engine control. The Windows operating system "Windows®7 Embedded" from Microsoft provides the ideal platform for visualisation and data recording.

Combined with the myPlant™ online plant management tool from INNIO, it assures reliable remote control of the plant over the internet.

4 System overview of PPC910

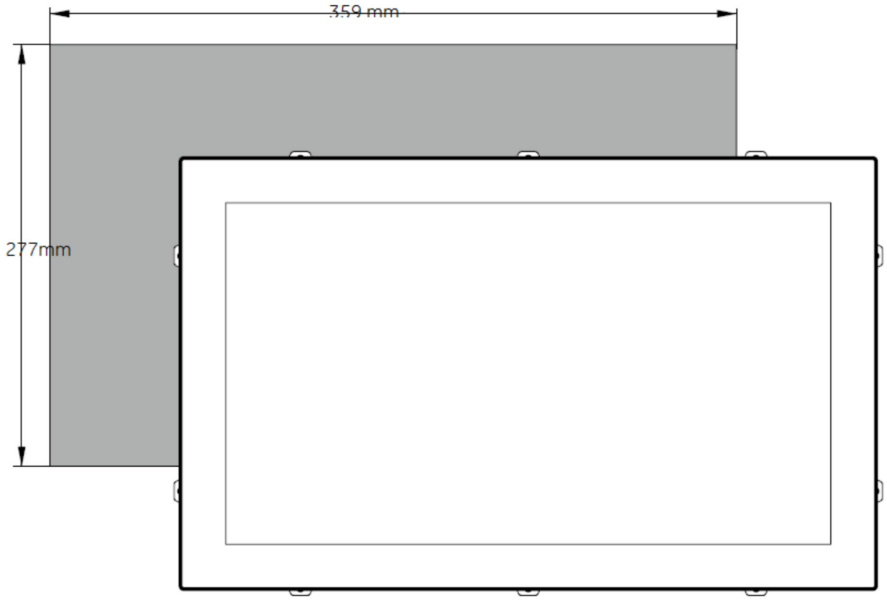
4.1 Hardware and interfaces

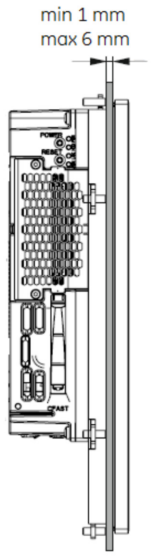


1 Touch display

DIA.NE XT4 CTR 4.08 HMI 2.9 R5

- 15“ TFT LCD with 1024 x 768 (XGA) resolution
- Resistive single-touch
- Splash-proof (front IP65, rear IP20)
- Luminosity 400 cd/m²
- Contrast 700:1
- 16.2m colours



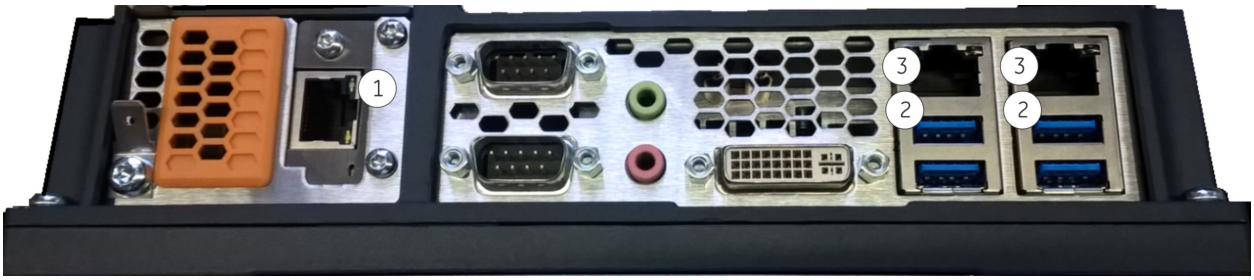


A hex screwdriver is required for the screws on the retaining clamps. The maximum torque is 1 Nm.

2 Controller

Industrial PC (APC910), built in into the back of the front door of the module control cabinet. All the software components for engine regulation, monitoring, control and visualisation are executed in this unit, as is the data recording.

- Fanless sturdy industrial PC (no rotating parts)
- Intel® Celeron processor 1020E dual core 2.2 GHz
- 128 GB GByte CFast permanent memory
- 4 GB RAM
- 4/8 GB CFAST storage medium for application data



1 Powerlink port

Connection to the X20 IO module by means of Red Ethernet cat5e cable

2 4 x USB 3.0 ports

Intended for INNIO internal use only. Do not connect any third-party devices such as USB memory chips here!

3 2 x Ethernet ports

4 Slot for CFast memory card

Intended for INNIO internal use only. Only DIA.NE XT4 CFast cards provided by INNIO may be plugged in here.

5 Power ON/OFF

Pressing this briefly when the unit is switched on will switch it off. Pressing it for longer (more than 5 secs.) will switch off the unit abruptly.

Pressing it when the unit is switched off will boot up the unit.

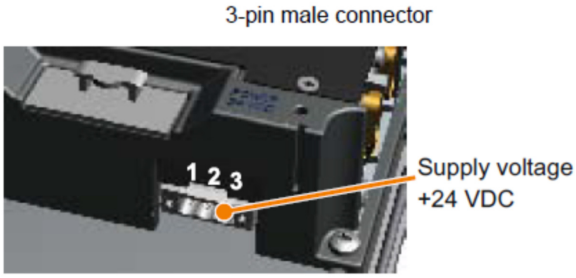
Never press this button while the plant is in operation!

6 Reset Button

Pressing this button switches off the unit abruptly (= power supply on/off).

Never press this button while the plant is in operation!

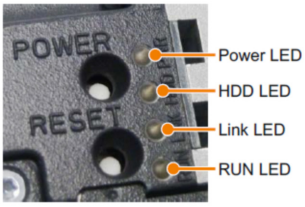
7 Power Supply



Protected against reverse polarity

Pin	Description
1	+
2	Functional ground
3	-

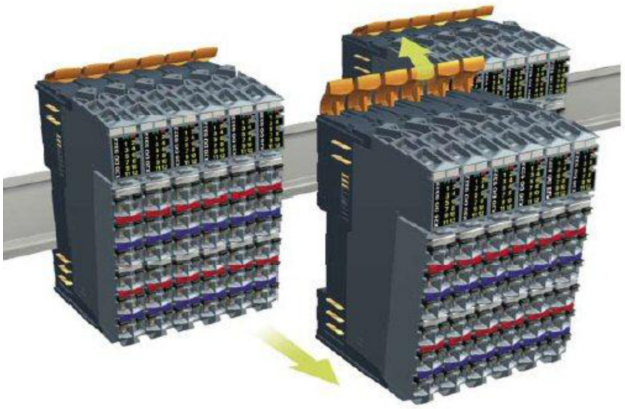
8 Status LEDs



LED does not light up	→ No power supply
Power LED lights up RED	→ Power supply connected
Power LED lights up GREEN	→ Power supply connected OK, CPU on (normal load)

3 Decentralised I/O module in the module control cabinet

Decentralised I/O module fitted in the module control cabinet to connect sensors and actuators.



The I/O hardware is a modular industrial automation system. The control philosophy is based on universal scalability and full compatibility. In this way it is possible to achieve response times of less than 1 ms. The I/O bus system allows the system to be expanded without problems. Modular system design permits flexible configurations at a granularity of 1 - 32 channels per module and the direct connection of sensors and actuators.

4 Decentralised I/O module at the engine

Decentralised I/O module fitted in the control cabinet at the engine to connect sensors and actuators.

5 9 DIA.NE XT4 plant network Ethernet switch

- 5 RJ45 ports
- ETHERNET 100/1000Base-T
- YELLOW cabling
- Mounted in the module control cabinet

This industrial-grade network switch is used to connect the controllers in multi-engine plants and as a connection for service technicians' notebooks.

Intended for INNIO internal use only. No customer devices may be connected to this network.

6 10 DIA.NE XT4 customer network Ethernet switch

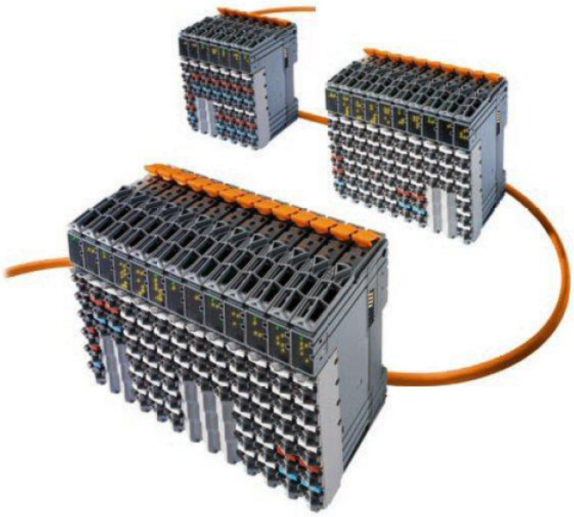
- 5 RJ45 ports
- ETHERNET 100/1000Base-T
- BLUE cabling
- Mounted in the module control cabinet

This industrial-grade network switch integrates the controller in the customer network, allowing the customer to operate and observe the engine "remotely" using his computers in the network or from a control room.

The **DIA.NE XT4 OPC Server** (optional) can also be accessed over this interface. OPC is a standardised data interface for exchanging process data.

7 I/O bus connection

Real-time Ethernet-based bus connection for connecting the IO modules with the controller.



Intended for INNIO internal use only. No customer devices may be connected to this network.

8 Data interface for customer (plant management system)

The DIA.NE XT4 system offers the capability of providing data for a higher-order plant management system belonging to the customer.

Several protocols are available. For example, serial protocols such as Modbus RTU (Slave) and Profibus DP (Slave) are possible options.

11 Interface with the decentralised control components

Decentralised control components are activated via a CAN bus connection.

Devices can be connected for:

control → ignition, gas proportioning valve (optional)

monitoring → KLS 98, SAFI (optional)

Intended for INNIO internal use only. No customer devices may be connected to this network.

5 Brief description – DIAN.NE XT 4 Panel PPC3100

DIA.NE XT4* – the new generation of engine control and visualisation systems for Jenbacher gas engines from INNIO.

The system consists of the I/O modules, a sturdy industrial PC (controller) and a 15" touch display, all built into the local control cabinet. For remote control, a software program "DIA.NE XT4 HMI Client" is provided for installation on any PC (including tablets running Windows 8®).

The system constitutes the human-machine interface for commissioning, operation, maintenance and troubleshooting of the gas engines. This means you have the Jenbacher gas engine firmly under control at all times – directly on site or via a remote connection.

A real-time multitasking operating system ensures the time-critical and safety-relevant tasks as part of engine regulation, engine monitoring and engine control. The Windows operating system "Windows®7 Embedded" from Microsoft provides the ideal platform for visualisation and data recording.

Combined with the myPlant™ online plant management tool from INNIO, it assures reliable remote control of the plant over the internet.

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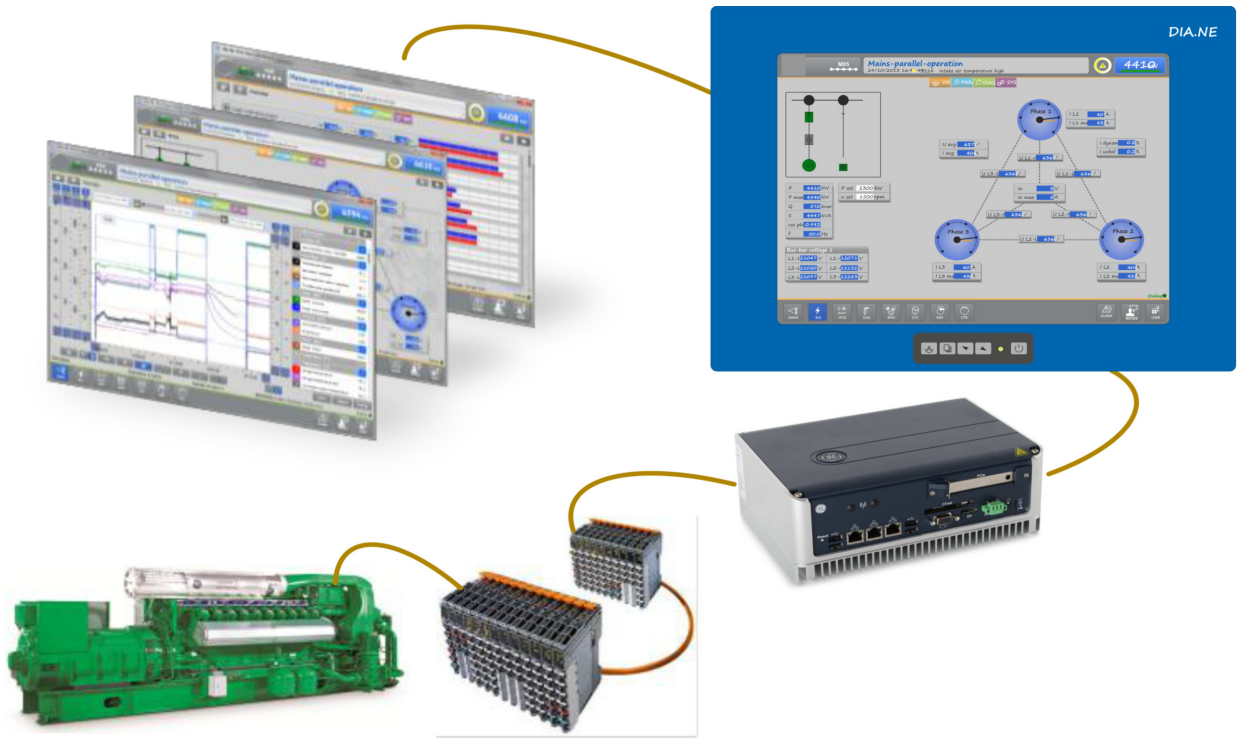
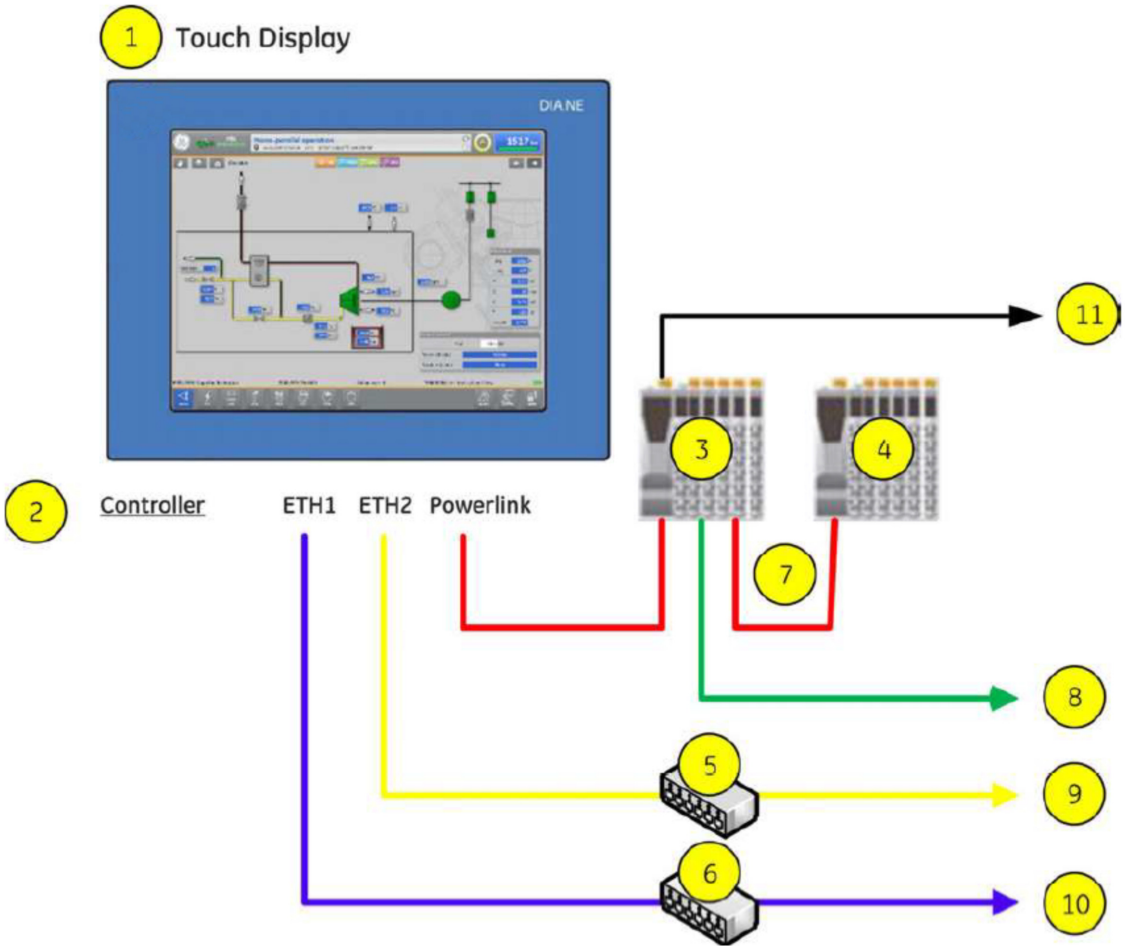
DIA.NE XT4 CTR 4.08 HMI 2.9 R5

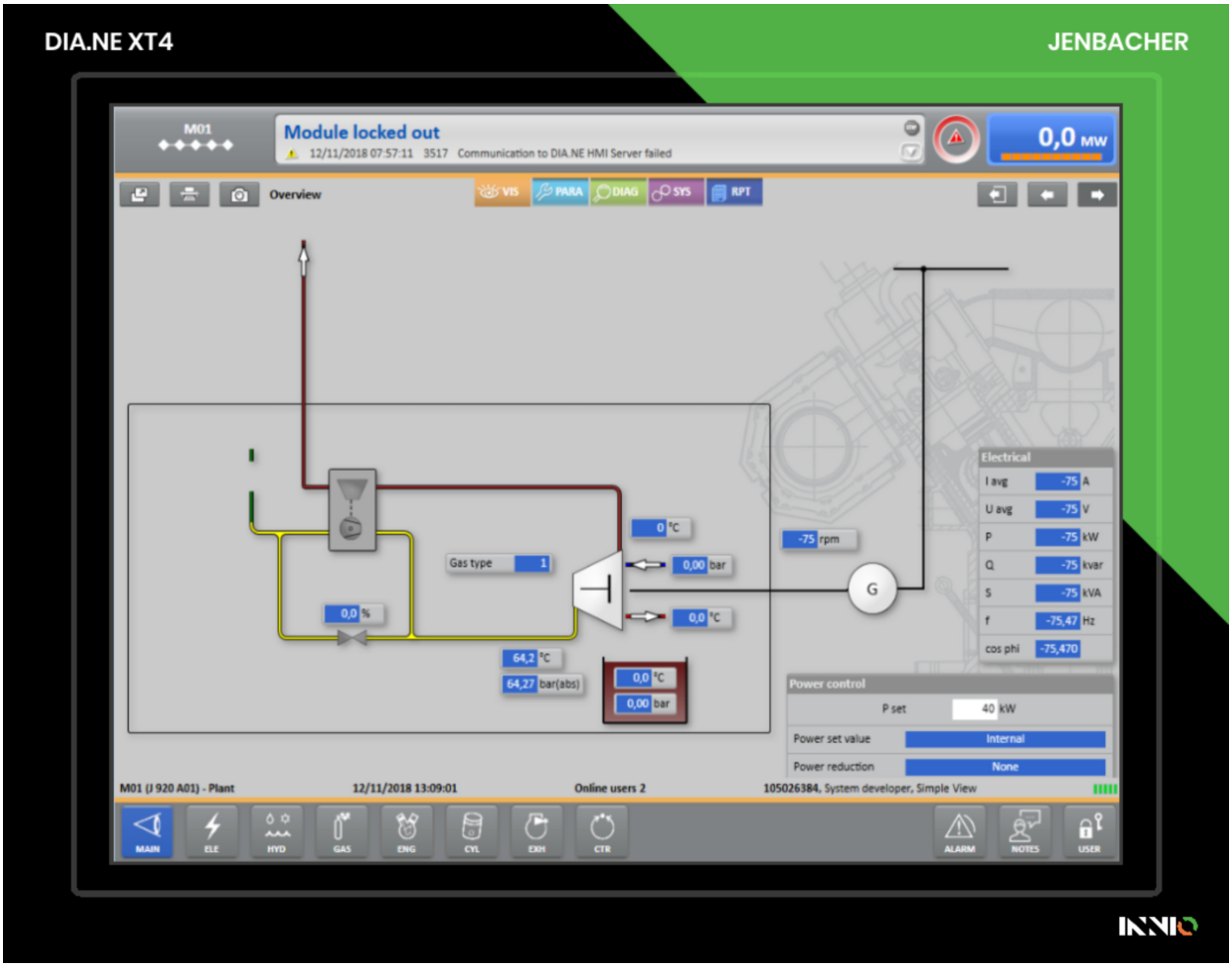


6 System general view of PPC3100

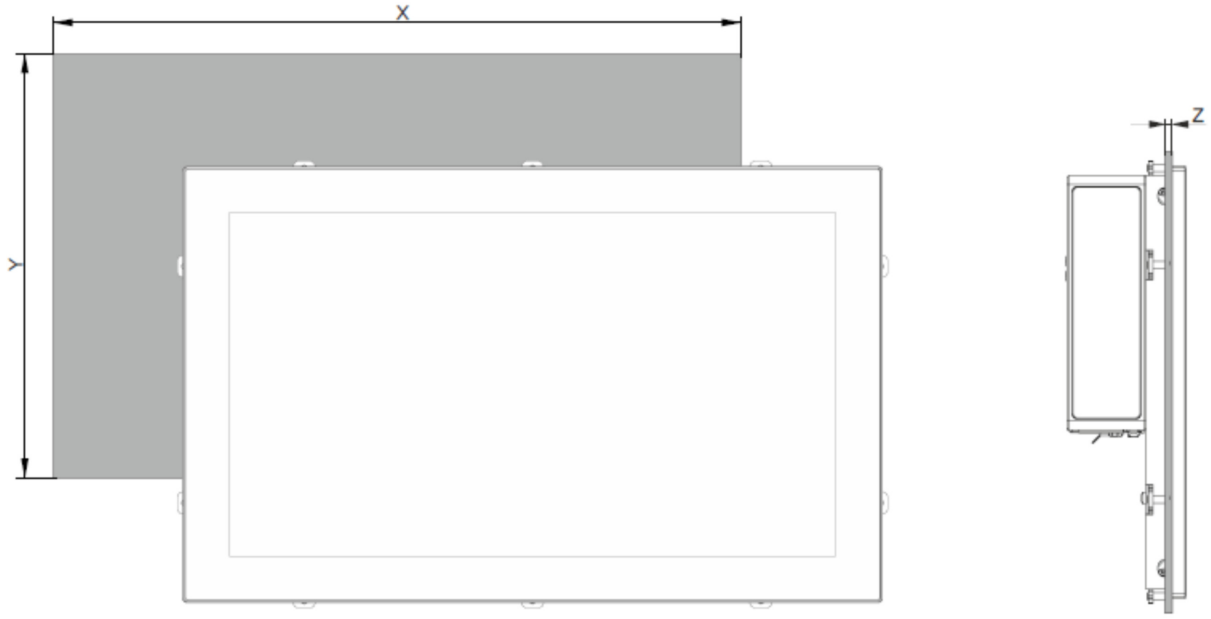
6.1 Hardware and interfaces



1 Touch display



- 15“ TFT LCD with 1024 x 768 (XGA) resolution
- Resistive single-touch
- Splash-proof (front IP65, rear IP20)
- Luminosity 400 cd/m²
- Contrast 700:1
- 16.2m colours



X = 359mm

Y = 277mm

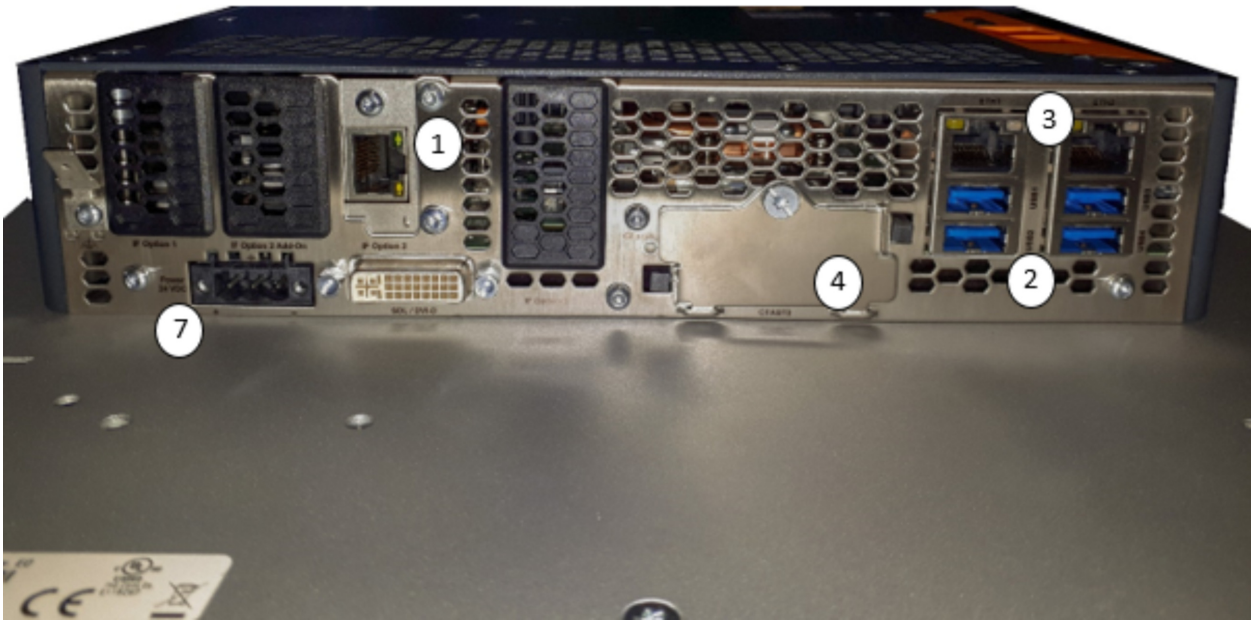
Z = min. 1 mm / max. 6 mm

A hex screwdriver is required for the screws on the retaining clamps. The maximum torque is 1 Nm.

2 Controller

Industrial PC (APC3100), built in into the back of the front door of the module control cabinet. All the software components for engine regulation, monitoring, control and visualisation are executed in this unit, as is the data recording.

- Fanless sturdy industrial PC (no rotating parts)
- Intel® i5-7300U Processor dual core 2.6 GHz
- 128 GB GByte CFast permanent memory
- 8 GByte working memory
- 8 GByte CFAST storage medium for application data



1. Powerlink interface
   Connection to the X20 IO module by means of Red Ethernet cat5e cable
2. 4 x USB 3.0 interface
   For GE internal use only. Do not connect any third-party devices such as USB memory chips here!
3. 2 x Ethernet ports
4. Slot for CFast memory card
   For internal use only. Only DIA.NE XT4 CFast cards provided by GE may be plugged in here.
5. Power ON/OFF
   A short-term operation when the unit is switched on will switch off the unit. Pressing it for longer (more than 5 secs.) will switch off the unit abruptly.
   Pressing it when the unit is switched off will boot up the unit. **Never press this button while the plant is in operation!**
6. Reset button
   Pressing this button will switch off the unit abruptly (= supply voltage off/on).
   Never press this button while the plant is in operation!
7. Power supply (polarity reversal protection available)

Pin	Description
1	+
2	Functional ground
3	-

1. Status LEDs

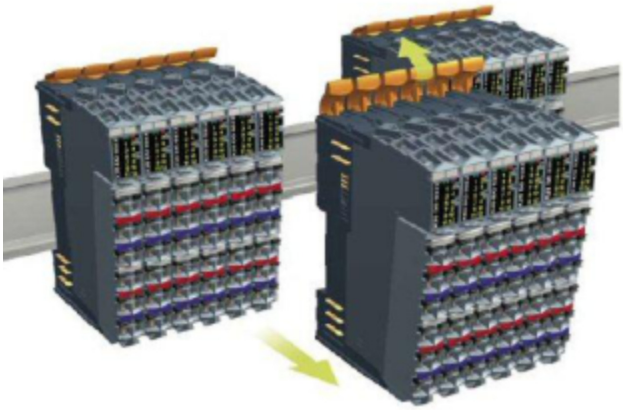
LED does not light up	→ No power supply
Power LED lights up RED	→ Power supply connected

Power LED lights up GREEN	→ Power supply connected OK, CPU on (normal load)

1. CFast 1 Slot (Should be closed with sticker)
   In this slot is the 128GB CFast card, THERE CAN NOT BE ANY OTHER CFAST CONNECTED!
   The 128GB CFast card is the C:/ Hard disk of the IPC!
2. CFast 2 slot
   Here is the 8 GB CFast card that contains the software supplied by Jenbacher.
   This CFast contains the software which is responsible for the operation of the module

3 Decentralised I/O module in the module control cabinet

Decentralised I/O module fitted in the module control cabinet to connect sensors and actuators.



The I/O hardware is a modular industrial automation system. The control philosophy is based on universal scalability and full compatibility. In this way it is possible to achieve response times of less than 1 ms. The I/O bus system allows the system to be expanded without problems. Modular system design permits flexible configurations at a granularity of 1 - 32 channels per module and the direct connection of sensors and actuators.

4 Decentralised I/O module at the engine

Decentralised I/O module fitted in the control cabinet at the engine to connect sensors and actuators.

5 9 DIA.NE XT4 plant network Ethernet switch

- 5 RJ45 ports
- ETHERNET 100/1000Base-T
- YELLOW cabling
- Mounted in the module control cabinet

This industrial-grade network switch is used to connect the controllers in multi-engine plants and as a connection for service technicians' notebooks.

Intended for INNIO internal use only. No customer devices may be connected to this network.

6 10 DIA.NE XT4 customer network Ethernet switch

- 5 RJ45 ports
- ETHERNET 100/1000Base-T
- BLUE cabling
- Mounted in the module control cabinet

This industrial-grade network switch integrates the controller in the customer network, allowing the customer to operate and observe the engine "remotely" using his computers in the network or from a control room.

The **DIA.NE XT4 OPC Server** (optional) can also be accessed over this interface. OPC is a standardised data interface for exchanging process data.

7 I/O bus connection

Real-time Ethernet-based bus connection for connecting the IO modules with the controller.

Intended for INNIO internal use only. No customer devices may be connected to this network.

8 Data interface for customer (plant management system)

The DIA.NE XT4 system offers the capability of providing data for a higher-order plant management system belonging to the customer.

Several protocols are available. For example, serial protocols such as Modbus RTU (Slave) and Profibus DP (Slave) are possible options.

11 Interface with the decentralised control components

Decentralised control components are activated via a CAN bus connection.

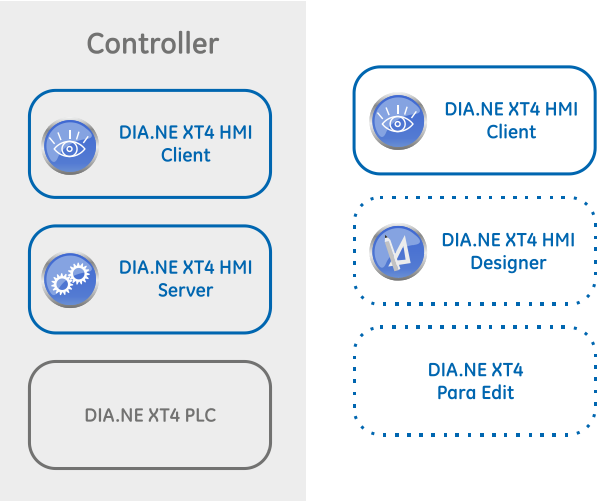
Devices can be connected for:

control → ignition, gas proportioning valve (optional)

monitoring → KLS 98, SAFI (optional)

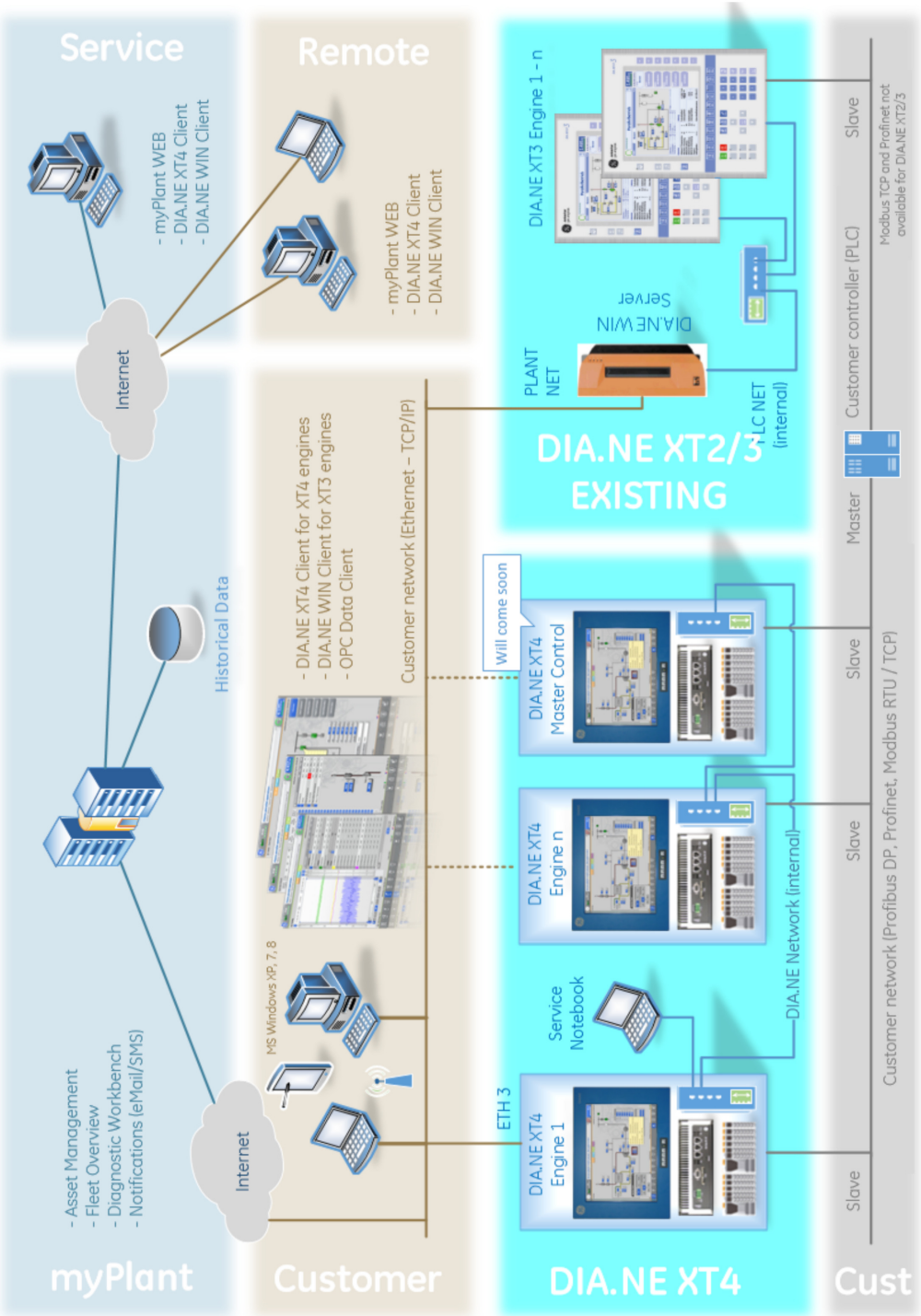
Intended for INNIO internal use only. No customer devices may be connected to this network.

7 Software



DIA.NE XT4 PLC:	Control software for engine regulation, monitoring and control based on a real-time multitasking operating system.
DIA.NE XT4 HMI Client:	HMI ... Human Machine Interface
	Client component of the visualisation system
	Runs on the controller and can also be installed and used on external computers for remote control purposes.
DIA.NE XT4 HMI Server:	Server component of the visualisation system
DIA.NE XT4 HMI Designer:	Program for creating the visualisation application
	Intended for INNIO internal use only!
DIA.NE XT4 Para Edit:	Program for editing parameters off-line
	Intended for INNIO internal use only!

8 Network diagram



Recommendation

Customers should not connect DIA.NE XT4 devices to networks not equipped with proper security precautions. These precautions should limit outbound and inbound connections from and to the DIA.NE XT4 device, thereby creating a kind of "demilitarised zone" (DMZ). A list of outgoing connections required for myPlant™ integration can be found in **TA 2300-0008 –** myPlant* Connection Requirements . The requirements for the incoming connections can be found in Section "⇨ Remote control with DIA.NE XT4 HMI software".

Note: Direct access from the internet to the plant server is inadmissible.

The customer must ensure that direct access to the plant server from the internet is prevented by technical means such as firewalls. INNIO Jenbacher GmbH & Co OG is **unable** to provide such safety facilities and services. It is also the customer's responsibility to protect any connected customer network from unintended communication between the plant server and this network. The above recommendation is to be understood as best practice

9 General approach to cyber security

The DIA.NE XT4 server meets the following standards in terms of cyber security:

1. Hardened operating system (OS):
   - All services that are not required have been deactivated
   - All input interfaces that are not required have been deactivated
   - Strict system firewall guideline
   - Patch-level generation per image (the latest patches are installed during the image generation)
2. No antivirus protection and no anti-malware Antivirus software and anti-malware are only effective if regularly updated, which is not possible on DIA.NE XT4 servers.
3. No pre-installed I/O devices (mouse, keyboard, screen, ...)
4. The DIA.NE XT4 server operates inkiosk mode: Only one set of predefined applications can run on the device.

10 Functional overview

10.1 Operating and monitoring

- 20 different views
- Easy to navigate between views
- Measurement displays and set point inputs
- Command buttons for all control commands
- Lists and bar displays for cylinder-specific measured values
- Dials and pointers to display various measured values
- Embedded trend displays (line charts from on-line recorders)
- Schematic diagrams with dynamic symbols

10.2 Parameter management system

- Clear overview and breakdown of the up to 2000 parameters
- Authorisation-dependent access protection for parameters
- Individual parameter collections
- Parameter import and export
- Filter functions
- Parameter comparison functionality (engines, file backup)
- Batch Edit Mode (change more than one parameter at once)

10.3 Diagnosis

DIAG

Trend display of measurement values

- Choice of up to 500 historic recorded measurements
- On-line trend and historic data
- Extensive zoom and move functionalities
- High data precision with up to 100 ms sampling interval
- Combined view of line graph and message list
- Display of minimum, maximum and average values (bar display)
- Pre-prepared trend compilations but also individual trend compilations by the user
- 2 cursors for taking measurements on the graph
- Trend display data export to Excel
- Performance-optimised loading of data

Alarm management system

- Up to 2000 different messages
- Current and historic message list display
- Recording of up to 1 million message events
- Alarm acknowledgement
- Messages prioritised as trips, warnings and operational messages
- All recorded user actions also displayed (changes in values, registration, control commands)
- Help information (causes, corrective measures) for various error messages
- Filter functions
- Alarm display data export (message list) to Excel

10.4 System functions

SYS

- User management
- System settings
- Network settings
- System diagnostic functions (logs, trends)
- Execution of software updates
- Version information display
- Export of historic data

10.5 Data recording

- Messages, measurements, and user actions including changes in values are recorded in a central database over an extended period.
- 10 GB storage capacity
- 100 ms recording interval
- Event-oriented data recording with high data recording rates
- Intelligent data compression

10.5.1 Scope of data

Messages: 1 million message events

User actions: 100.000 user actions

General measured values:

1 h (Min/Max/Avg)	30 s (Min/Max/Avg)	1000 ms (Min/Max/Avg)	100 ms

10 years 1 month 1 day 3 h now

In addition, the raw data are stored from 30 minutes before the occurrence of a fault until 15 minutes afterwards, with 100 ms resolution. These data are not compressed and are therefore available for an extended period a very high resolution. This memory can hold up to 50 million measured value changes.

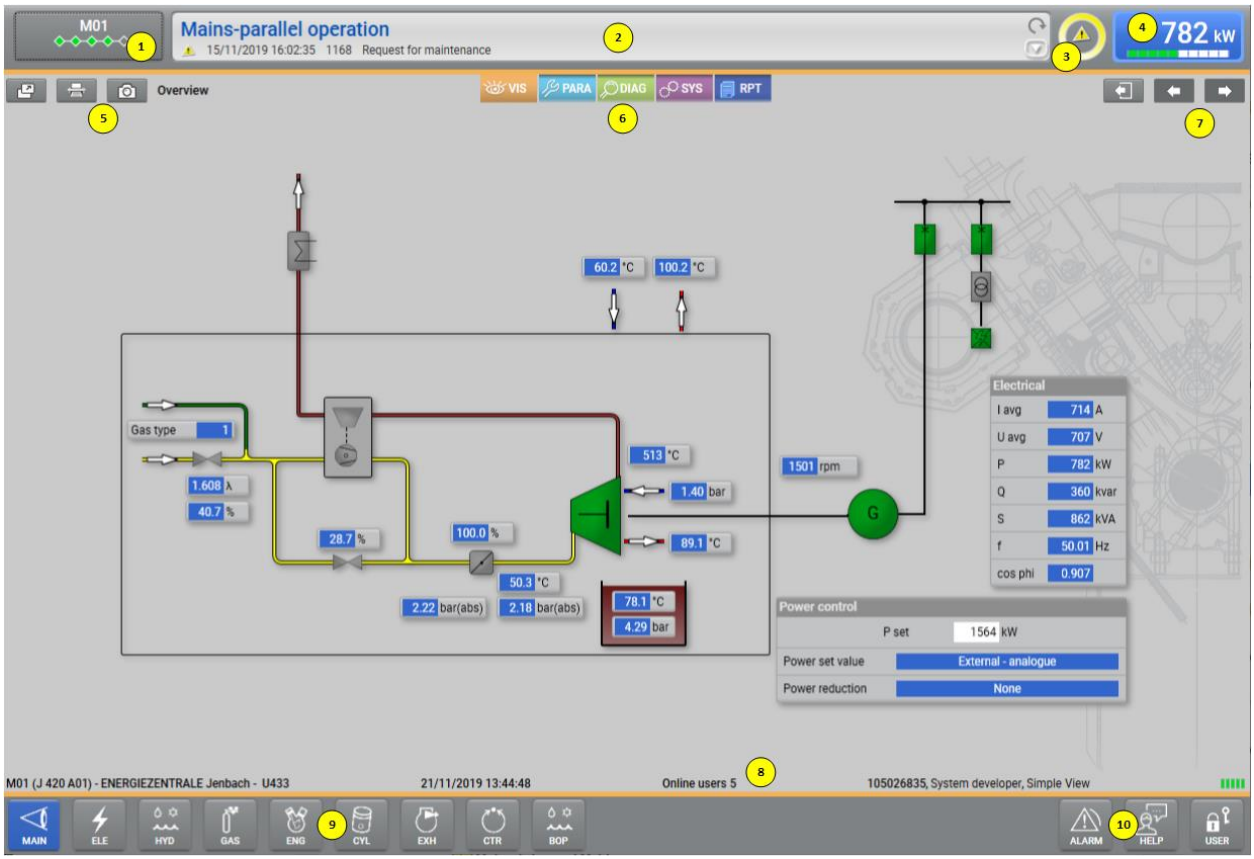
10.6 Other functions

- Multiple engine monitoring for up to 90 engines
- User access control and access protection
- PDF printout of images, trends and message lists
- Excel (*.xls) export of trend data and message lists
- Forwards and backwards navigation
- Message portal
- Remote control with a PC or tablet (Windows 8) over the Ethernet interface
- Optional: Remote control over the Internet with myPlant™
- Optional: OPC interface

11 User interface

11.1 Operation and navigation

There are two main navigation bars for operation and navigation. One is under the header for the VIS, PARA, DIAG and SYS areas. The other is under the footer and brings up the screens for the respective areas. These and other basic control elements and displays are described below.



1 Engine status progress indicator/engine change

Engine status progress display:
This display gives information on the engine run-up status. This allows you to see at a glance whether the engine is running at the pre-selected operating point or not.

 Module not activated

 Module activated

 Engine run-up

 Idling

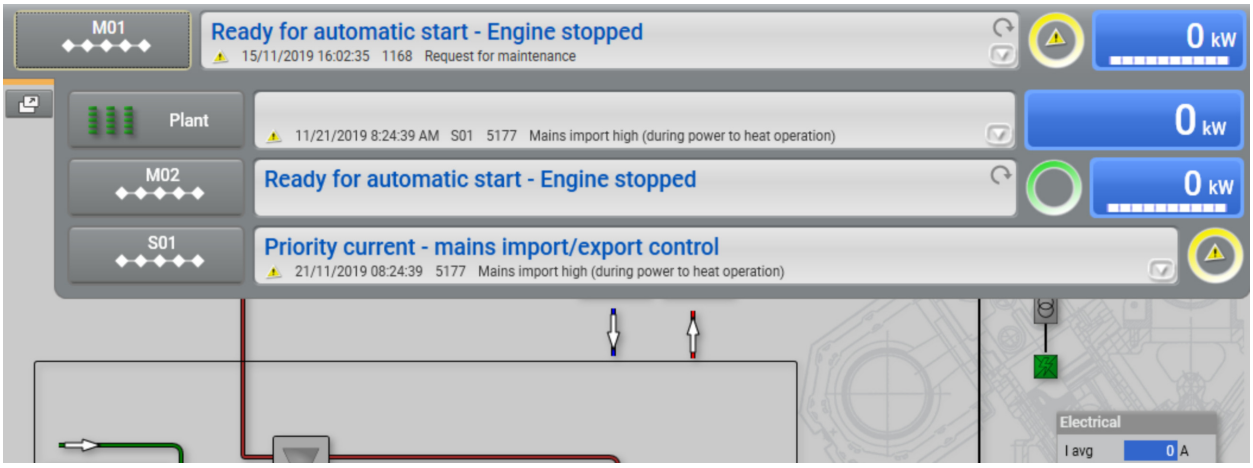
 Mains parallel or island operation

 LEANOX® control active

 The engine is delivering 95% power or more with regard to the rated load for the current gas type.

Engine change (only via remote client, not on local panel):

In a multi-engine system or in combination with a station, the "display" also has the same function as a button with which you can switch to another engine, station or plant overview.



2 Engine status and message display

This box shows the engine status in plain text and also the last outstanding message. Clicking on this display shows the last 15 messages as well. The maximum number of messages in the header can be changed under SYS/Client.

The following symbols are displayed at the top right so that the operating mode selector status can be seen remotely:


Operating mode selector Off


Operating mode selector Manual


Operating mode selector Automatic

3 Alarm display and engine status

This symbol shows whether a warning or alarm is outstanding. The circle is also animated and rotates as a function of engine speed. Clicking once on the symbol switches directly into alarm management.


No warning or trip active.


In the event of a warning, the colour changes to yellow and a warning triangle appears.


In the event of a trip, the colour changes to red and a warning triangle appears.

4 Power display

The electrical power currently being produced is shown by a figure and also by a bar. The bar grows from left to right. When the bar reaches the right-hand end, the engine has reached its rated power for the current gas type.

A power reduction may be necessary for various reasons, see the ENG - Power reductions screen. This operating condition is indicated by a colour change of the power output bar to orange.

5 Shortcuts


The screen currently displayed can be opened in a new window. This allows a number of screens to be opened simultaneously. The function is only available on the PC Client and not the panel.


The current screen can be output to a printer or saved as a PDF. If this function is used in the alarm management, a corresponding list of messages is printed out. The function is only available on the PC Client and not the panel.


The current screen is copied to Clipboard and can e.g. be attached to the message portal.

6 Navigation

Visualisation. All the screens described in the Operating and monitoring Section.

Parameter management system

Diagnosis (Trend)

System functions

7 Navigating forwards/backwards

The number of screens for navigating forwards and backwards is limited to 10 and can be adjusted under SYS/ Client. The default value is 5.

8 Footer

M01 (J624) - Plant name.

[M01]	Module name. Changed under SYS/SYSTEM/Modules
[J624]	Engine type
[Plant name]	The name of the plant. Changed under SYS/SYSTEM/Modules

20/05/2014 12:58:57.

Date and time from the controller. Changed under SYS/SYSTEM/Time.

Online users 3.

Displays the number of clients currently connected. Clicking once on the display shows further details (user, role, computer name):

Guest, Base role	DS000001
Guest, Base role	DS000001
105026835, System developer	AT-JEN-BXJVSY1

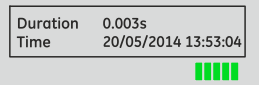
:

105026835, System developer, Simple View

Displays the user identity and role, and whether the simple or expert view is active.

 :

Indicates the quality of the connection between client and controller. On the panel, five solid green bars should be displayed. With a remote connection (internet) fewer bars will be shown, depending on the connection quality, and the colour changes from green to yellow and red. Further details can be seen by clicking on the display.



[Duration]	Transmission time in seconds between client and controller
[Time]	Time from controller

9 Navigation

The navigation is structured differently in the VIS, PARA, DIAG and SYS areas. The VIS and DIAG areas are structured so that each screen is displayed together with an associate trend display. The following list applies to VIS and DIAG.

Level 1	Level 2	Screen name	Visibility
[MAIN]			
	[Start-Stop]	Start-stop	
	[Overview]	General view	
	[Auxiliaries]	Auxiliaries	
	[Operational data]	Operational data	
	[Custom]	Customer	Optional
	[Custom 2]	Customer 2	Optional
[ELE]			
	[MMD1]	Multi-measurement converter	
	[Synchronisation]	Synchronisation	Synchronisation active (parameter 11714)
	[Generator]	Generator	
[HYD]			
	[Oil / cooling water]	Oil / cooling water	
	[Oil counter]	Oil meter	Oil counter (parameter 10003)
	[Oil quality]	Oil quality	Oil quality sensor active (parameter 10012)
[GAS]			
	[Gas details]	Gas details	
[ENG]			
	[Overview]	General view	
	[Power reductions]	Power reductions	
	[LEANOX controller]	LEANOX controller	
	[N- P controller]	Speed - power controller	
	[Knock controller]	Knock controller	
	[Charge temp. controller]	Charge temperature controller	Charge temperature controller (parameter 11872)
	[Two stage charger]	Two-stage pressure charging	Double exhaust gas turbochargers (parameter 10018)

Level 1	Level 2	Screen name	Visibility
	[Humidity]	Humidity	Humidity-LEANOX compensation (parameter 12310)
[CYL]			
	[Ignition]	Ignition	
	[Knocking signals]	Knocking signals	KLS98 (parameter 12071) or SAFI (parameter 12114)
[EXH]			
	[Exhaust gas temperatures]	Exhaust gas temperatures	
[CTR]			
	[Overview]	General view	
	[Controller 1 – 8]	Controllers 1 - 8	Plant controllers 1 – 8 (parameters 10734 – 10741)
	[Return water temperature]	Return water temperature	Return temperature, controller (parameter 11876)
	[Return water temperature after cooler]	Return temperature after cooler	Return temperature controller, after cooler (11875)
	[Room temperature]	Room temperature	Room temperature, cooler (parameter 12245)
	[Power factor]	Power factor	Power factor, controller (parameter 12485)
	[Supply water temperature]	Supply temperature	Supply temperature, controller (parameter 11877)
	[Charge temperature ventilation fan]	Charge temperature fan	Charge temp. fan controller (parameter 11874)
	[Engine cooling water temperature]	Engine cooling water temperature	Cooling water, controller (parameter 10005)
	[Charging cooling water high pressure]	Charging cooling water high pressure	Charge temperature controller (high pressure) (parameter 11873)
	[Thermal reactor heater]	Thermal reactor heater	Thermal reactor heating active (parameter 12222)

10 Navigation

These three buttons are always visible, regardless of whether VIS, PARA, DIAG or SYS is active.

Alarm management system

⇨ Message portal

⇨ Login

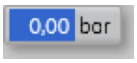
See also

- Message portal

11.2 Display items

Measurement displays

Data are displayed as white text on a blue background:



If the control system is unable to read the data properly, e.g. because of a failed connection, the box appears as follows.

Input fields for set values and parameters

Input fields are displayed as black text on a white background:

If the input field appears as follows with a grey background, the value cannot be changed (e.g. the user does not have the required role).

If the control system is unable to read the value properly, e.g. because of a failed connection, the display appears as follows.

Button for switching between operating modes

The active mode is displayed as white text on a blue background: The button indicates the mode available for switching.

If the button appears as follows, the value cannot be changed (e.g. the user does not have the required role).

If the control system is unable to read the mode properly, e.g. because of a failed connection, the button appears as follows.

Icons

The status of the various icons (pump, valve, mixer, catalytic converter, breaker, etc.) is displayed as follows:

Active (on, open)	
Inactive (off, closed)	
Invalid data	
Not dynamised (static)	
Moving (between active and inactive)	
Error	

The symbol ▶ denotes an active controller and the symbol ■ an inactive controller.

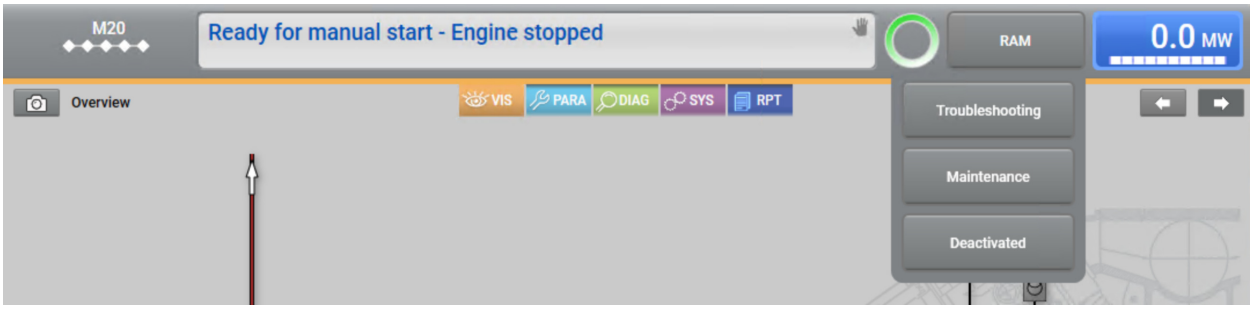
11.3 Languages

Modules are available in English, German and the respective national language. The desired language can be selected under Anmeldung. The DIA.NE XT4 HMI is currently available in the following languages.

Language	Language code
English (default)	ENG
German	DEU
Bulgarian	BUL
Chinese	ZHO
Czech	CES
Danish	DAN
Spanish	SPA
Estonian	EST
Finnish	FIN
French	FRA
Hungarian	HUN
Greek	ELL
Croatian	HRV
Lithuanian	LIT
Latvian	LAV
Italian	ITA
Dutch	NLD
Norwegian	NNO
Polish	POL
Portuguese	POR
Romanian	RON
Russian	RUS
Serbian	SRP
Slovak	SLK
Slovene	SVN
Swedish	SWE
Turkish	TUR

11.4 Status display for availability calculation (optional)

To improve the determination of engine availability, the [Engine – Engine data – Engine availability tracking active/ID 13240] parameter can be used to activate this display and positioning function of the current availability status. If this parameter is set, then the drop-down button [RAM] is displayed in the header as shown below.



If [RAM] is displayed and none of the offered statuses are selected, the time is assigned to the current operating mode, in the case shown [Ready for manual start – Engine stopped] by default assigned availability status. A specific setting of another availability status can be made by selecting one of the available options [Troubleshooting], [Maintenance] or [Deactivated]. In this case, this availability status will then be highlighted in blue as shown in the following illustration.

In this case, the status [Troubleshooting] is set.

To prevent the availability status from being set to [Troubleshooting] but the engine is already running again, when the engine is running, after expiration of a time, the [Troubleshooting] status is cleared and the engine is reported as available. This time to reset is displayed directly on the button in seconds. By holding down the button for 5 seconds, the counter starts to count down again from the start value. This will increase the time to reset the status. This time can be set with the parameter [Engine – Engine data – RAM timer auto reset/ID 14380].

Notice: The availability status can only be set on the local control panel. The current state is only displayed on the removed clients, but can not be changed. To create a status, you must also be logged on to the system as a user with at least a user role [customer].

12 User registration and settings

DIA.NE XT4 is equipped with a comprehensive authorisation system to prevent unauthorised access. After a user has successfully registered, he is allocated a specified user role. Certain information is then displayed as a function of this role and the write authorisation issued for parameters, set values and control commands.

Users are divided into **global users**, who are authenticated by means of a licence file and user code, and **local users** who can be managed within the local user administration of the plant in question. These local users authenticate themselves by a user name and user code.

After the DIA.NE XT4 system has booted up, a user with the name *[Guest]* and the role **[Base role]** is automatically activated at the panel. Basic operation of the plant is then enabled. For advanced operation (changes to set values, parameters, commands, ...), the user must log in. For remote control, the user must already have logged in when establishing the connection. Remote control is not possible without registering.

After an adjustable time without any control actions (see System Client Settings), the current user is automatically logged out and the "Guest" user activated.

1 **Screen for registration/logout and user settings**

2 **List of available users**

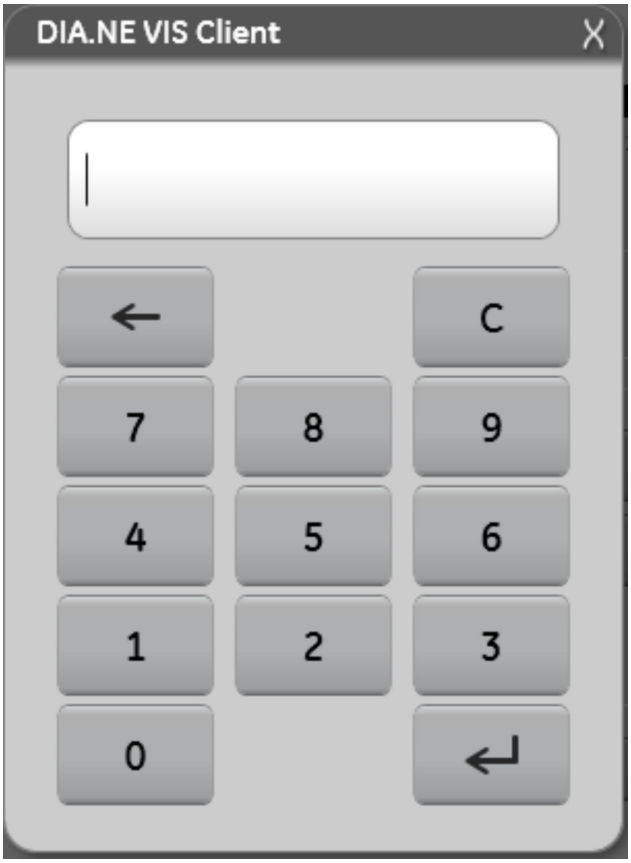
All available users are listed. The current user logged in is highlighted in blue and displayed at the top of the list. The user name and user role are displayed, as is the remaining duration of the licence validity for time-limited global users (licence users).

The  symbol indicates a **global user**, in other words one authenticated by means of a licence. Licences are only valid for a specified time and must be updated regularly.

Users without this symbol are **local users** of this plant. These are managed in the local user administration and are only available on this plant. Local users are not subject to any time restrictions.

Other users can be selected in the **[Others]** selection box.

The button for the desired user must be pressed in order to register. The log-in dialogue box then appears,

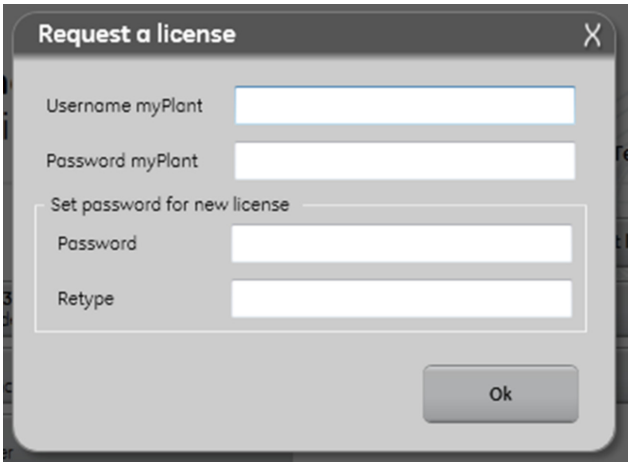


Enter a 6-digit user code and press **[Enter]**.

Note: After 5 unsuccessful attempts (incorrect user code entered), the user is locked out for 10 minutes. Only then can the input be attempted again.

3 Request a user licence (* only on the PC client)

This brings up the dialogue box for requesting a licence or updating the user's own licence.



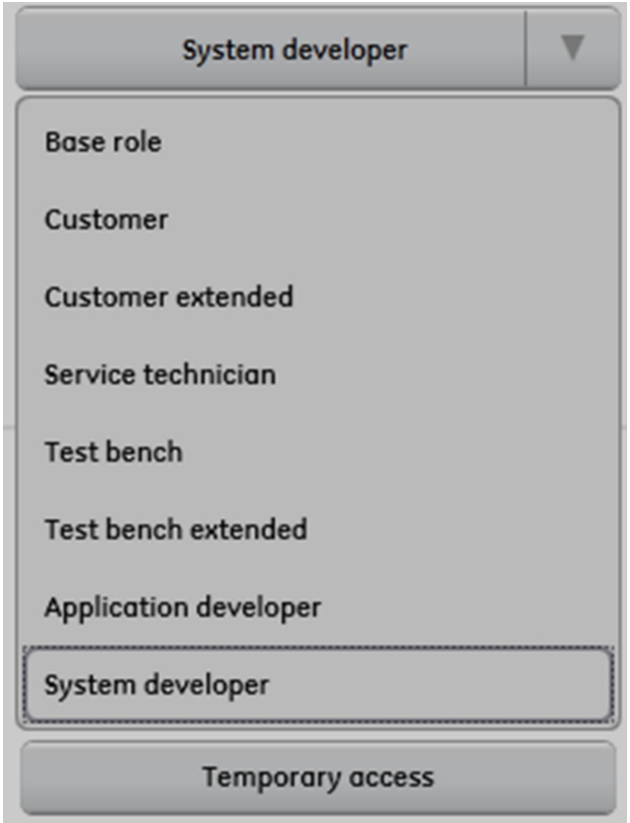
To request a licence, enter the user name and password from myPlant™. Then select a random 6-digit code as the DIA.NE XT4 password.

Registration as a myPlant™ user, allocation of a corresponding DIA.NE XT4 user role for this user and an Internet connection at the time of requesting the licence together constitute the precondition for obtaining a licence.

4 Selecting the desired language for the displayed text

5 Select of the user role

This allows a "lower" user role to be selected if desired. The "highest" user role, in other words the one with the most access rights allocated to it, is selected automatically.

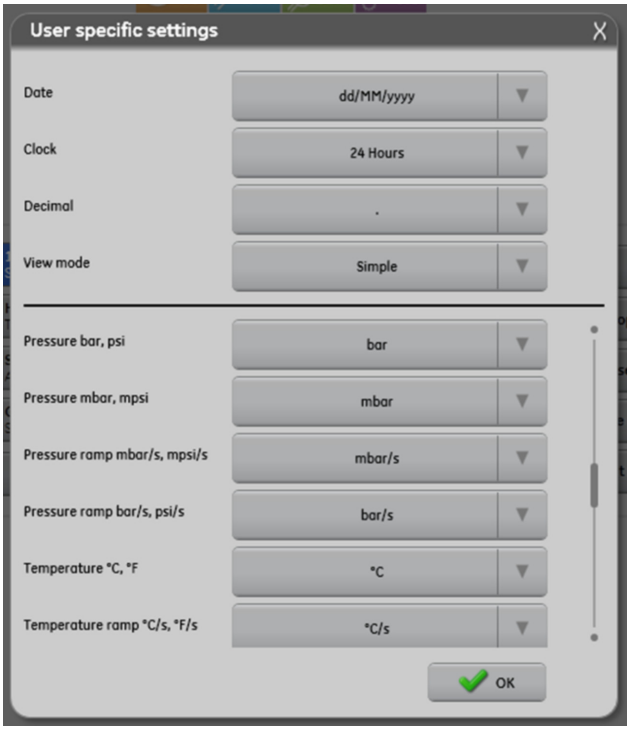


The **[Temporary access]** button allows an advanced user role, in other words one with more access rights, to be requested. An appropriate request code must be sent to the support centre and the enabling code received entered in the displayed dialogue box. The extended access is then available for a limited period.

6 **User specific settings**

This button opens the dialogue box for setting the user-specific settings. The desired format for displaying the time and date can be selected. The decimal point or comma can be selected. Units (e.g.: °C or °F for temperatures) can be specifically selected by the user. These are then always displayed expressed in the selected units.

A choice can be made between **[Simple]** and **[Expert]** display mode. [Simple] display mode shows a significantly simplified user interface with limited information. [Simple] display mode is currently not available.



7 Transferring the user licence to the panel (* only on PC client)

This transfers the licence of the user currently logged in (global users only) to the DIA.NE XT4 panel in the control cabinet. The global user can then register and use the associated extended functionality at the panel. The licence at the panel is deleted automatically after 24 hours.

8 ... Logout

9 Remove user licence from the panel (* only at the local panel)

This prematurely removes the user licence transferred to the panel. This avoids any misuse of transferred licences. The licence is removed automatically for security reasons after 24 hours.

10 Exclusive mode (* only at the local panel)

This blocks changes to the parameters and set values and also the execution of control commands by other PC clients. So long as exclusive mode is activated, no other values can be changed by other users on remote DIA.NE XT4 clients.

This exclusive mode is indicated by the  symbol at the bottom right of the screen.

Caution: This mode can only be activated and deactivated on the panel and is only enabled for the authorisation role "Test engineer" and above.

13 Operating and monitoring

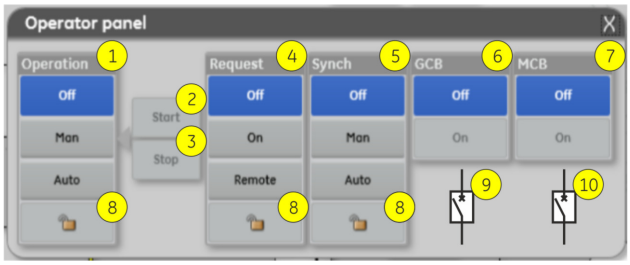
13.1 Operator panel screen

This screen is only available on the local touch panel. Remote operation of the plant with these operating mode selectors is not permitted for safety reasons.

This button 

in the screen navigation menu bar at the bottom of the screen switches the operator panel screen **[Operator panel]** on and off. This appears as a dialogue box, and is pinned to the foreground and can be moved around the screen at will. It can be closed with the "x" or the button. The background screen can be changed whenever and however desired, despite having the operator panel pinned to the foreground.

This box contains the switches for operating the plant. Depending on the operating condition and version, certain elements may or may be displayed and activated (operation enabled) or not displayed and deactivated (operation not enabled).



1 Operating mode selector

This selects the plant operating mode as follows:

- **OFF:** The plant is shut down.
- **MANUAL:** The plant can be started and shut down manually with the "Start" and "Stop" buttons.
- **AUTO:** The plant is started and stopped automatically by request commands.

2 Manual plant start

3 Manual plant shut-down

4 Activation mode selector switch

This selects the type of request as follows:

- **OFF:** The plant is not requested (shut-down request)
- **ON:** The plant is requested
- **REMOTE:** The plant is sent start-up and shut-down requests remotely (customer control signal, DIA.NE XT4 remote control, master control system)

5 Synchronisation selector switch

Selecting the type of synchronisation.

- **OFF:** Generator breaker synchronisation is aborted / blocked
- **MANUAL:** Automatic synchronisation initiation and aborting by generator breaker On/Off.
- **AUTO:** Fully automatic synchronisation.

6 Generator breaker On/Off

Generator breaker control. Control function depends on position of operation mode selector switch and the synchronisation selector switches. The precise function description can be found in the technical specification for the control system.

7 Mains breaker On/Off

Mains breaker control. Control function depends on position of operation mode selector switch and the synchronisation selector switches. The precise function description can be found in the technical specification for the control system.

8 Locking the selector switch

Caution: This function is not a LOTO (Lock Out Tag Out) shut-down of the plant!

It locks the selector switch in question in its current setting. Users must be authenticated (logged in) for locking to be enabled.

Locking:


This display shows that the selector switch is not locked.

Pressing this button opens the locking dialogue box.

To lock the switch, enter your user code and then press **[Lock]** .

The selector switch is then displayed as locked and no changes in the selector switch position can be effected by other users.

Unlocking:


Selector switch displayed as locked

Pressing this button opens the unlocking dialogue box. **The same user who locked the selector switch must be logged in to unlock it.**

To unlock the switch, enter your user code and then press **[Unlock]** .OK

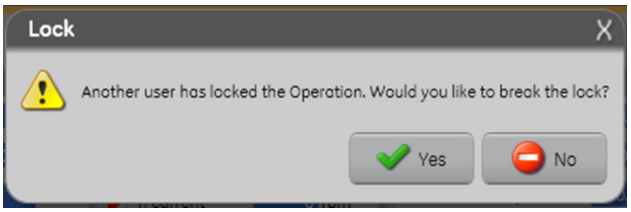
Breaking the lock

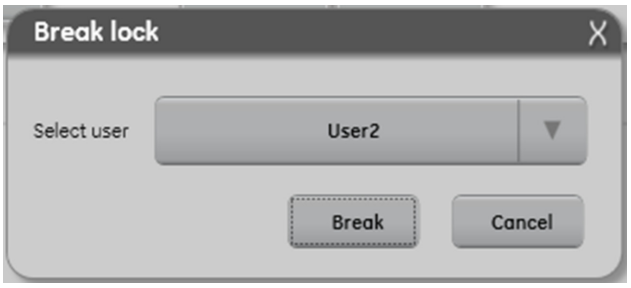
This allows 2 users to release the lock. In such cases, we refer to "breaking" the lock. Breaking requires the registration of two independent users. This is done in the following steps.

The first user [User1] presses the unlock **button.**

The first user [User1] enters his user **code.**

As the selector switch was locked by a different user it cannot be unlocked, and a second user must be selected to break the lock.



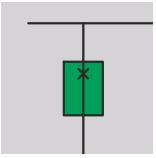


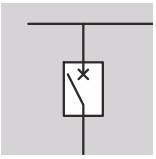
Selection of a second independent user

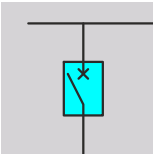
The second user **[User2']** enters his user code and then presses **[UnLock]** OK

The selector switch is then unlocked.

9 **Generator breaker display**


... closed


... open

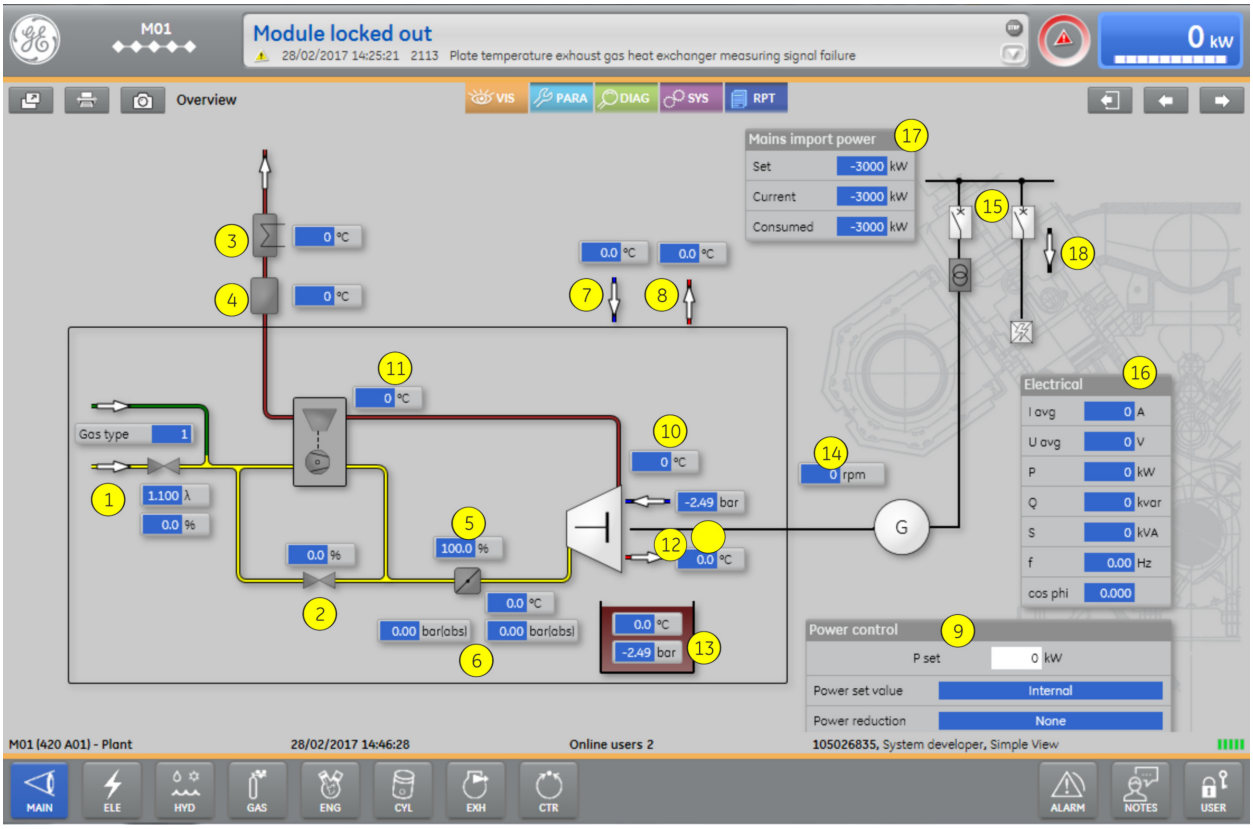

... synchronisation / back synchronisation

10 **Mains breaker display**

Status display as for the generator breaker.

13.2 MAIN – overview

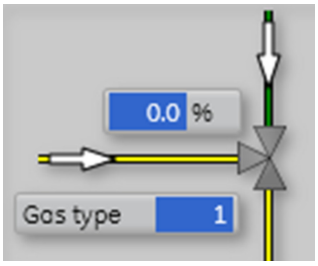
This screen provides an overview of the main engine data and also displays information on the current operating and switching status of the module. In addition, it is also possible to view plant-specific features, e.g. catalytic converter, return temperature, etc., at a glance.



1 Gas mixer / Gas proportioning valve

This is where details of the gas mixer and/or the gas proportioning valve are displayed, depending on the engine type and the design of the installation.

Gas mixer:

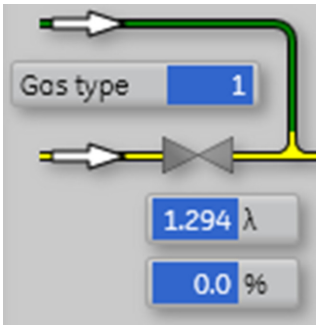


The gas type **[Gas type]** and the position of the gas mixer are displayed as a percentage.

Gas type	Description
[1]	Gas type 1
[2]	Gas type 2
[3]	Gas type 3
[4]	Gas type 4
[1-2]	Gas quality = interpolation between the gas 1 and gas 2 parameter sets
[1-2/3]	Gas 1-2 (gas train 1) mixed with gas 3 (gas train 2)
[1/3]	Gas 1 (gas train 1) mixed with gas 3 (gas train 2)

Gas proportioning valve:

The gas proportioning valve only regulates the amount of gas.



In addition to the gas type **[Gas type]**, the position of the gas proportioning valve as a percentage and the lambda value are displayed.

2 **Compressor bypass**

Display showing the compressor bypass position (optional).

3 **Waste-heat boiler**

Display showing the tube plate temperature (optional).

4 **Catalytic converter**

Display showing the catalytic converter temperature (optional).

5 **Throttle valve**

Display showing the throttle valve position.

6 **Charge temperature and pressure**

Display showing the charge temperature (t2') and pressure (p2'). The display showing charge pressure upstream of the throttle valve (p2) is optional.

7 **Return water temperature**

Display showing the return temperature (optional).

8 **Supply water temperature**

Display showing the supply temperature (optional).

9 **Power control**

The "Customer" user role is the minimum required for changing the power set point **[Pset]**.

The following types of **[Power set value]** are available:

Power set value	Description
Internal	The power set value is determined on the basis of the power set point set by the operator. The power set point can be set in the MAIN/General, ENG/General, ENG/LEANOX - Controller and Power Controller screens.
External - analogue	The power set value is generated by an external analogue signal (4-20mA). See the [Engine / Power / Scaling external power set point] parameter.
External - bus	The power set value is imposed by a higher-order control system connected to DIA.NE XT4 via an industrial bus connection.

The following types of **[Power reduction]** are possible:

Power reduction	Description
None	No power reduction is in effect.

Power reduction	Description
Maximum power	The pre-set power set point has exceeded the rated power related to the gas type and is limited to the latter. See the [Engine / Power / Nominal values] parameter.
Minimum power	The pre-set power set point has fallen below the minimum permissible power set point and is limited to the latter. See the [Engine / Power / Nominal values / Minimum power] parameter.
	See Fig. ENG - Power reductions The most effective power reduction is displayed.

10 Average exhaust gas temperature

11 Temperature ahead of turbocharger (optional)

12 Engine cooling water

Display showing the cooling water temperature and pressure.

13 Engine oil

Display showing the engine oil temperature and pressure.

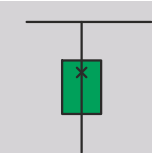
14 Engine speed

15 Electrical schematic

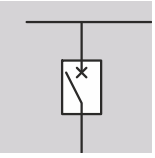
The arrangement of the generator switch, mains switch and transformer varies and is designed for each specific installation.

Status of generator and mains breakers:

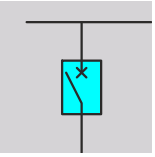
Closed:



Open:



Synchronisation / Resynchronisation:



In the event of mains failure, the mains status indication is white  , otherwise it is green  .

16 Electrical data

Display showing electrical data for the generator. Further details are displayed on the "ELE/MMD 1" screen.

Abbreviation	Description	Unit
[I avg]	Current - average value	Amperes
[U avg]	Voltage - average value	Volts
[P]	Active power	Kilowatts
[Q]	Reactive energy	Kilo-Volt-Ampere-reactive

Abbreviation	Description	Unit
[S]	Apparent power	Kilo-Volt-Ampere
[f]	Frequency	Hertz
[cos phi]	Power factor (cos Phi)	

17 **System interconnection outputs**

This is only displayed when the system interconnection controller (Plant controller 32) has been activated.

Abbreviation	Description	Unit
[Set]	System interconnection output, setpoint value	Kilowatts
[Current]	System interconnection output, actual value	Kilowatts
[Consumed]	Consumed output (current generator output + current system interconnection output)	Kilowatts

18 The arrow is only displayed when the system interconnection controller (Plant controller 32) has been activated. The direction of the arrow indicates whether power is being drawn from or supplied to the mains:

+ value for mains power consumption is the arrow pointing to the bus bar side

- value for mains power consumption is the arrow pointing to the mains side

13.3 MAIN – Start – Stop

The most important measured and control variables for starting the gas engine are grouped together on this screen. An on-line trend is also available for better diagnosis of the control actions.

1 General [General]

[Charge temp. (t2')]	Charge temperature (t2')
[Charge pressure (p2')]	Charge pressure p2'
[Prechamber gas diff. pressure]	Prechamber gas differential pressure (optional)
[Throttle valve position]	Throttle valve position
[Compressor bypass]	Compressor bypass

2 Speed / Power [Speed / Power]

[n set]	n set ("Customer" user role)
[n set current]	n set current
[n current]	n current
[P set]	P set ("Customer" user role)
[P set current]	P set current

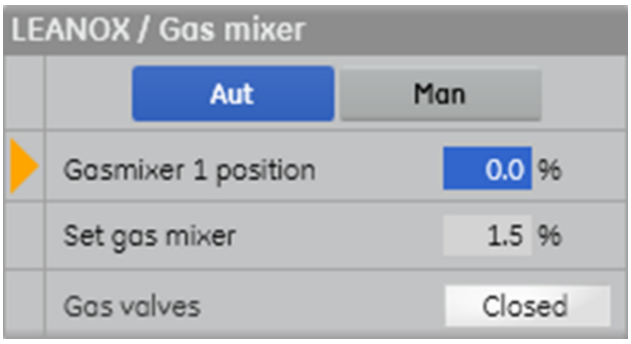
3 Oil / Cooling water / Power [Oil / Cooling water]

[Oil temperature]	Oil temperature
[Oil pressure]	Oil pressure
[Cooling water temperature]	Cooling water temperature
[Cooling water pressure]	Cooling water pressure

④ LEANOX / Gas proportioning valve [LEANOX / Gas proportion valve]

[Aut/Man]	Button for automatic / manual operation of the LEANOX controller. Service Partner User Level.
[Lambda]	Lambda
[Set lambda]	Lambda set point. Entry possible during manual operation
[Position]	Item
[Gas volume]	Gas volume
[Gas valves]	Gas valves open/closed

Depending on the *[Gas/Gas proportioning valve]* parameter, the values for the gas mixer instead of the gas proportioning valve can be displayed here.



⑤ On-line trend

The following control variables are displayed as a trend:

Display	Description	Display range	Unit
[Power current], [Power set current]	Actual power output, current power set point	0 / P max	kW
[Compressor bypass], [Gas mixer position], [Throttle valve position]	Compressor bypass, gas mixer, throttle valve positions	0/100	%
[Speed]	Speed	0/2000	rpm
[LEANOX active]	LEANOX controller active / inactive	0/1	

⑥ Operating mode selector

Only the status is shown on the remote PC. The switch cannot be operated.

⑦ Plant manual start/shut-down

Only the status is shown on the remote PC. The switch cannot be operated.

⑧ Activation mode selector switch

Only the status is shown on the remote PC. The switch cannot be operated.

For details of items ⑥, ⑦ and ⑧ see Operator panel screen.

13.4 MAIN – Auxiliaries

This screen displays the status of the auxiliaries, special gas measured values and other variables. The auxiliaries are designed to be plant-specific and are therefore optional, as the other displayed measured values.

[Operating state auxiliaries]:

[Preheating water pump]	Preheating pump
[Preheating]	Preheating system
[Air inlet louvre 1]	Air intake louvre 1
[Air inlet louvre 2]	Air intake louvre 2
[Air outlet louvre]	Air outlet louvre
[Intake air fan 1]	Air intake fan 1
[Intake air fan 2]	Air intake fan 2
[Intake air fan]	Air intake ventilator
[Air inlet ventilator frequency converter]	Air intake fan frequency converter
[Room ventilation 100%]	Room ventilation 100 %
[Emergency cooler stage 1]	Emergency cooler stage 1
[Emergency cooler stage 2]	Emergency cooler stage 2
[Emergency cooler pump]	Emergency cooler pump
[Cooling radiator stage]	Emergency cooler stages
[Charging cooler stage]	Charging cooler stages
[Charge cooler pump]	Charge cooler pump
[Exhaust gas valve bypass]	Exhaust gas bypass valve

[Exhaust gas heat exchanger]	Boiler valve
[Condenser pump]	Condenser pump
[Boiler house fan]	Boiler house fan
[Heat circuit flap]	Heat circuit flap
[Charge cooler preheating]	Charge cooler preheating
[CODINOX]	CODINOX
[Preheating engine oil]	Preheating engine oil
[Valve engine oil heating]	Valve engine oil heating
[N2 Gas valves]	N2 gas valves
[Room temperature]	Room temperature
[Room difference pressure]	Room differential pressure
[Outdoor temperature]	Outside temperature
[Waste heat recovery supply temp. prim.]	Waste heat recovery supply temperature, primary
[Waste heat recovery return temp. prim.]	Waste heat recovery return temperature, primary
[Waste heat recovery supply temp. sec.]	Waste heat recovery supply temperature, secondary
[Waste heat recovery return temp. sec.]	Waste heat recovery return temperature, secondary
[Position circulation louvre 1]	Position circulation air louvre 1
[Position circulation louvre 2]	Circulation air louvre, Position 2
[Position inlet louvre 1]	Position intake louvre 1
[Position inlet louvre 2]	Intake louvre, Position 2
[Position outlet louvre 1]	Position outlet louvre 1
[Position outlet louvre 2]	Outlet louvre, Position 2
[Pos. valve control ret. water temp.]	Position of control valve for return water temperature
[Pos. valve control ret. water temp. after cooler]	Position of control valve for return water temperature after cooler
[Pos. valve control temp. charge cooling circuit]	Position of control valve for temperature of charge cooling circuit
[Condenser supply temperature]	Condenser supply temperature
[Condenser return temperature]	Condenser return temperature
[Heat circuit return temperature]	Heating circuit return temperature

[Prechamber gas pressure (compressor)]	Prechamber gas pressure (compressor)
[Prechamber gas pressure (gas train)]	Prechamber gas pressure (gas train)
[Prechamber gas pressure (engine)]	Prechamber gas pressure (engine)
[Prechamber gas difference pressure]	Prechamber gas differential pressure
[Prechamber gas temperature after cooler]	Prechamber gas temperature after cooler
[Charge pressure (p2')]	Charge pressure p2'
[Charge pressure before throttle valve (p2)]	Charge pressure before the throttle valve (p2)
[Charge cooler differential pressure LP]	Charge cooler differential pressure ND
[Charge cooler differential pressure]	Charge cooler differential pressure
[Charge air filter difference pressure]	Charge air filter difference pressure
[Flame arrestor differential pressure]	Flame arrestor differential pressure
[Barometric pressure]	Barometric pressure
[Crankcase pressure]	Crankcase pressure

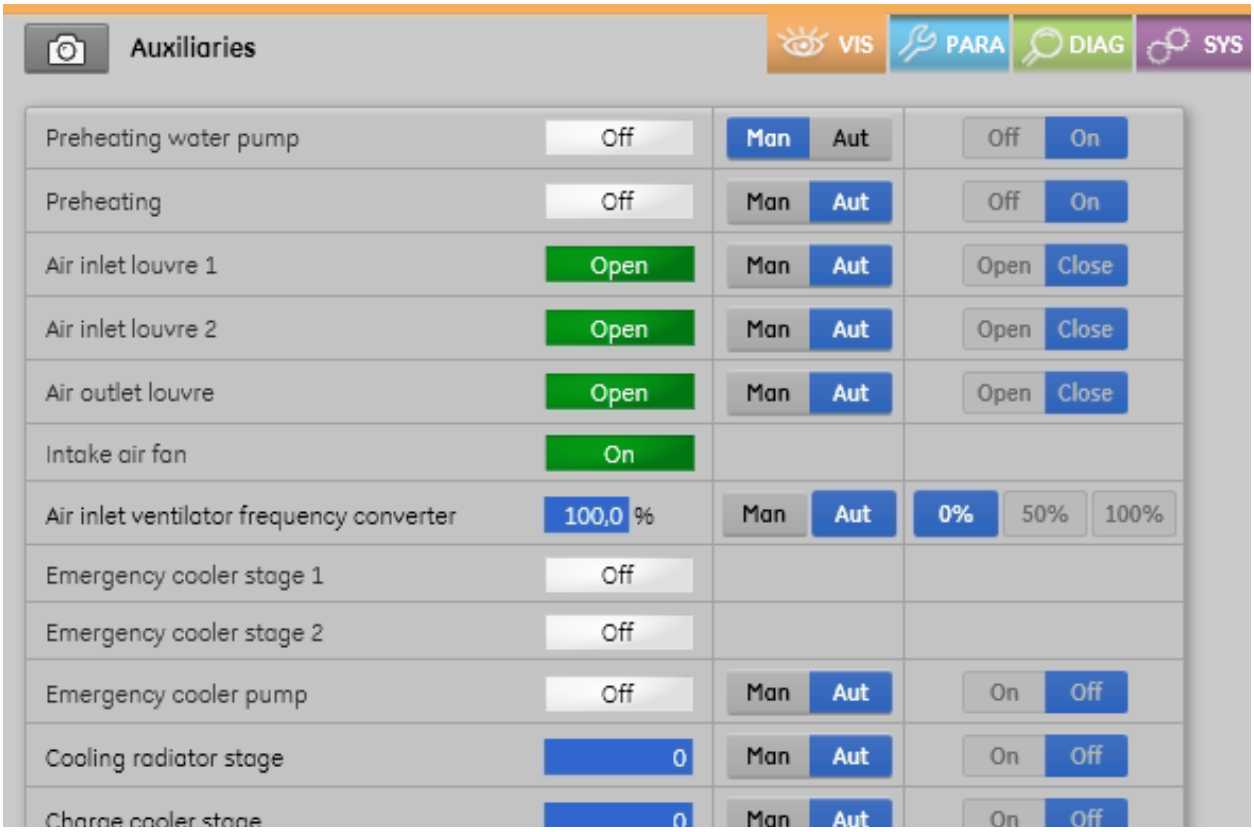
[Pressure before blow-by filter]	Pressure before blow-by filter
[Pressure before blow-by filter bank A]	Pressure before blow-by filter, Bank A
[Pressure before blow-by filter bank B]	Pressure before blow-by filter, Bank B
[Pressure after blow-by filter]	Pressure after blow-by filter
[Pressure after blow-by filter bank A]	Pressure after blow-by filter, Bank A
[Pressure after blow-by filter bank B]	Pressure after blow-by filter, Bank B
[Air starter tank pressure]	Air starter tank pressure
[Air starter supply pressure]	Air starter supply pressure
[Air starter start speed]	Air starter start speed
[Starter battery voltage]	Starter battery voltage

Auxiliaries - manual activation:

This function is local, available on the DIA.NE panel as from the user role of Customer and is enabled with the parameter *[Auxiliaries/Manual operating auxiliaries control/Operating section manual active]*. At active manual operating level, additional buttons are revealed in the auxiliaries screen (see screenshot below) which allow the operator to take manual control of the engine and plant auxiliaries controlled by DIA.NE, provided that the following conditions are met:

- Operation mode selector in "Man"
- Safety circuit OK
- Closed-current circuit OK
- Fire alarm OK
- Gas alarm OK
- Gas pre-alarm OK
- Engine cool-down run completed/No auxiliaries activated

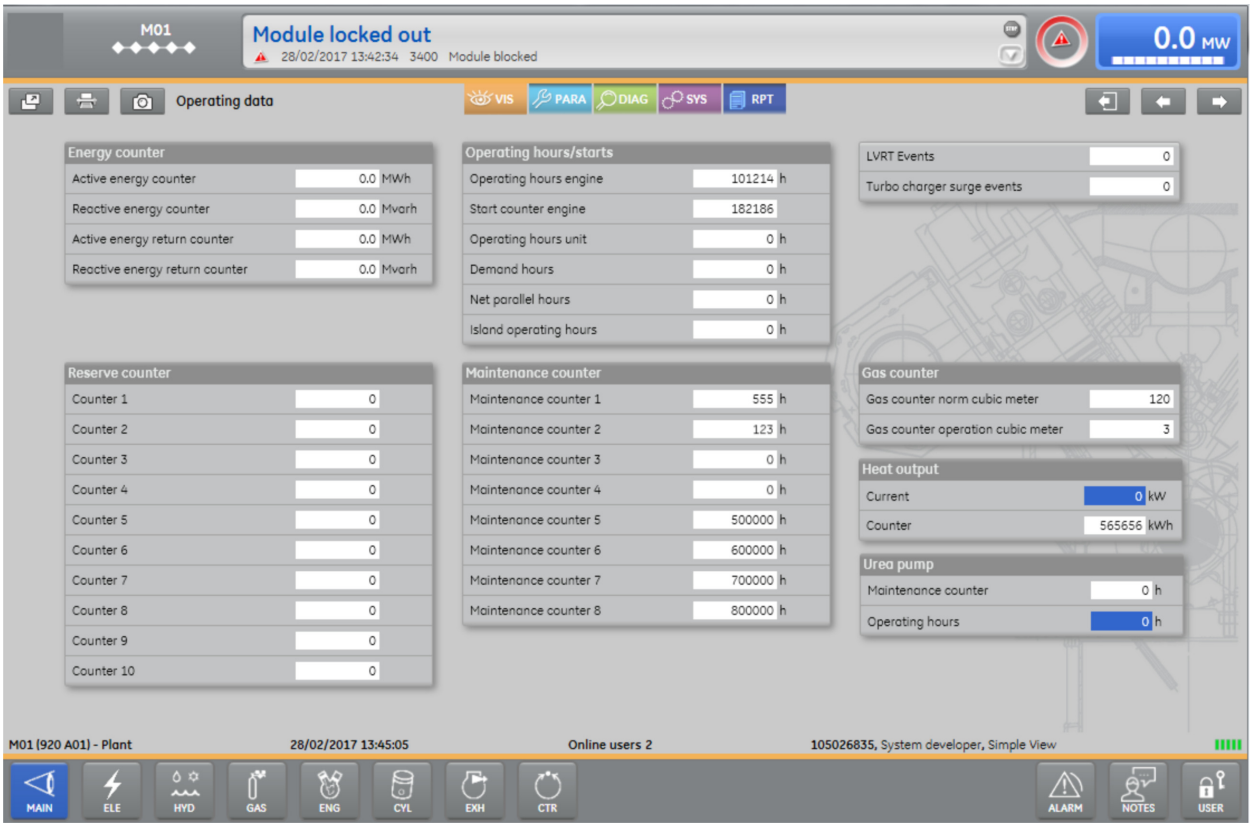
If manual mode ("Man" button) has been selected, another two buttons are enabled to switch the auxiliary on and off. They allow the operator to activate the relevant fan, pump motor, valve motor, control valve, frequency converter, etc. and set a desired fixed value (e.g. room air circulation fan). If any of the above conditions are not met, all the auxiliaries remain in automatic mode (Aut button), or a switch-over takes place without delay, to avoid dangerous statuses from the outset. The function also involves a large number of monitoring operations to prevent undesirable activation situations (e.g. the preheating system cannot be activated until the preheating pump has started / position feedback that louvres are in open position is required before room ventilation can be switched in manually).



To prevent an undesirable, prolonged manual activation of auxiliaries (e.g. deactivation of automatic engine preheating in manual mode) and to implement a running time monitoring operation, manual mode is reset to automatic mode after a time preset by parameters *[Auxiliaries/ Manual operating auxiliaries control/Time maximum for manual activation]*.

13.5 MAIN – Operational data

This screen displays operational data for the engine, including operating hours, number of starts, active energy counter, etc.



Energy counter:

Display	Description	User role for inputs
[Active energy counter]	Active energy counter	Service engineer
[Reactive energy counter]	Reactive energy counter	Service engineer
[Active energy counter received]	Active energy counter reference	Service engineer
[Reactive energy counter received]	Reactive energy counter reference	Service engineer

The counter readings are stored on the multi-function transducer.

Operating hours/starts:

Display	Description	User role for inputs
[Operating hours engine]	Engine operating hours. The engine operating hours counter must be reset to the hours and starts of the newly installed crankshaft when replacing the engine core (crankcase and crankshaft).	Service engineer
[Start counter engine]	Start counter engine	Service engineer
[Operating hours unit]	Module operating hours. The module operating hours counter will not be reset when the engine or other components are reset. This counter is only reset when the module serial number changes.	Service engineer
[Demand hours]	Demand hours (optional)	Service engineer
[Mains parallel hours]	Mains parallel hours (optional)	Service engineer

Display	Description	User role for inputs
[Island operating hours]	Island operating hours (optional)	Service engineer

The counter readings are stored in the control system.

Reserve counter:

Display	Description	User role for inputs
[Reserve counter 1 - 10]	Freely allocatable reserve counters	Customer

The use of these counters is optional, depending on the customer's requirements. The counter readings are stored in the control system.

Maintenance counter:

Display	Description	User role for inputs
[Maintenance counter 1 - 8]	Freely allocatable counters for maintenance intervals	Customer

When the engine is running, the maintenance counters count backwards from the set value. If the counter reading reaches 0, a warning is generated in the alarm management system. The maintenance counters can be allocated in the most appropriate way, depending on the customer's requirements. The counter readings are stored in the control system.

Display	Description	User role for inputs
[LVRT Events]	Number of all detected LVRT events (low voltage ride through – grid code) (optional)	Service engineer
[Turbo charger surge events]	Number of all detected turbocharger surge events. (optional)	Service engineer

Gas counter (optional):

Display	Description	User role for inputs
[Gas counter norm cubic metres]	Gas counter norm cubic metres	Service engineer
[Gas counter operation cubic metres]	Gas counter operational cubic metres	Service engineer

Heat output (optional):

Display	Description	User role for inputs
[Current]	Current	No entry
[Counter]	Counter	Service engineer

Urea pump (optional):

Display	Description	User role for inputs
[Maintenance counter]	Maintenance counter	Service engineer
[Operating hours]	Operating hours	No entry

13.6 MAIN - Statistics

This screen displays performance and status data. In the **[Statistic]** block, different starts are compared with each other. The blocks **[Start performance]** and **[Fast start preperations]** blocks display all relevant data that are important for the start up phase. **[Cylinder State]** visualises the different states of the individual cylinders. CBM Info provides the information of the ATD module.

1 Bar display of the different sections

The times of the individual sequences (Load pick-up, Synchronisation, Engine startup, Start preparation) are displayed in the various bars. The absolute value in seconds is also displayed next to the respective bar

Caution! Since these values are rounded to one second, it can happen that the sum (Total Time) varies by +/- 1 s.

2 Number of "Successful" starts

The number of starts, which had a target power output of more than 95% Prated and at which the target performance was not changed during the startup, is added up in the ring buffer.

3 Evaluation of the last 10 successful startup sequences

The 10 most recent starts that had a target power output of more than 95% Prated and at which the target performance was not changed during the startup are evaluated here

4 Last startup sequence

The last startup sequence is evaluated and displayed here. This bar display enables comparison of the current startup behaviour with previous starts.

5 Target load of the last start

The target load of the last start is displayed here

6 Start performance

This block shows all relevant performance data such as energy generated since start or runtime since last start. The current power ramps are also displayed.

7 Quick start preparations

This block shows all the relevant checks for a quick start and also the current values for oil temperature and other parameters.

The time after which the target load is reached is also displayed.

8 Cylinder status, optional for DMR

The individual cylinder states (Limp home, Trip, ATD, etc.) are visualised with different colours on this engine diagram.

9 ATD instruction, optional for engine type 9
The "After Trip Diagnosis" (ATD) instruction is intended as a decision aid for troubleshooting. Using the PBCMem files, the trip is examined, and the most probable work instruction is displayed.

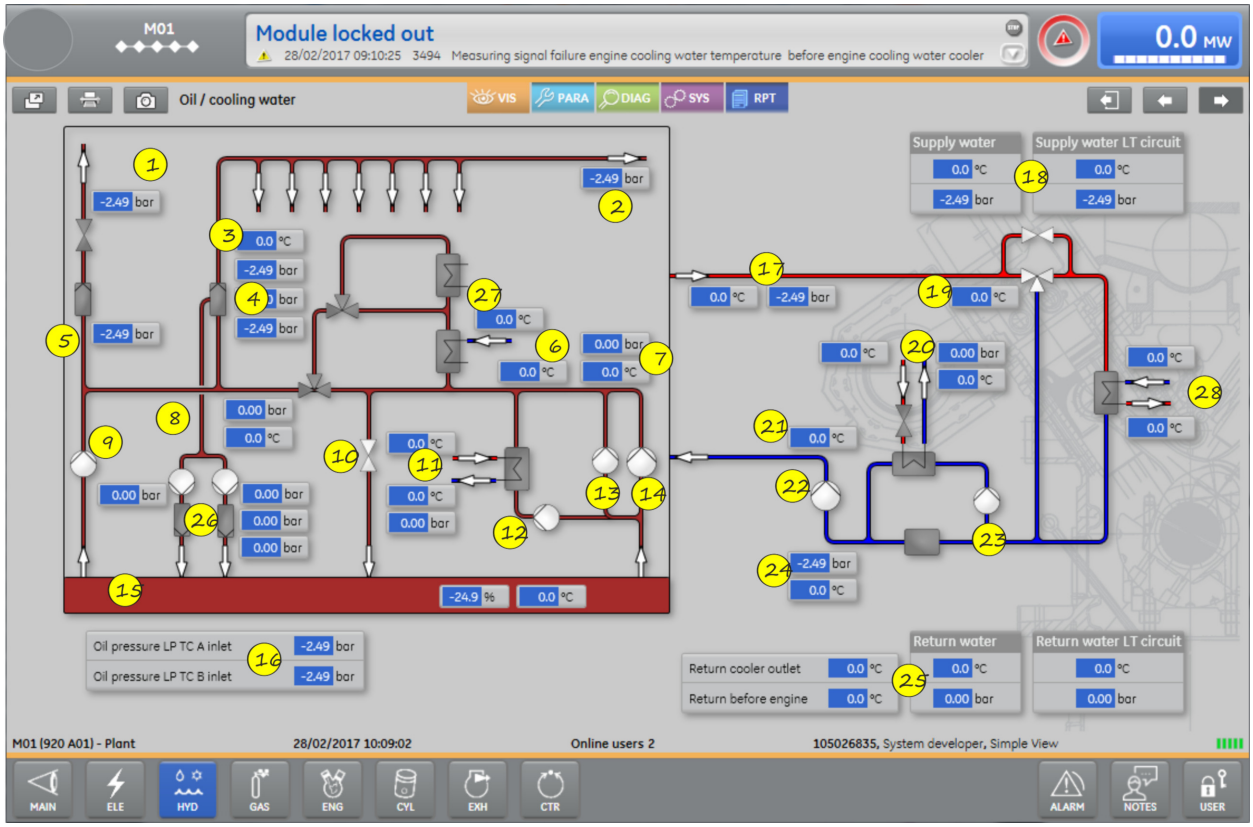
10 Confirmation button, optional for engine type 9

This button must be pressed immediately after executing the ATD instruction, in order for ATD to receive the correct response and to be able to adjust its probabilities accordingly.

13.7 HYD – Hydraulics

This screen displays the main measured values for the oil and cooling water circuits and the statuses of pumps, heaters, valves etc.

The engine oil circuit varies according to the engine type and the cooling water circuit according to the design of the installation.



1 Turbocharger oil pressure downstream of control valve (optional)

2 Oil pressure

3 Oil temperature (optional, J920)

4 Oil filter differential pressure, oil pressure before and after filter (optional)

5 Oil pressure before turbocharger filter (optional)

6 Oil temperature at oil module inlet (optional)

7 Oil temperature and oil pressure after oil pump (optional)

8 Oil pressure and temperature at oil module outlet (optional)

9 Turbocharger post-shut-down lubrication pump and engine prelubrication pump (optional)

10 Oil valve preheating (optional)

11 Oil preheating supply temperature, return temperature and pressure (optional)

12 Three-phase current for prelubrication pump (optional)

13 Direct current for prelubrication pump (optional)

14 Main oil pump

15 Oil level and oil temperature in oil pan (optional)

16 Oil pressure in low-pressure turbocharger at Bank A/B inlet (optional)

17 Cooling water temperature, cooling water pressure downstream of engine (optional)

18 Heating water supply temperature and pressure in high-temperature circuit and low-temperature circuit (optional)

19 Cooling water temperature at module inlet (optional)

20 Hydraulic and/or electric cooling water preheating flow and return temperature and pressure (optional)

21 Cooling water temperature at module outlet (optional)

22 Cooling water pump

23 Preheating pump (optional)

24 Cooling water pressure, cooling water temperature upstream of engine (optional)

25 Return temperature at cooler outlet, return temperature upstream of engine, cooling water return temperature and pressure in high-temperature circuit and low-temperature circuit (optional)

26 Oil filter unit (optional)

The oil filter unit consists of oil centrifuges and oil filters, each with its own oil pumps. The display shows the oil pressure before the centrifuge and the pressures before and after the filter. The oil filter differential pressure is calculated and also displayed.

27 Cooling water temperature upstream of oil cooler (optional)

28 Cooling water temperature upstream of engine cooling water cooler and cooling water temperature upstream of high-temperature charge air cooler (optional)

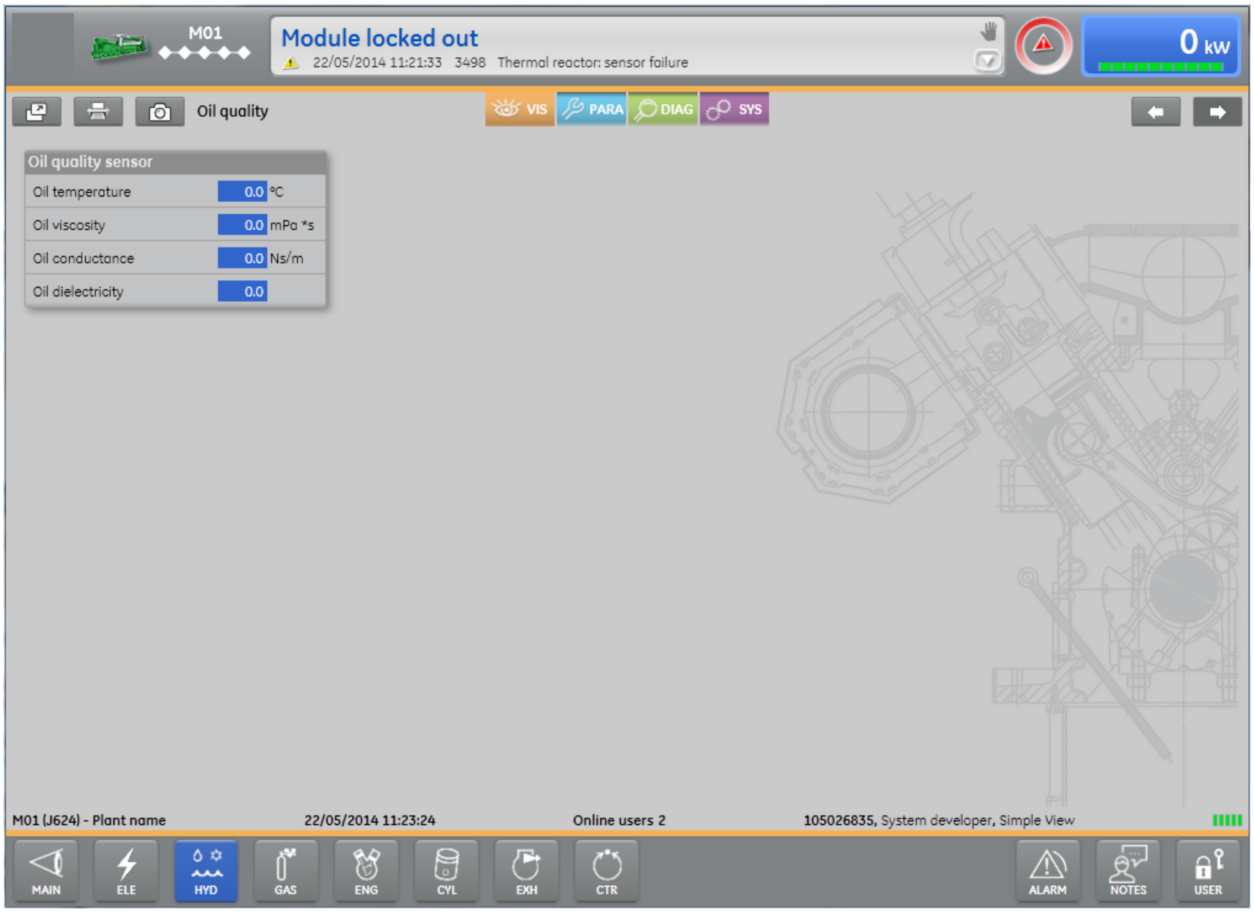
13.8 HYD - Oil counter

The oil amount actually used at the last 20 oil top-ups and the active power supplied between the top-ups are displayed. The results of some calculations such as oil consumption [g/kWh], average power [kW] and operating hours [h] between top-ups are also displayed. The screen is activated and deactivated with the *[Hydraulic/Oil/Oil counter]* parameter.

[Avg]	If the check box is activated, this top-up is included into the average calculation (see blue line at the end of the table).
[Date]	Date of oil top-up
[Op hour]	Engine operating hours at time of oil top-up
[Δ Op hour]	Number of engine operating hours between two oil top-ups (current and previous)
[Δ Active energy]	Active power demand between two oil top-ups
[Avg Power]	Average effective power between two oil top-ups
[Oil volume]	Oil amount topped-up
[Oil consumption]	Average oil consumption since last oil top-up

13.9 HYD – Oil quality

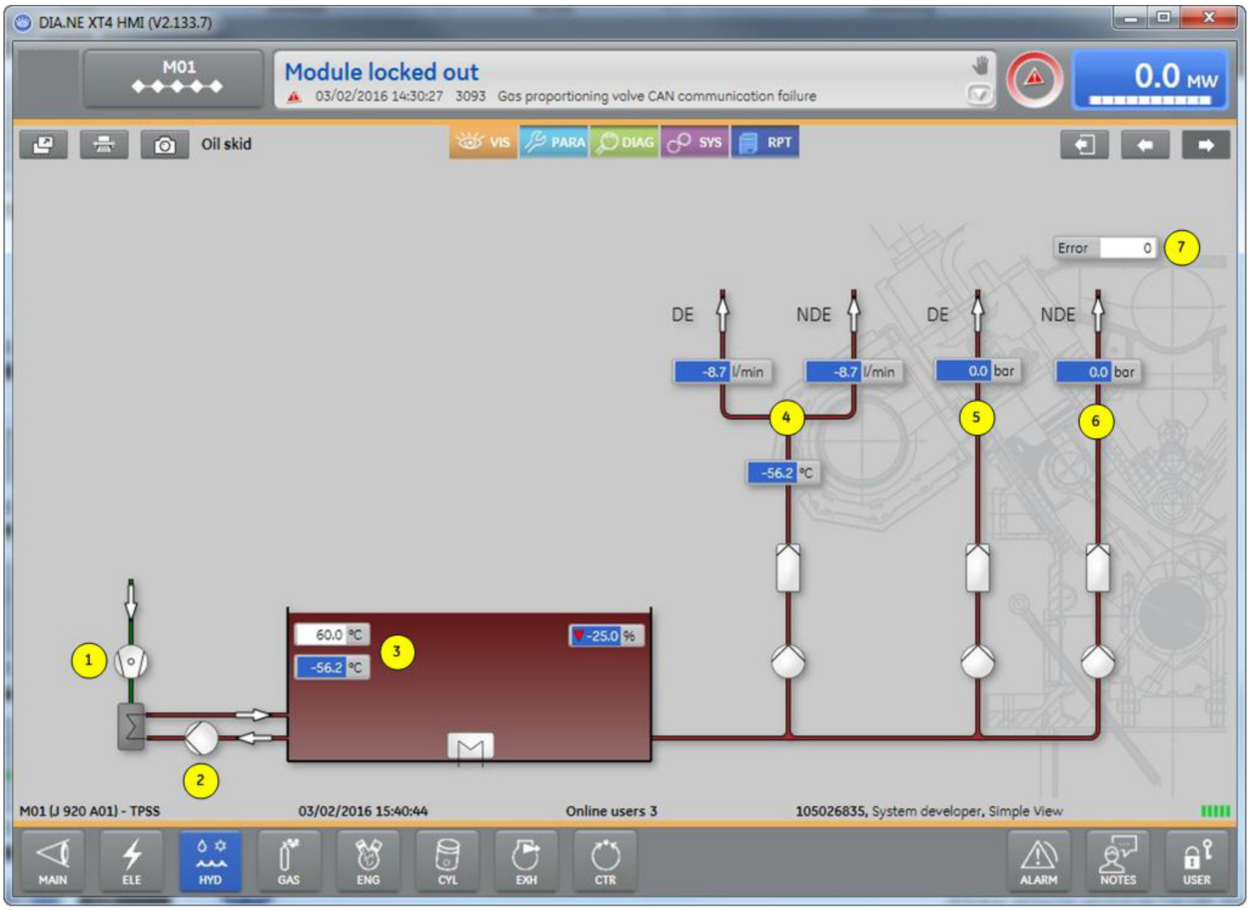
Display of the oil quality sensor data. The screen is activated and deactivated with the *[Hydraulic/Oil/Quality sensor active]* parameter.



[Oil temperature]	Oil temperature
[Oil viscosity]	Oil viscosity
[Oil conductance]	Oil conductance
[Oil dielectricity]	Oil dielectricity

13.10 HYD oil skid

This screen shows the lubricating oil system (oil skid) for Type 9 generators.



1 **Cooling fan**

2 **Oil circulation pump**

3 **Oil tank:**

Temperature set/actual value, level indicator, heating oil preheating

4 **Cooling lubrication circuit:**

Flow rate at drive end/non-drive end

Supply temperature

Indication for filter and low-pressure pump

5 **Oil pressure in high-pressure circuit at drive end**

Indication for filter and high-pressure pump

6 **Oil pressure in high-pressure circuit at non-drive end**

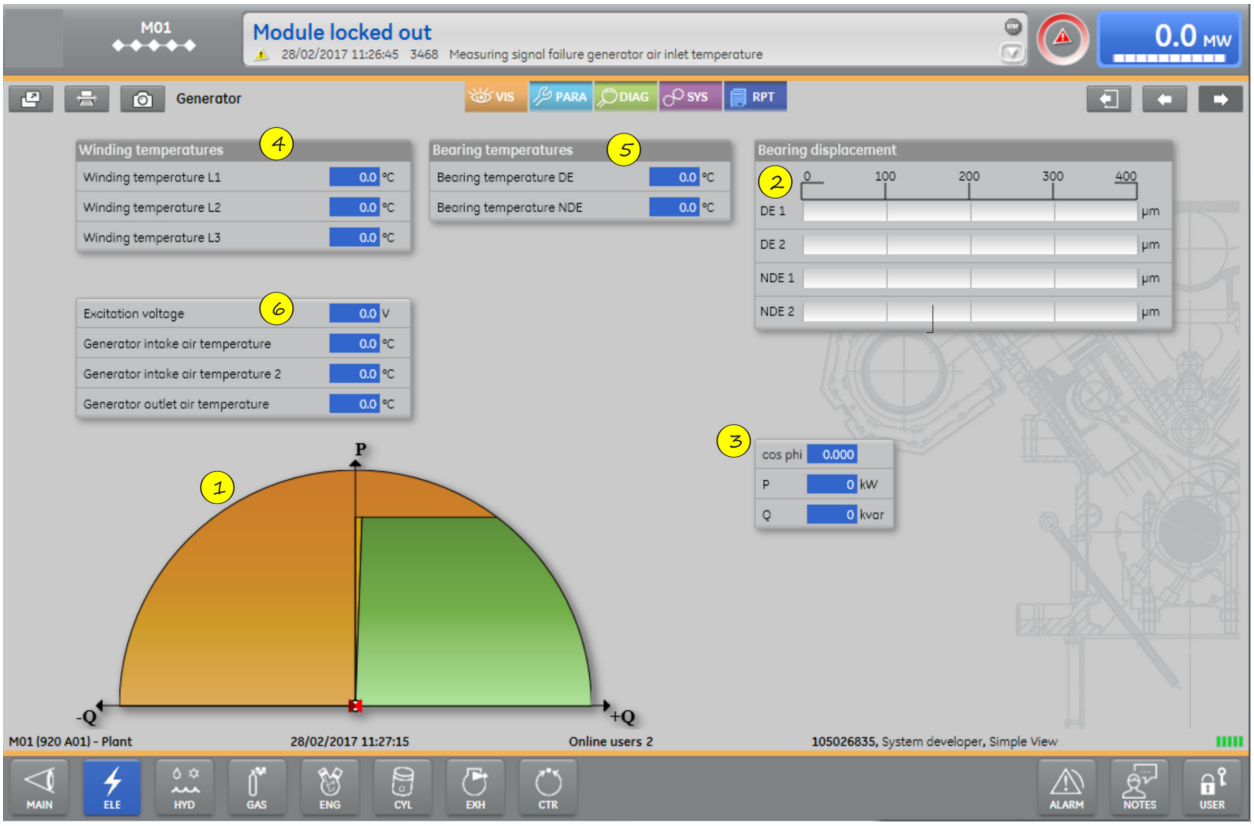
Indication for filter and high-pressure pump

7 **Counter for standstill without high-pressure oil system (hydraulic jacking)**

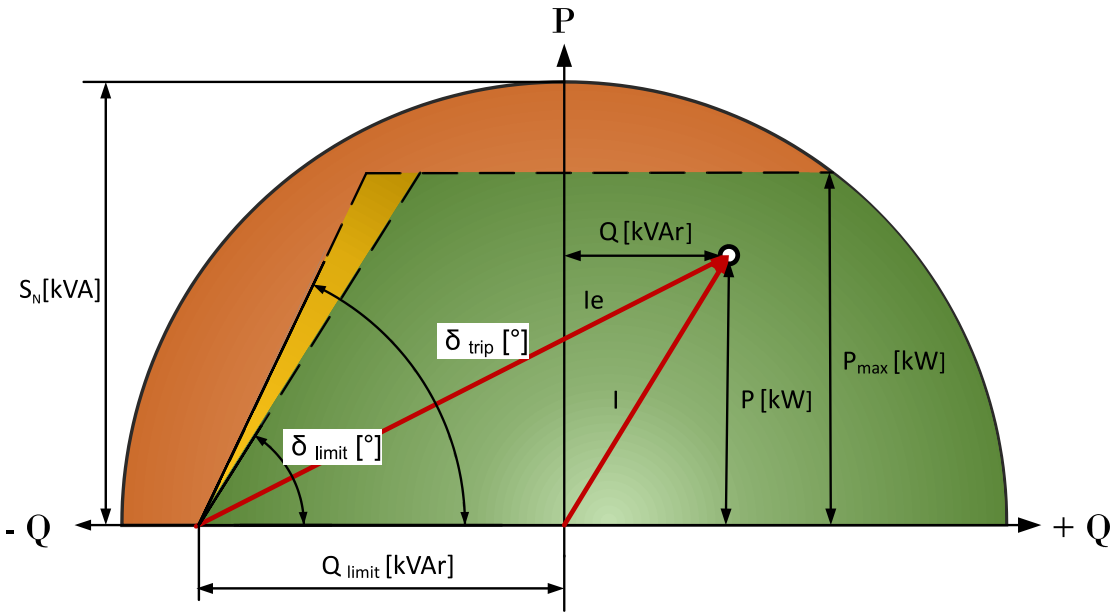
13.11 ELE - Generator

This screen displays the operating diagram of the synchronous generator and also optionally the bearing and winding temperatures.

Details on the operation and parametrisation of the generator controller are included in the Technical Instruction 1530-0182 - Generator power reduction and reactive power management .



1 **P/Q operating diagram of the synchronous generator**



The P/Q operating diagram of the synchronous generator shows the current operating point (white spot) with the current vectors and the operating ranges. The valid operating range is marked in green, with the transitional range in yellow and the prohibited range in red.

If the control limit value for reactive power is reached (yellow range) and generator control is activated, an operational message is issued and control is restricted to this value. If the maximum reactive power is reached (exciter failure value, red range), the exciter failure trips the engine.

Q [kVAr]	... current reactive power in kilovolt amperes reactive
P [kW]	... current active power in kilowatts
P_{max} [kW]	... maximum active power in kilowatts
S_N[kVA]	... rated apparent power in kilovolt amperes
Q_{limit}[kVAr]	... reactive power limit in kilovolt amperes reactive
δ_{limit} [°]	... control limit load angle in degrees
δ_{trip} [°]	... maximum (trip limit) load angle in degrees

2 **Display showing the generator bearing offset (optional)**

DE...Drive End

NDE...Non-Drive End

3 **Display of electrical measured values**

The following electrical measured values are displayed:

Abbreviation	Designation	Unit
[P]	Active power	Kilowatts
[Q]	Reactive power	Kilo-Volt-Ampere-reactive
[cos phi]	Power factor (cos phi)	

4 **Generator winding temperature**

Display showing the temperatures of one or three generator stator windings (optional).

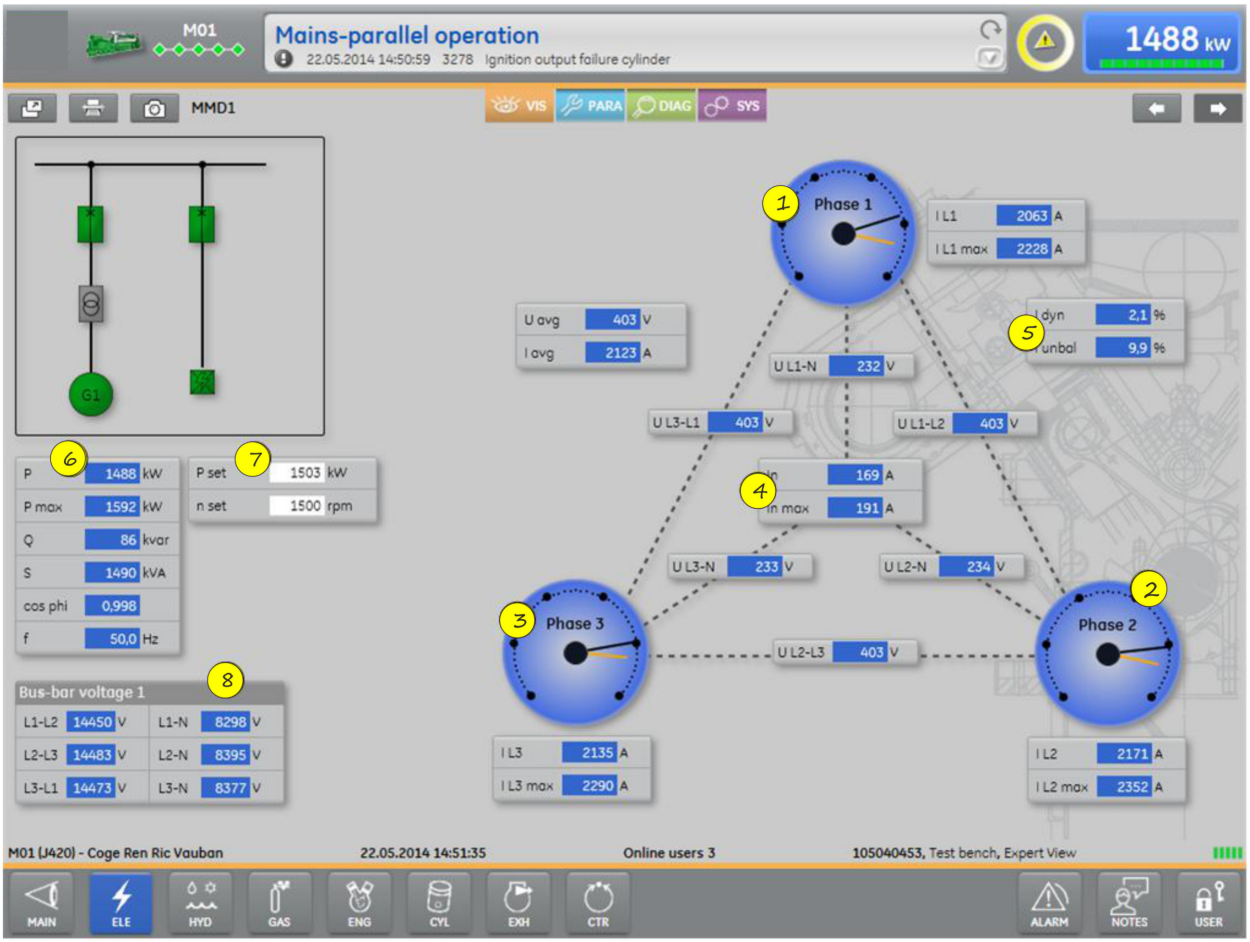
5 **Generator bearing temperature**

Display showing the temperature of one or both generator bearings (optional).

6

Abbreviation	Designation	Unit
[Excitation voltage]	Generator excitation voltage	Volts
[Generator intake air temperature]	Generator intake air temperature (optional)	Degrees Celsius
[Generator intake air temperature 2]	Generator intake air temperature 2 (optional)	Degrees Celsius
[Generator outlet air temperature]	Generator outlet air temperature (optional)	Degrees Celsius

13.12 ELE multi-measurement device



1 Phase 1 [Phase 1]

[IL1]	Phase 1 current
[IL1 max]	Maximum Phase 1 current
[UL1-L2]	Voltage between Phase 1 and Phase 2
[UL1-N]	Voltage between Phase 1 and neutral conductor

2 Phase 2 [Phase 2]

[IL2]	Phase 2 current
[IL2 max]	Maximum Phase 2 current
[UL2-L3]	Voltage between Phase 2 and Phase 3
[UL2N]	Voltage between Phase 2 and neutral conductor

3 Phase 3 [Phase 3]

[IL3]	Phase 3 current
[I3max]	Maximum Phase 3 current
[UL3L1]	Voltage between Phase 3 and Phase 1
[UL3-N]	Voltage between Phase 3 and neutral conductor

4 and 5

[In]	Neutral current
[In max]	Maximum neutral current
[Iadyn]	Dynamic pulsation amplitude of the phase currents to assess the smooth running of the engine while in mains-parallel operation. Ideally, the lowest possible value should be displayed.
[Iunbal]	Calculated negative phase sequence current (unbalanced phase load) referred to the generator rated current.

6

[P]	Electrical power
[P max]	Maximum electrical power
[Q]	Reactive power
[S]	Apparent power
[cos phi]	Power factor (negative value = capacitive, positive value = inductive)
[f]	Frequency

7

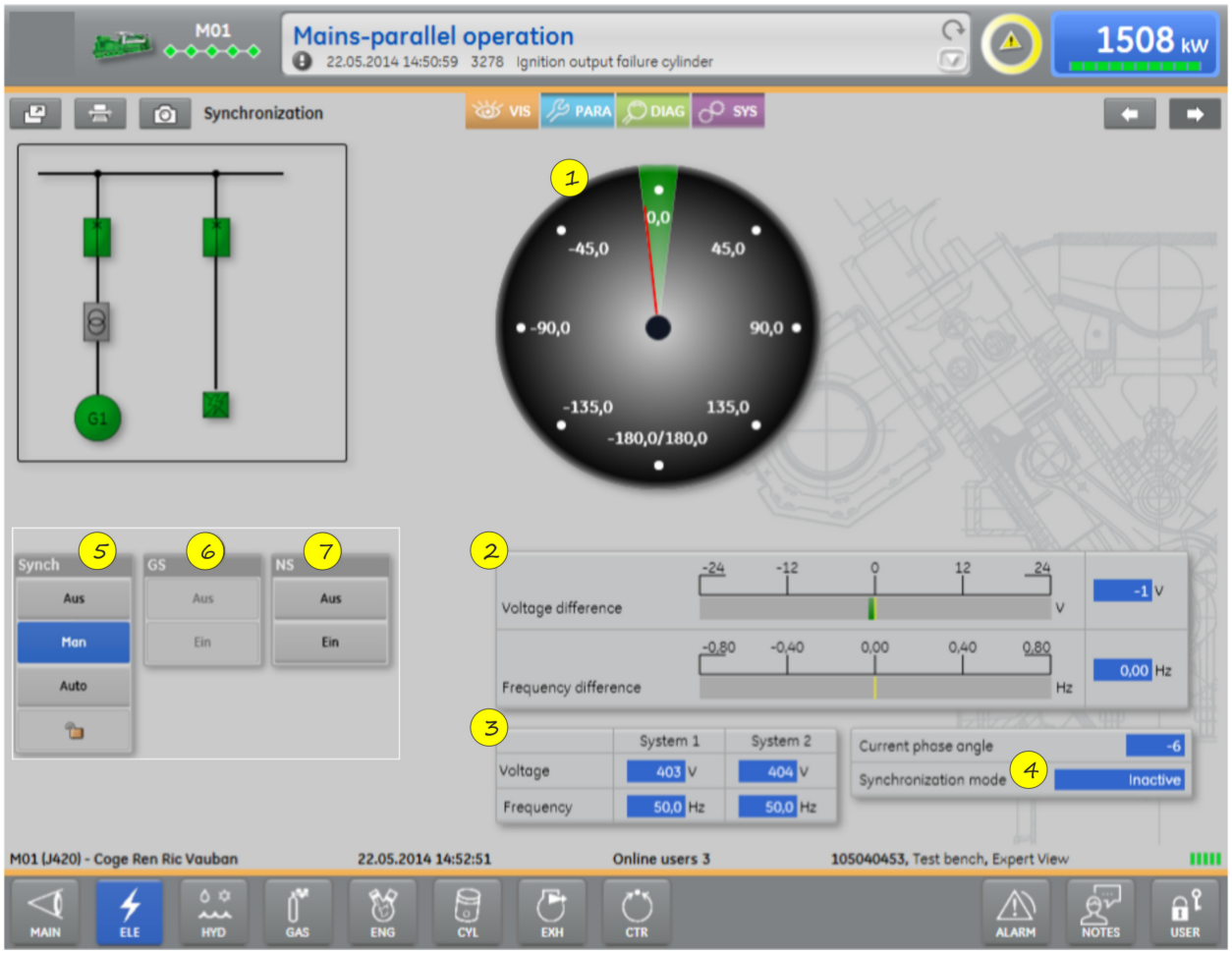
[P Set]	Power setpoint
[n set]	Speed setpoint

8 **Bus-bar voltage 1**

Bus-bar voltage 1 and frequency (only shown if the generator switch is open)

13.13 ELE – Synchronisation

This screen shows a synchronoscope with all the measurements necessary for synchronisation.

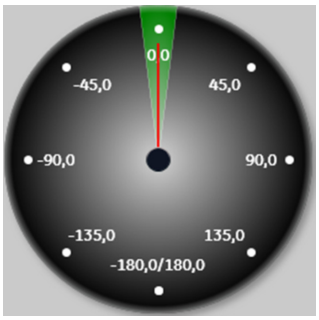


1 Synchronoscope

The synchronoscope is used to display the changes in phase position during the synchronisation process. The position of the pointer corresponds to a figure of **Φ diff.** The value is displayed from -180.0 to +180.0 degrees.

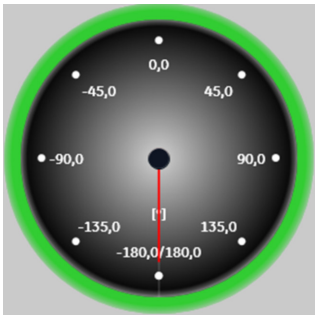
The synchronoscope pointer indicates the current phase position. The lower the differential frequency, the more slowly the pointer moves.

Permissible connection range:



This connection condition is satisfied if the synchronisation pointer is within the permissible phase position (green).

Synchronisation completed



Synchronisation is completed when the power breaker feedback indicates this. This status is displayed by a green disc. This provides a check as to whether the control system is trying to close the breaker.

Deviation from measured value in synchronised condition

Deviations may occur in the measured values because of errors in the measurement accuracy tolerance, despite the fact that the systems are electrically linked.

2 Voltage difference

The current voltage difference between the two networks to be synchronised (U diff = U system 1 - U system 2) is displayed.

Frequency difference:

The actual current frequency difference between the two networks to be synchronised (f diff = f system 1 - f system 2) is displayed.

3 Comparison of two electrical systems:

[System 1]

The current voltage and frequency of electrical system 2 are displayed under the entry **[System 1]** . System 1 is activated at the X4 terminals of the multi-measurement device. The voltage closer to the generator is displayed here during the synchronisation procedure.

Examples:

When the generator breaker is being synchronised, the generator voltage is displayed here.

When the mains breaker is being synchronised, the bus-bar voltage is displayed here

[System 2]

The current voltage and frequency of electrical system 2 are displayed under the entry **[System 2]** . System 2 is activated at the X6 terminals of the multi-measurement device. The voltage closer to the mains is displayed here during the synchronisation procedure.

Examples:

When the generator breaker is being synchronised, the bus bar or mains voltage is displayed here.

When the generator breaker is being synchronised, the generator voltage is displayed here

4 Phase angle

The current phase angle Φ diff (-180,0 to +180,0 °) between the networks being synchronised is displayed here.

Synchronisation mode:

There are three ways in which synchronisation can be performed:

Inactive:

No function has been selected, or synchronisation has already been completed

Slip:

The following applies to the generator and synchronisation voltage:

50% < U < 125% of nominal voltage UN

80% < f < 110% of nominal frequency fN

The generator voltage is adjusted to the synchronisation voltage in terms of amplitude and frequency. The switch command is calculated and executed in advance to take account of the parameterised phase angle, a preset transformer connection circuit and the switch response time so that the main contacts of the power switch are closed at the point of synchronisation.

Synchronisation takes place subject to the following conditions:

- The "Select synchronisation" command is set in the software
- The parameterised limit for the voltage difference has been maintained (dUmax)
- The parameterised limits for the frequency difference have been maintained (dfmax and dfmin)
- The parameterised limit for the phase angle (including transformer connection circuit) has been maintained (dalpha)

If all the conditions have been satisfied, the activation output changes its condition from LOW to HIGH. When the parameterised pulse period has ended, it switches back from HIGH to LOW.

Synchro Check

In this operating mode the device can be used as a synchronisation control.

The “Close LS” relay remains attached as long as the following conditions are satisfied:

- The “Release synchro check” command is set in the software
- The parameterised limit for the voltage difference has been maintained (dUmax)
- The parameterised limits for the frequency difference have been maintained (dfmax and dfmin)
- The parameterised limit for the phase angle has been maintained (phimax)

The activation output remains set so long as all the conditions are satisfied.

Dead bus

The activation command for the power switch is issued without synchronisation if the following conditions are satisfied:

- The "Release dead bus" command is set in the software
- The bus bar is dead (USS < 5% UN)
- The generator voltage and frequency can have any valid value.

If all the conditions have been satisfied, the activation output changes from LOW to HIGH.

5 **Synchronisation selector switch** (only visible on the panel)

Selecting the type of synchronisation.

- **OFF:** Generator breaker synchronisation is aborted / blocked
- **MANUAL:** Automatic synchronisation initiation and aborting by generator breaker On/Off.
- **AUTO:** Fully automatic synchronisation.

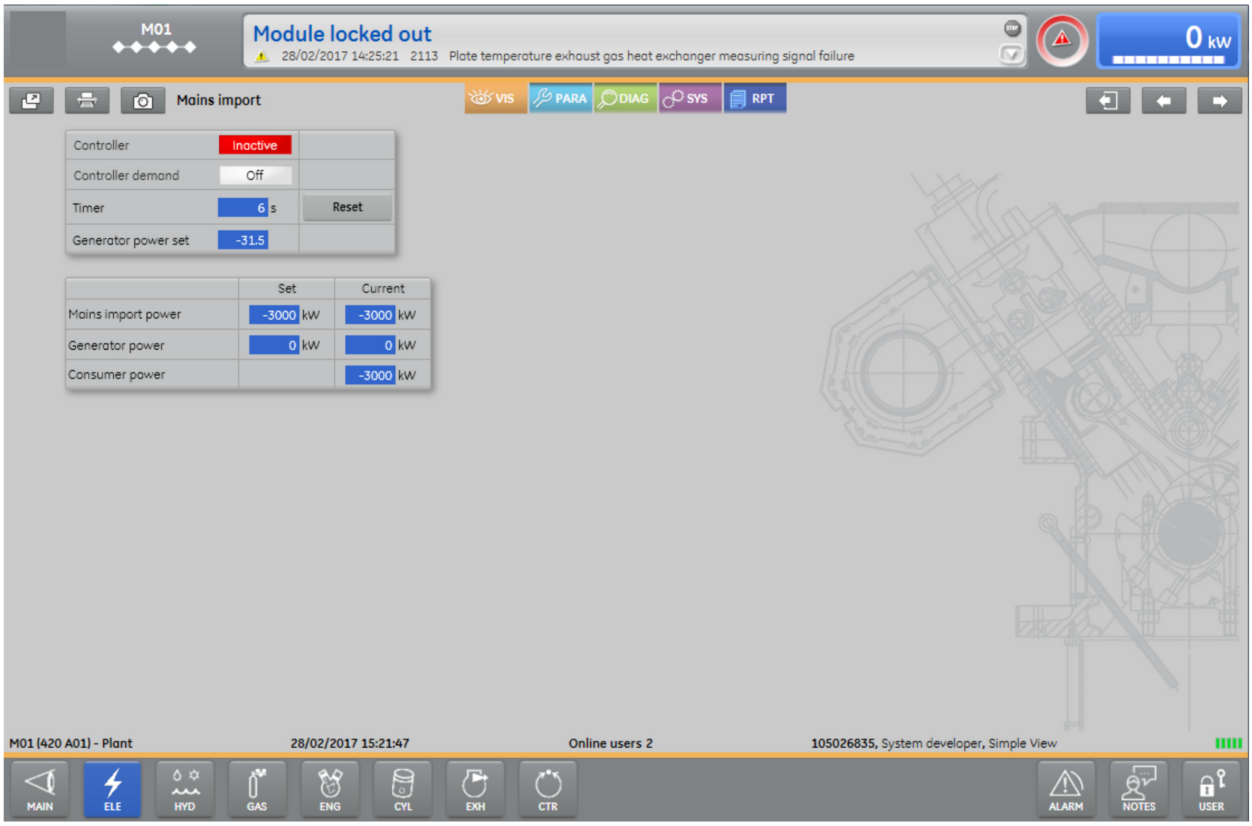
6 **Generator breaker On/Off (only visible on the panel)**

Generator breaker actuation when the synchronisation selector switch is set to "Off" or "Man". The precise function description can be found in the technical specification for the control system.

7 **Mains breaker On/Off** (only visible on the panel)

Mains breaker actuation when the synchronisation selector switch set to "Off" or "Man". The precise function description can be found in the technical specification for the control system.

13.14 ELE system interconnection

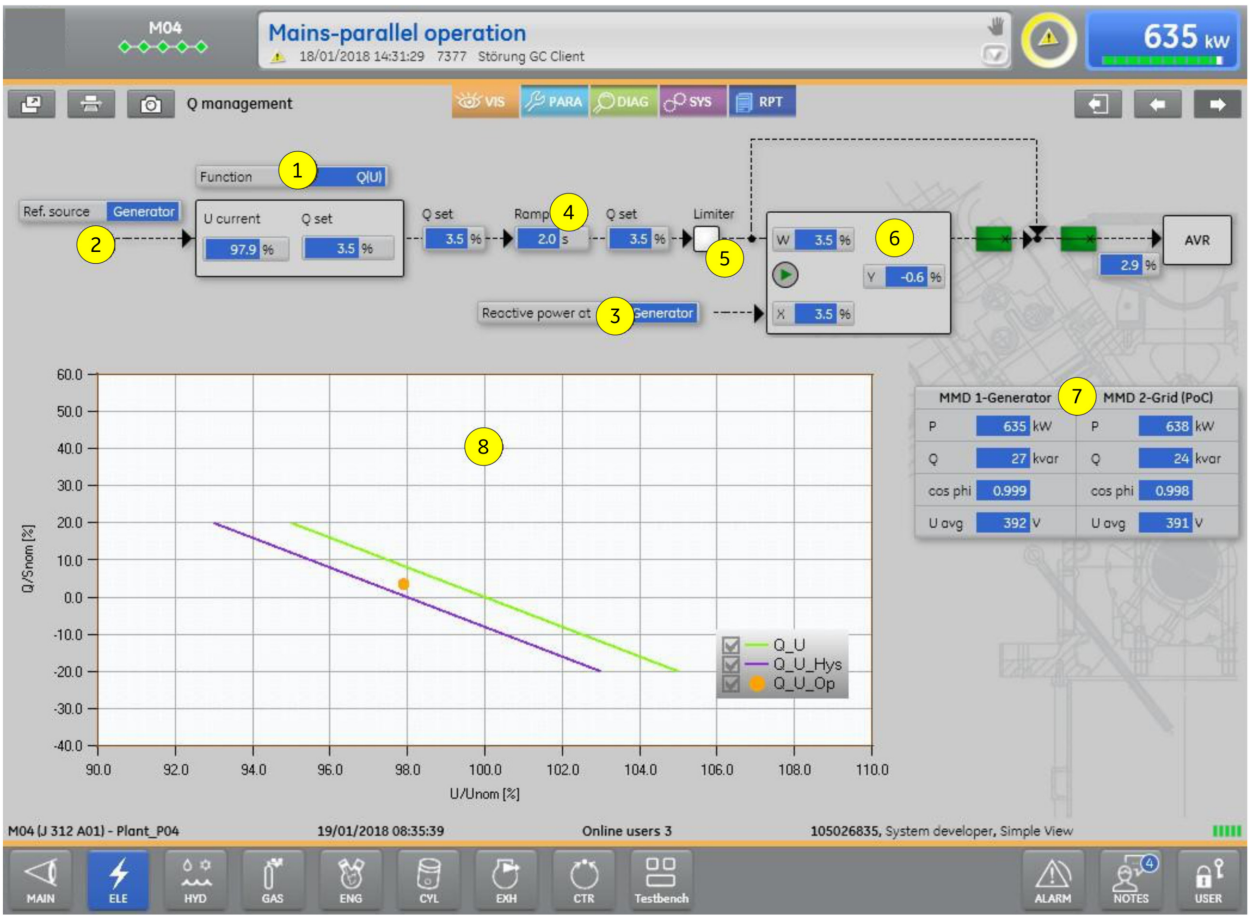


This screen displays an overview of the system interconnection controller and system interconnection outputs.

Display	Description
[Controller]	Status display for the system interconnection controller (active/inactive)
[Controller demand]	Status display showing the demand from the engine via the system interconnection controller (on/off)
[Timer]	Delay in demand from the engine via the system interconnection controller (time adjustable by means of parameters)
[Reset]	Reset of delay to 0 (demand is executed without further delay)
[Generator power set]	Generator power rating as %.
[Mains import power]	Setpoint value of system interconnection output (by means of parameters or analogue input signal) Actual value of system interconnection output (by means of analogue input signal)
[Generator power]	Setpoint and actual value of generator power in kW.
[Consumer power]	Consumed output (current generator output + current system interconnection output)

13.15 ELE - Q Management

This screen shows the selected reactive power function, control point, limiter status and the current operating point.



1 Current reactive power function and corresponding input/output values

2 Reference point: Defines the measuring point at which the reference voltage/power is measured.

3 Control point: Defines the measuring point at which reactive power, cos phi or voltage is regulated.

4 Ramp time display

5 Status display: Reactive power limiter (winding temperature, underexcitation, Q(U))

6 Reactive power regulator: Display of set/actual/control value

- The status symbol indicates an active ▶ or inactive ■ controller.

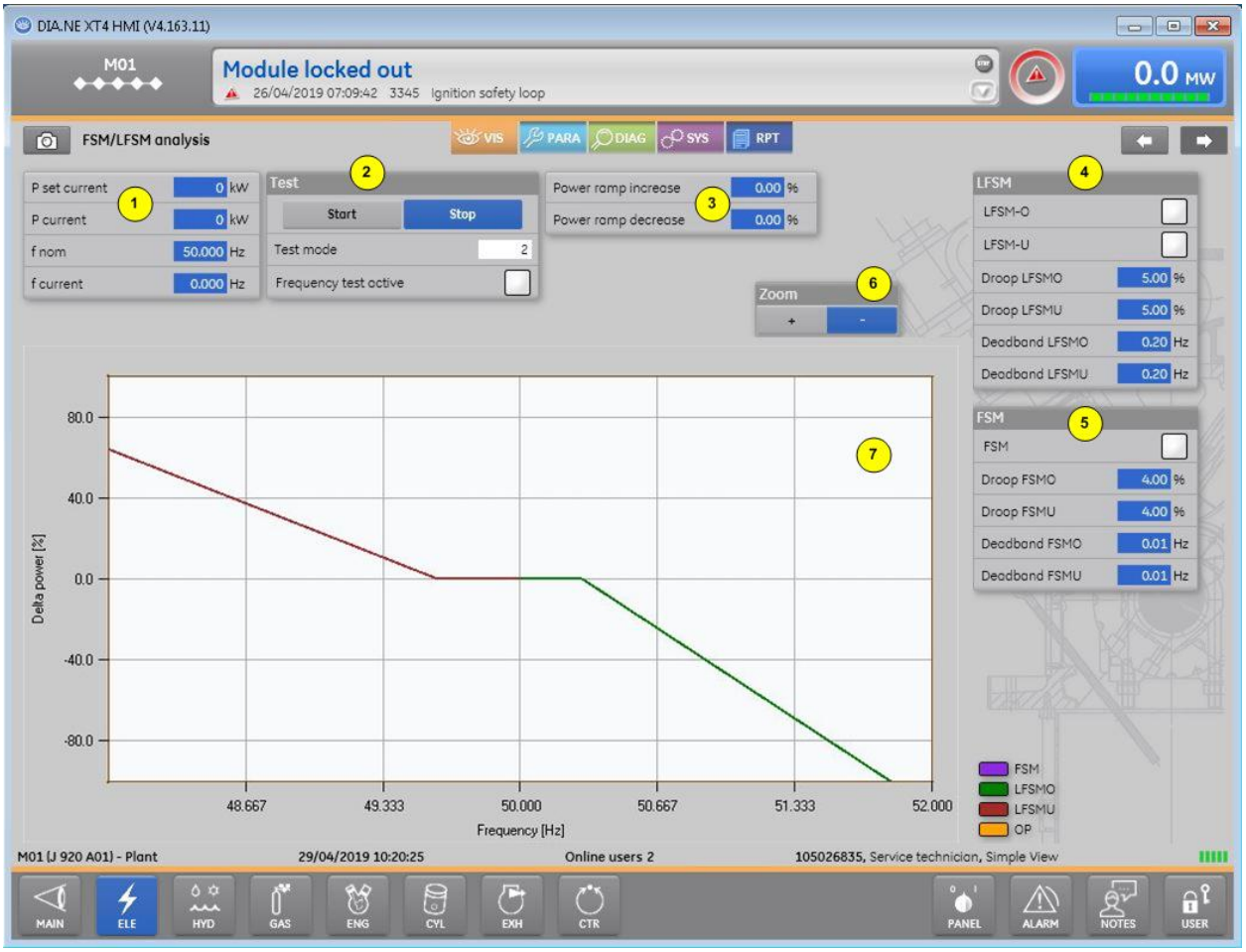
7 Measured value display of MMU1/2

- - [P] Electrical power
- - [Q] Reactive power
- - [cos phi] Power factor (negative value= underexcited, positive value=overexcited)
- - [U avg] Phase-to-phase voltage, averaged

8 The x/y diagram shows the defined characteristic curve and the current operating point.

13.16 ELE - FSM/LFSM analysis

This screen is used to display the selected active power function depending on the frequency. In addition, all relevant setting values are displayed. A test function facilitates a basic function test.



1

[P set current]	Current set power
[P current]	Current actual power
[f nom]	Shows the nominal frequency The nominal frequency can be simulated by setting Test mode to 2 and clicking the Start button (input active).
[f current]	Shows the actual frequency The actual frequency can be simulated by setting Test mode to 4 and clicking the Start button (input active).

2

[Start/Stop]	Start/Stop button for test function (Service Technician user role)
[Test mode]	Test mode input options (Service Technician user role) 0...not used 1...Automatic test run: the nominal frequency is varied according to a predefined scheme 2...Manual test: the nominal frequency can be set individually 3... Automatic test run: the actual frequency is varied according to a predefined scheme 4... Manual test: The actual frequency can be set individually
[Frequency test active]	Status display Frequency test active/inactive

3

[Power ramp increase]	Shows the currently set power ramp increase
[Power ramp decrease]	Shows the currently set power ramp decrease

4 LFSM: Shows the current settings for the LFSM function

[LFSM-O]	Status display LFSM-O
[LFSM-U]	Status display LFSM-U
[Droop LFSMO]	Droop LFSMO
[Droop LFSMU]	Droop LFSMU
[Deadband LFSMO]	Deadband LFSMO
[Deadband LFSMU]	Deadband LFSMU

5 FSM: Shows the current settings for the FSM function

[FSM]	Status display FSM
[Droop FSMO]	Droop FSMO
[Droop FSMU]	Droop FSMU
[Deadband FSMO]	Deadband FSMO
[Deadband FSMU]	Deadband FSMU

6 Zoom for y-axis

[+]	X-axis from -48 Hz to +52 Hz; Y-axis from -80% to +80%
[-]	X-axis from -49.8Hz to +50.2Hz; Y-axis from -8% to +8%

7 X/Y diagram

The following functions or operating points are displayed.

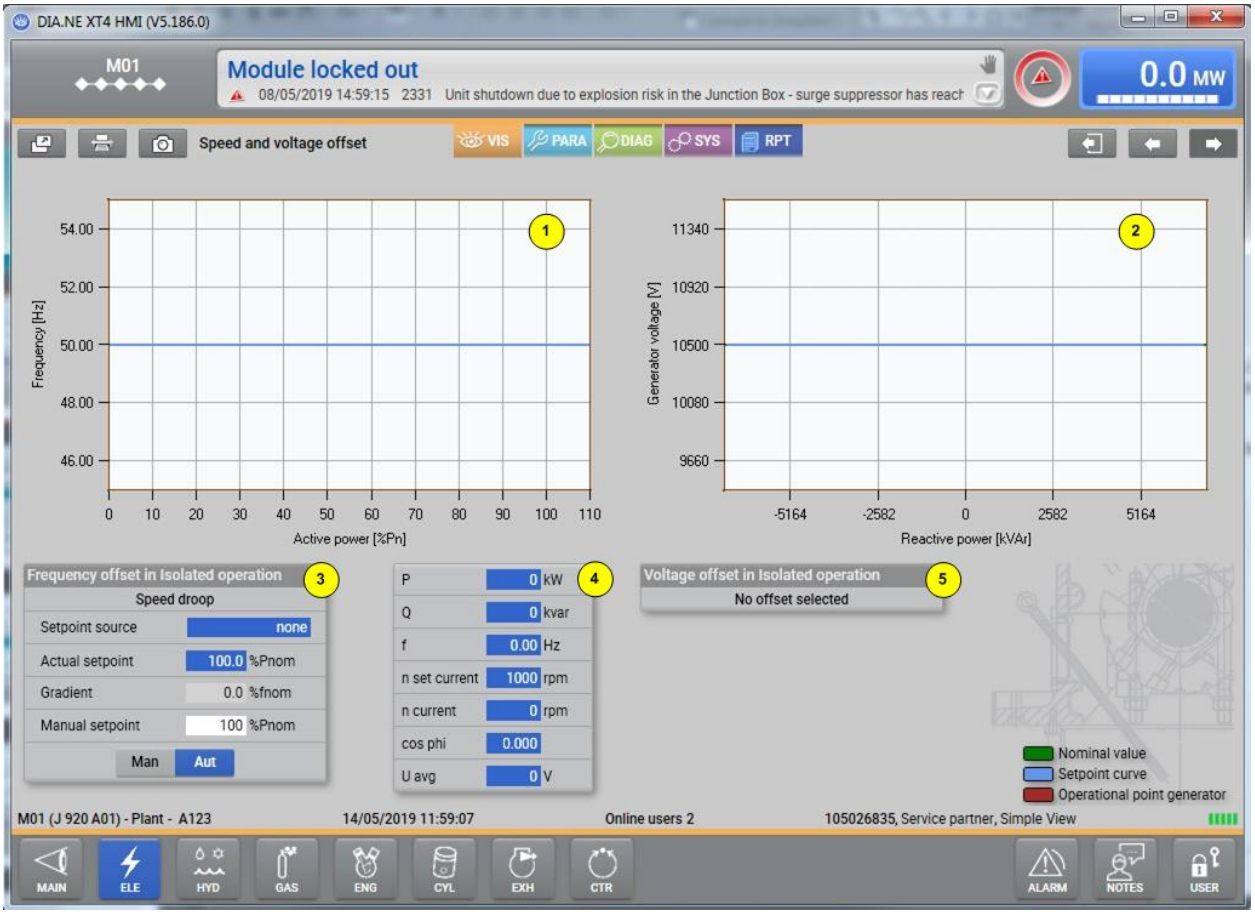
FSM	FSM
LFSMO	LFSMO
LFSMU	LFSMU
OP	Operating point

13.17 ELE - Frequency/voltage offset

This screen shows the speed and voltage droop of the module control, on which the set speed and voltage values are based that are relevant for the engine and the generator in isolated operation. Furthermore, the current operating points with respect to frequency, active power, voltage and reactive power are displayed as red dots. The preset nominal frequency and voltage of the overall system is shown as a green horizontal line for improved guidance.

This overview serves to better illustrate the control behaviour in speed-controlled mode, for example in applications without grid connection or in micro-grid environments (load sharing between Jenbacher gas engines and other power generators such as turbines, solar power plants, battery systems or other gas engines), in which sharing of the active load and reactive power between all power generators in the network is necessary.

The screen is displayed if one of the two parameters 14298 [Engine/Isolated Operation/Load sharing/Voltage offset set point in island mode] or 14300 [Engine/Isolated Operation/Load sharing/Frequency / speed offset set point in island mode] is unequal to zero. Using the parameters mentioned, you can choose between the load distribution variants described in the following tables (points 3 & 4).



1 Display of speed droop and offset

2 Display of the voltage droop

3 Frequency offset in isolated operation

[Active load sharing]	Depending on parameter 14300, the display shows: 0 = No offset selected 1 = Frequency droop 2 = External offset 3 = Load distribution
[Setpoint source]	Setpoint source: 0 = none 1 = analog 2 = BUS 3 = HMI
[Gradient]	Gradient
[Manual setpoint]	Manual setpoint
[Man/Aut]	Manual/Automatic mode

4 Electrical measured values

[P]	Active power
[Q]	Reactive power

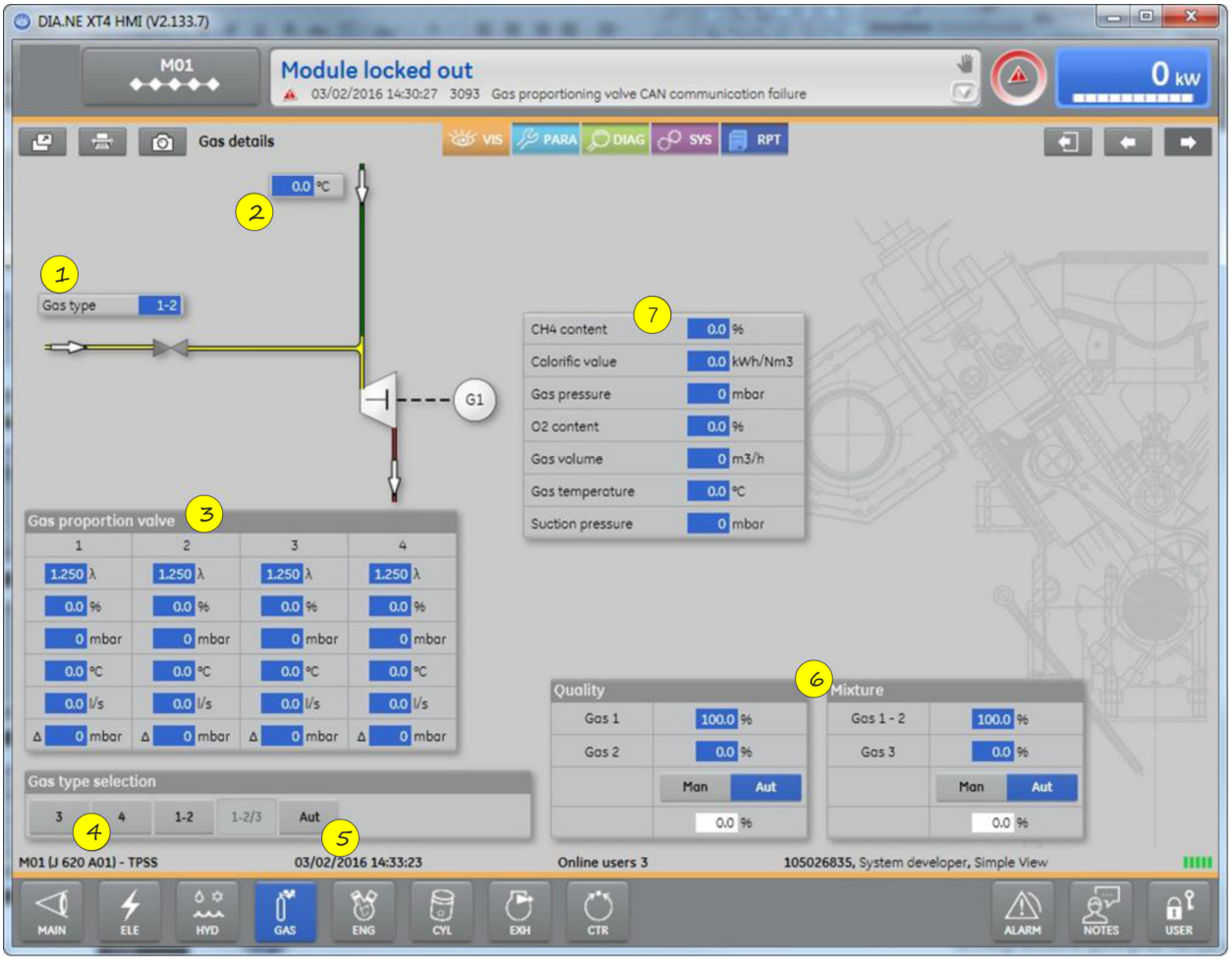
[f]	Frequency
[n set current]	Current speed setpoint
[n current]	Actual speed
[cos phi]	Cos phi
[U avg]	Voltage average value

5 **Voltage droop in isolated operation**

[Reactive load sharing]	Depending on parameter 14298, the display shows: 0 = No function selected for reactive load distribution 1 = Voltage droop 2 = External offset
[Gradient]	Gradient of the voltage droop (only displayed if parameter 14298 = 1)

13.18 GAS – Gas

This screen shows the gas mixer / gas proportioning valve position and other gas-specific data. Depending on the design of the installation, a gas switching system and a gas mixture may also be included.



1 **Gas type**

Display showing the gas type.

Gas type	Description
[1]	Gas type 1
[2]	Gas type 2
[3]	Gas type 3
[4]	Gas type 4
[1-2]	Gas quality = interpolation between the gas 1 and gas 2 parameter sets
[1-2/3]	Gas 1-2 (gas train 1) mixed with gas 3 (gas train 2)
[1/3]	Gas 1 (gas train 1) mixed with gas 3 (gas train 2)

2 **Intake air temperature** (optional)

3 **Gas proportioning valve** (optional)

Display of the Lambda set value [Lambda], the position [%], the gas pressure [mbar], the gas temperature [°C] and the gas flow [l/s] of a maximum of 4 gas proportioning valves.

Gas mixer (optional)

Gas mixer position 1 displayed as a percentage.

4 **Manual gas type selection**

It is possible to select up to four different gas types and mixed gas operation modes **[1-2], [1-2/3], [1-3]**, depending on the design of the plant.

The gas type selected is indicated by a change of colour from grey to blue. After switching from one gas type to another, the new gas type is displayed in the 1 **[Gas type]** box.

5 **Automatic gas type selection**

Activation of the automatic gas type selection.

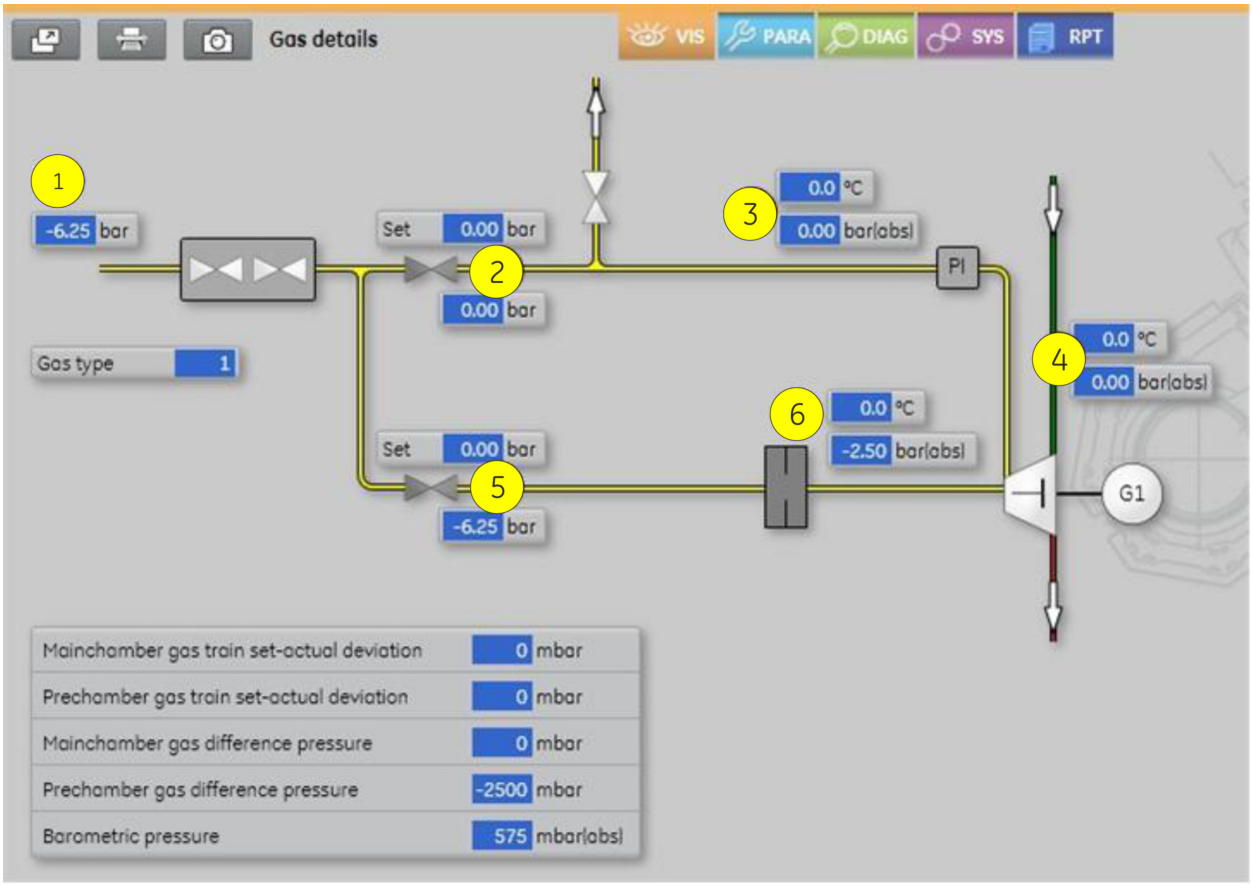
6 **Gas quality and gas mixture** (optional)

Depending on the plant design, and the gas quality (CH4 signal) **[Quality]**, interpolation between gas type 1 and gas type 2 and a gas mixture **[Mixture]** between gas trains 1 and 3 is possible. For both operating modes, automatic or manual mode can be selected using the **[Aut/Man]** selection button.

7 **Special gas:**

[CH4 Content]	CH4 content
[Calorific value]	Calorific value
[Gas pressure]	Gas pressure
[O2 content]	O2 content
[Gas volume]	Gas flow rate
[Gas temperature]	Gas temperature
[Suction pressure]	Suction pressure

Gas details for J920 (optional):



1 **Main chamber gas train - gas pressure after gas filter**

2 **Main chamber gas train - set pressure/gas pressure at train outlet - calculated**

3 **Gas temperature/Gas rail pressure**

4 **Intake air temperature/Charge pressure (p2')**

5 **Prechamber gas train - set pressure/prechamber gas pressure at train outlet**

6 **Prechamber gas temperature (gas train)/Prechamber gas pressure (engine)**

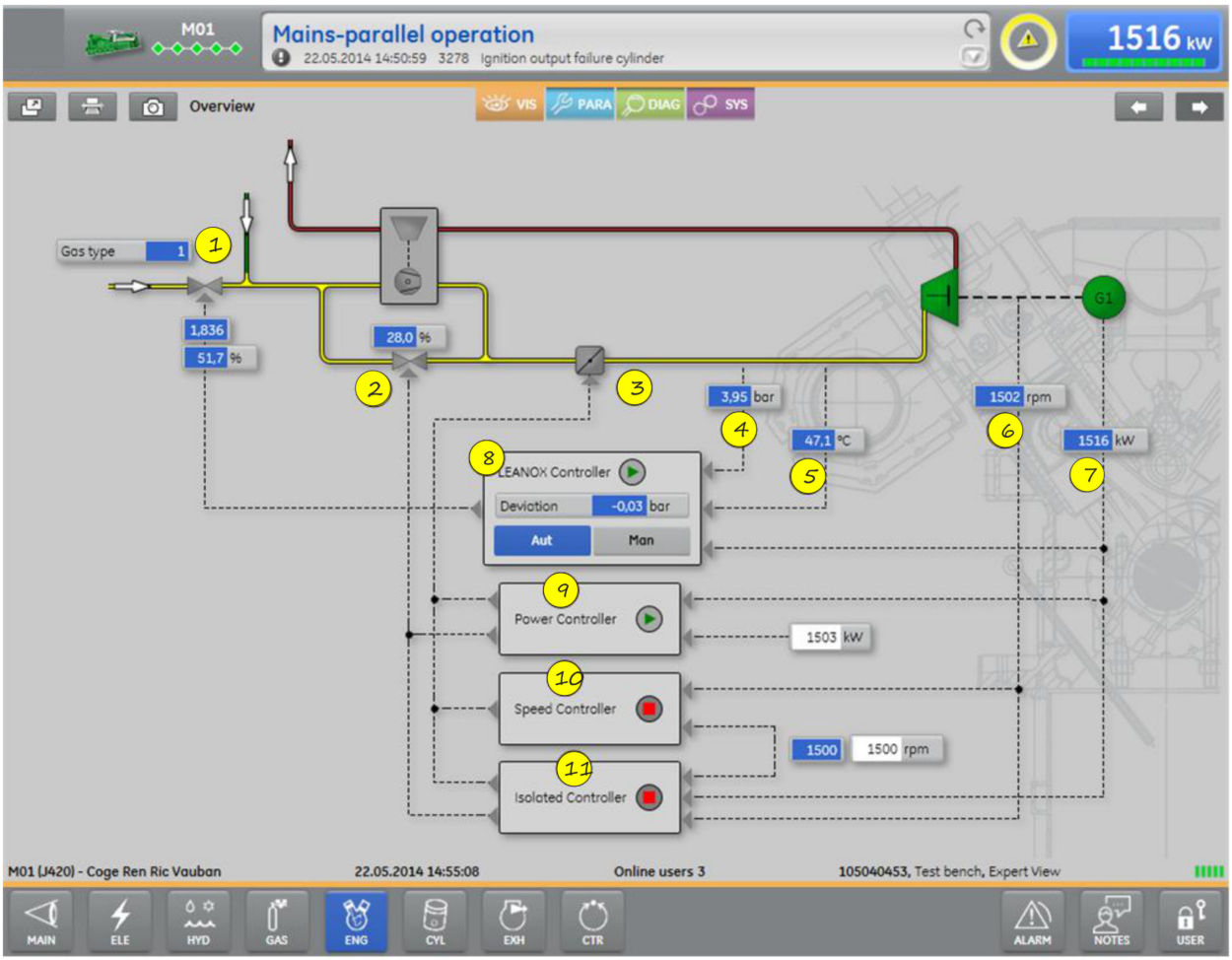
[Main chamber gas train set/actual deviation]	Main chamber gas train set/actual deviation
[Prechamber gas train set/actual deviation]	Prechamber gas train set/actual deviation
[Mainchamber gas difference pressure]	Main chamber gas differential pressure
[Prechamber gas difference pressure]	Prechamber gas differential pressure
[Barometric pressure]	Barometric pressure

13.19 ENG – Engine controller overview

This screen displays an overview of the status, operating mode and controlled variables of all the engine controllers (LEANOX, power, speed and isolated-operation controller). The symbol ▶ denotes an active controller and the symbol ■ an inactive controller.

Click the **[Aut/Man]** button to toggle the LEANOX controller between automatic and manual mode.

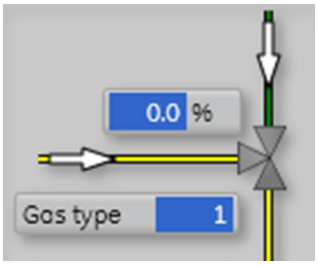
If you have the appropriate user level and the engine is in the correct operating mode, you can set the gas mixer position, power set point and engine speed set point manually.



1 Gas mixer

This is where details of the gas mixer and/or the gas proportioning valve are displayed, depending on the engine type and the design of the installation.

Gas mixer



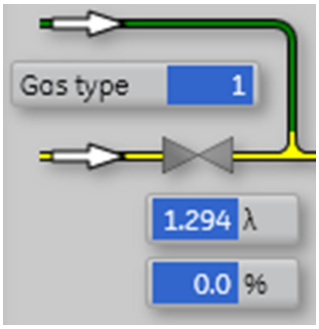
In addition to the [Gas type], the position is displayed as a percentage.

Gas type	Description
[1]	Gas type 1
[2]	Gas type 2
[3]	Gas type 3
[4]	Gas type 4
[1-2]	Gas quality = interpolation between the gas 1 and gas 2 parameter sets

Gas type	Description
[1-2/3]	Gas 1_2 (gas pressure control system 1) mixed with gas 3 (gas pressure control system 2)
[1/3]	Gas 1 (gas train 1) mixed with gas 3 (gas train 2)

Gas proportioning valve:

The gas proportioning valve only regulates the amount of gas.



In addition to the gas type **[Gas type]**, the position as a percentage and the Lambda value are displayed.

Further details of the gas mixer are displayed on the "Gas details" screen.

2 **Compressor bypass** (optional)

3 **Throttle valve**

4 **Charge pressure**

5 **Charge temperature**

6 **Speed**

7 **Power**

Display showing the electrical power produced by the generator.

8 **LEANOX controller**

Click the **[AUT/MAN]** button to toggle the operating mode of the LEANOX controller between "Automatic" and "Manual". You will need to have at least the "Customer" user role to do this if the engine is at a standstill. The button is always enabled for the "Advanced customer" user role.

The **[Deviation]** box shows the control deviation of the LEANOX controller (charge pressure).

9 **Power controller**

The power setpoint can be set at "Customer" user role and above. The power set point displayed as a measured value is the current calculated set value and the default set value for the engine.

10 **Speed controller**

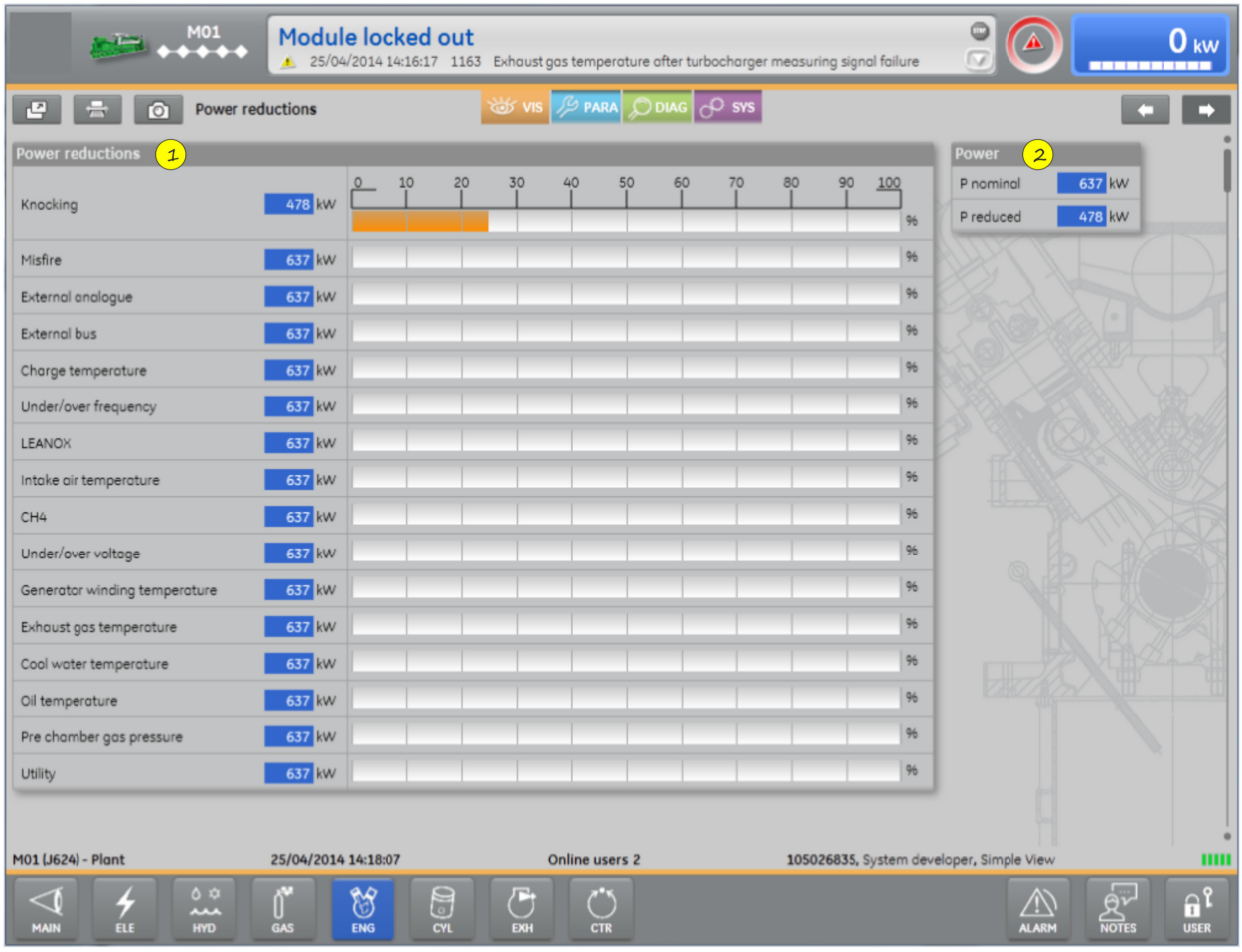
The speed setpoint can be set at "Customer" user role and above. The speed set point displayed as a measured value is the current calculated set point and the default set point for the engine.

11 **Isolated-operation controller**

The speed setpoint can be set at "Customer" user role and above.

13.20 ENG - Power reductions

This screen displays an overview of the possible power reductions.



1 Nominal power and reduced power

Display showing the nominal power **[P nominal]** and the reduced power **[P reduced]**.

2 Power reductions

The following causes of a possible power reduction are displayed in the form of bars. Nominal power is represented by 100% of the bar.

Display	Power reduction	Description
[Knock]	Knocking	The knocking intensity has exceeded the limit value for power reduction.
[Misfire]	Misfires	The number of misfires has exceeded the limit value for power reduction.
[External analogue]	External - analogue	Power reduction due to an external analogue signal. This signal can be used for a variety of applications (e.g. to control return temperature). See *[Engine / Power / Scaling external power limitation]* parameter. The analogue value shown here can exceed the nominal power if a parameter in excess of the nominal power is selected for the external signal scaling. This allows the external signal to be checked when the signal values exceed the rated power.
[External bus]	External - bus	The power reduction is carried out by a higher-order control system connected to DIA.NE XT4 via an industrial bus connection.

Display	Power reduction	Description
[Charge temperature]	Charge temperature	The charge temperature has exceeded the limit value for power reduction. The power rating is reduced linearly. See the *[Engine / Power / Reduction charge temperature]* parameter.
[Under/over frequency]	Underfrequency/overfrequency	If the generator frequency drops below 98% of the nominal generator frequency, power reduction begins. At 90 % of the nominal generator frequency, power reduction is at 50%. If the generator frequency exceeds 102% of the nominal generator frequency, power reduction begins. At 105 % of the nominal generator frequency, power reduction is at 50%. Power reduction only ends at 100.5% of the nominal generator frequency (hysteresis window)
[LEANOX]	LEANOX	The LEANOX controller deviation limit value has been exceeded towards "lean". The power rating is reduced linearly. If the LEANOX controller deviation limit value is exceeded by than 20 percent towards "rich", the engine is tripped. See the *[Engine / LEANOX / Gas type x / Controller / Controller deviation limit] parameter*.
[Intake air temp.]	Intake air temperature	The intake air temperature has exceeded the limit value for power reduction. The power setpoint is reduced linearly. See the *[Engine / Power / Reduction intake air]* parameter.
[CH4]	CH4	The power is reduced linearly from full to half load depending on a CH4 signal. See the *[Gas / Special gas / CH4 content]* parameter.
[Gas pressure]	Gas pressure	The power is reduced linearly from full to half load depending on a gas pressure signal. See the *[Gas / Special gas / Gas pressure]* parameter.
[Suction pressure]	Suction pressure	The power is reduced linearly from full to half load depending on a suction pressure signal. See the *[Gas / Special gas / Suction pressure]* parameter.
[Under/ overvoltage]	Undervoltage/overvoltage	If the generator voltage drops below 95% of the nominal generator voltage, power reduction begins. At 80 % of the nominal generator voltage, power reduction is at 50%. If the generator voltage exceeds 105% of the nominal generator voltage, power reduction begins. At 110 % of the nominal generator voltage, power reduction is at 50%.
[Gen. winding temp.]	Generator winding temperature	If the generator winding temperature exceeds 140 °C, power reduction begins.
[Exhaust gas temperature]	Exhaust gas temperature	If the cylinder temperature *[Exhaust temp. positive/ negative deviation max.]* deviates from the average value for more than 30 seconds, a power reduction is activated. In addition, the power is reduced when the limit value is reached (average exhaust temperature > 40% Prated).
[Jacket water temp.]	Cooling water temperature	If the cooling water temperature rises, power is reduced. See the *[Engine / Power / Reduction cooling water temperature]* parameter.
[Oil temperature]	Oil temperature	If the oil temperature rises, power is reduced. See the *[Engine / Power / Reduction oil temperature]* parameter.

Display	Power reduction	Description
[Return water temp.]	Return water temperature	If the hot water return temperature rises, power is reduced. See the *[Engine / Power / Reduction return water temperature]* parameter.
[Pre chamber gas press.]	Prechamber gas pressure	If the pressure in the prechamber gas train decreases, power is reduced. See the *[Engine / Power / Reduction pressure prechamber gas train]* parameter.
[Utility operator]	Utility operator	The power is reduced in accordance with the set parameters, or the engine is shut down, via 3 digital inputs.
[Charge temperature HP]	Charge temperature upstream of high-pressure turbocharger	If the maximum permissible charge air temperature upstream of the high-pressure turbocharger is exceeded, the power is reduced.
[PBC]	PBC	Power reduction due to various PBC safety functions.
[Humidity]	Humidity	The LEANOX control system adjusts to compensate for increasing intake air humidity levels. The charge temperature is increased when the charge air humidity limit is reached. If it is not possible to increase the charge temperature, power is reduced.
[Hierarchic controller]	Hierarchic controller	In the event of serious combustion faults, e.g. misfiring or auto-ignition, the affected cylinder is deactivated by the hierarchic controller based on cylinder pressure (the relevant port injection gas valve remains closed) and the power is simultaneously reduced to 75%. The engine can then continue to be operated in this "limp home" mode for a limited period. After this preset period (currently 1 minute), the engine shuts down automatically. This refers to Type 9 engines only.
[Crankcase controller]	Crankcase pressure	If the crankcase pressure exceeds the permissible limit value, the power is reduced in relation to the rated power by the percentage set by the [*Engine/Power/ Reduction crankcase pressure/Power reduction]* parameter. This refers to Type 9 engines only.
[Transformer temperature]	Transformer temperature	If the transformer temperature exceeds the permissible limit value (temperature switch), the power is reduced in relation to the rated power by the percentage set by the *[Engine/Power/Reduction transformer/Power reduction limit]* parameter.
[Generator switch cabinet temperature]	Generator switch cabinet temperature	If the temperature in the generator switch cabinet exceeds the permissible limit value (temperature switch), the power is reduced in relation to the rated power by the percentage set by the [*Engine/Power/ Reduction generator circuit breaker cabinet/Power reduction limit]* parameter.
[Generator intake air temperature]	Generator intake air temperature	If the temperature exceeds the permissible limit value, the power is reduced in relation to the rated power by the percentage set by the *[Engine/Power/Reduction generator]* parameter.
[Gas pressure minimum]	Minimum gas pressure	
[Calorific value]	Calorific value	The power is reduced linearly from full to half load depending on a calorific value signal. See parameter *[Gas / Special gas / Calorific value]*.

Display	Power reduction	Description
[Power factor<1]	Power factor < 1	When operating the genset in the overexcited reactive power range, the electrical power is reduced according to the set generator efficiency [Engine/Power/ Reduction generator].
[Cylinder peak pressure integrator]	Cylinder peak pressure integrator	The number of cylinder pressure peaks has exceeded the limit value for power reduction. See parameter 14217 [Cylinder / PBC / Cylinder Peak Pressure Integrator Power reduction maximum].

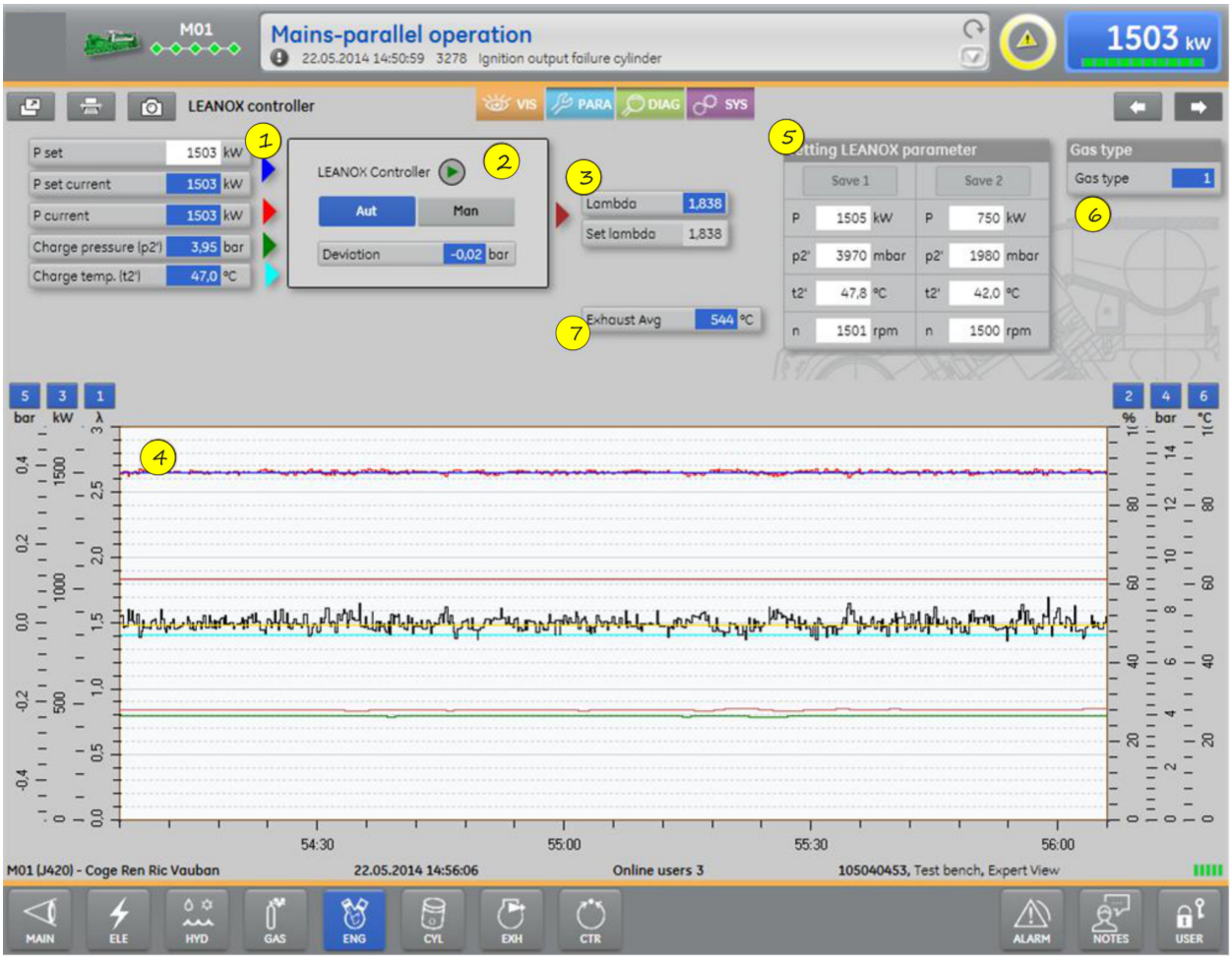
Power reductions caused by intake temperature, CH4 content, gas pressure, suction pressure, turbocharger speed, generator winding temperature, exhaust gas temperature, cooling water temperature, oil temperature, return temperature, prechamber gas pressure, crankcase pressure, transformer temperature, generator switch cabinet temperature, generator intake air temperature and calorific value are optional.

In addition, a reactive energy reduction can also take place. This is not displayed in this screen, however, but only as an operational notification in the alarm management:

Reactive power reduction	Description
Generator winding temperature	If the generator winding temperature exceeds 135 °C, a reactive energy reduction begins.
Pole wheel angle	If the capacitive reactive power exceeds a certain value calculated on the basis of the pole wheel angle, the reactive power is limited.

13.21 ENG – LEANOX controller

Use this screen to set the LEANOX controller and adjust the gas mixer or gas proportioning valve position when the engine is at a standstill and idling. The controlled variables are available as a trend display.



1 Input values

[P Set]	Power setpoint, can be adjusted from "Customer" user role and above
[P Act]	Actual power
[p2']	Charge pressure
[t2']	Charge temperature

2

The ▶ symbol denotes an active controller and the ■ symbol an inactive controller.

Click the **[AUT/MAN]** button to toggle the operating mode of the LEANOX controller between "Automatic" and "Manual". You will need to have at least the "Customer" user role to do this if the engine is at a standstill. The button is always enabled for the "Advanced customer" user role.

The **[Deviation]** box shows the control deviation (charge pressure).

3 Gas mixer or gas proportioning valve position

The availability of the option to alter the setpoint for the gas mixer or the gas proportioning valve depends both on the operating mode of the engine and on the user role.

Operating mode	Minimum user role required
LEANOX controller, manual	Advanced customer
Engine at standstill	Customer

Operating mode	Minimum user role required
Engine idling	Customer

If you have "Customer" user role, you can only change the position when the engine is in jog mode. Steps of 1% are possible with the gas mixer and 0.005% with the gas proportioning valve.

4 **Online trend**

The following control variables are displayed as a trend:

Display	Description	Display range	Unit
[Power[kW]]	Actual power (red) and power setpoint (blue)	0 / 4000	kW
[Boost pressure[bar]]	Charge pressure	-1 / 5	bar
[Charge temperature[°C]]	Charge temperature	0 / 120	°C
[Actuator position[%]]	Turbo bypass position (brown) and throttle valve position (red)	0 / 100	%
[Controller deviation[bar]]	Controller deviation (charge pressure)	-0.5 / 0.5	bar
[Lambda]	Mixing ratio lambda	1 / 3	

5 **Setting the LEANOX parameters**

Users with "Advanced customer" user role and above can set the LEANOX parameters. When the engine is in manual mode, click the **[Set1]** and **[Set2]** buttons to set the fixed points for the LEANOX controller. This stores the current power, charge temperature, charge pressure and engine speed.

The LEANOX control parameters cannot be entered for the gas 1-2, gas 1-2/3 and gas 1/3 operating modes. The values interpolated in the control system are displayed instead.

6 **Gas type [Gas Type]**

Display showing the gas type.

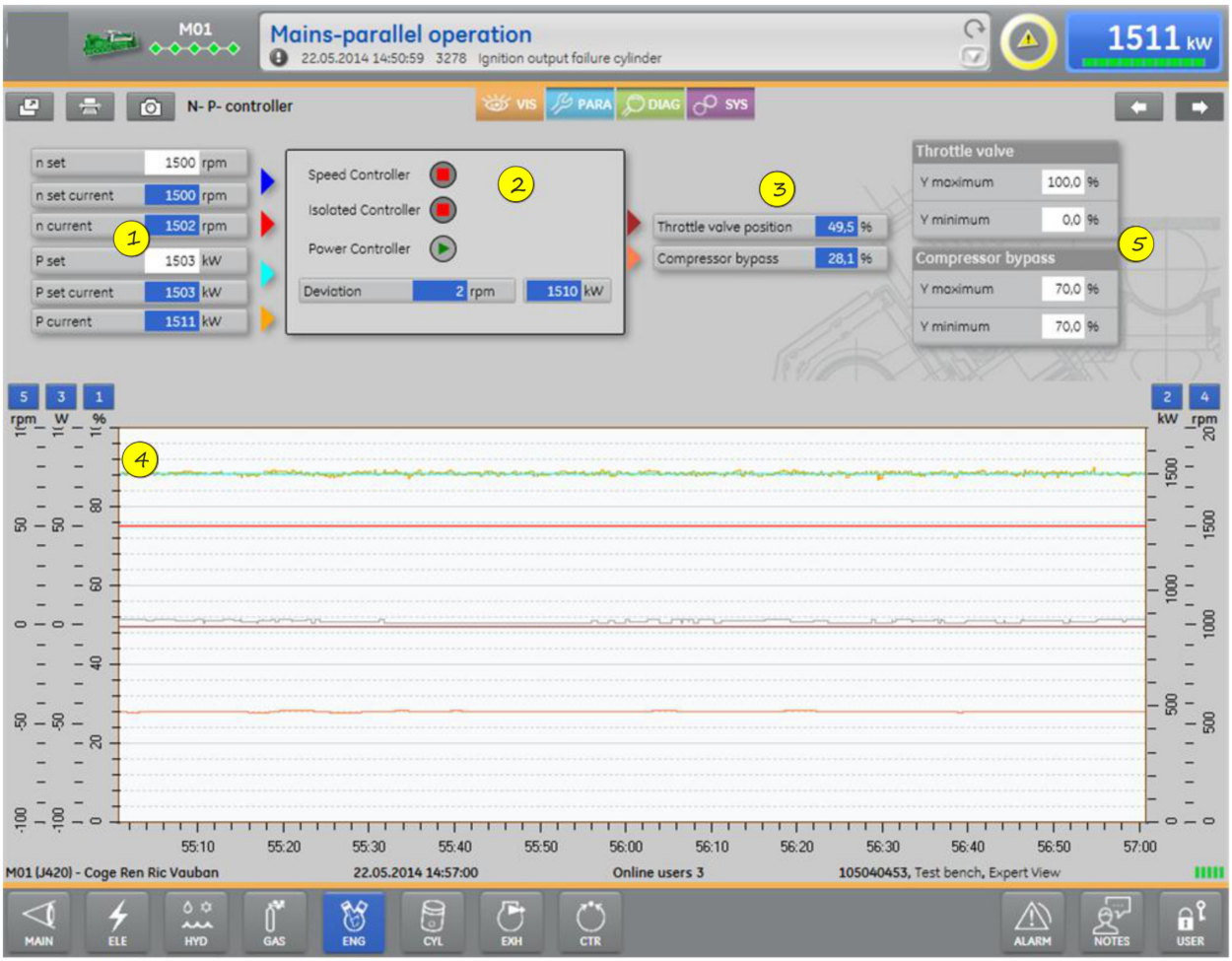
Gas type	Description
[1]	Gas type 1
[2]	Gas type 2
[3]	Gas type 3
[4]	Gas type 4
[1-2]	Gas quality = interpolation between the gas 1 and gas 2 parameter sets
[1-2/3]	Gas 1-2 (gas train 1) mixed with gas 3 (gas train 2)
[1/3]	Gas 1 (gas train 1) mixed with gas 3 (gas train 2)

The interpolation ratio, which is proportional to the gas quality, is also displayed for gas type **[1-2]**.

7 **Average exhaust gas temperature**

13.22 ENG - Speed - Isolated - Power controllers

This screen is used for setting the speed, isolated and power controllers. The speed controller is active when the engine is idling and acts on the throttle valve. The isolated controller is active in island operation and acts on the throttle valve and the turbo bypass. The power controller is active in mains-parallel mode and acts on the throttle valve and the turbo bypass. The controlled variables are available as a trend display.



1 Input values

[n set]	Speed set point, can be adjusted from "Customer" user role and above
[n set current]	Current engine speed set point
[n current]	Actual engine speed
[P set]	Power set point, can be adjusted from "Customer" user role and above
[P set current]	Current power set point
[P current]	Actual power

2

The symbol ▶ denotes an active controller and the symbol ■ an inactive controller.

The **[Deviation]** box shows the control deviation (speed and power).

3 Throttle valve and turbo bypass

[Throttle valve] indicates the throttle valve position and **[Turbo bypass]** the turbo bypass position.

4 On-line trend

The following control variables are displayed as a trend:

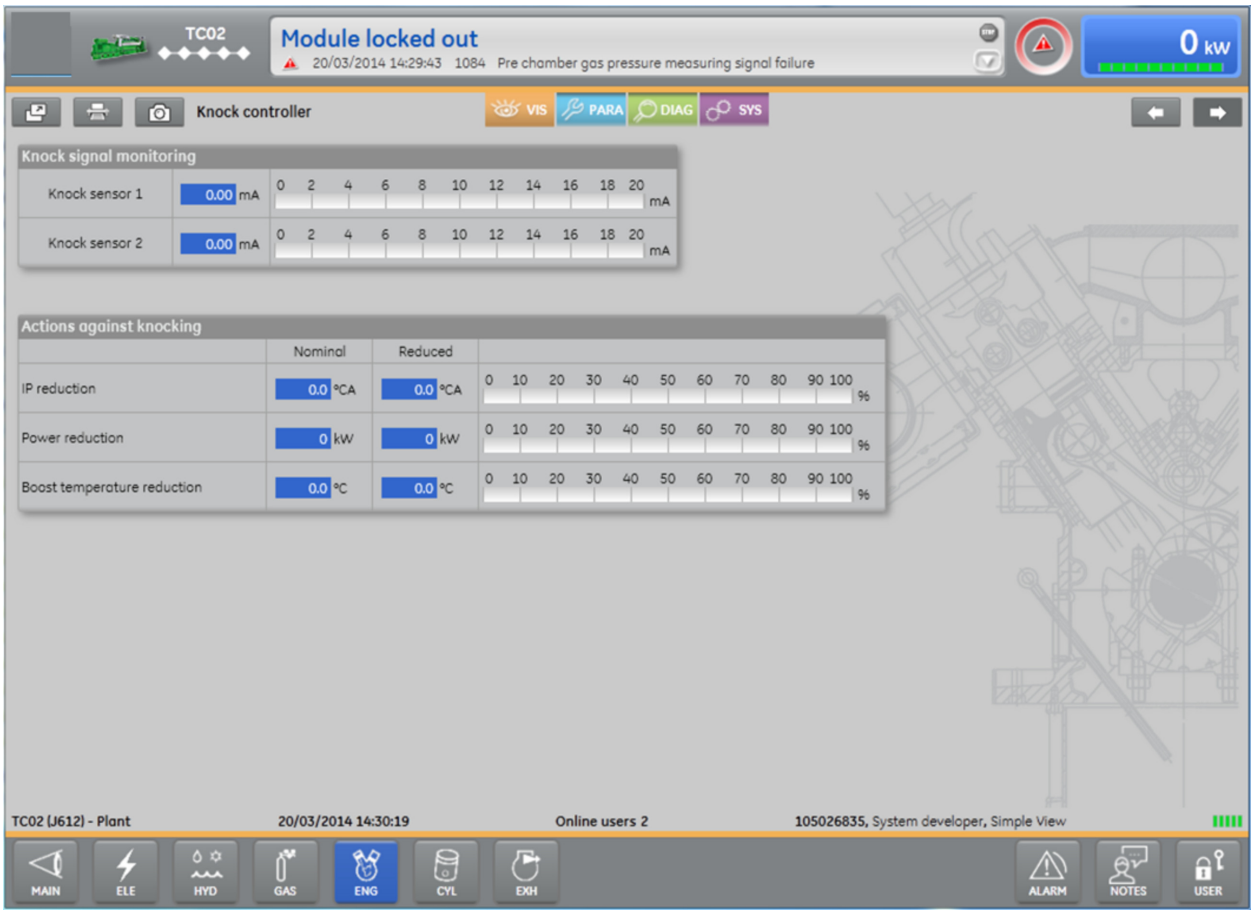
Display	Description	Display range	Unit
[Power current, Power set current [kW]]	Power actual value, current power set point	0 / P max	kW
[Power deviation[kW]]	Power controller deviation	-100 / 100	kW
[Speed current, Set speed current [rpm]]	Speed actual value, current speed set point	0 / 2000	rpm
[Compressor bypass[%]]	Turbo bypass position	0 / 100	%
[Throttle valve position [%]]	Throttle valve position	0 / 100	%

5 Control variable limits for the throttle valve **[Throttle valve]** and compressor bypass **[Compressor bypass]**.

[Y maximum]	Maximum control variable limiter
[Y minimum]	Minimum control variable limiter

13.23 ENG - Knock controller

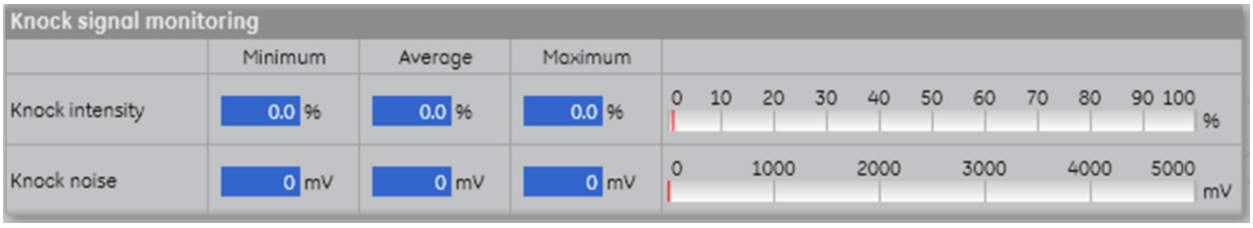
This screen shows the most important characteristics relating to knock control.



Knocking signal monitoring [Knocking signal monitoring]

If the mA signal of a knock sensor [**Knock sensor 1]** or **[Knock sensor 2]** exceeds the preset control limit, the colour changes from green to red.

The following information can also be displayed on screen as an option with SAFI or KLS98:



The minimum **[Minimum]**, maximum **[Maximum]** and average **[Average]** values for knocking intensity **[Knock intensity]** and the knocking noise **[Knock noise]** for all cylinders are displayed.

Actions against knocking

IP reduction [IP reduction]

Display of the nominal ignition point **[Nominal]** and the controlled ignition point to reduce knocking **[Reduced]**. The numerical display is given in crankshaft angle degrees.

100 percent of the bar corresponds to the maximum permissible adjustment.

[Power reduction]

Display showing the nominal power **[Nominal]** and the power as adjusted to prevent knocking **[Reduced]**. The numerical display is given in kilowatts.

100 percent of the bar corresponds to the maximum permissible adjustment.

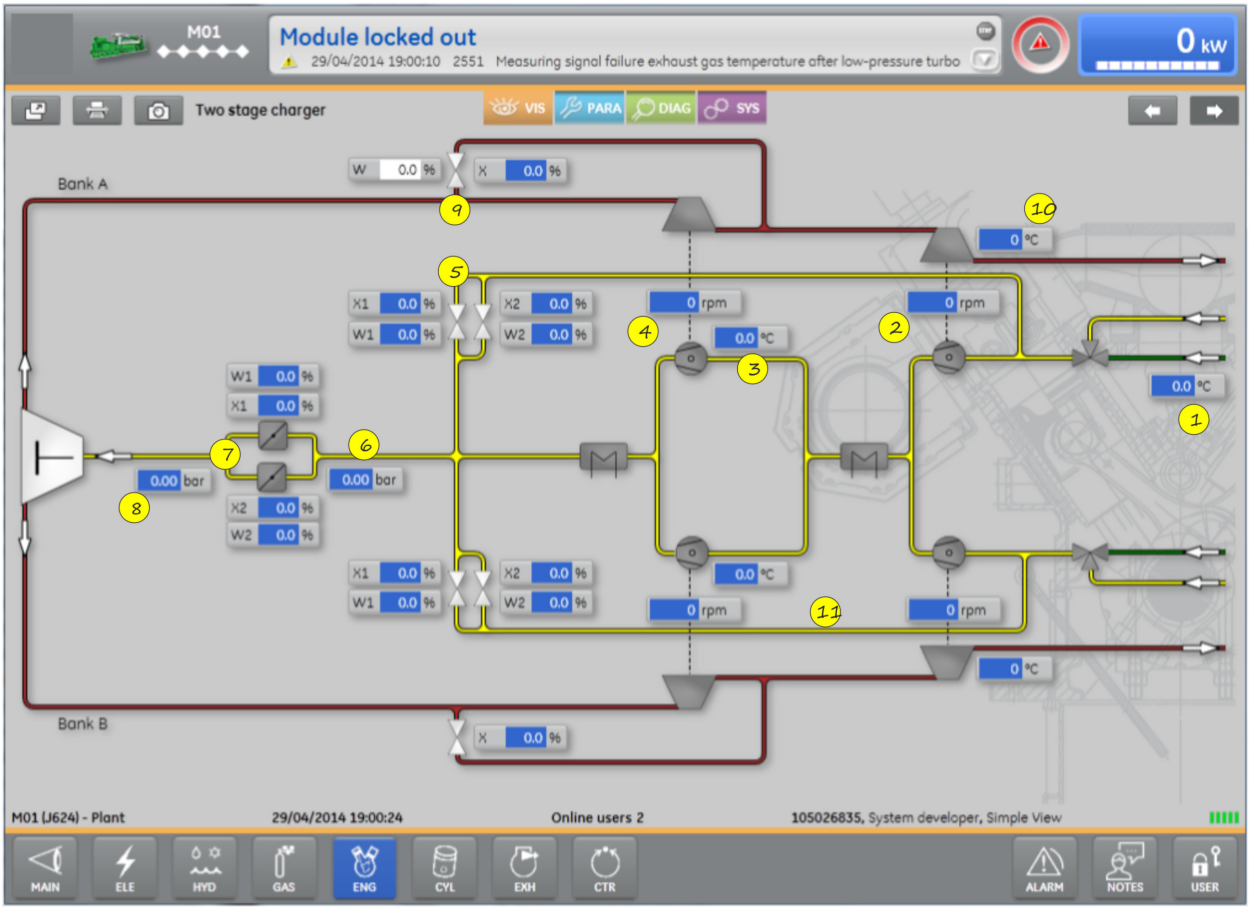
Charge temperature reduction [Charge temperature reduction]

Display of the set charge temperature **[Nominal]** and the temperature as adjusted to prevent knocking **[Reduced]**. The temperatures are displayed numerically in degrees Celsius or Fahrenheit.

100 percent of the bar corresponds to the maximum permissible adjustment.

13.24 ENG - Two-Stage Turbo Charging

This screen shows the two-stage turbocharging (TSTC) with the associated relevant measurements, such as charge pressure, charge temperature, turbocharger temperatures and speeds, and various control variables.



1 Intake air temperature

2 Turbocharger speed, bank A low pressure

3 Temperature upstream of exhaust gas turbocharger, high pressure

4 Turbocharger speed, bank A high pressure

5 Compressor valve position displays, bank A

[X1']	Valve 1 actual value
[W1']	Valve 1 set point
[X2']	Valve 2 actual value (optional)
[W2']	Valve 2 set point (optional)

6 Charge temperature and pressure upstream of throttle valve

7 Throttle valve position displays

[X1']	Valve 1 actual value
[W1']	Valve 1 set point
[X2']	Valve 2 actual value (optional)
[W2']	Valve 2 set point (optional)

8 Charge temperature t2' and charge pressure p2' after the throttle valve

9 **Wastegate** (optional)

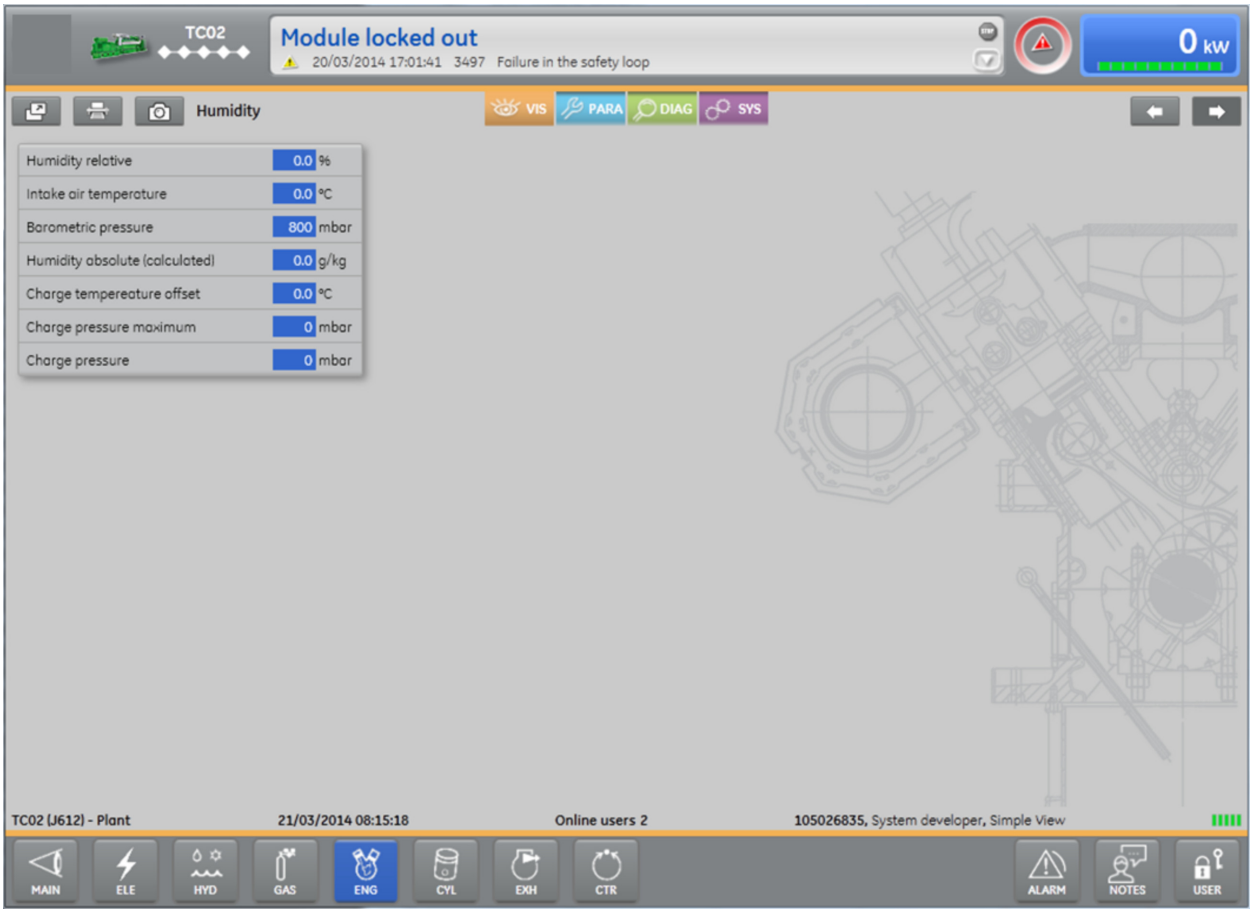
Setpoint value preset **[W]** (User 30) and actual value display **[X]**.

10 **Turbocharger outlet temperature, low pressure**

11 **Bank B has the same measurement displays, similar to bank A**

13.25 ENG - Humidity

This screen displays the measured values for the humidity control. The screen is activated and deactivated with the *[Engine/Engine data/Humidity-LEANOX compensation]* parameter.

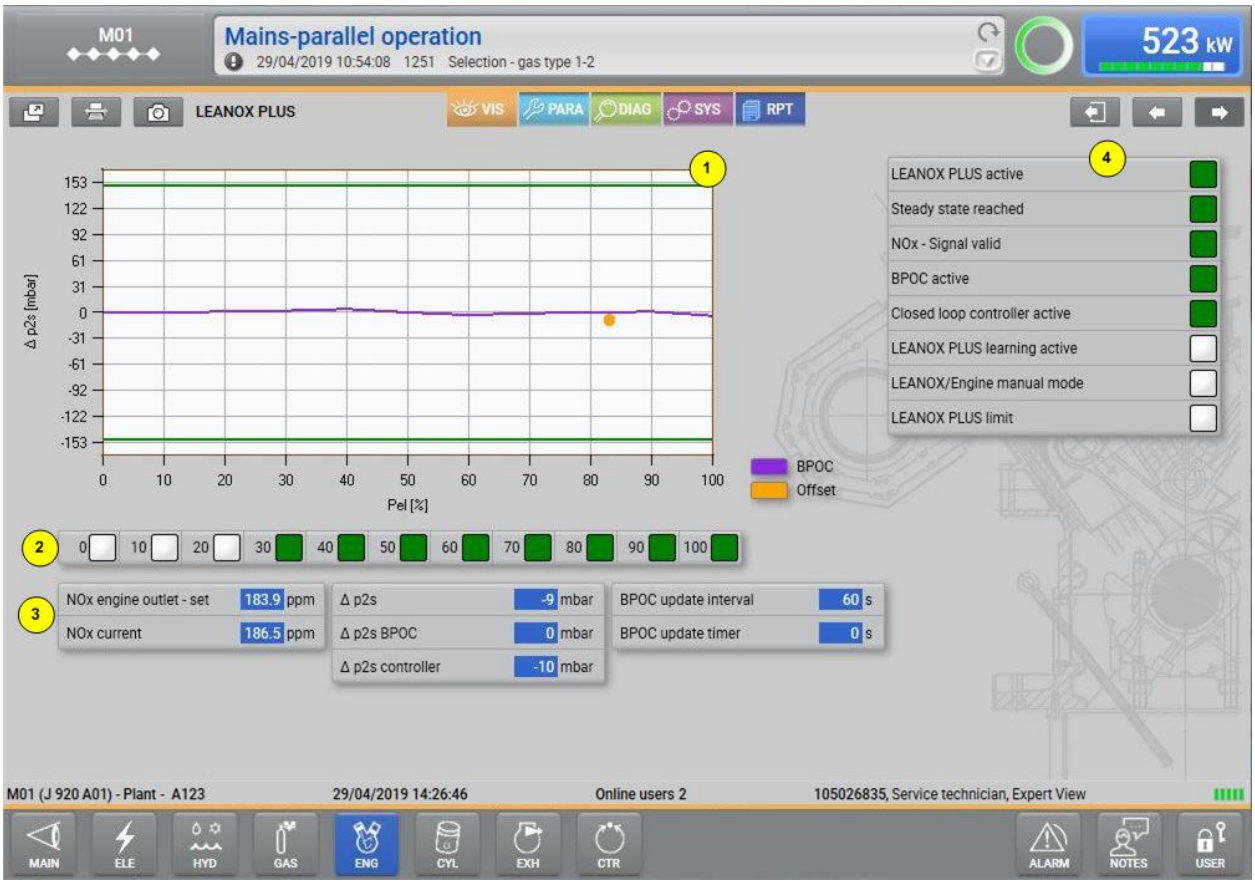


[Humidity relative]	Intake air humidity, from the humidity sensor
[Intake air temperature]	Intake air temperature, from the humidity sensor
[Barometric pressure]	Ambient pressure measured by the boost pressure sensor with the engine at standstill
[Humidity absolute (calculated)]	Humidity of the dry intake air, calculated from the above three values (humidity, intake temperature and ambient pressure).
[Change temperature offset]	Necessary increase in the charge air temperature from the nominal charge air temperature by the humidity regulator.
[Charge pressure Max]	Maximum possible charge pressure calculated from "Relative humidity", "Intake temperature", "Barometric pressure" and "t2'".
[Charge pressure]	Average charge pressure.

13.26 ENG - LEANOX plus

This screen provides an overview of the LEANOX PLUS controller.

The screen is only shown from user role Service Technician or above and if parameter 14305 LEANOX PLUS active is set.



1 BPOC - Boost Pressure Offset Curve

Shows the offset (orange dot) of the controller (when closed-loop controller is active) and the currently stored BPOC (purple)

The boost pressure offset limits are shown as continuous green lines (parameter 14337)

The value 0 corresponds to the value set by the LEANOX line

(see TA 1503-0056)

2 Status display learning points

Load points for which a valid offset value has already been stored in the BPOC are shown in green.

3 Controller values

[NOx engine outlet - set]	NOx setpoint [14280] converted to ppm Only displayed if parameter 14067 NOx sensor configuration is set accordingly.
[NOx current]	Current value of the NOx sensor in ppm (filtered)
[Δ p2s]	Difference between current offset and 0
[Δ p2s BPOC]	Difference between BPOC and 0
[Δ p2s controller]	Difference between current offset and BPOC
[BPOC update interval]	BPOC update interval

[BPOC update timer]	Time elapsed since last BPOC update

4

[LEANOX PLUS active]	Status is green if LEANOX PLUS is active (parameter 14305) and the engine is running.
[Steady state reached]	The gas engine is in a steady operating state (no fluctuation in power and LEANOX deviation).
[NOx signal valid]	The signal of the NOx sensor is valid.
[BPOC active]	The taught BPOC is active.
[Closed loop controller active]	The closed-loop controller is active and adjusts the boost pressure to the currently measured emissions.
[LEANOX PLUS learning active]	The BPOC is in learning mode.
[LEANOX/Engine manual mode]	Engine is running in manual operating mode.
LEANOX PLUS limit	BPOC limit has been reached.

13.27 CYL - Ignition

This screen shows the ignition points and ignition voltages. Further optional displays include the ignition energy, and hardware and spark duration failure rates. The self-test function can also be activated from this screen.

Individual ignition point adjustment is only available with the KLS98 or SAFI.

Ignition voltages are only displayed if the engine is fitted with a MONIC ignition-voltage measurement system (integrated in SAFI /MORIS).

1 Display shows minimum **[Min]**, maximum **[Max]** and average **[Avg]**

[Voltage]	Ignition voltage
[Timing point]	Ignition point
[HW failure rate]	Hardware failure rate Display showing how often no ignition spark has been produced within the last ten engine cycles. (Optional SAFI)
[Duration failure rate]	Spark duration failure rate Display of how often the combustion time has exceeded or fallen below the permissible tolerance within the last ten engine cycles. (Optional SAFI)

2 **ignition energy level** (optional)

The ignition energy shown is the energy supplied to the ignition coils. This value is pre-set in the parameter management system. 100% equals the maximum ignition energy of the ignition system.

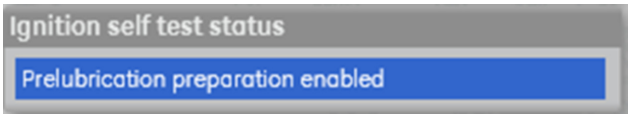
3 **Ignition self-test**

"Customer" or higher user role must be present.

Using the self-test function, you can test the ignition voltage supply of the ignition coils while the engine is at standstill. The self-test is automatically de-activated after 10 minutes.

After the **[Start]** button is pressed a warning is displayed that a scavenging start will take place, and the engine will turn.

A status message is then 4 put up.



The following statuses run though:

Preparing prelubrication active
Starter preparation on
Preparation
Self-test running

The procedure can be cancelled at any time by pressing the **[Stop]** button.

5 **Maximum ignition voltage**

The **[Ignition voltage maximum]** checkbox can only be activated when the ignition self-test has been switched on. If the check box has been activated, the relative maximum values are displayed instead of the current ignition voltages.

6 **Bar chart for individual cylinder displays**

Selecting the appropriate line 7 (blue background) controls which values are displayed on the bar chart.

[Voltage]	Ignition voltage If an upper or lower limit is exceeded, the colours will subsequently change.
[Timing point]	Ignition point The values shown correspond to the crankshaft angle before the upper dead centre.

[HW failure rate]	Hardware failure rate Display showing how often no ignition spark has been produced within the last ten engine cycles. (Optional SAFI)
[Duration failure rate]	Spark duration failure rate Display of how often the combustion time has exceeded or fallen below the permissible tolerance within the last ten engine cycles. (Optional SAFI)

8 **Misfire frequency**

The misfire frequency is a combined value of the actual number of misfires counted and is shown as a percentage.

13.28 CYL – Knocking signals

This screen displays the knocking signals (knock integrator, knock noise, mechanical noise) and the ignition points. The screen is only displayed if the *[Engine/Engine data/KLS98]* or *[Engine/SAFI/Knocking]* parameter is set.

1 Display shows minimum **[Min]**, maximum **[Max]** and average **[Avg]**

[Knock integrator]	Knock integrator
[Knock noise]	Knock noise
[Mechanical noise]	Mechanical noise
[Ignition timing point]	Ignition point

2 **Bar chart for cylinder-specific display**

Selecting the appropriate line 3 (blue background) controls which values are displayed on the bar chart.

[Knock integrator]:

Knocking intensity is calculated from an integrated knock noise signal and is displayed as an absolute value as a percentage.

If the *IP Reduction Start* parameter is reached, the ignition will be retarded by the knock control system. If the *Power reduction start* limit value is reached, the power is reduced. If a 100% knocking intensity value is reached despite the ignition timing point adjustment and the reduction in the engine power, the engine will be shut down. In addition, the charge temperature will be lowered if the plant control system allows this.

Knock noise:

Knock noise is the actual noise of combustion in a specific crankshaft angle window and is displayed in absolute numbers of millivolts. If the *Knock limit* parameter is exceeded, the knock noise is detected by the engine control system as actual knocking.

Ignition timing point:

The ignition timing points are displayed relatively, as a deviation from the general ignition timing points.

Mechanical noise:

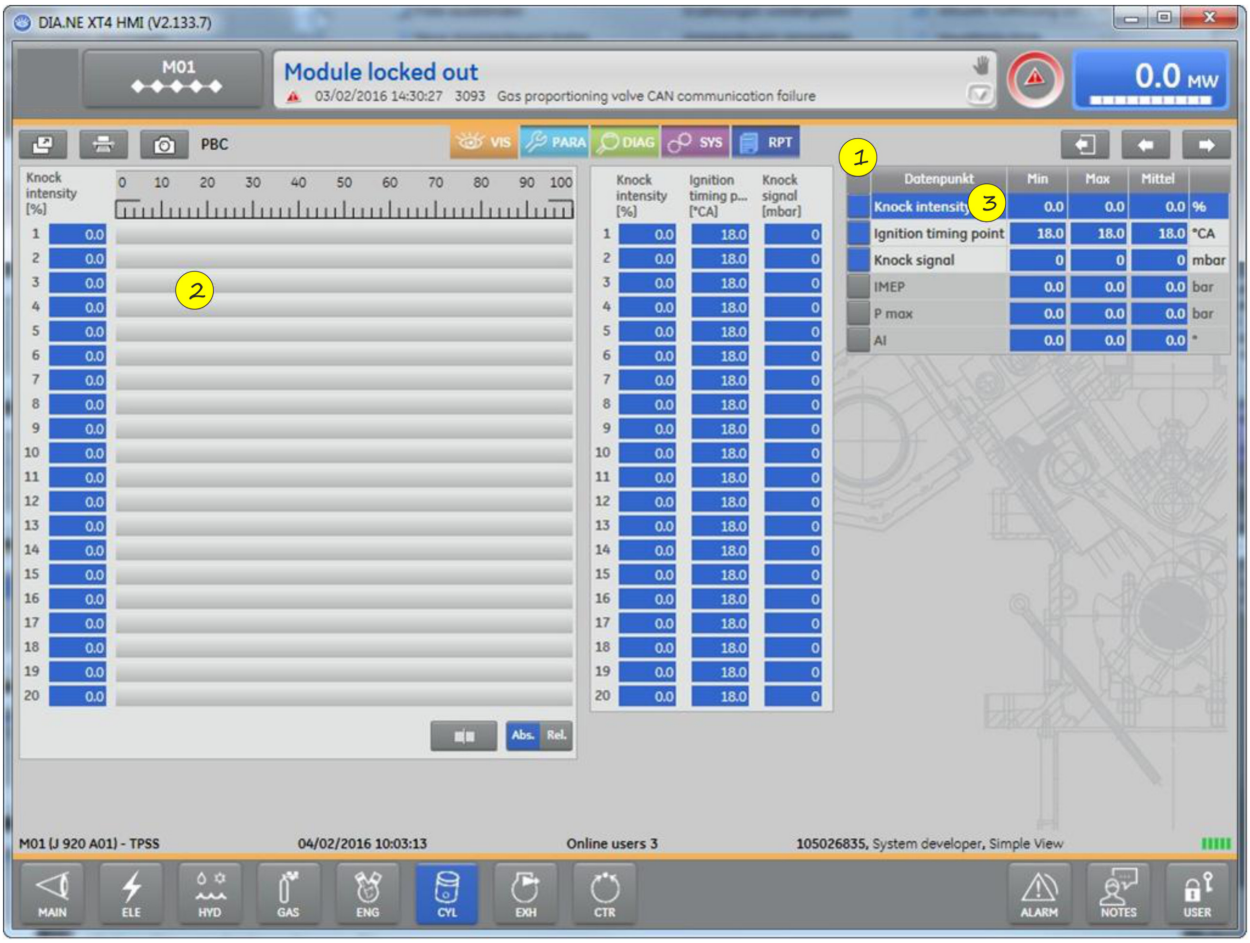
Mechanical noise is measured using the knock sensors of the KLS98/SAFI. The signal thus measured is assigned to a specific crankshaft angle range within which mechanical noise is likely to occur.

The display shows absolute values in millivolts. If, from half-load upwards, a value smaller than the *Measuring signal failure limit* is not reached, a corresponding warning (measurement signal failure in knock sensor) will be generated in the alarm management system. If 50% of all measurement signals fail, the engine will also be shut down because of KLS98/SAFI failure.

If the *Mechanical noise limit* parameter is exceeded, a trip warning (maximum mechanical noise) will be generated in the alarm management system. Possible causes may include excessive valve play, broken valve spring, damaged bearing, etc.

13.29 CYL – PBC

This screen shows the PBC - pressure-based control - signals (knock integrator, knocking signal, IMEP, P max, AI) and the ignition points. This screen only appears when the [Engine/SAFI/PBC] parameter has been set.



1 **Display shows minimum [Min], maximum [Max] and average [Avg]**

[Knock intensity]	Knock integrator
[Ignition timing point]	Ignition point
[Knock signal]	Knock signal
[IMEP]	Indicated mean effective pressure
[P max]	Cylinder peak pressure
AI	Centre of gravity of combustion

2 **Bar chart for cylinder-specific display**

Selecting the appropriate line 3 (blue background) controls which values are displayed on the bar chart.

Knock integrator:
Knocking intensity is calculated from an integrated knock noise signal and is displayed as an absolute value as a percentage.
If the *IP Reduction Start* parameter is reached, the ignition will be retarded by the knock control system. If the *Power reduction start* limit value is reached, the power is reduced. If a 100% knocking intensity value is reached despite the ignition timing point adjustment and the reduction in the engine power, the engine will be shut down. In addition, the charge temperature will be lowered if the plant control system allows this.

Ignition timing point:
The ignition points are shown in absolute terms as crankshaft angle degrees before top dead centre.

Knock signal:
Knock noise is the actual noise of combustion in a specific crankshaft angle window and is displayed as harmonic vibration in millibar. If the *Knock limit* parameter is exceeded, the knock signal is detected by the engine control system as actual knocking.

IMEP:
The indicated mean effective pressure is calculated from the cylinder pressure signal and displayed as an absolute value in bar.

P max:
The cylinder peak pressure is analysed from the cylinder pressure signal and displayed as an absolute value in bar.

AI:
The centre of gravity of the combustion is analysed from the cylinder pressure signal and describes the position of the combustion in crankshaft angle degrees after top dead centre.

13.30 CYL - PI

This screen shows the signals of the PI – Port Injection (opening duration, pressure 49° before TDC, close current gradient). The screen only appears when the *[Engine/SAFI/PI]* parameter has been set.

1 **Display shows minimum [Min], maximum [Max] and average [Avg]**

[Opening duration]	Opening duration
[Pressure 49° before TDC]	Pressure 49° before TDC
[Close current gradient]	Closed detection, current gradient

2 **Bar chart for cylinder-specific display**

Selecting the appropriate line 3 (blue background) controls which values are displayed on the bar chart.

Opening duration:
Indicates the opening duration of the port injection valves in crankshaft angle degrees.

Pressure 49° before TDC:
Indicates the pressure in the cylinder at 49° before top dead centre as an absolute value in bar.

Closed detection, current gradient:

Shows the raw measured value of the PI valve closed detection. It indicates the inductance of the valve. If this reading changes too much within the last 10 seconds, it indicates that either the PI driver electronics or the PI valve is damaged, or the valve is stuck or contaminated with foreign particles.

4 **PI -balancer**

The PI optimiser optimises the cylinders among themselves. This control window is used to optimise the control of the cylinders in relation to each other during commissioning and after changes to the hardware. The buttons (commissioning optimiser, manual trigger, clear characteristic diagram) are only activated as from user role "Service Partner". The control lights indicate the condition of the PI optimiser

[Optimisation required]	Optimisation required
[Steady state reached]	Steady state reached
[Calibration in progress]	Calibration in progress
[Closed loop compensator]	Closed loop compensator

Optimisation required:
Indicates whether retraining would be possible.

Steady state reached:
Indicates whether stable engine operation has been reached and the conditions for possible training have been met.

Calibration in progress:
Indicates whether the engine is in the calibration phase.

Closed loop compensator:
Indicates whether the compensator is active for cylinder optimisation.

5 **SAFI PI self-test**

The button is only visible and active for user role "Service Partner" if the mode selector switch is set to Stop and the speed is less than 50 rpm.

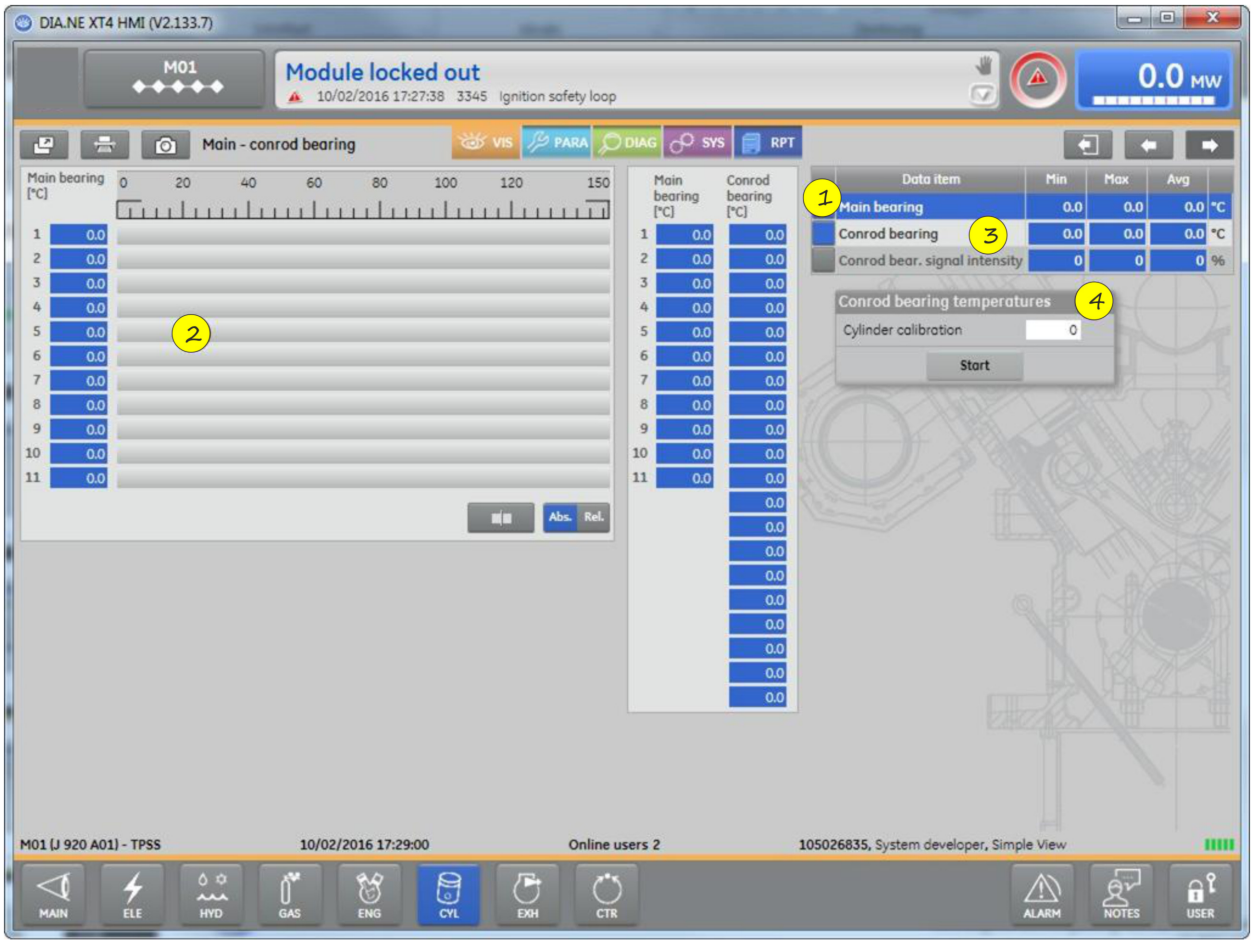
This function is used to check the correct function of the Port Injection (PI) valves. The test checks whether:

- the supply voltage is present
- the valve can be controlled (although the valve is not physically opened in this test)

The valve functions correctly if the value of the "Closed detection, current gradient" shows values from approx. -90 to -150 (BR9 Hörbiger PI valves) or -200 to -250 (BR Woodward PI valves) after activation of the self-test.

13.31 CYL - main / big-end bearing

This screen shows the main and big-end bearing temperatures. The screen is only visible for Type 9 engines.



1 **Display shows minimum [Min], maximum [Max] and average [Avg]**

[Main bearing]	Main bearing temperature
[Big-end bearing]	Big-end bearing temperature
[Big-end bear. signal intensity]	Signal intensity of wireless sensor on big-end bearing

2 **Bar chart for cylinder-specific display**

[Main bearing] and [Big-end bearing]	If, where all the bearings are in similar ranges, one bearing deviates significantly from the average of the other bearings and exceeds the maximum value, this indicates bearing damage and will result in a trip event.
[Big-end bear. signal intensity]	This is determined at engine start when 1,000 rpm is reached, and at trip events. The values should always be roughly around 50%. A significant deviation is an indication that either the sensor has to be recalibrated, the sensor alignment or cabling has to be checked or the sensor has an internal defect and must be replaced.

Selecting the appropriate line 3 (blue background) controls which values are displayed on the bar chart.

4 Calibration of big-end bearing temperature

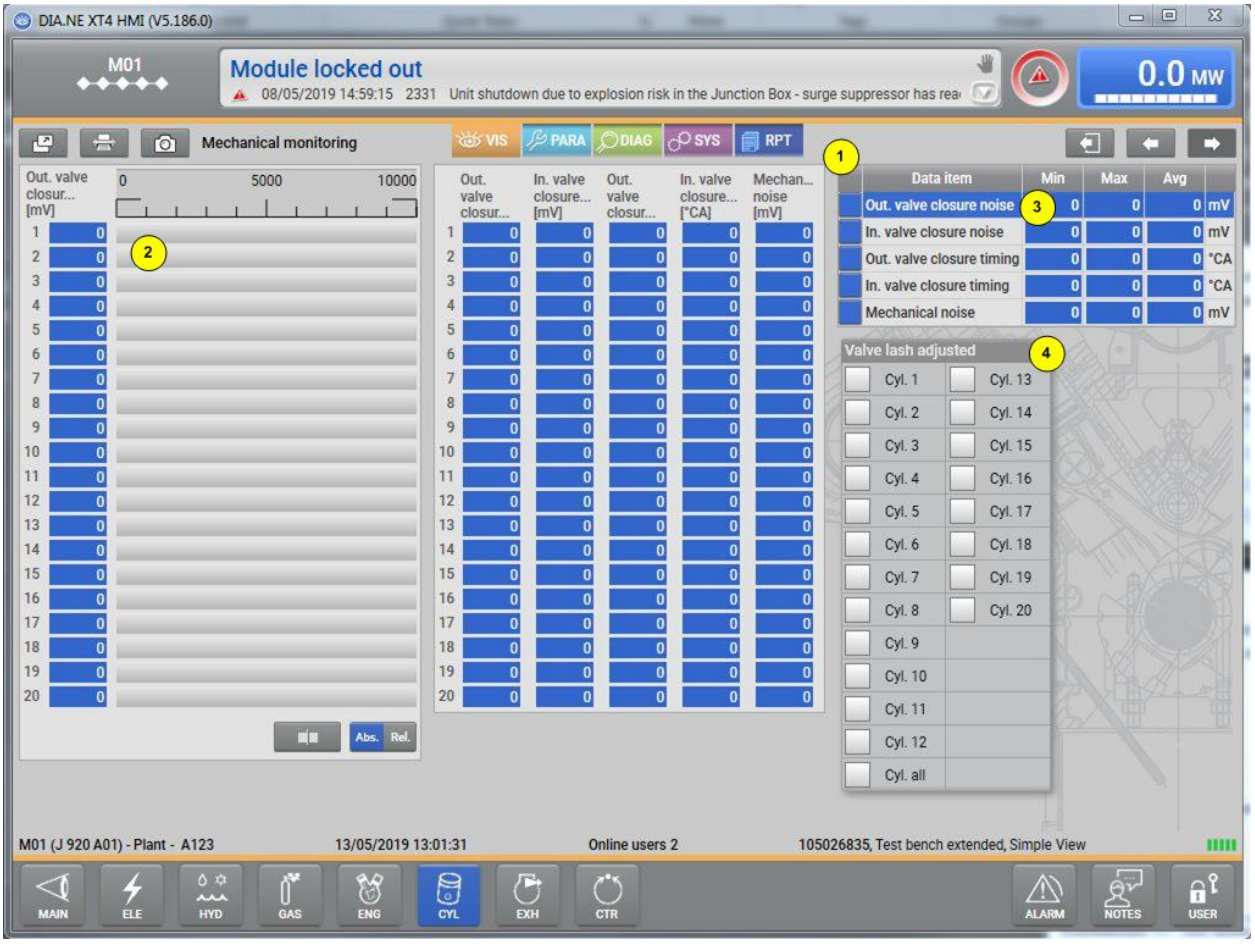
Each time a sensor is replaced, each time the sensor's alignment with the antenna is changed, whenever the sensor's signal intensity is too low and whenever sporadic signal losses occur, the sensor will have to be recalibrated. This should be done with the engine at rest. Use the engine turning gear to rotate the sensor exactly in front of the antenna. Then, select the appropriate cylinder in field 4. To start the calibration, select Start. It is not possible to calibrate all the cylinders (select cylinder = 0) during a standstill.

In some cases, it may be necessary to calibrate sensors during engine operation as materials will sometimes expand due to the higher temperatures, changing distances.

As no temperature data are transmitted during calibration, calibration while the engine is running is very critical. It should only be done at part load and when all the temperatures are stable and no unusual deviations are apparent. It is preferable to calibrate individual cylinders rather than all of the cylinders (select cylinder = 0). If the calibration process takes too long, this can lead to an undesired engine shut-down. In this case, the affected sensor has to be recalibrated while at a standstill before the engine is restarted.

13.32 CYL - Mechanical monitoring

This screen shows the following measured values for mechanical monitoring of the engine: outlet/inlet valve closing noise, outlet/inlet valve closing time (Test Stand user role extended) and mechanical noise. The screen is only displayed if parameter 12118 *[Engine/SAFI/Knocking]* is set and SAFI2 is installed at the engine.



1 **Display shows minimum [Min], maximum [Max] and average [Avg]**

[Out. valve closure noise]	Outlet valve closure noise
[In. valve closure noise]	Inlet valve closure noise

[Out. valve closure timing]	Outlet valve closure timing (user role Test Stand Extended)
[In. valve closure timing]	Inlet valve closure timing (user role Test Stand Extended)
[Mechanical noise]	Mechanical noise

2 **Bar chart for cylinder-specific display**

Selecting the appropriate line 3 (blue background) controls which values are displayed on the bar chart.

4 Valve clearance adjusted

Input possible from user role Customer Extended or above.

Each time the valve clearance is reset to its nominal value, the corresponding checkbox must be set. If the valve clearances of all valves are set to the nominal value, the checkbox [Cyl. All] can be set.

[Out. valve closure noise] - outlet valve closure noise

The noise when the outlet valve closes is measured with the knock sensors of the SAFI2. A certain crankshaft angle range of the knock sensor signal is analysed within which the closing event of the output valve is likely to occur.

The display shows absolute values in millivolts of the maximum amplitude measured over this crankshaft angle range.

If the closing noise of the outlet valve exceeds the limit value (14316) for more than 3 seconds, alarm 2334 (outlet valve noise maximum) is triggered in the alarm management system. In parallel with this alarm, message 9027 (outlet valve noise maximum) containing the cylinder number that caused the trip is generated in the alarm management system. Possible causes include excessive valve clearance, a broken valve spring etc.

[In. valve closure noise] - Inlet valve closure noise

The noise when the inlet valve closes is measured with the knock sensors of the SAFI2. A specific crankshaft angle range of the knock sensor signal within which the inlet valve is likely to close is analysed.

The display shows absolute values in millivolts of the maximum amplitude measured over this crankshaft angle range.

If the closing noise of the inlet valve exceeds the limit value (14317) for more than 3 seconds, alarm 2335 (inlet valve noise maximum) is triggered in the alarm management system. In parallel with this alarm, message 9028 (inlet valve noise maximum) containing the cylinder number that caused the trip is generated in the alarm management system. Possible causes include excessive valve clearance, a broken valve spring etc.

[Out. valve closure timing] - outlet valve closure timing

Only visible from user role 45 (Test Stand Extended).

The noise when the outlet valve closes is measured with the knock sensors of the SAFI2. A certain crankshaft angle range of the knock sensor signal is analysed within which the closing event of the output valve is likely to occur.

The display shows absolute values of the crankshaft angle in degrees during the time in which the outlet valves close. The outlet valve closing time curve can provide information about the remaining outlet valve clearance.

[In. valve closure timing] Inlet valve closure timing

Only visible from user level 45 (Test Stand Extended).

The noise when the inlet valve closes is measured with the knock sensors of the SAFI2. A specific crankshaft angle range of the knock sensor signal within which the inlet valve is likely to close is analysed.

The display shows absolute values of the crankshaft angle in degrees during the time in which the inlet valves close. The inlet valve closing time curve can provide information about the remaining inlet valve clearance.

[Mechanical noise] Mechanical noise

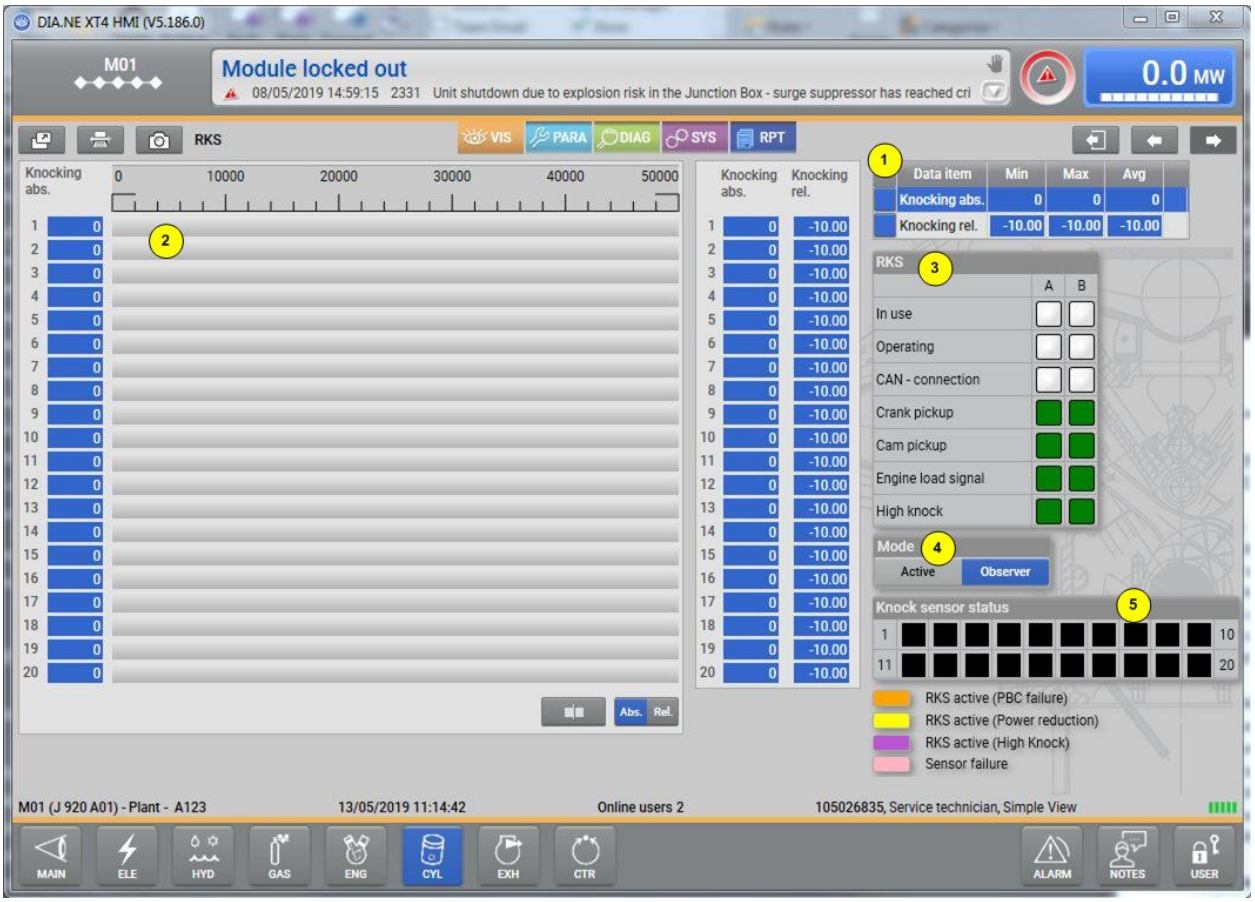
The mechanical noise is measured with the knock sensors of the KLS98 / SAFI / SAFI / SAFI2. A specific crankshaft angle range of the knock sensor signal is analysed.

The display shows absolute values in millivolts of the maximum amplitude measured over this crankshaft angle range. If a value smaller than *[limit value measuring signal fault]* is not reached from half-load, a corresponding warning (measuring signal fault knock sensor) is triggered in the alarm management system. If 50% of all measuring signals fail, the engine is switched off due to the failure of KLS98 / SAFI / SAFI / SAFI2.

If the mechanical noise exceeds parameter 12073 *[mechanical noise limit]* for more than 2.5 seconds, alarm 3341 (mechanical noise maximum) is triggered in the alarm management system. In parallel with this alarm, message 3281 (mechanical cylinder noise maximum) containing the cylinder number that caused the trip is generated in the alarm management system. Possible causes include excessive valve clearance, a broken valve spring, piston abrasion etc.

13.33 CYL - RKS

This screen shows the Redundant Knocking System (RKS) with the cylinder-specific measured values, absolute & relative knock signal and various states. The screen is optional and is visible from the Service Technician user role or higher.



1 Display shows minimum **[Min]**, maximum **[Max]** and average **[Avg]**

[Knocking abs.]	Knocking signal, absolute
[Knocking rel.]	Knocking signal, relative

2 **Bar chart for cylinder-specific display**

The RKS system sends a relative and an absolute knocking signal, one of which is used for control purposes, depending on the internal configuration. In the default configuration the relative knocking signal is used.

3 RKS Status Bank A and B

The status for both banks of the RKS system is shown here. Whether a system is in use/active depends on whether it has been in operation since the engine startup and no errors have occurred.

[In use]	Active/Inactive display
[Operating]	Running
[CAN - connection]	CAN connection
[Crank pickup]	Crank pickup
[Cam pickup]	Cam pickup
[Engine load signal]	Engine load signal
[High knock]	Strong knocking

4 Active/Observer mode

Both modes:

signals are evaluated / recorded (Diane Trend, ECBMem, ...).

Observer mode:

no influence on the engine control.

Active mode:

RKS control intervenes: Cylinder pressure sensor error, power reduction (through knocking) or strong knocking (detected by RKS).

Knock integrator is now loaded/unloaded via RKS knock sensors.

Port injection valves are controlled via the characteristic diagram and exhaust gas temperatures.

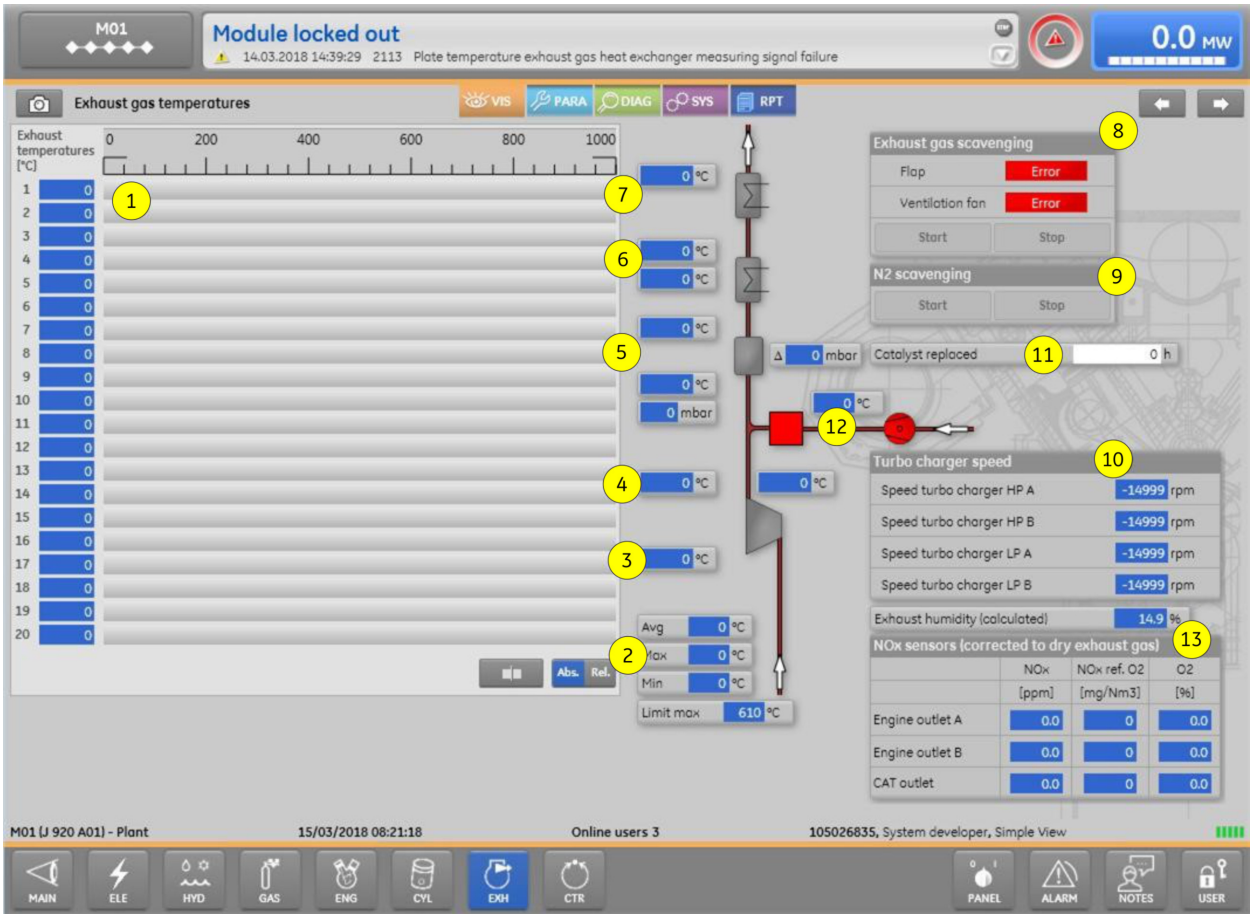
5 Knock sensor status

The knock sensor status indicates which cylinders are controlled by the RKS system and why.

[RKS active (PBC failure)]	RKS active (PBC error)
[RKS active (Power reduction)]	RKS active (power reduction)
[RKS active (High Knock)]	RKS active (strong knocking)
[Sensor failure]	Sensor fault

13.34 EXH – Exhaust temperatures

This screen shows the individual cylinder temperatures as a bar chart and as a numerical value. Depending on the design of the plant, the temperatures of the waste heat boiler and the catalytic converter can also be displayed.



1 Cylinder exhaust temperatures

The exhaust gas temperatures of the individual cylinders are displayed both in a bar chart and as a numerical value.

The bar chart can be switched between an absolute display **[Abs.]** and a relative display **[Rel.]** of the exhaust gas temperatures. The relative display shows the deviationfrom the average value. It also shows an upper and lower limit value for the maximum permissible deviation from the average value. If the upper limit value for a cylinder is exceeded, the relevant bar changes colour from blue to orange. If the lower limit value for a cylinder is not reached, the relevant bar changes colour from blue to orange.

2

[Avg]	Average cylinder exhaust temperature
[Max]	Maximum cylinder exhaust temperature
[Min]	Minimum cylinder exhaust temperature

3 Turbocharger inlet temperature (optional)

4 Turbocharger outlet temperature banks A and B (optional)

5 Catalytic converter (optional)

Display of the inlet and outlet temperatures of the catalytic converter and the temperature of the catalytic converter itself.

6 Waste heat boiler (optional)

Display of the tube plate temperature and outlet temperature of the waste heat boiler.

7 **Waste heat boiler 2** (optional)

Display of the inlet and outlet temperature of waste heat boiler 2.

8 **Exhaust-gas scavenging** (optional)

Display of the scavenging air valve **[Flap]** and the scavenging fan **[Ventilation fan]**. Exhaust-gas scavenging can be started and stopped if the operating mode selector is set to Off or Manual (Service Technician user level).

9 **Nitrogen scavenging** (optional)

Nitrogen gas scavenging can be started and stopped if the operating mode selector is set to Scavenge ((Service Technician user level).

10 **Turbocharger speed** (optional)

[Speed turbo charger HP A]	High-pressure turbocharger speed, bank A
[Speed turbo charger HP B]	High-pressure turbocharger speed, bank B
[Speed turbo charger LP A]	Low-pressure turbocharger speed, bank A
[Speed turbo charger LP B]	Low-pressure turbocharger speed, bank B

11 **Catalytic converter replaced** (optional)

The counter must be reset to zero after replacing the catalytic converter.

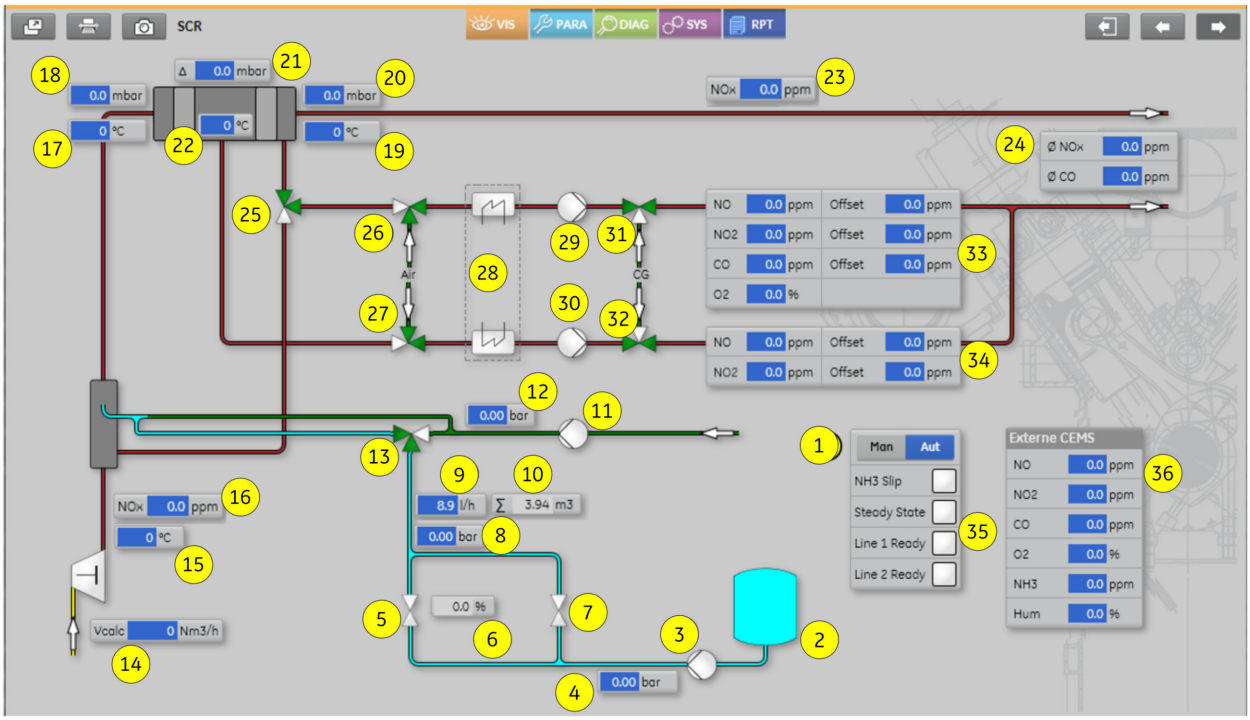
12 **Temperature ahead of exhaust gas scavenging valve** (optional)

13 **Exhaust gas humidity** (calculated) and **NOx sensors** (corrected to dry exhaust gas) (optionally extended from Customer user role)

Depending on parameter 14067 NOx sensor configuration, the exhaust gas humidity and the respective sensor data are displayed

13.35 EXH - SCR

This screen provides an overview of all relevant measured values and valve settings for the SCR/OXI exhaust gas after-treatment system. Various options (see below) can be enabled or disabled via parameter settings, which are also reflected in the overview screen.



1 Activation of the manual operating mode (Service Technician authorisation level or higher). This activates all manual operating elements in the SCR image (not shown in the image) and enables manual entries. For details see Section "General Function Description"

2 Urea tank with level indicator – minimum (red)

3 Urea supply pump (when dosing valves are used and activated by parameter); in manual mode additional switching elements appear, which can be used to switch the pump on or off

4 Display of urea pressure before dosing (when using dosing valves)

5 Dosing valve or dosing pump (selection via parameter, if dosing valve is deselected dosing pump is displayed)

6 Display of the valve or Pump control signal (0-100%), in manual mode this becomes the input field for manual input of the control signal: Pump in l/h and valve in %.

7 Redundant metering valve or dosing pump, selection via parameter; in manual mode, a switching option between the valves/pumps appears here. If a valve is blocked, this is also shown in the image with a button.

8 Display of urea pressure after dosing

9 Display of current urea flow rate

10 Display of cumulative urea quantity (resettable from Customer user level)

11 Air compressor or solenoid valve for compressed air; in manual mode the compressor or valve can be switched on/off.

12 Display of air supply pressure

13 3/2-way valve (urea/air) for flushing the dosing lance and line to the injector; the current switching position (air/urea/closed) is displayed. If blocked, the valve appears red.

14 Display of the calculated gas exhaust volume flow (visible from Service Technician authorization level)

15 Display of exhaust gas temperature at the engine outlet (if available)

16 Display NOx measurement at the engine outlet (if available, activation via parameter)

17 Display of the exhaust gas temperature at the catalytic converter inlet

18 Display of the exhaust gas pressure at the catalytic converter inlet

19 Display of the exhaust gas temperature at the catalytic converter outlet

20 Display of the exhaust gas pressure at the catalytic converter outlet

21 Display of calculated differential pressure across the catalytic converter (SCR+OXI)

22 Display of the calculated average catalytic converter temperature (visible from Service Technician authorisation level)

23 Display of NOx sensor at the catalytic converter outlet (if available and activated via parameter)

24 Display of time averages for NOx and CO, if available; the time base (averaging time) can be changed via a parameter. Note: Once the start-up timer (parameter), which is set after the urea dosing starts and enables the system to stabilise (especially after a cold start) has finished, the average emission values are reset and emission monitoring starts again. This function can be enabled/disabled in the parameter menu.

Option for internal sample gas analysis with 2 emission measurement lines:

Measuring line 1: Measurement according to OXI, with optional manual switchover to crude gas (engine outlet)

Measuring line 2: Measurement before OXI (between SCR and OXI)

25 Valve alignment for sample gas position: Clean gas / crude gas (activation via parameter); in manual mode the valve can be switched.

26 Valve position for air purging of measuring line 1: Sample gas (exhaust gas) / air; in manual mode the valve can be switched. The air is used for zero point calibration.

27 Valve position for air purging of measuring line 2: Sample gas (exhaust gas) / air; in manual mode the valve can be switched. The air is used for zero point calibration.

28 Sample gas cooler for gas drying for both measuring lines; in the event of an error (temperature too high) the cooler is shown in red. The sample gas cooler is also equipped with automatic condensate pumps to discharge the resulting condensate.

29 Gas pump for measuring line 1; in manual mode the pump can be started or stopped.

30 Gas pump for measuring line 2; in manual mode the pump can be started or stopped.

31 Calibration gas valve for measuring line 1 (if available and activated by parameter; in manual mode the calibration gas valve can be activated to check the measuring cells of measuring line 1 with calibration gas.

32 Calibration gas valve for measuring line 2 (if available and activated by parameter; in manual mode the calibration gas valve can be activated to check the measuring cells of measuring line 1 with calibration gas.

33 Overview of the current measured values of the existing measuring cells for measuring line 1; these can be activated and scaled individually via parameters. For measurement line 1 up to 4 measuring cells (NO, NO2, CO and O2) can be activated. In addition, the zero point deviation (offset) is also displayed for NO, NO2 and CO, which is determined anew for each measuring cell during each fresh air purging procedure. No zero point correction is performed for O2.

34 Overview of the current measured values of the existing measuring cells The measuring line 2; these can be activated and scaled individually via parameters. For measurement line 2 up to 2 measuring cells (NO, NO2) can be activated. In addition, the zero point deviation (offset) is also displayed, which is determined anew for each measuring cell during each fresh air purging procedure.

35 Additional overview of some statuses (visibility from Advanced Customer):

- NH3 slip: Indication that an NH3 slip correction is performed as the algorithm has detected an NH3 slip (see **TA 1511-0072**)
- Steady State: Indicates that the system is in stable operation (engine load stable and catalytic converter temperature stable).
- Line 1 Ready: Indication that measuring line 1 is ready for measurement and supplies measured values
- Line 2 Ready: Indication that measuring line 2 is ready for measurement and supplies measured values

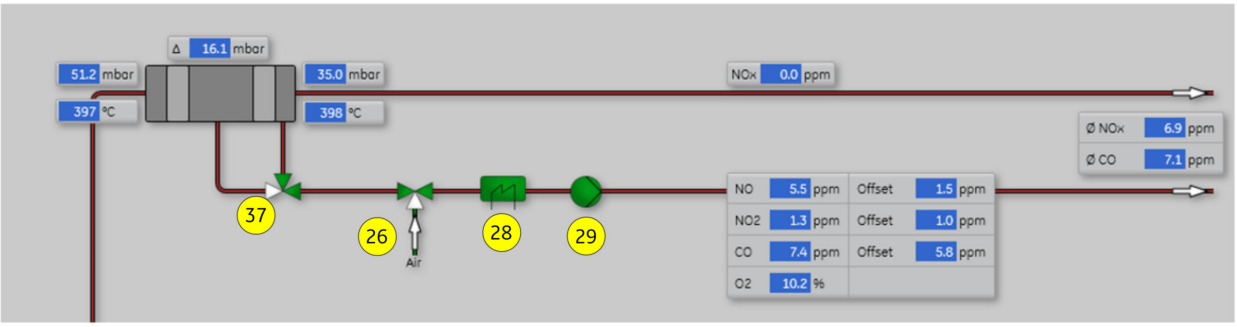
Option for external emission measurement:

36 Overview of the measured values of an external emission measurement; this can be activated by parameter if an external measurement is available.

Option for internal sample gas analysis with only one emission measurement line:

Measuring line 1: Measurement after OXI, with switchover to pre-OXI. The design is similar to that described under "Internal sample gas analysis with 2 emission measurement lines", but with an additional valve (see figure below)

37 Valve alignment for sample gas position: after/before OXI; in manual mode the valve can be switched. By default the measurement is performed according to OXI, for an NH3 slip check it is automatically switched to pre-OXI



General functional description of SCR

Manual / Automatic mode [Manual / Aut] (can be changed from Service Technician authorisation level)

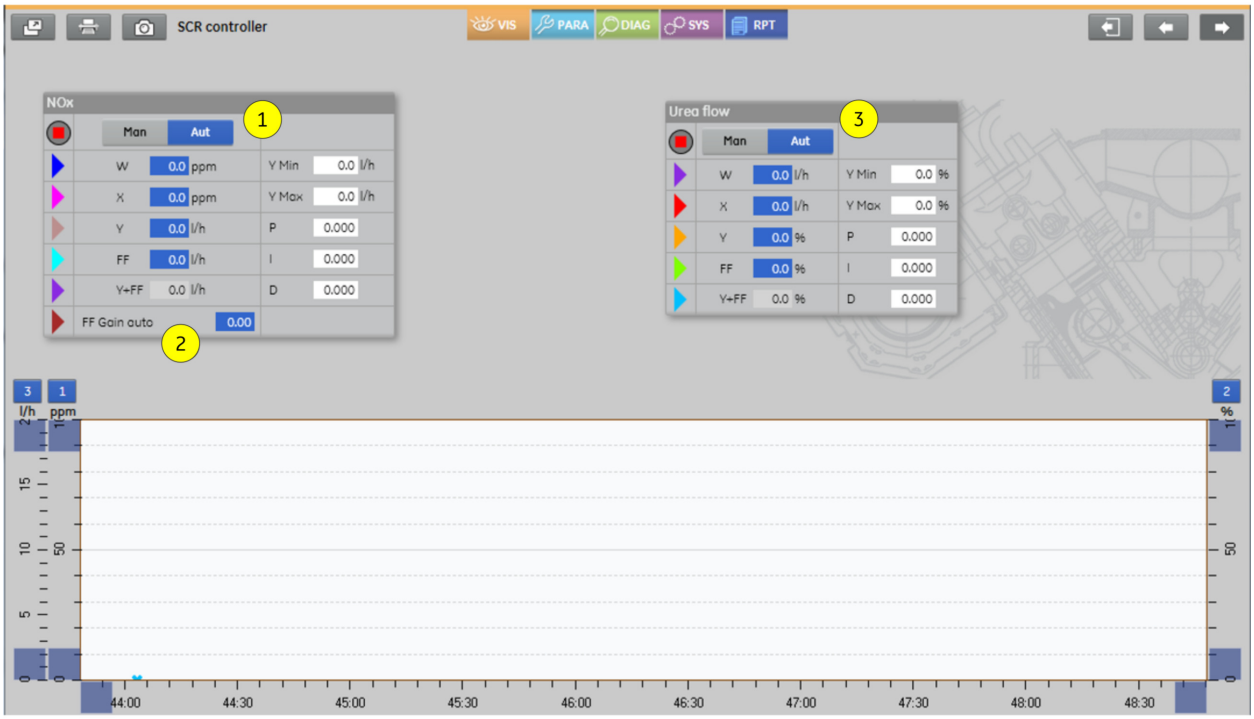
You can switch between automatic and manual SCR mode in the visualisation unit. In automatic mode, all pumps and valves are controlled automatically and do not require any user input in control mode. By contrast, in manual mode additional switching and input elements appear on the SCR screen, which enable all valves and pumps to be actuated manually and process values to be specified irrespective of any state functions, the only exception being where the closed-current circuit has been interrupted. In this case, for safety reasons, manual inputs will have no effect and all the outputs will be switched electrically dead. If you switch from automatic mode to manual mode (irrespective of the engine operation), all valve settings and setpoints (output values) are taken over and no longer changed automatically. All the control functions for the SCR are deactivated blocked in manual mode. This means, for example, that the urea dosing is kept constant irrespective of the engine load and/or the outlet NOx emission, which can result in a significant overdosing or underdosing and eventually to a failure to adhere to emission limits.

Note: The manual SCR mode may only be used during direct oversight and is only recommended for servicing/ testing purposes and confined solely to trained users (user role Service Technician or higher).

Further information on the automatic sequence can be found in **TA 1511-0072**.

13.36 EXH – SCR controller

The relevant controllers are shown on the SCR controller screen. As a minimum, a NOx regulator is always present, and depending on the metering device also a urea flow controller. Further information on the controller architecture and setting guidelines can be found in **TA 1511-0072**. In addition, the image shows a trend of the relevant controller values.



1 All relevant parameters (from Service Technician authorisation level) for the NOx controller can be entered here, and actual and target values can be read.

Name	Description
MAN/AUT	Switch to manual controller -> field "Y+FF" becomes input field, the set flow rate can be specified manually. When switching from Aut to Man, the current flow value is applied but then no longer automatically updated. When switching from Man to Aut, the controller starts from the previous settings.
W	NOx setpoint in ppm
X	Current actual NOx value in ppm; this is frozen if fresh air purging takes place during an internal emission measurement.
Y	Set flow rate in l/h from controller output (correction for pre-control)
FF	Set flow rate in l/h from pre-control (depending on which pre-control option was selected
Y+FF	Sum of controller output and pre-control in l/h – this corresponds to the set flow rate. If a urea flow controller is available, this corresponds to the set value (with urea flow controller).
Y Min	Lower limit for the controller output (negative pre-control correction) in l/h
Y Max	Upper limit for the controller output (positive pre-control correction) in l/h
P	Amplification factor KP of the PID NOx controller
I	Amplification factor KI of the PID NOx controller
D	Amplification factor KD of the PID NOx controller

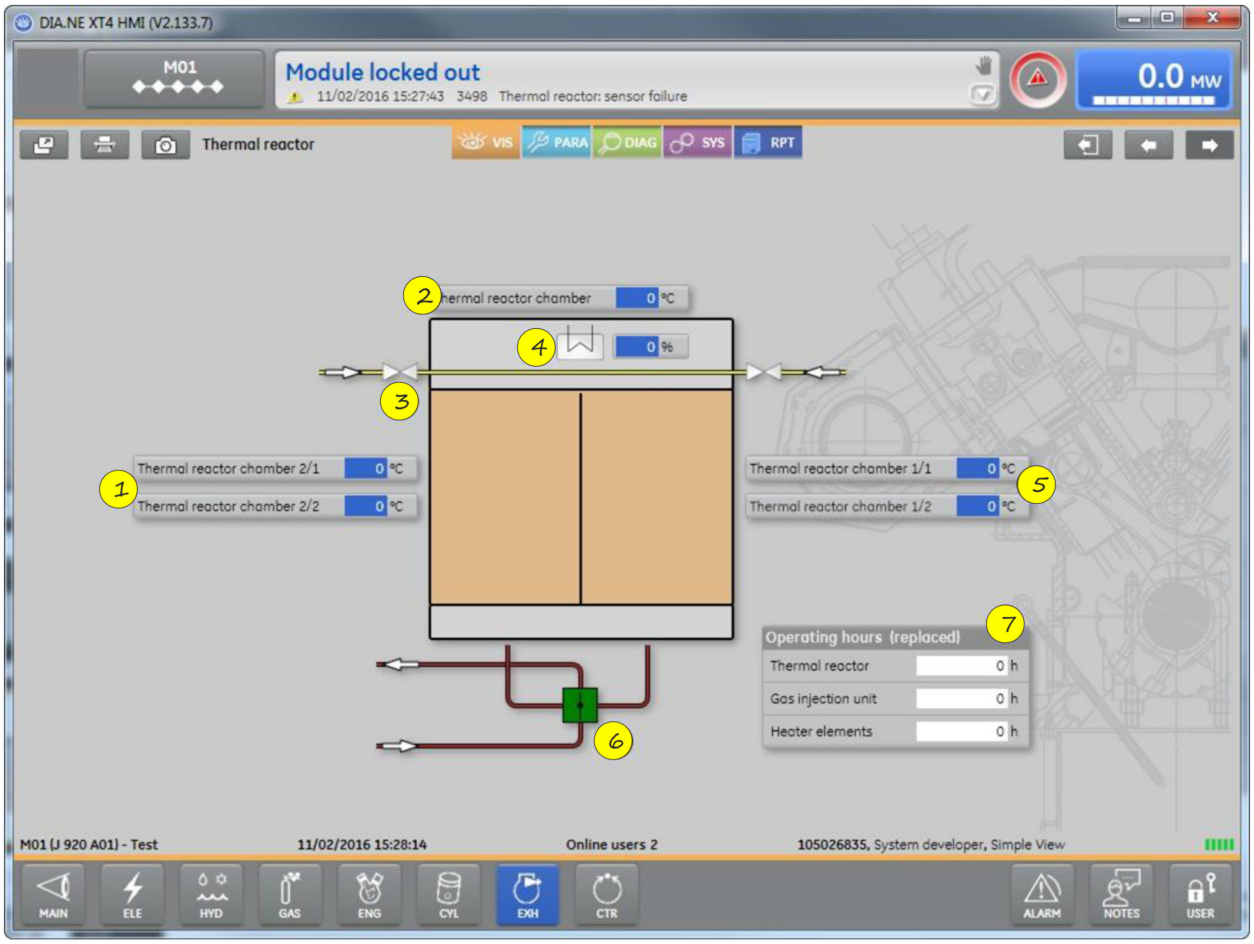
2 Correction factor from automatic input control adjustment, if activated by parameter. A factor of 1 means no adjustment, values >1 mean an increased pre-controlled quantity, values <1 mean a lower pre-controlled quantity. Details can be found in TA 1511-0072.

3 All relevant parameters for the urea flow controller (from Service Technician authorisation level) can be entered here, and actual and target values can be read. The urea flow controller is used with uncontrolled metering pumps and proportional proportioning valves. If an external dosing control is used, it is not active and not shown .

Name	Description
MAN/AUT	Switch to the manual controller -> Field "Y+FF" becomes the input field, valve or pump output (in %) can be set manually. When switching from Aut to Man, the current percentage value is applied but then no longer automatically updated. When switching from Man to Aut, the controller starts from the previous settings.
W	Urea quantity setpoint in l/h -> output from the NOx controller or manual set quantity specification
X	Current urea flow rate in l/h
Y	Position in % from controller output (correction for pre-control)
FF	Set position in % from pre-control (valve or pump characteristic curve)
Y+FF	Sum of controller output and pre-control in %; this corresponds to the output to the valve or pump.
Y Min	Lower limit for the controller output (negative pre-control correction) in %
Y Max	Upper limit for the controller output (positive pre-control correction) in %
P	Amplification factor KP of the PID urea controller
I	Amplification factor KI of the PID urea controller
D	Amplification factor KD of the PID urea controller

13.37 EXH - Thermal reactor

This screen shows the thermal reactor (Clair) and is optionally activated or deactivated with the [Exhaust/ Thermal reactor active] parameter.



1 Thermal reactor chamber 2, temperatures 1 and 2
Displays the exhaust gas temperature in chamber 2 of the thermal reactor, designed with redundancy.

2 Thermal reactor chamber temperature
Displays the average temperature in the thermal reactor.

3 Displays gas injection active/inactive
Indicates whether supplementary firing gas is being introduced from the engine gas train or from a separate gas supply entering the thermal reactor.

4 Displays thermal reactor heating active/inactive and percentage
Indicates whether the ceramic heating elements are active and in what load condition they are being operated.

5 Thermal reactor chamber 2, temperatures 1 and 2
Displays the exhaust gas temperature in chamber 1 of the thermal reactor, designed with redundancy.

6 Valve position
Displays the valve position and therefore the flow direction of the exhaust gas through the thermal reactor. The valve position is changed at regular intervals and the flow of the two thermal reactor chambers is reversed. There is no flow through the thermal reactor when the valves are in the middle position.

7 Operating hours displays for thermal reactor, gas injection and heating elements
The counters indicate the current operating hours for the relevant components. In the event of replacement, the reading can be reset to zero (possible as from user role "Service technician").

13.38 EXH - NOx sensor

This screen shows the status of the NOx sensors and is optionally displayed with parameter 14067 *[Exhaust/ NOx sensor configuration]* (and from user level 15 Customer Extended).

In addition, a self-diagnosis function can be activated, and the current measured values (NOx and O2) of the sensors are displayed.

Depending on parameter 14067, the sensors at the engine outlet, engine outlet bank A, engine outlet bank B and/or CAT outlet are displayed (see TA 1530-0300).

Status

[CAN connectivity]	The sensor is detected at the CAN connection and values are received.
[Countdown]	A minimum temperature must be reached to activate the sensor. Once this is reached, a countdown (heating phase of the sensor and measured value stabilisation) of 180 seconds starts until the sensor signal becomes available.
[Sensor active]	The sensor is active and sends values.
[Status NOx - signal]	The read-out status bits (NOx, O2, heating element, supply voltage) of the sensor are displayed. If one of these lights up red, the sensor must be replaced.
[Status O2 - signal]	
[Status heater]	
[Status power]	
[Sensor operating hours]	The operating hours of the sensor are displayed. At 6000 h a warning appears (W9233-W9236) and the sensor must be changed as soon as possible

Self-diagnosis

[Activation]	Activation of self-diagnosis
[Manual Triggering]	Manual triggering (only active if self-diagnosis is set to active and status is "OK" or "Error")
[Status self-diagnosis]	Self-diagnosis status (OK, error, wait for O2 stable, active, wait)
[Load self-diagnosis]	Shows the number of engine operating hours at which the last sensor self-diagnosis took place.
[Result self-diagnosis]	Result value of the self-diagnosis in %
[NOx (raw) during self-diagnosis]	NOx (raw) during self-diagnosis
[O2 (raw) during self-diagnosis]	O2 (raw) during self-diagnosis

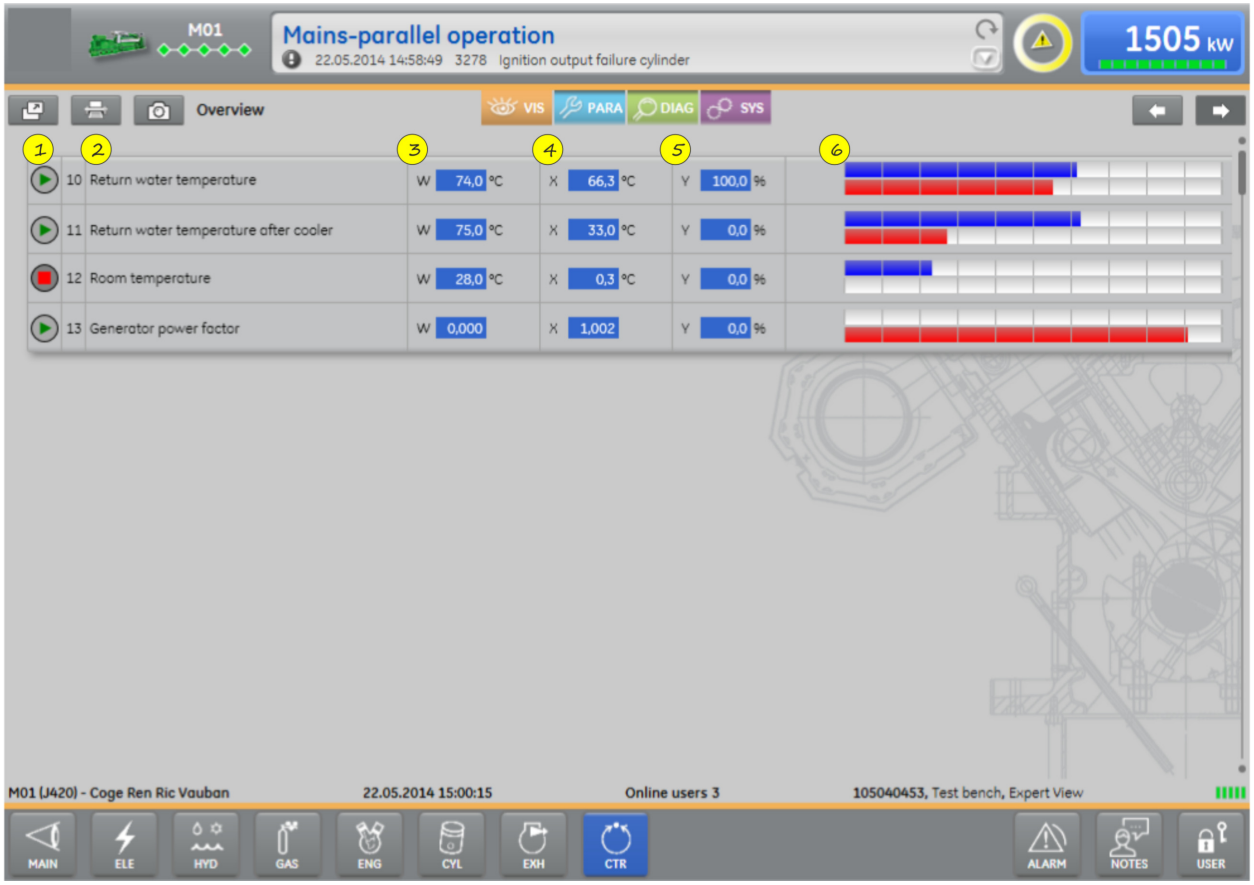
Measured values (adjusted to dry exhaust gas)

[NOx]	NOx in [ppm]
[NOx @reference oxygen]	NOx for reference oxygen in [mg/Nm³]
[O2]	O2 in [Vol-%]

[Exhaust water content (calculated)]	Water content in exhaust gas (calculated)

13.39 CTR – Plant controller overview (optional)

Use this screen to obtain an overview of all the plant controllers. Depending on the configuration, up to eight additional controllers can be activated in addition to the fixed controllers (i.e. return temperature, return temperature after cooler, engine-room temperature, generator cos phi, supply temperature, charge temperature ventilation fan and gas compressor).



1 **Controller in active/inactive mode**

The ▶ symbol denotes an active controller and the ■ symbol an inactive controller.

2 **Controller number and name**

3 **Set value [W]**

4 **Actual value [X]**

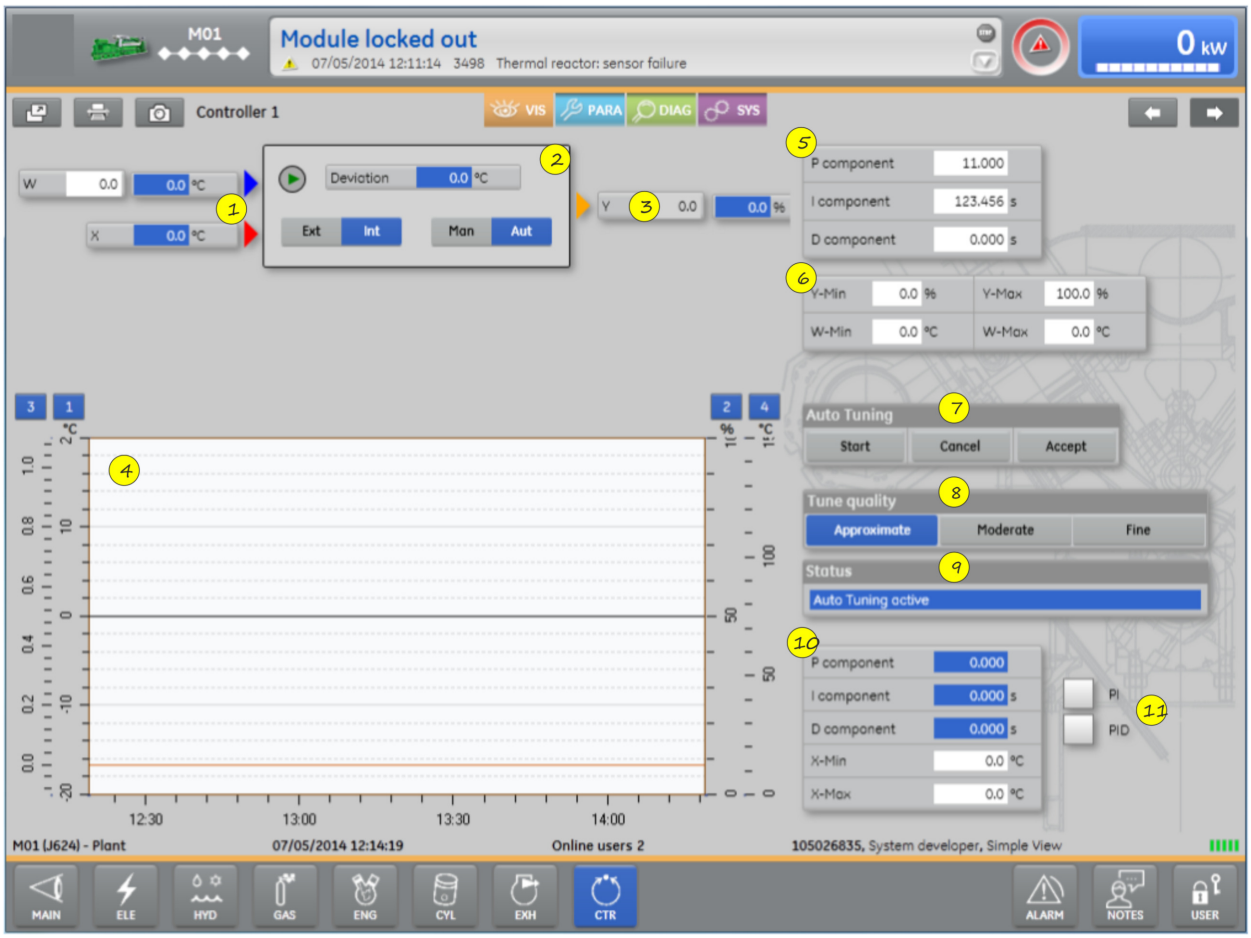
5 **Control variable [Y]**

6 **Bar display**

The set value is represented by the blue bar and the actual value by the red bar.

13.40 CTR – Plant controller

This screen is used to observe the control response and to switch the plant controller to different modes of operation (internal/external set value, automatic/manual mode). Other display and input fields are the controller parameters, minimum/maximum for the control variable or set value, and the auto-tune controller. The controlled variables are available as a trend display.



1 Input variables

[W]	Set value. An entry can only be made in "Internal" mode and as from the corresponding user level (the default is "Advanced customer").
[X]	Actual value

2

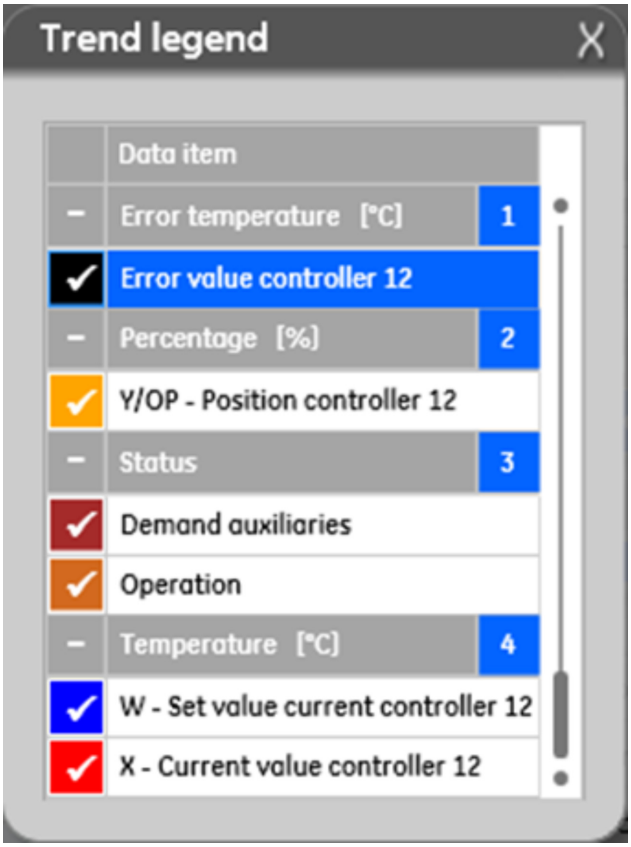
▶ ■	The ▶ symbol denotes an active controller and the ■ symbol an inactive controller.
[Deviation]	Controller deviation
[AUT/MAN]	This button switches the controller between "Automatic" and "Manual" modes. In manual mode, you can change the control variable [Y] by hand. The default user level is "Service Technician".
[INT/EXT]	This button switches the controller between using an internal and external set value. The default user level is "Service Technician".

3

[Y]	Control variable. An entry can only be made in "Internal" mode and as from the corresponding user level (the default is "Service partner").

4 **Online Trend**

	Measured value	Display range	Unit
[Error value controller x]	Controller deviation	-50/50	°C
[Y/OP-Position controller x]	Control variable	0 / 100	%
[Demand auxiliaries], [Operation]	Auxiliaries request active/inactive, operation on/off	0/1	-
[X–Current value controller x], [W-Set value current controller x]	Actual value (red) and current set value (blue)	0 / 120	°C



5 **Controller parameters**

[P component]	Proportional component
[I component]	Differential component/Derived time

[D component]	Differential component/Derived time

6 Control variables - set point limitation

[Y-max]	Maximum control variable limiter
[Y-min]	Minimum control variable limiter
[W-max]	Maximum setpoint limiter
[W-min]	Minimum setpoint limiter

7 Auto tuning

The displays and input fields are used to set the possible tuning options and to carry out the tuning. The "Advanced customer" user level is required. All input fields are locked during the tuning process. The message "Autotuning Active" appears in the status display.

[Start]	Start tuning process. The controller must be active and in automatic mode.
[Cancel]	Abort tuning process or reject calculated parameters
[Accept]	Copy calculated parameters

8 Tuning quality

[Approximate]	Tuning quality approximate: 1 oscillation test over 3 periods
[Moderate]	Tuning quality medium: 2 oscillation tests over 4 periods If the quality of the first oscillation test is OK, the tuning is ended after the first run.
[Fine]	Tuning quality fine: 3 oscillation tests over 5 periods If the quality of the first vibration test is OK, the tuning skips the second test and proceeds immediately to the third test.

9 Status display for the autotune process

The display appears as soon as the tuning process is active. The following status displays may be generated:

Autotuning parameters ascertained
Autotuning active
Invalid value for P component
Invalid value for I component
Invalid value for D component
Y-Max smaller than or equal to Y-Min
Error in calculation of controller parameters
Maximum tuning time has been exceeded
Invalid value for control variable change dy-Max
Controller variable outside the permissible range
Difference between W and X is too small to start the tuning process
Error in calculating the slope of the controlled variable
Y-Max or Y-Min modified during tuning
The minimum pulse/pause duration is larger than the period duration.
Period duration is less than the basic cycle time

10 Calculated parameters:

Displayed here are the parameters which are used during or after the tuning process for the controller. On completion of the parameter calculation, the status display shows the text below: "Autotuning parameters calculated" Press the **[Accept]** button to accept these parameters for the controller or the **[Cancel]** button to reject them. If you press the **[Cancel]** key, the controller will continue using the existing parameters. If tuning is aborted automatically because of an error, the controller will likewise continue using the existing parameters. In this case, a message will appear in the status display explaining why the process was aborted.

[P component]	Display showing the calculated proportional component
[I component]	Display showing the calculated integral component/integral time
[D component]	Display showing the calculated differential component/derivative time

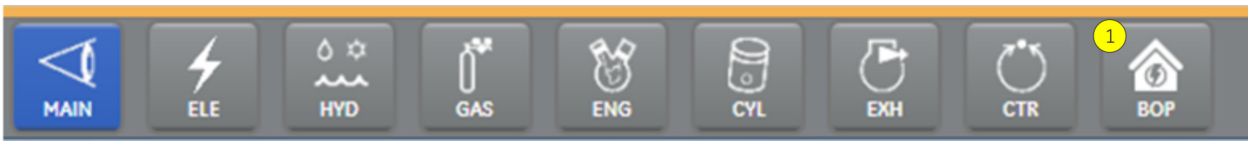
Limitations:

If values exceed or fall short of the limitations during the tuning process, the process is aborted and a message to that effect appears on the status display.

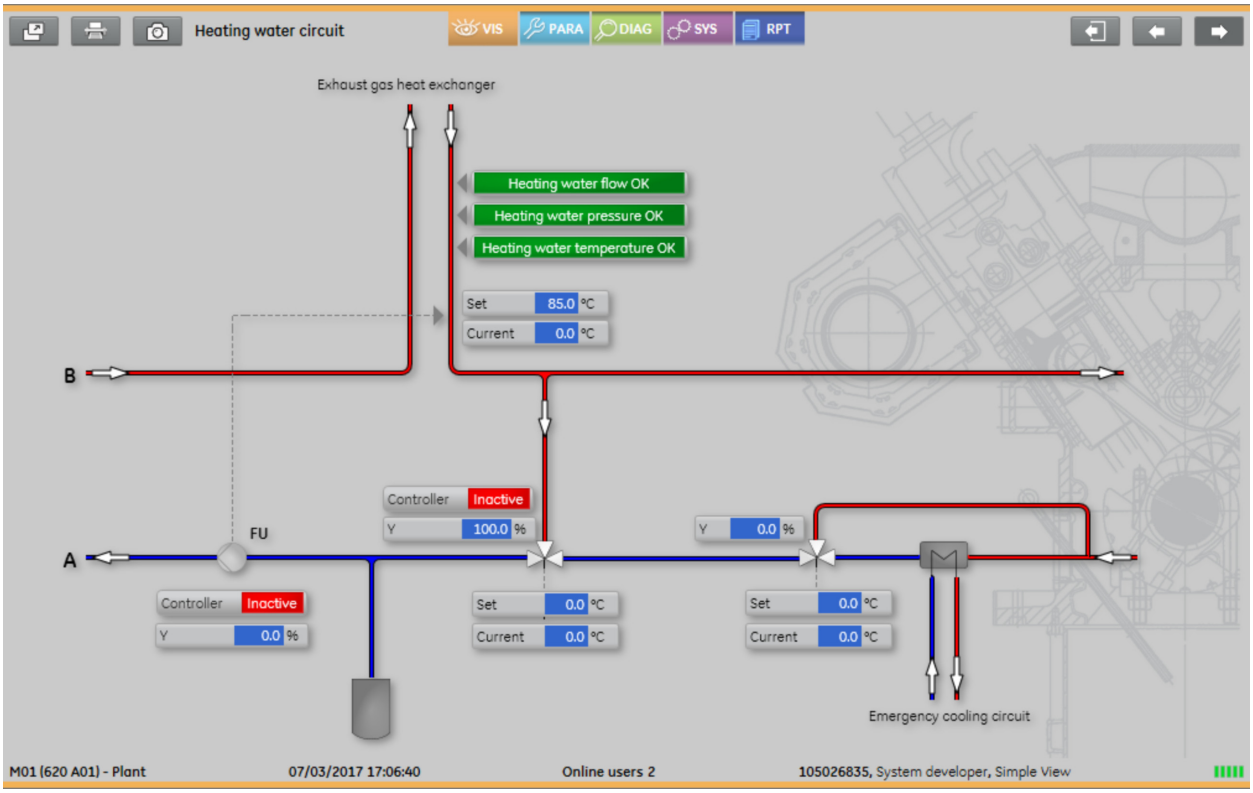
[X-min]	Input field for the permitted minimum value of the controlled variable during the tuning process.
[X-max]	Input field for the permitted maximum value of the controlled variable during the tuning process.

11 Select the check box to calculate either the P and I component or the P, I and D component. If neither of the two options is selected, only the P component is calculated.

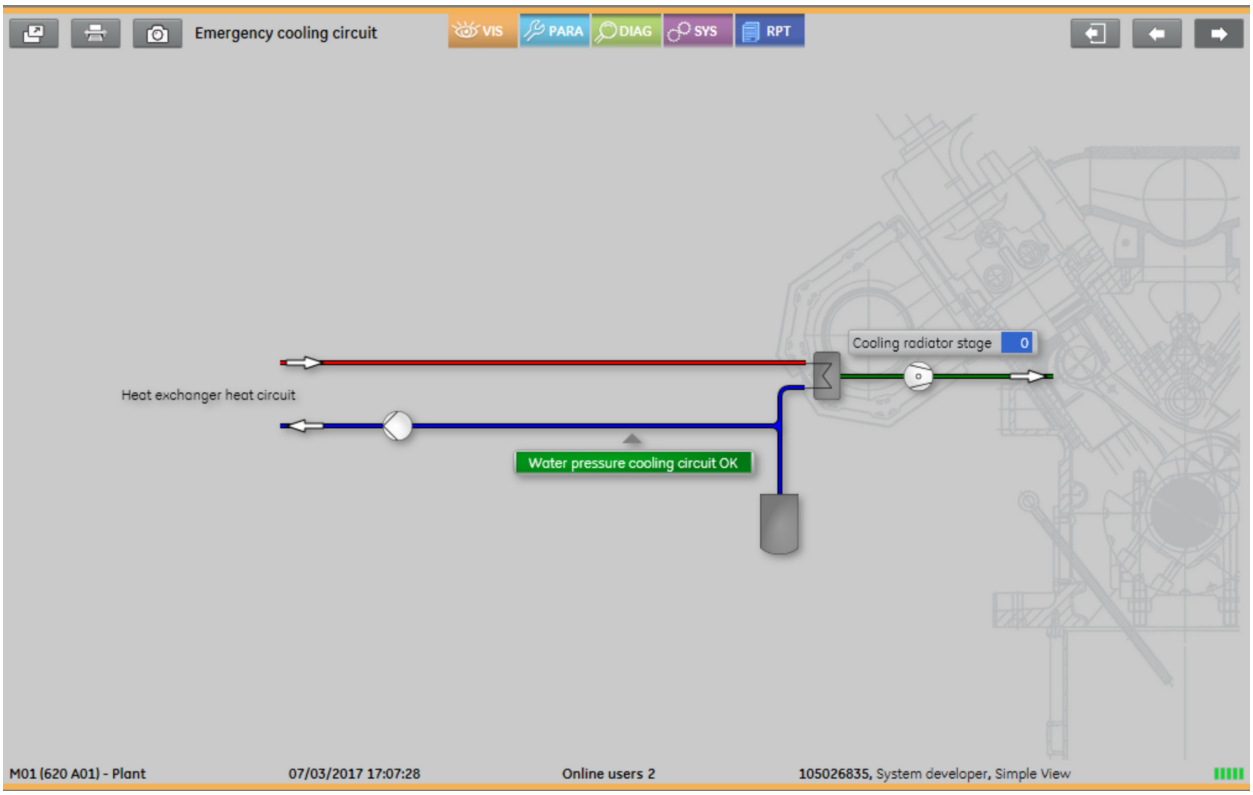
13.41 BOP - Balance of Plants



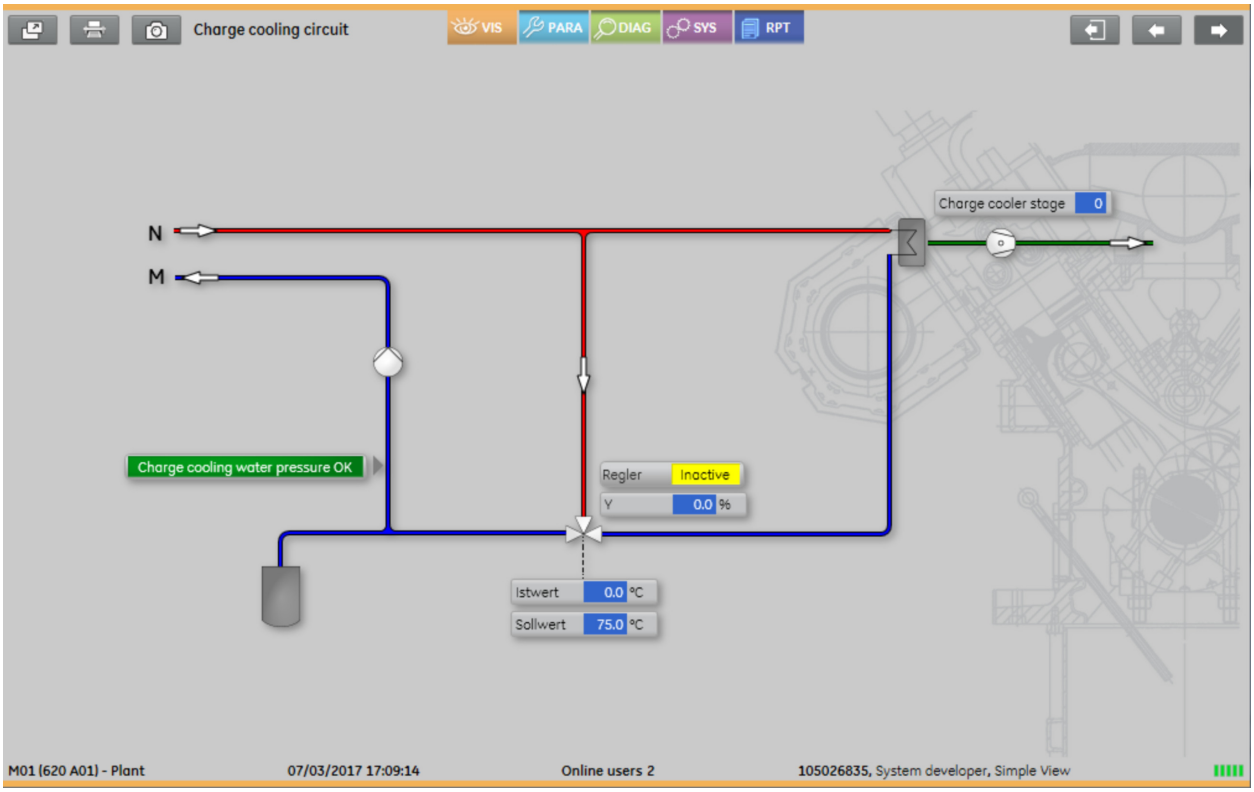
Choose the "Balance of Plant" 1 menu item, which is available as an OPTION, to display various mechanical circuits in the form of plant diagrams (P&IDs). These provide a quick overview of the current situation of the plant, as all the available measured values such as temperatures, pressures, flow rates, control signals, etc. are visually displayed. The different screens can be displayed or hidden with the *[Auxiliaries/BOP]* parameter. The plant screens already included in the standard layout reflect the most frequently occurring integration variants. Due to the range of possible mechanical designs and components used, the diagrams displayed generally have to be adapted to show the actual situation with the plant. This can be done during the design phase if the customer so wishes. The screens for the "Balance of Plant" components provide the user/plant operator with any easy way of improving the plant overview and troubleshooting in the event of a fault, especially in the case of projects in which the plant auxiliaries are controlled, monitored and regulated by DIA.NE XT4. The following screens are available in the standard layout: heating circuit, emergency cooling circuit, charge cooling circuit, gas pre-processing (main gas), room ventilation, exhaust gas system. If necessary, the plant visualisation can be extended for specific projects.



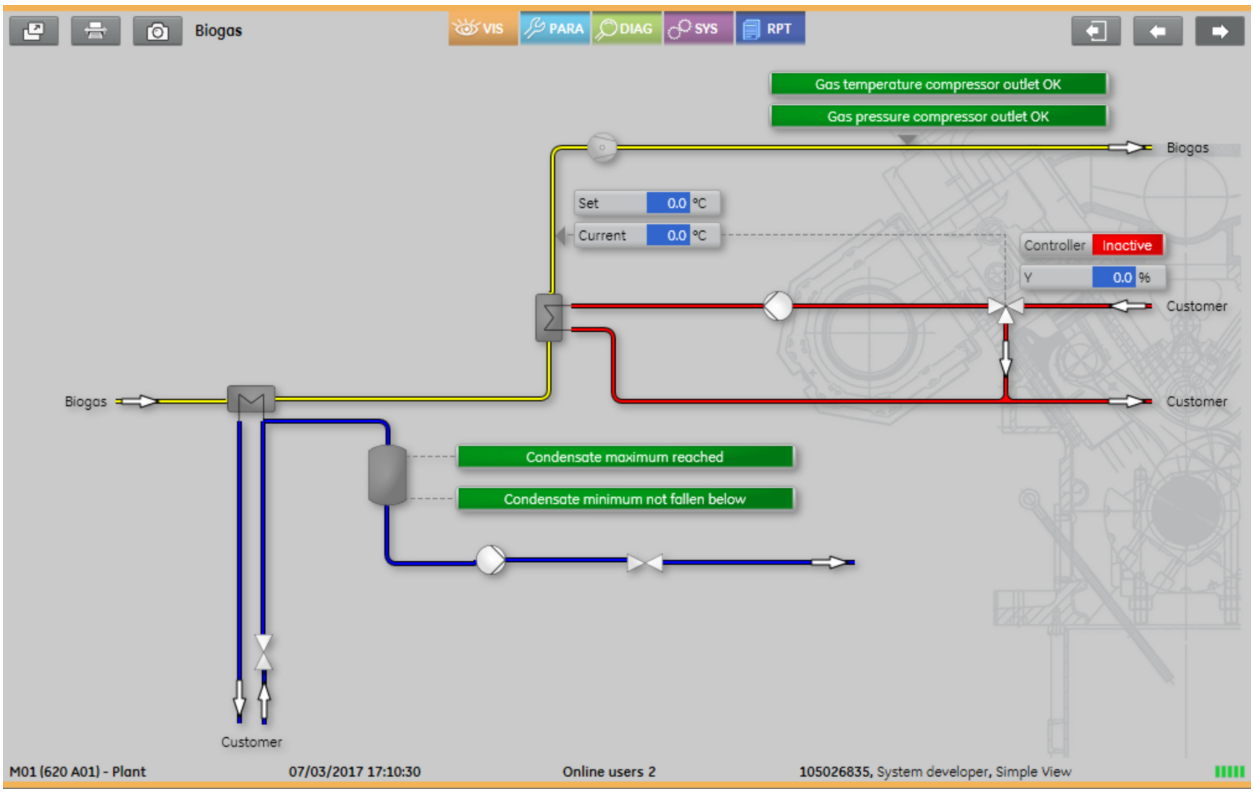
Heating circuit



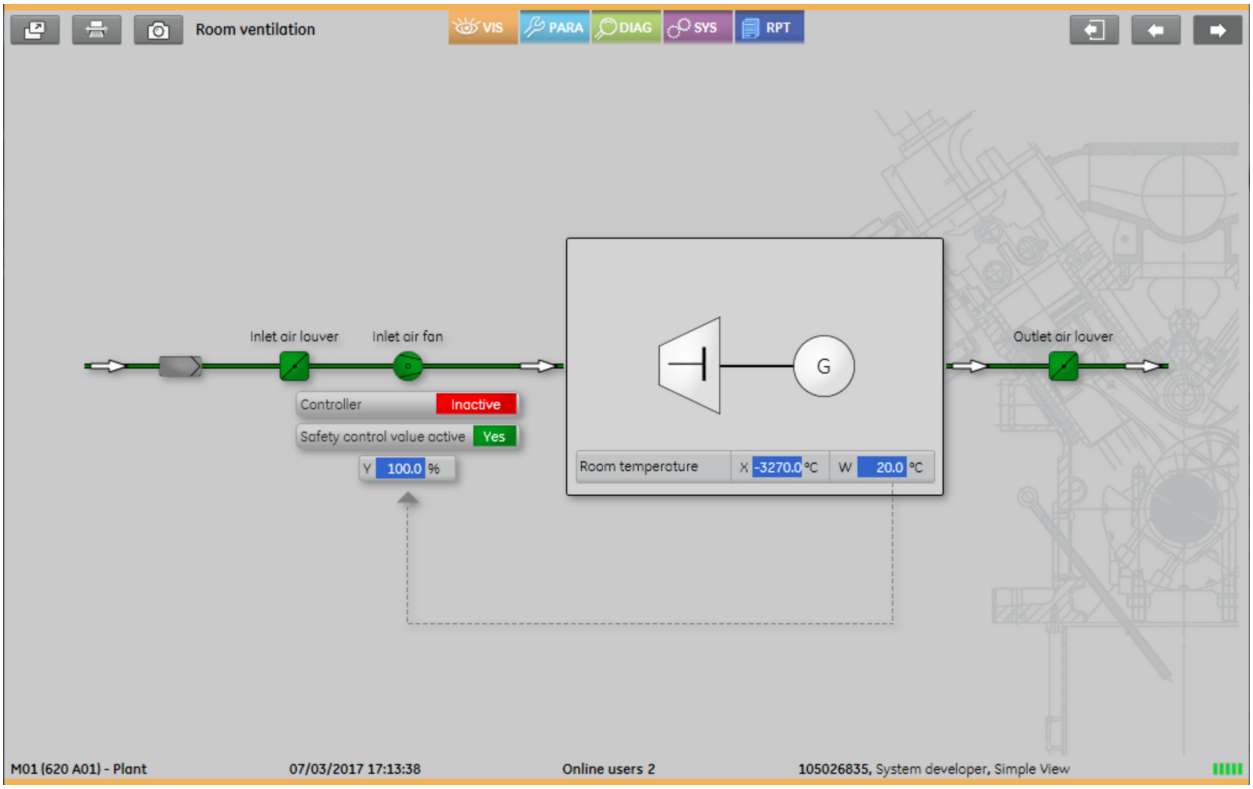
Emergency cooling circuit



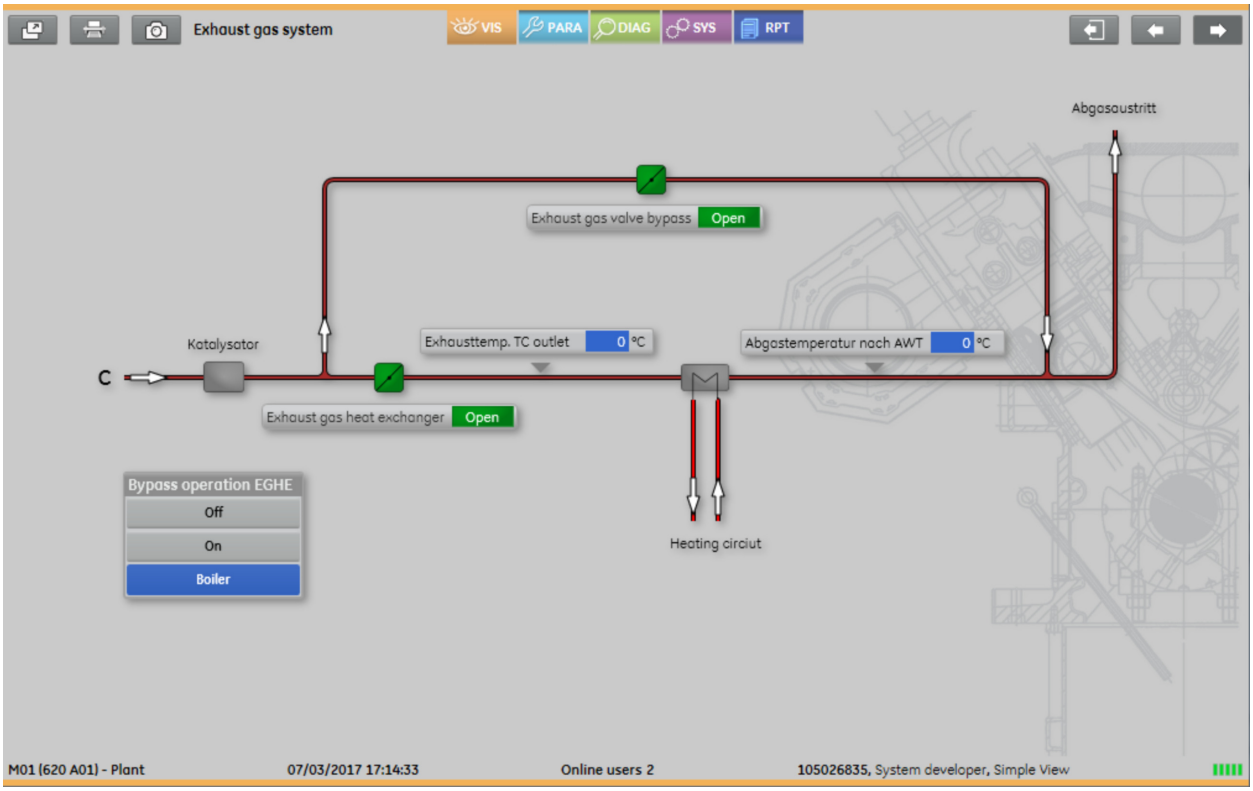
Charge cooling circuit



Gas pre-processing (main gas)



Engine room ventilation



Exhaust gas

14 Parameter management system

14.1 General

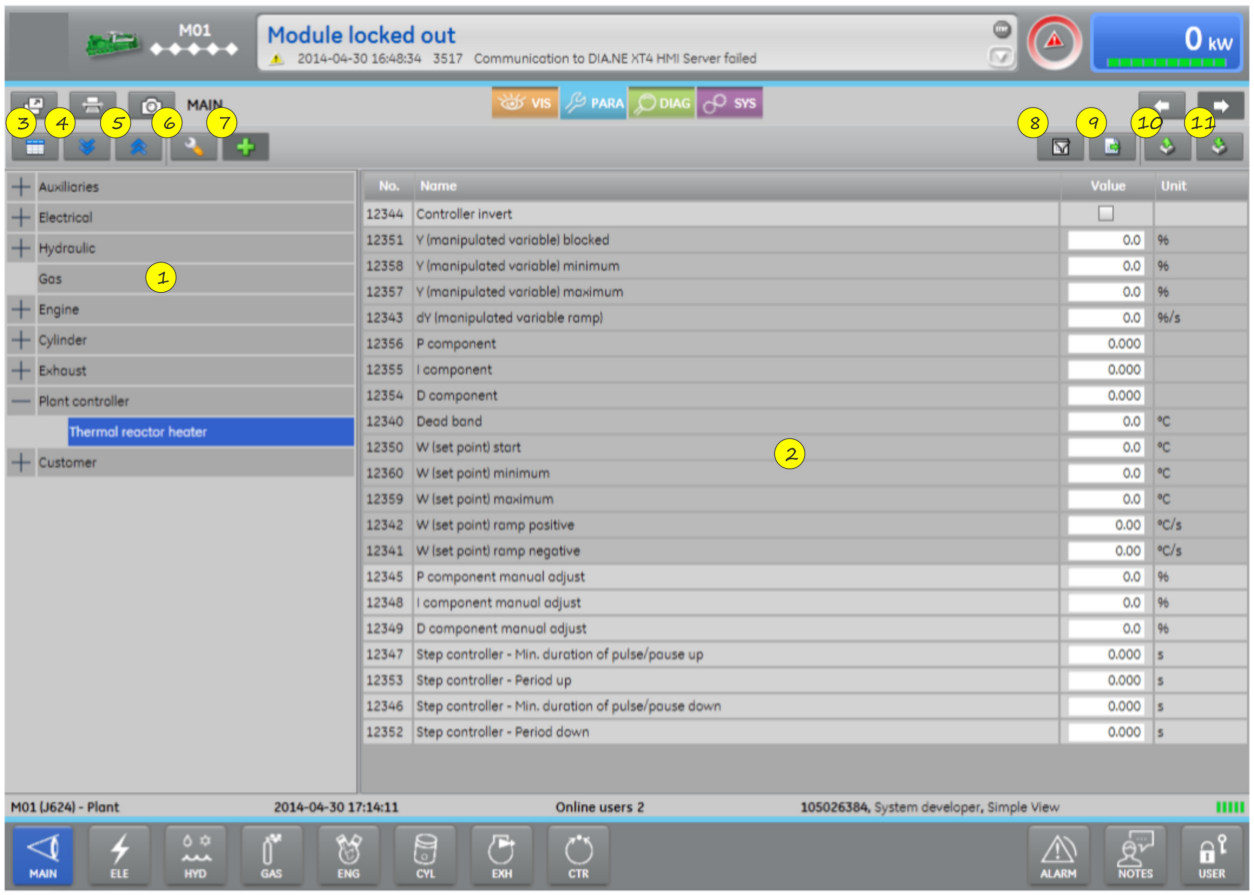
The parameter management system contains all the controller setting values, limit values, measurement ranges etc., arranged into groups and displayed in tabular form. Parameters can be varied (set) within their input limits. Changes to parameters affect the operation of the plant. The parameters, over 2000 in number, are structured into a number of levels (groups) for clarity. Various filters and search functions are also provided.

Visibility and write authorisation depend on the authorisation role of the used logged in. Depending on the equipment at the plant, only certain specific parameters and parameter groups will be displayed.

The parameter settings will be permanently stored in the system. They will therefore persist event in the event of a power failure.

Parameters can be exported to a file for back-up purposes. Parameters can be imported (uploaded) back into the control system with the import command.

As well as the direct editing mode, where the value is changed immediately after the input and confirmation, a "Batch Edit Mode" is also provided. This allows several parameters to be changed and then activated in a second step. In this advanced editing mode, current settings can be compared with parameters in a file, or in the case of multi-engine plants, directly with another engine.



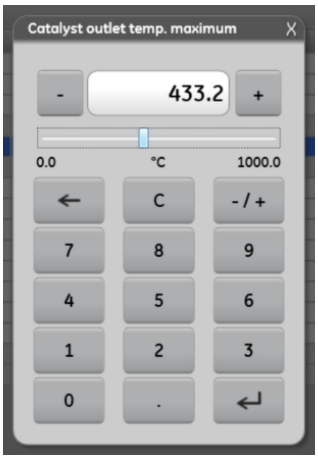
1 Parameter structure tree view

The parameter groups, which are structured over several levels, are shown here in a tree view. The group is expanded with "+" and collapsed again with "-". Selecting (clicking on) the desired parameter group marks it in blue and the parameters of the group are displayed in the right-hand pane.

Depending on the engine version (engine type, options) and the user role, only certain parameter groups are displayed or not.

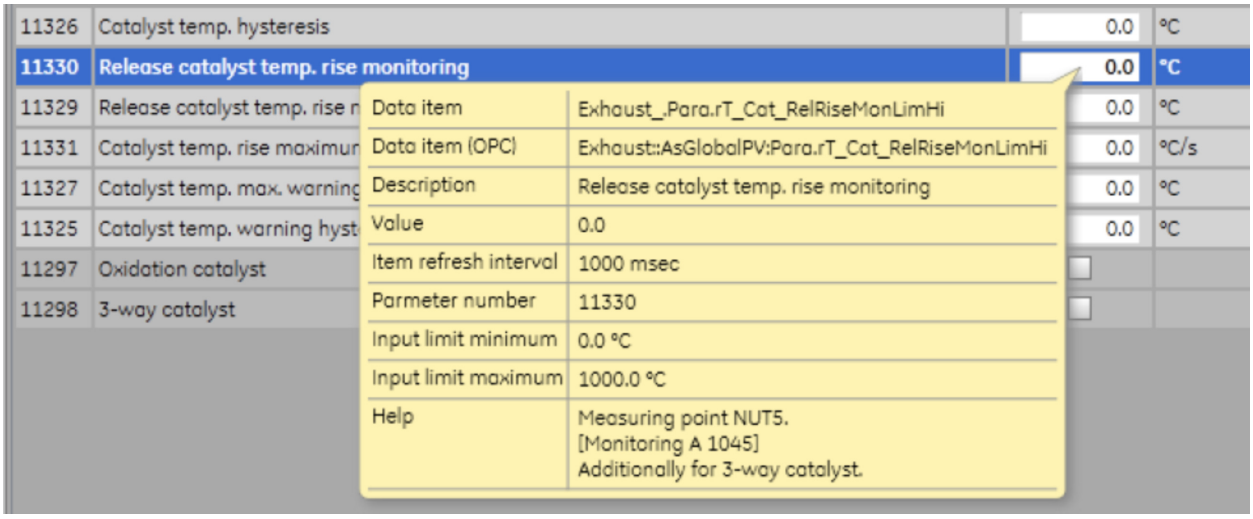
2 Parameter display pane

The parameters (number, name, value, units) of the selected group are displayed here. If write authorisation is held (user role), the parameter values can be changed within the setting limits. To do this, click on the corresponding value and enter the value.



Depending on the engine version (engine type, options) and the user role, only some parameters are displayed.

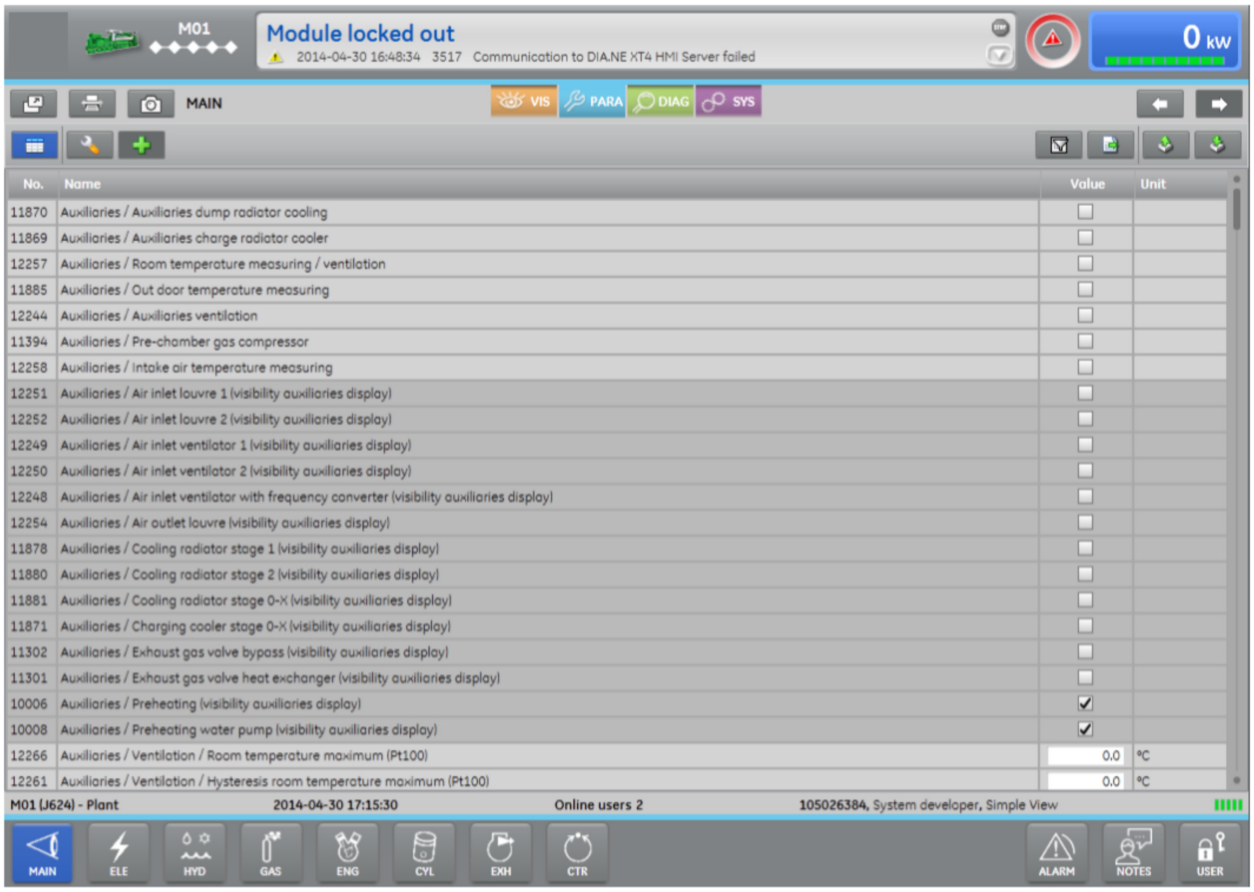
A right-hand mouse click or prolonged touch on the touch screen brings up a pop-up window with additional information (limit values, setting help, ...)



3 Switching between tree and list views

If a simple list is selected, all the parameters in the list are displayed. The group name appears in front of the parameter name in this display (<Name Group 1> / <Name Group 2> / <Name Parameter>).

List view:



4 **Expand all tree view elements**

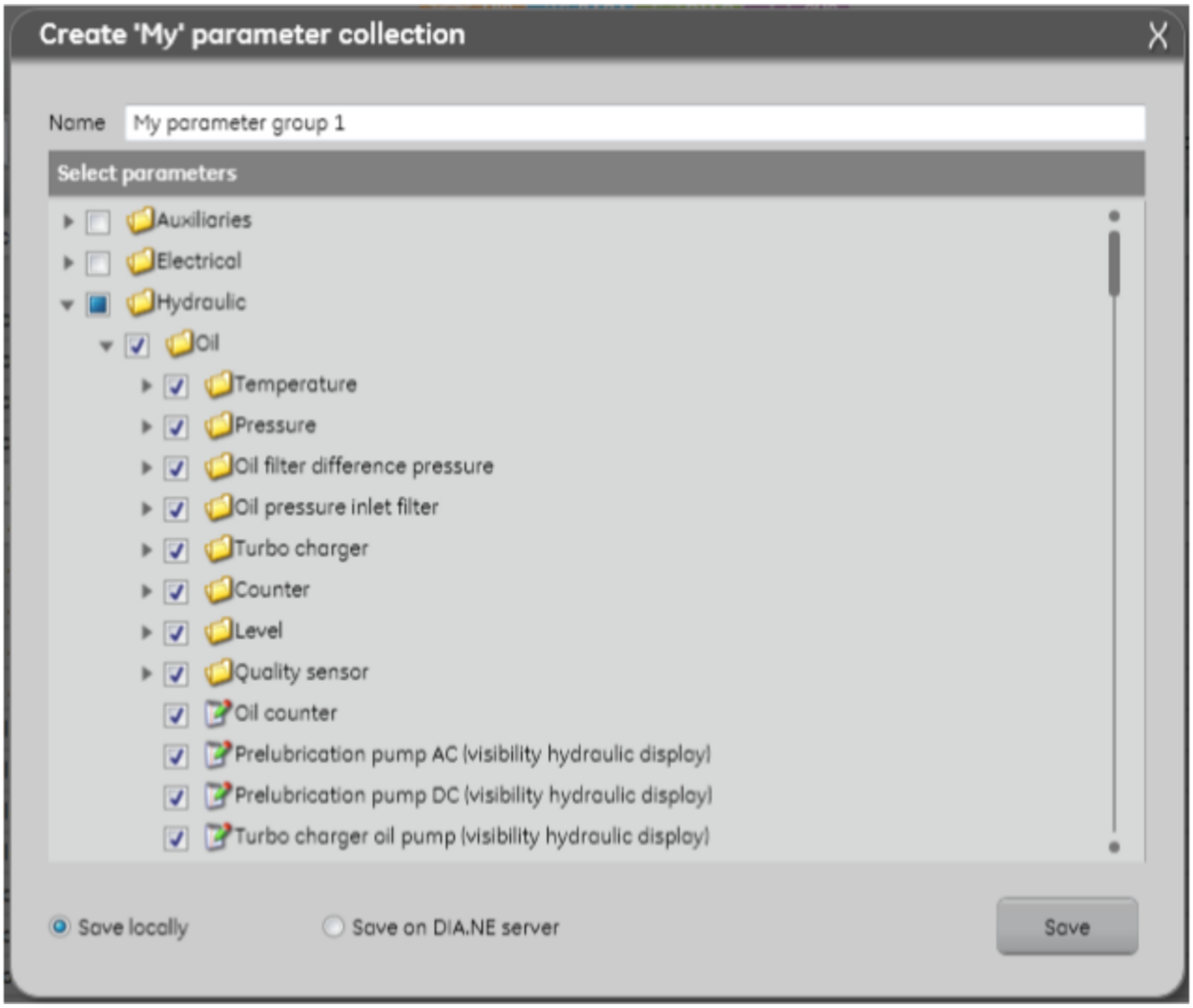
5 **Collapse all tree view elements**

6 **Create (change and delete) a user-specific parameter group (* only on PC Client)**

This button creates individual user-specific parameter collections and stores then on the server (panel) or local computer (PC). These parameter groups can then be activated under the navigation item 

.

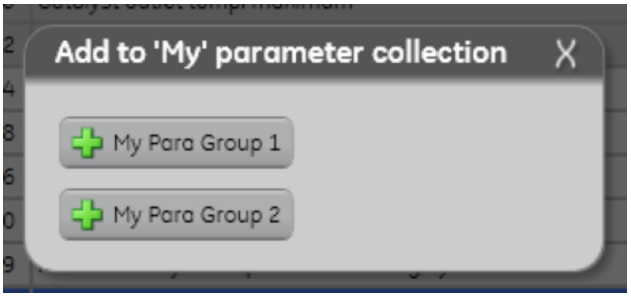
The desired parameters can then be selected in the open dialogue box and a name entered for the parameter collection. Individual parameters or existing groups can be selected (added).



Existing parameter groups can be changed with **[Update]** or deleted with **[Delete]**.

7 Adding selected parameters to user-specific parameter groups (* only on PC Client)

This button adds the selected parameters to an existing user-specific parameter group. Select the desired parameter group in the dialogue box displayed.



8 Filter and search function

This button displays the field to enter various filter criteria. Filters and searches can operate by parameter name (*only on the PC client), message number and parameter number.

Parameter name:

All parameters containing the entered text in the parameter name are displayed.

Message number **[By message no.]:**

All the parameters associated with the entered message number are displayed.

Parameter number **[By parameter no.]:**

The parameter with the entered parameter number is displayed.

9 **Activate "Batch edit mode"**

(see the "Batch Edit mode" section for the description)

10 **Parameter export**

(see the "Export/Import" section for the description)

11 **Parameter import**

(see the "Export/Import" section for the description)

14.2 Parameter export

Parameters can be exported into a file (*.pvx) with this button  . This function allows parameter settings to be backed up in a file at any desired storage location.

The following dialogue box appears before the export.

[Total parameters]	.... Number of all parameters to be exported.
[Invalid parameters]	.... Number of invalid parameters that therefore cannot be exported. Expanding the **[Invalid Parameters]** pane (drop-down) shows all the invalid parameters and the reasons for their invalidity.
[Module ID]	... Module ID (7-digit engine number)
[Module Name]	... Module name
[Module Type]	... Module type (engine type)
[Plant Name]	... Plant name
[Order number]	... order number (J number)

The [Export] button carries out the export and saves the parameters in a selected file.

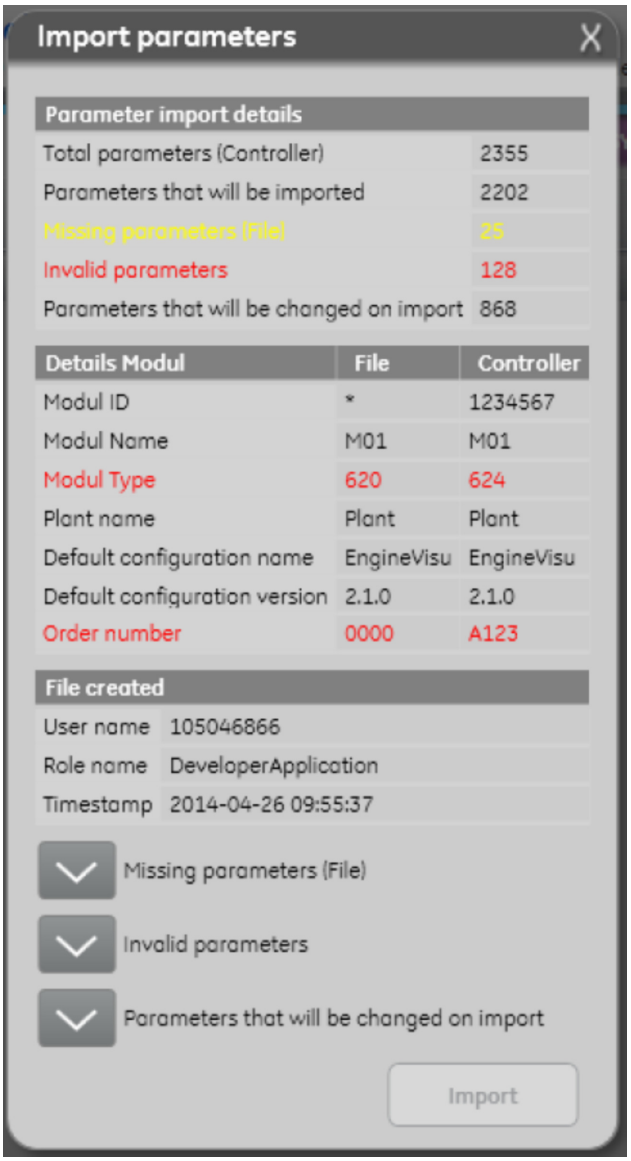
Note: Some users (high user roles) have the ability to export only some of the parameters. If export of only some parameters (parameter group) in the parameter tree structure is selected, these users can select in a corresponding file whether all the parameters or just the selected group are to be exported.

14.3 Parameter import

This button  imports parameters from a file (*.pvx). This function only loads parameters that have been previously backed up in a file.

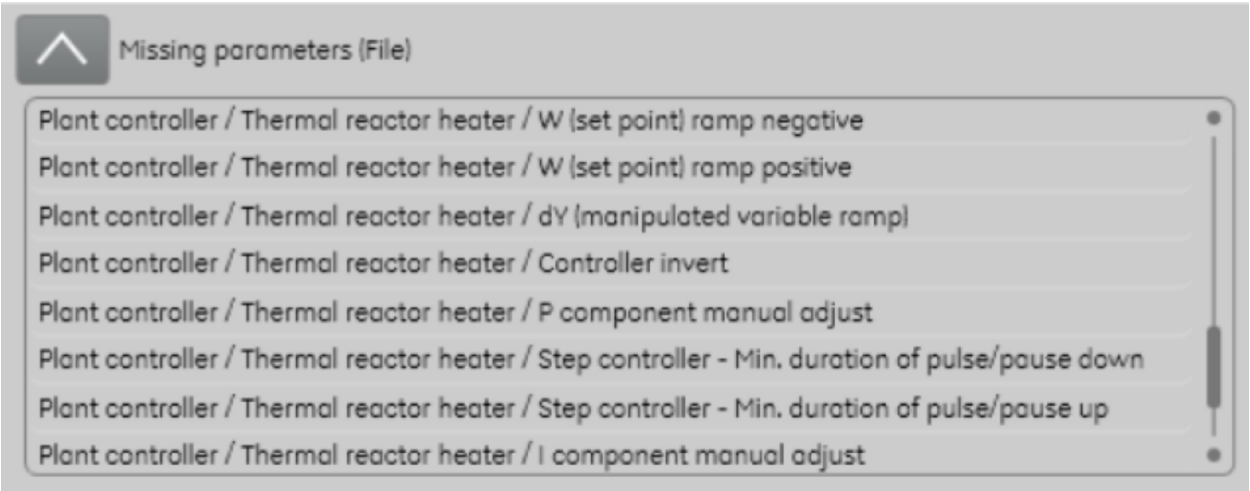
The following dialogue box appears before the import.

The import is then carried out with the **[Import]** button.



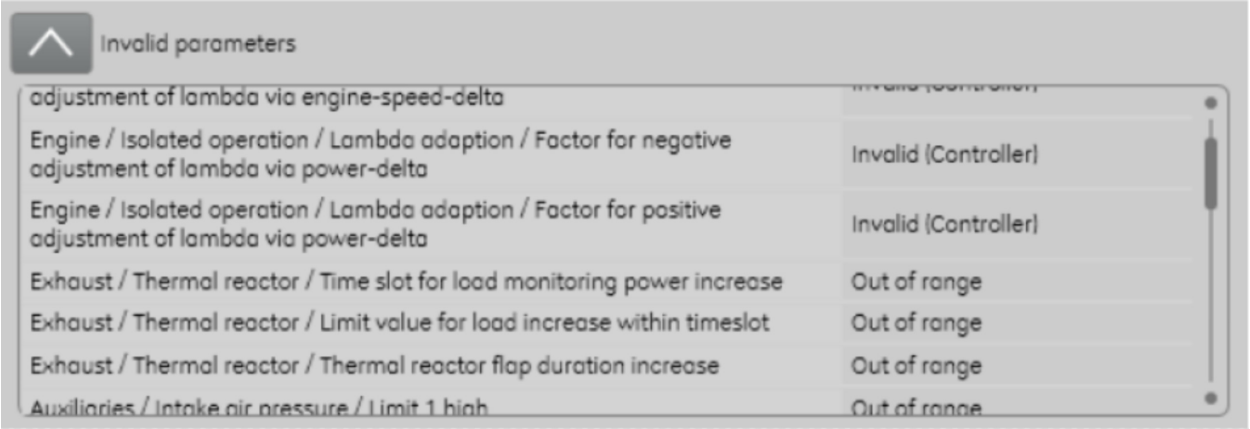
[Total parameters (Controller)]	.... Number of all the required parameters at the destination system (controller)
[Parameters that will be imported]	.... Number of parameters that will be imported Missing and invalid parameters cannot be imported (= required parameters - invalid parameters - missing parameters).
[Missing parameters (File)]	.... Number of missing parameters in the selected file. Expanding the **[Missing parameters (file)]** pane (drop-down) shows all the missing parameters.

Note: The rest of the parameters may still be imported despite missing parameters, depending on the authorisation level (user role). If they are marked in red, no import is not possible; if marked in yellow, they can be imported.



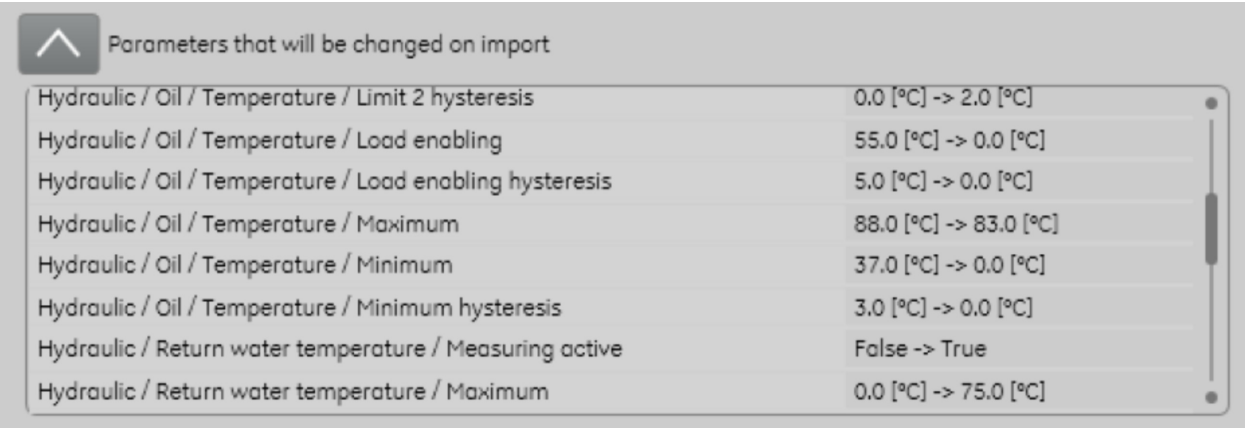
[Invalid parameters]	.... Number of parameters that cannot be imported as they are invalid for a particular reason. Expanding the **[Invalid Parameters]** pane (drop-down) shows all the invalid parameters and the reasons for their invalidity.

Note: The rest of the parameters may still be imported despite invalid parameters, depending on the authorisation level (user role).



Reasons for invalid parameters

[Invalid (Controller)	Data point at the control system not present or connection interrupted (bad quality)
[Invalid (File)]	Undefined value for the parameter in the parameter file.
[Out of range]	Value for the parameter in the parameter file is outside the input range (limit values).
[Parameters that will be changed on import]	.... Number of parameters changed as a result of the import process. Expanding the **[Parameters that will be changed on import]** pane (drop down) shows all the changes in value.



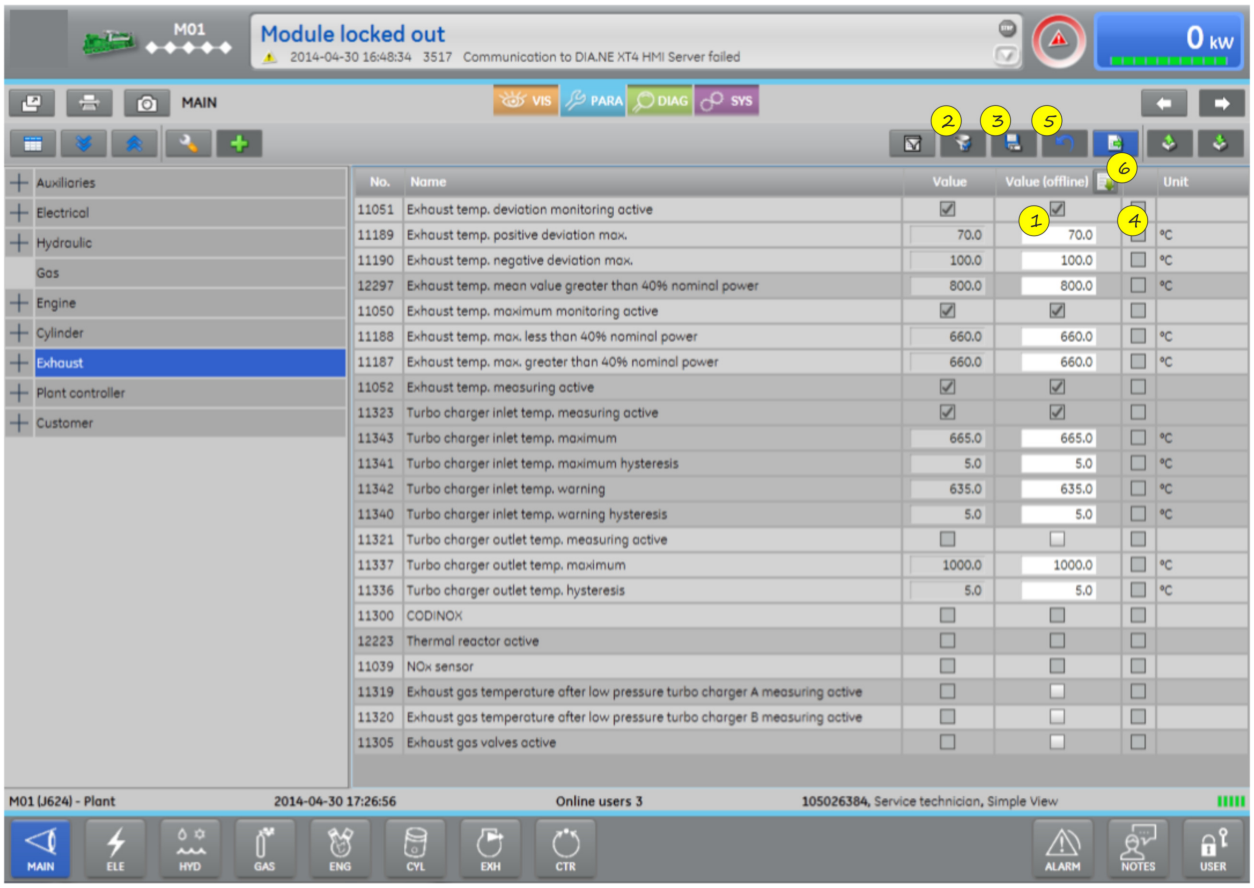
[Module ID]	... Module ID (7-digit engine number)
[Module Name]	... Module name
[Module Type]	... Module type (engine type)
[Plant Name]	... Plant name
[Default Configuration Name]	... name of the visualisation application
[Default Configuration Version]	... version of the visualisation application
[Order number]	... order number (J number)

Note: The information from the source (parameter file) and destination (controller, engine) is displayed. This information is checked for agreement before it is imported. Depending on the authorisation level (user role), parameters can be imported despite differences, see above.

[User Name]	... Name of the user who created the parameter file
[Role Name]	... Role (authorisation level) of the use who created the parameter file.
[Timestamp]	... Point in time when the parameter file was created.

14.4 "Batch-Edit-Mode" (Edit mode)

This button activates and deactivates the batch edit mode. This allows several parameters to be changed and then activated in a second step. In this advanced editing mode, current settings can be compared with parameters in a file, or in the case of multi-engine plants, directly with another engine.

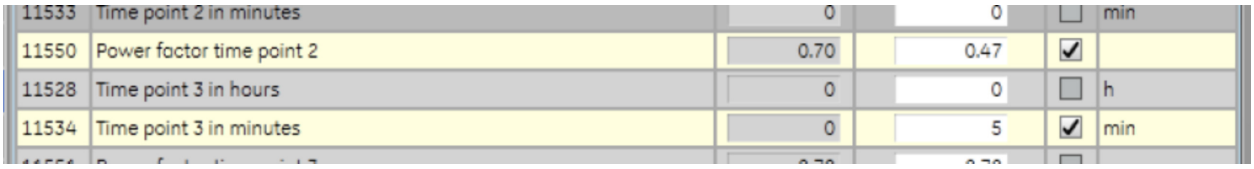


1 Second value column for editing parameters

A second value column [Value (off-line)] is displayed. The parameter values can be changed in it appropriately. The changes are not activated immediately after input, however,

2 Filter: Only display changed parameters

This button sets the filter so that only the parameters changed in "Batch edit mode" but not yet activated are displayed. In other words, those parameters where the active value (column 1) differs from the edited "off-line" value (value column 2).

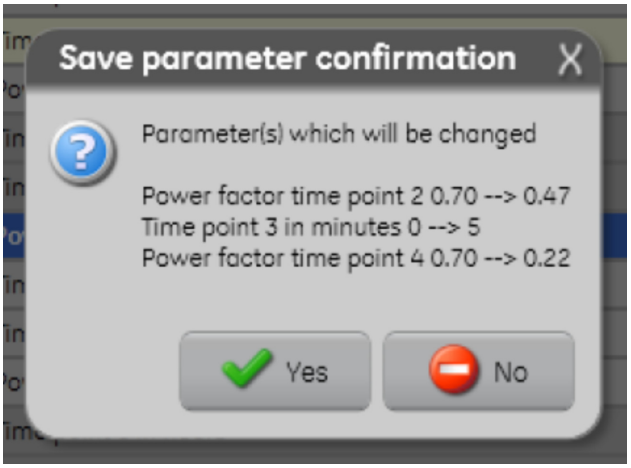


All the parameters with changed values (deviation from the current value) are highlighted in yellow.

3 Activate value changes (upload)

This button activates the values changed in batch edit mode, or uploads them to the control system, as appropriate. Only those changes selected in the check box in column 4 are uploaded. If at least one value is ready for uploading, the activate button (Upload) flashes.

A dialogue box is brought up before activation as a check, showing all the changes once again. The changes are not activated until confirmed with **[Yes]**.

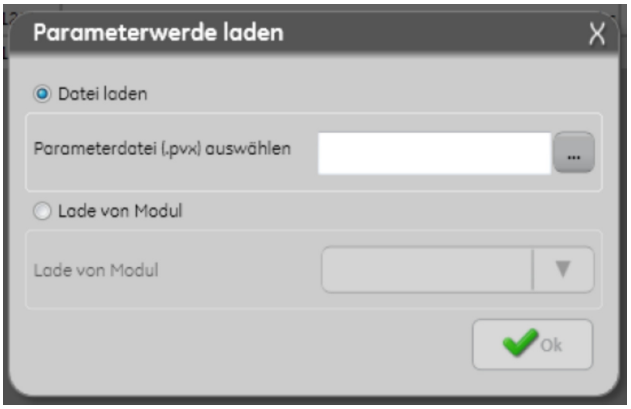


5 **Reverse changes**

This button reverses the last uploaded (activated) changes in values, in other words resets them to their previous values.

6 **Values loaded from a file or from another engine in multi-engine plants**

This button opens a dialogue box (see below), in which a parameter file or an engine (only with multi-engine plants) can be selected. All the parameter values are then read from this selected source and copied to the fields for editing in batch edit mode. These values are then activated or uploaded to the control system with 3.



15 Diagnosis (Trend)

Clicking on the **[DIAG]** tab opens the diagnostics area, where current (on-line trend) measured values and also those recorded in the database are displayed as a line graph (trend). The trend messages stored in the database can also be shown in the trend display for diagnosis purposes.

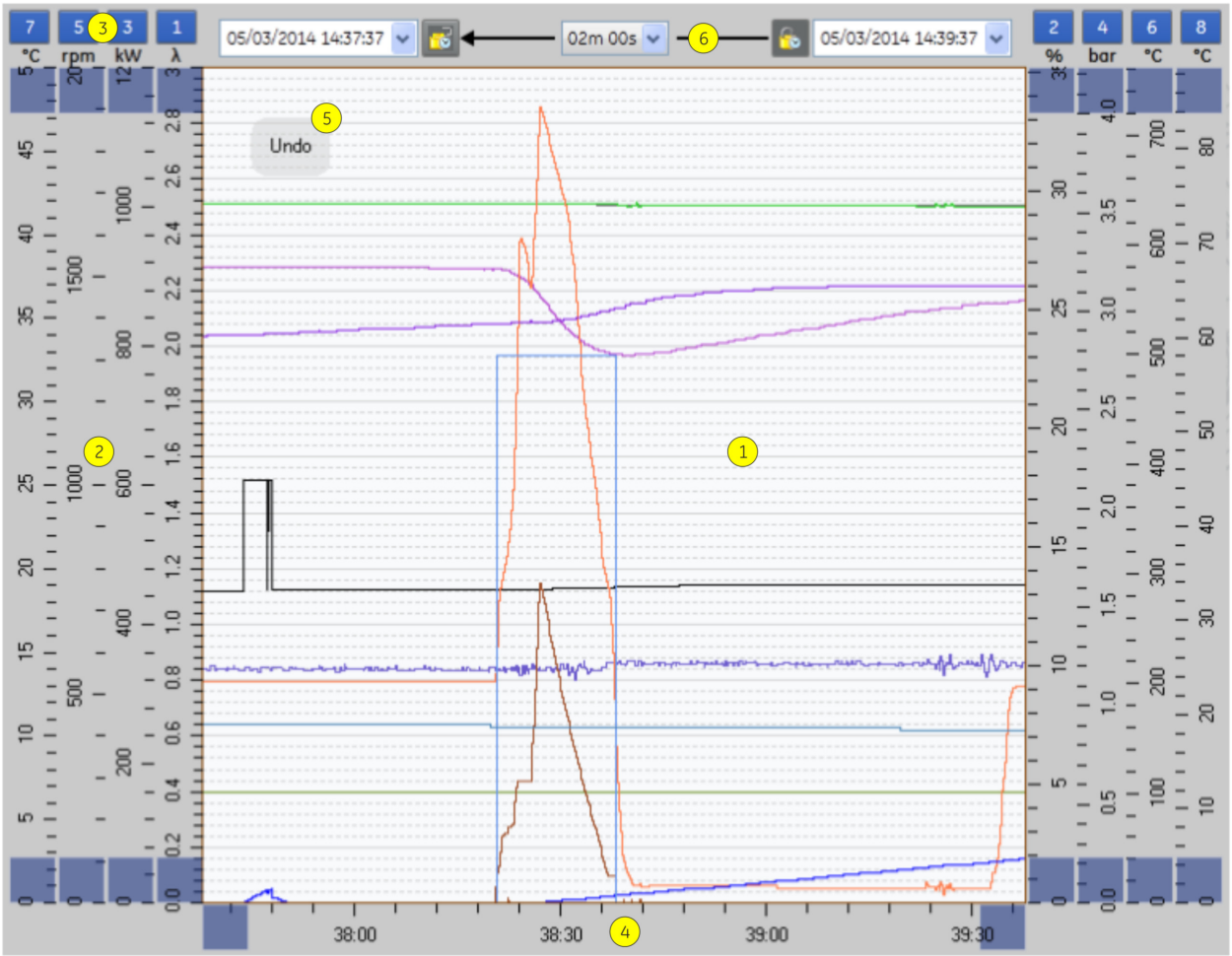
The desired trend can be selected using the navigation buttons at the bottom of the screen.

Preconfigured trends about a specific topic (measured value collections) are available. These are structured by subject in the same way as the visualisation screens and parameters. Example: When changing from a visualisation screen to the subject of ignition, selecting the **[DIAG]** tab leads directly to the ignition trend. In addition to these preconfigured trends, user-defined trends can also be configured, saved and called up when required. These can be called up with the **[MY]** navigation button.

The trend display consists of a line graph with a Y-axis and X-axis, the legend, the time selection bar and the function buttons.

15.1 Trend display

The measured value trends are shown as lines in the trend display.

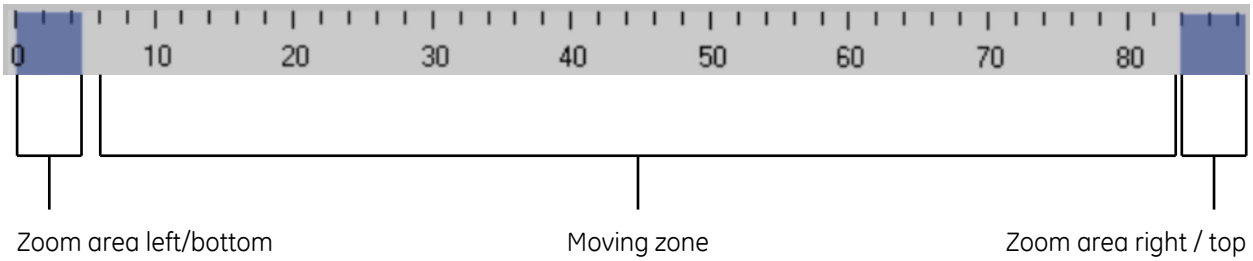


1 Line graph

The entire trend display can be moved upwards, downwards, to left and to the right by clicking and dragging and dropping. When the end value of the measurement range is reached, the display is stretched appropriately.

2 Y-axis

A corresponding Y axis is shown for measured value lines. A Y-axis is shown for measured values with the same unit and measurement range. The Y-axes are shown alternately to the left and right of the line graph. The Y-axis can be elongated and compressed, and also moved, by dragging and dropping on the touch screen or with the mouse. All the measured value lines linked to this Y-axis are then also changed (elongated, compressed, moved). Dragging and dropping in the zoom area compresses and elongates the axis, while dragging and dropping in the move area moves the axis and its measured value lines.



3 Fading out the Y-axis

The corresponding Y-axis can be hidden with this button. It can be reactivated (switched back on) in the trend legend.

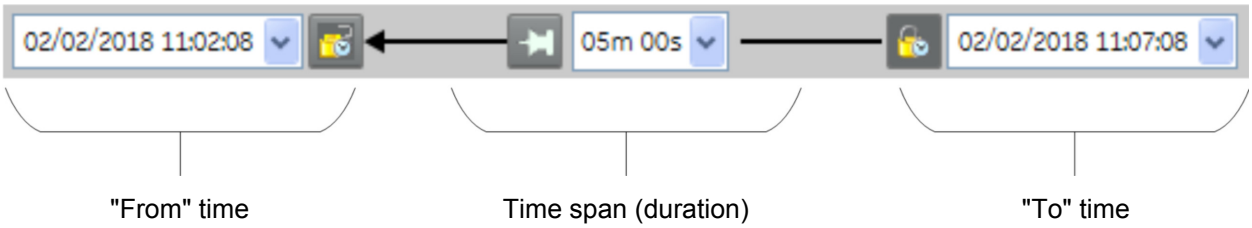
4 X-axis

The X-axis is the time axis for the trend display. The X-axis can be elongated and compressed, and also moved, by dragging and dropping on the touch screen or with the mouse. This allows the desired time range to be changed. Dragging and dropping in the zoom area compresses and elongates the axis, while dragging and dropping in the move area moves the axis and its measured value lines.

5 ... Reversing the last zoom or move operation

6 Time selection bar

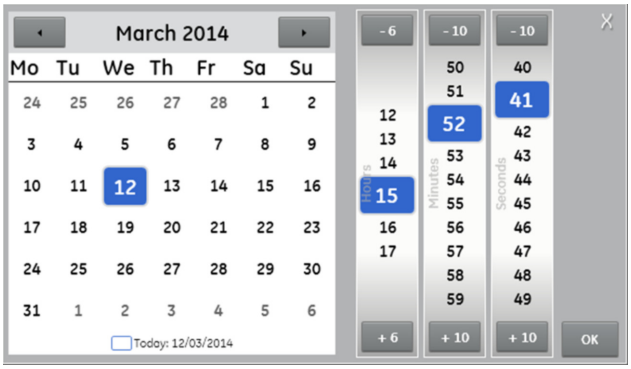
Changing the times can change the desired time span for the trend display. The time range can also be changed by dragging and dropping the time axis or the trend display.



The padlock symbol and the arrow direction determine the behaviour when the respective times are changed. If the arrow points to the left (as in the illustration), the time is anchored "To" (on the right). In this case, when the time period is changed the "From" time is also changed accordingly, while the anchored "To" time remains unchanged. If the "From" time is changed, the time span also changes accordingly. The anchored "To" time remains unchanged again. If the anchored "To" time itself is changed, the "From" time is also changed accordingly and the time span remains the same. If the arrow is pointing to the right, the "To" time is locked or changed, and the behaviour changes accordingly.

Pressing a  or  button changes the direction of the arrow and therefore the locking or anchoring.

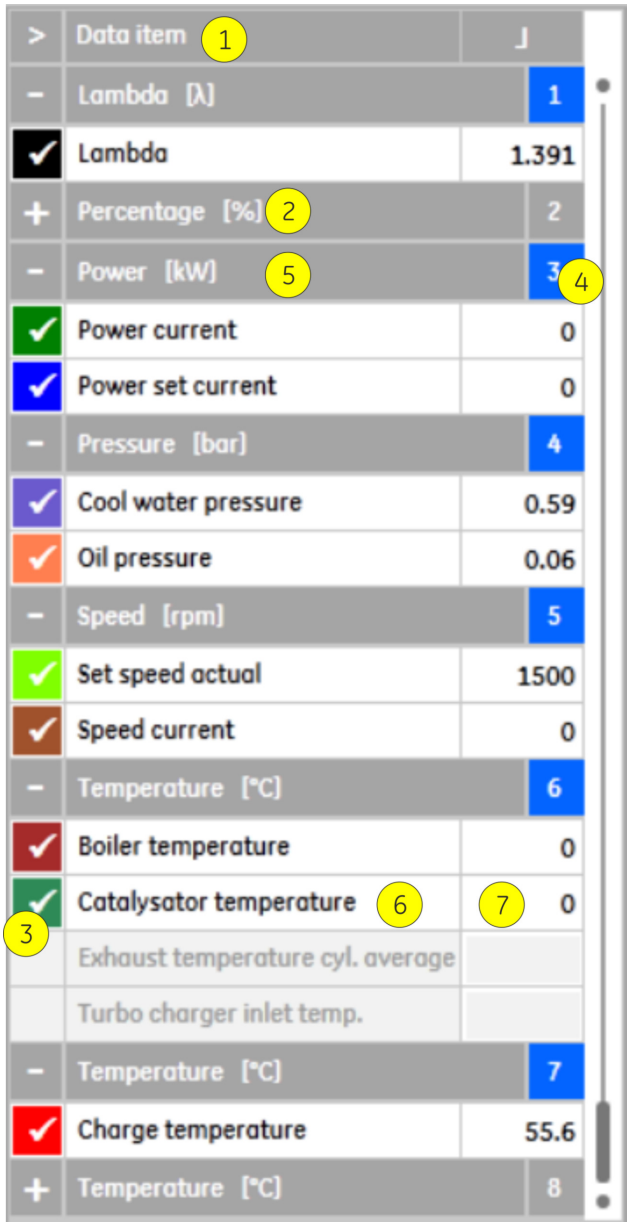
Clicking on the selection field for the time or time span brings up the dialogue box for time entries. Enter the required time there.



By pressing this button the currently selected time period is saved (blue symbol) and retained until the button is pressed again (grey symbol). This makes it possible to switch between several diagnostic windows and the alarm list without changing the time selection.

15.2 Key

The legend displays the measured values and allows the desired measurements in the trend display to be selected (switched on/off).



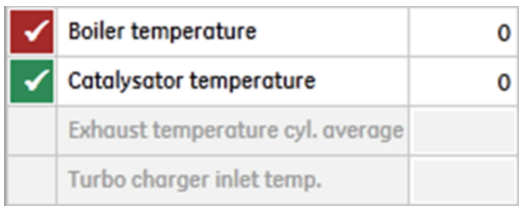
1 **... Expand and collapse the legend**

2 **Expand and collapse the measurement group**

Clicking once on the + symbol expands the measurement group, and clicking once on the − symbol collapses it. Expanding the group activates all the measurements in the group, and collapsing deactivates them.

3 **Switching a measurement on and off in the trend**

Clicking once on the ✓ symbol switches the display of the measurement in question on and off in the trend display. This box is in the same colour as the line in the trend display, thereby establishing a link between the measurement in the legend and the line in the trend display.



... activated (switched on) measurements. These are shown in the trend display as lines.

... ... deactivated (switched off) measurements. These are not shown in the trend display.

4 Switching the Y-axis display on and off in the trend

Clicking once on the 3 symbol switches the display of the corresponding Y-axis on and off in the trend display. The Y-axes are numbered from 1 to n. The number is the reference linking the Y-axis in the trend display to the measurement group in the legend.

5 Measurement group

Measured values with the same unit and the same measurement range are automatically put together in a measurement group. A Y-axis is shown in the trend display for all the measured values in a group.

6 Measurement name

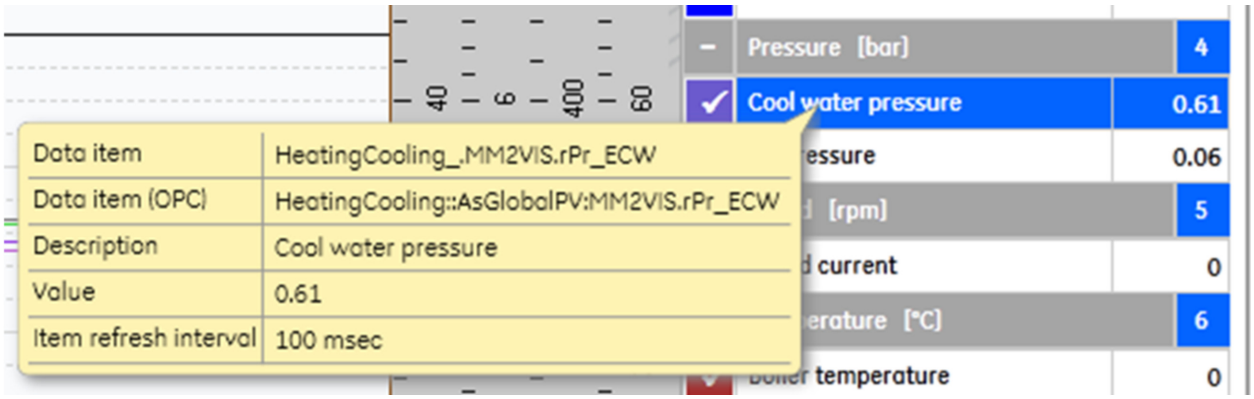
All the measured values available for the selected trend are listed here inside the corresponding measurement group. Clicking once on this area selects the corresponding measured value in blue and marks the line in the trend display (line width). It is also possible to select the line in the trend display, in which case the corresponding measured value name is marked blue in the legend. This then allows a simple association to be made between the measurement name and the line in the trend display.

... selected measured value

7 Measured value

The numerical measured values are displayed in this column. This value corresponds to the current measurement at the time of the trend display at the right-hand end. In the case of the on-line trend, this corresponds to the current value.

Display of additional information about the measured value



Clicking on the right mouse button or a prolonged touch on the measurement name on the touch panel brings up a pop-up window. Additional information on this measured value, depending on the user role in question, is displayed there.

Deleting a measured value from the group (Y-axis)

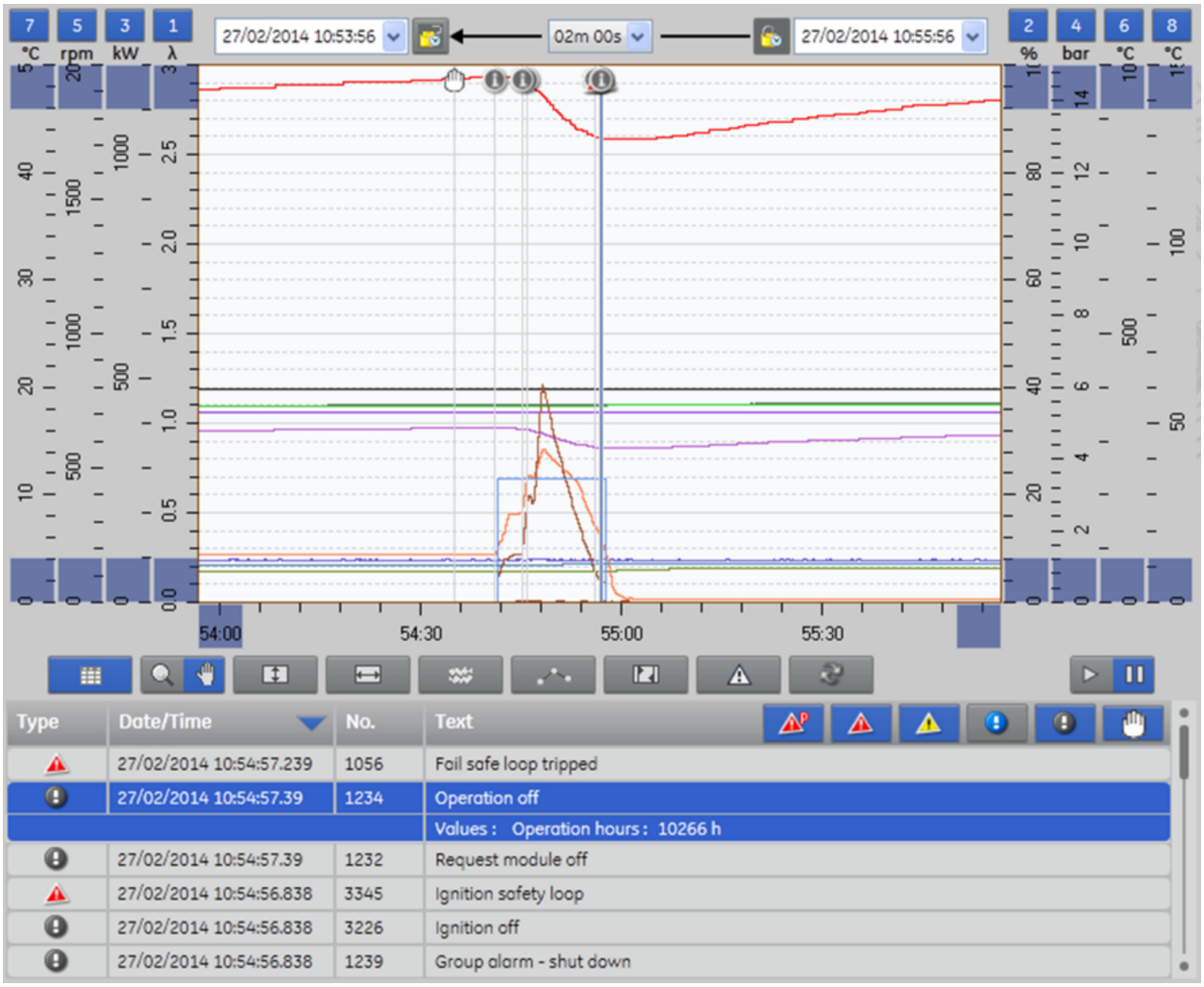
This function is used to delete a measured value associated with a Y-axis with other measured values/ Clicking on the right mouse button or a prolonged touch on the measurement selection ✓ brings up the **[New]** menu button. Clicking on this button deletes the measured value from the group and sets it up as a group by itself.

Pressing the ✕ button in this newly-created measured value group sends the measured value back to the old group and deletes the additional Y-axis.

15.3 Function keys

Displaying the message list

This brings up the message list as shown in the illustration.



This message list shows all the messages and user actions in the selected time range of the trend display. A vertical line with the corresponding icon (message type and user action) is shown in the trend display for each message event. This combines the display of the time the message occurred with the measured value lines. The filter buttons for the message type and user actions can be used to hide and bring up the corresponding message types. When a specific message event is selected it is marked (in blue) and the associated message line in the trend display is highlighted in colour (blue). The message line can also be selected in the trend display and the message event marked in that way.

Note: A maximum of 100 message lines are displayed for reasons of clarity of overview. However, if the list contains more messages, a message line, namely that of the selected message, is shown.

Switching between zoom and move mode

When move mode is activated (the "Hand" symbol is highlighted in blue), the majority of the Y-axes and the X-axis are activated as move areas and only a small area left and right is given over to the zoom functionality. The drag and drop function in the display initiates movement of the display in this case.

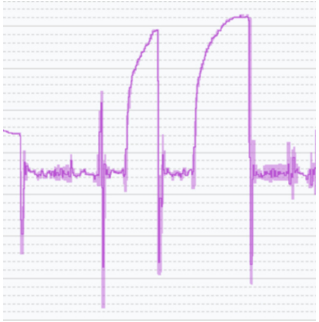
If zoom mode is activated (the magnifying glass symbol is highlighted in blue), the majority of the axes are activated as zoom area. In this mode, a rectangle can be drawn in the trend display using drag and drop and then zoomed.

 **... Automatic adjustment (zoom) of all Y-axes**

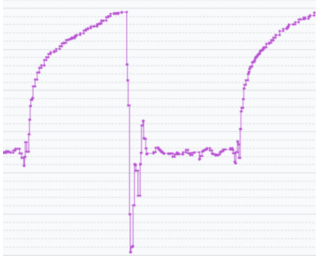
 **... Zoom the time range in the time range bounded by the 2 rulers**

 **Min/Max display as an envelope**

If this function is activated, the minima and maxima are shown as an envelope as well as the average value curve. The average value formation and also the minima and maxima calculation are based on the recording interval of 100 ms. This allows the important information to be displayed in the best possible way despite the selection of a large time span and limited pixels. By "zooming in" to existing raw data for the selected time range, more and more details, up to the 100 ms raw data, can be resolved and details.



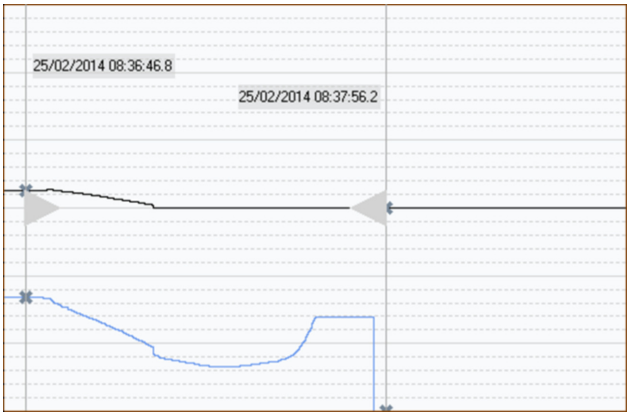
 **Display of the recorded measuring points**



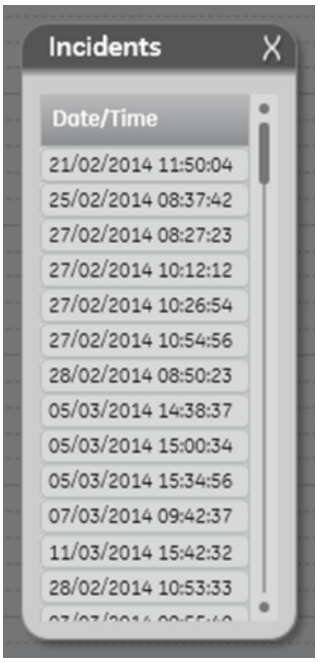
Every measuring point is marked by a point.

 **Displaying the 2 rulers**

This allows the 2 rulers (left and right) to be displayed. The measuring line can be measured with these rulers and the values at any point determined exactly. The values at the ruler position, the difference and also the minimum, maximum and average for the range between the rulers can be determined in the legend. The rulers can be moved freely by dragging and dropping on the grey arrows, or the line itself moved as desired.



Bringing up the list of plant trips caused by faults

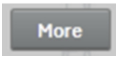


This brings up the list of plant trips due to faults. The list shows the times of the last 100 trips. Clicking on the desired time point loads this time range into the trend display. This is a simple way of showing the trend display for any of the last trips.

Resetting all old trend settings to their status when the screen was opened

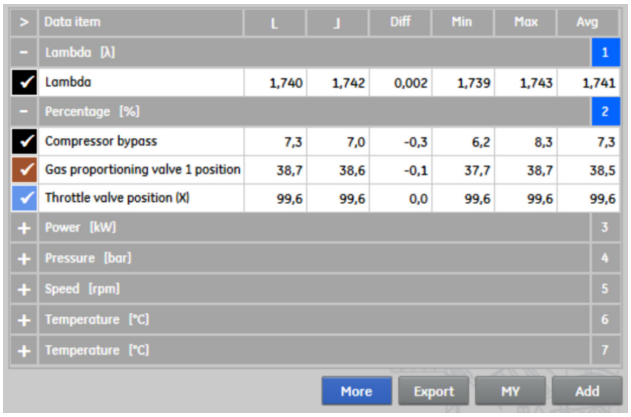
Stopping and starting the trend update

This allows cyclical updating of the trend display to be switched on and off. If cyclical updating is switched on, the trend is updated every second with the latest values. If this case, the latest values are always shown on the far right. In this mode the trend display acts like an online chart recorder.



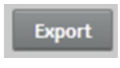
Expanded legend

This allows the legend to be expanded as shown. 2 additional rulers (left and right) are shown in the trend display and the measured values at the ruler positions, the difference between the measured values, and the minimum, maximum and average between the ruler positions calculated and displayed. The rules can be freely moved in the trend display by clicking on the ruler or the triangle symbol.



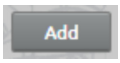
>	Data item	L	J	Diff	Min	Max	Avg	
–	Lambda [λ]							1
✓	Lambda	1,740	1,742	0,002	1,739	1,743	1,741	
–	Percentage [%]							2
✓	Compressor bypass	7,3	7,0	-0,3	6,2	8,3	7,3	
✓	Gas proportioning valve 1 position	38,7	38,6	-0,1	37,7	38,7	38,5	
✓	Throttle valve position (X)	99,6	99,6	0,0	99,6	99,6	99,6	
+	Power [kW]							3
+	Pressure [bar]							4
+	Speed [rpm]							5
+	Temperature [°C]							6
+	Temperature [°C]							7

More Export MY Add



Data export to an MS Excel file (*.xlsx) (* only on the PC client)

This exports the measuring points on the displayed line graph to an MS Excel (*.xls) file. Data is only exported from the activated (displayed) measured value lines and the displayed time range.



Adding additional measured values (* only at the PC client)

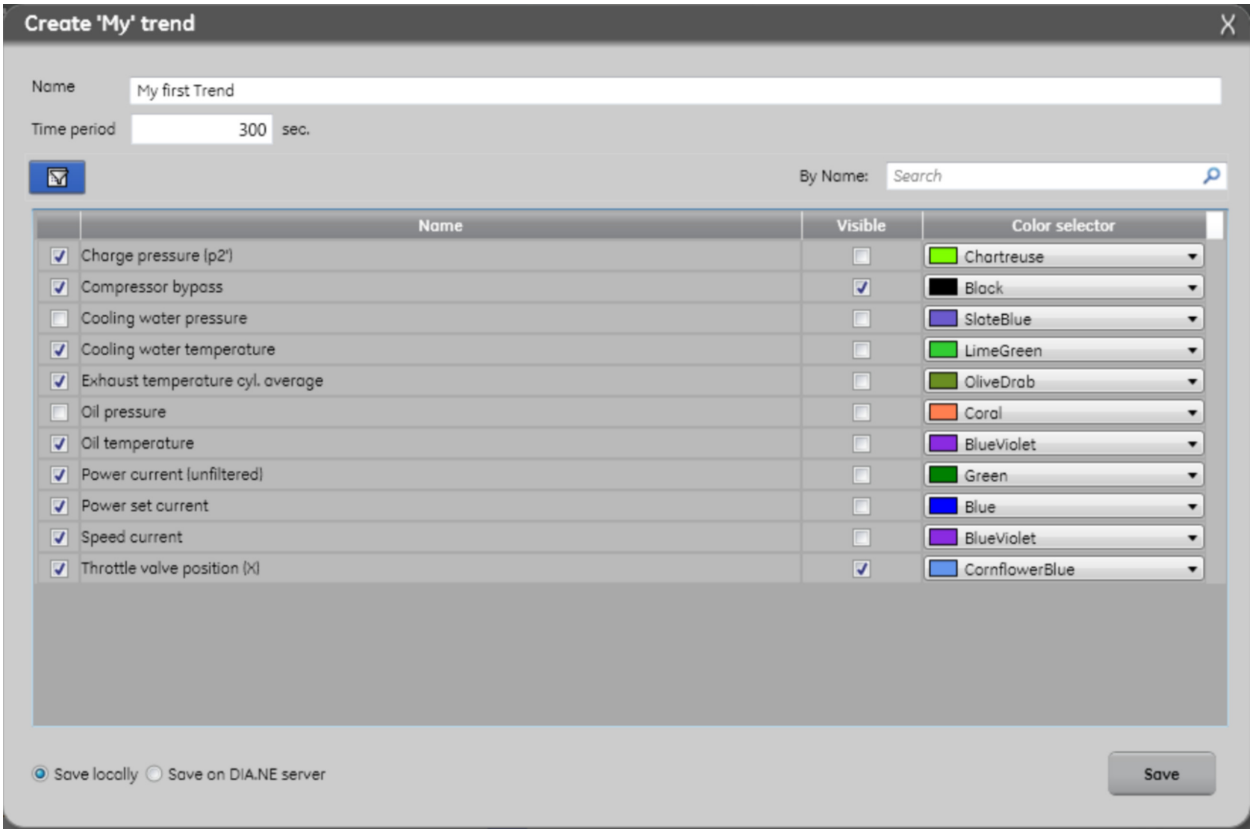
This allows any measured values to be added to the current trend display and displayed. This display is then retained until the display is closed. After pressing this button, a dialog box for selecting the desired measured value is displayed.

Create a user-specific trend display (* only on PC Client)

This allows user-specific individual trend compilations to be created and stored on the server (panel) or local computer (PC). These trends can be brought up under the 

navigation point.

The desired measured values can be selected in the opened dialog box. The colour can also be selected for the line **[Colour selector]** . The **[Visible]** check box is used to define whether this measured value is displayed (activated) when the trend is brought up or not.



16 Operational data reports

Operational data reports are used to record the engine's operation. They can be automatically generated in cycles or, if necessary, manually prepared and displayed at the time. All the settings for reports can be determined by the users themselves. The contents and layout of the report are preset by the reporting template. A reporting template [Operational Data] is available in English as an example. Reporting templates can be modified and expanded for a specific order.

16.1 Contents of operational data reports

The report can contain general information such as plant name, engine type, date of issue, start time, end date, report name, reporting period, etc.

Report	Operational Data		Created	2016-02-16 00:00:12	
Plant	R&D Testbench 19			Order	J624
Engine	P19	Nr	5024480	Type	624
From	2016-02-14 23:59:59	To	2016-02-15 23:59:59	-->	1 days 0 hours

The report may contain counter readings, e.g. operating hours, active energy, start counter, etc. The initial value (start time of report), the final value (end date of the report) and the difference between them can be shown for each counter. Each counter reading available on the DIA.NE XT4 system can be included.

Counters					
Counter	From	To		Diff	Unit
Energy active counter	0.0	19372.5	-->	19372.5	MWh
Energy active return counter	0.0	0.1	-->	0.1	MWh
Energy reactive counter	0.0	13230.9	-->	13230.9	Mvarh
Energy reactive return counter	0.0	0.1	-->	0.1	Mvarh
Operation hours	0	19258	-->	19258	h
Starts	0	7614	-->	7614	

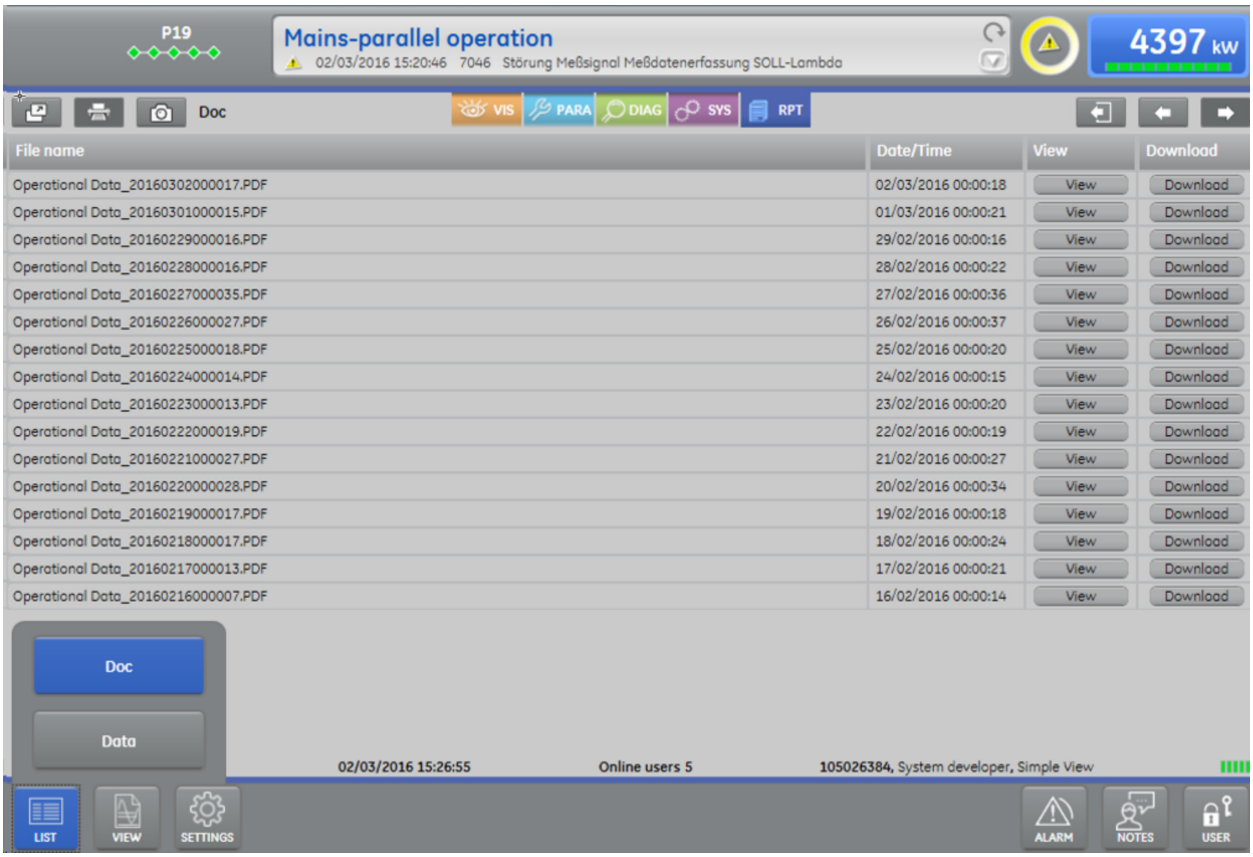
The report can contain measured values such as power, temperatures, pressures, etc. The minimum value, maximum value and average for the reporting period and the current value at the time the report was generated can be shown for each measured value. Each measured value available on the DIA.NE XT4 system can be included.

Measurement Values					
Data Item	Min	Max	Avg	Actual	Unit
Power current	0	0	0	0	kW
Power reactive	0	0	0	0	kvar
Power apperent	0	0	0	0	kVA
Current avarage	0	0	0	0	A
Voltage average	0	0	0	0	V
Frequency	0.0	0.0	0.0	0.0	Hz
Speed current	0	0	0	0	rpm
Charge temperature	0.0	54.9	49.8	52.7	°C
Charge pressure (p2')	-2.50	9040.02	4456.15	0.96	bar
Cool water temperature	0.0	60.2	52.5	57.6	°C
Cool water pressure	-2.50	11962.0	508.83	2.21	bar
Exhaust temperature cyl. average	0	57	52	54	°C
Exhaust temperature cyl. minimum	0	56	49	52	°C
Exhaust temperature cyl. maximum	0	59	53	56	°C
Oil temperature	0.0	37.9	31.8	30.2	°C
Oil pressure	-2.50	6576.00	215.98	0.00	bar
Room temperature	-3270.0	28.7	20.6	25.6	°C
Intake air temperature	0.0	30.0	25.5	25.1	°C
Gas temperature	0.0	0.0	0.0	0.0	°C
Gas pressure	-251	0	-250	-250	mbar
Ignition voltage average	0.0	0.0	0.0	0.0	kV
Ignition voltage minimum	0.0	0.0	0.0	0.0	kV

The report can contain operational, warning and error messages. They can be filtered on the basis of message type and/or message number. Each message available on the DIA.NE XT4 system can be included.

Messages			
Timestamp		Nr.	Text
2016-02-15 10:05:27	Tr	1084	Pre chamber gas pressure measuring signal failure
2016-02-15 10:05:27	Tr	1031	Emergency stop / safety loop
2016-02-15 10:05:27	Tr	2224	Measuring signal failure pressure after turbocharger oil filter
2016-02-15 10:05:27	W	1189	Release from synchronizing missing
2016-02-15 10:05:27	W	2549	Measuring signal failure exhaust gas temperature after low-pressure
2016-02-15 10:05:27	Tr	3323	Crankcase pressure measuring signal failure

16.2 Displaying and downloading cyclically (automatically) generated operational data reports

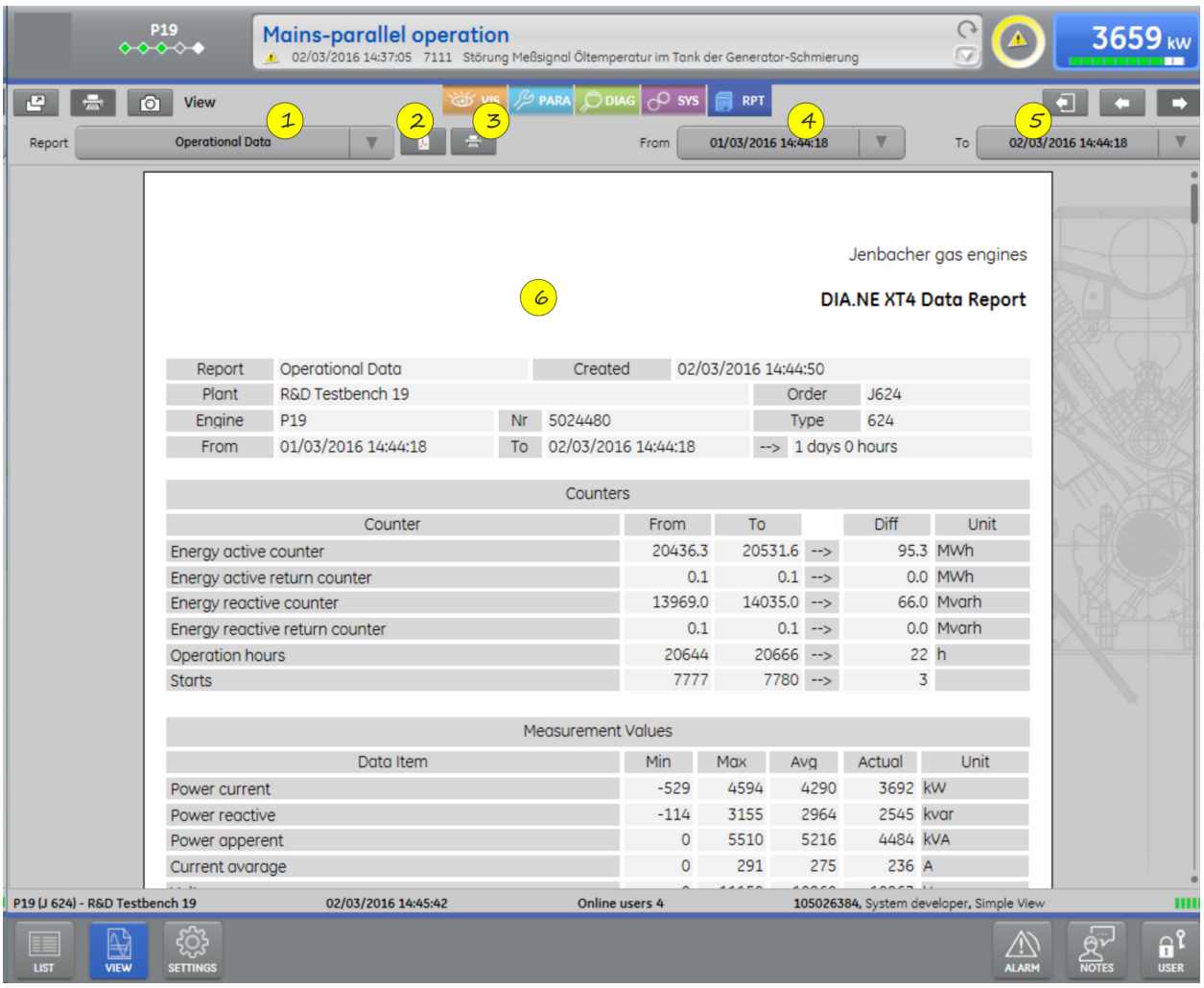


To display the list of operational data reports, click the menu button **[List]** at the bottom edge of the screen. You can select the list of documentary reports **[Doc]** or the list of data reports **[Data]**.

A documentary report is a formatted file in PDF, XPS or RTF format which can be displayed in readable form by the relevant program (reader). A data report is a file formatted as XML which has been designed for the further processing of the operational data in the program. These data reports cannot be directly displayed but they can be downloaded for further processing.

To display the desired report directly, click the **[View]** button. To download and save the report file, click the **[Download]** button. You can only download operational data reports on to an external computer connected to the server. Data reports cannot be displayed directly, they can only be downloaded and saved.

16.3 Displaying operational data reports currently being generated



To generate and display any operational data report, click the menu button **[VIEW]** at the bottom of the screen.

1 ... Select the desired report template

2 ... Save the displayed operational data report

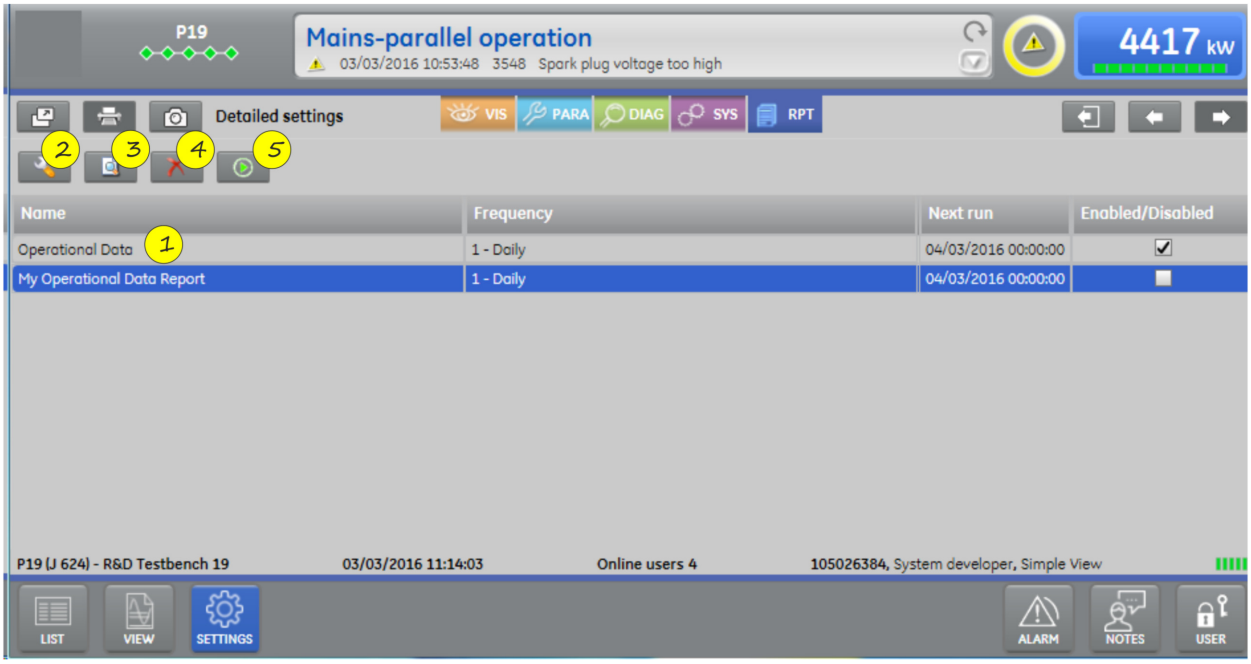
3 ... Print the displayed operational data report

4 ... Select the start time for the reporting period

5 ... Select the end date for the reporting period

6 ... Display showing an operational data report

16.4 Settings for operational data reports



To open the area for customer-specific report settings, click the menu button **[SETTINGS]** at the bottom of the screen.

1 This is where all the templates for operational data reports are listed. As a minimum, the **[Operational Data]** report template supplied as a sample template is displayed here. You can create other templates for specific orders. Customers can also create other templates based on an existing report template, thereby changing various settings.

The list contains the name of the operational data report, the frequency or cycle in which the report is generated and the time at which the next report will be generated. Click in the last column to activate and deactivate the report. If the report is deactivated, no cyclical reports based on this template are generated.

If you select a specific report template in the list, you can use the buttons to activate the following functions:

2 ... Create a new report template (based on an existing one)

3 ... Change the settings for a report template

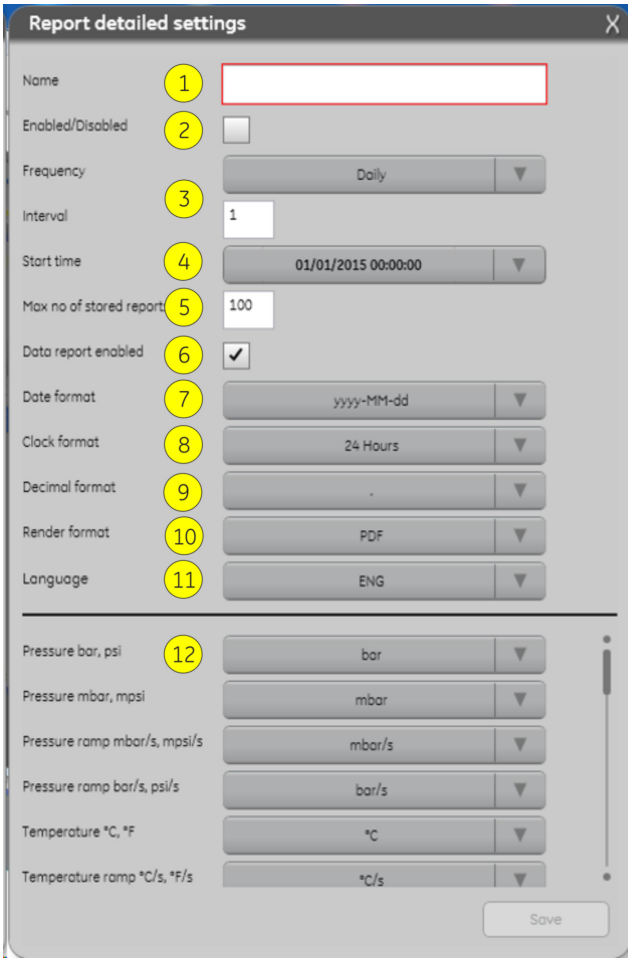
4 ... Delete a report template

5 ... Manually generate a report based on the selected template

Info: After being manually generated, this report will be displayed on the list of existing reports after a few seconds.

16.4.1 User-specific settings for reports

When you press the button 2 to create a new report template, this dialogue box appears. Here you can enter all the user-specific changes for the new report template.



1 ... Enter a name for the new report template.

2 ... Activate or deactivate this report template here. You can only generate reports for activated templates.

3 ... Set the cycle for generating reports here. **[Frequency]** = "Daily" and **[Interval]** = 3 means, for example, that a report will be automatically generated every 3 days.

4 ... Set the start time for generating the report here. This is the reference time for the report. If it has been set, for example, to 1/1/2000 2:00::00, the daily report will always be generated at 2:00 am.

5 ... Set the maximum number of reports here. Once this number has been reached, the oldest report is deleted whenever a new one is generated.

6 ... Activate or deactivate the additional production of the data report in XML format here. When this option is activated, a data report is generated and saved in addition to the documentary report.

7 ... Set the desired date format here.

8 ... Set the desired time format here.

9 ... Set the desired symbol for the decimal point here.

10 ... Set the format (PDF, RTF, ...) for the report here.

11 ...Set the desired language for the report here. The sample report **[Operational Data]** only supports the English language.

12 ... Change the details (e.g.: °C or °F) of the report here.

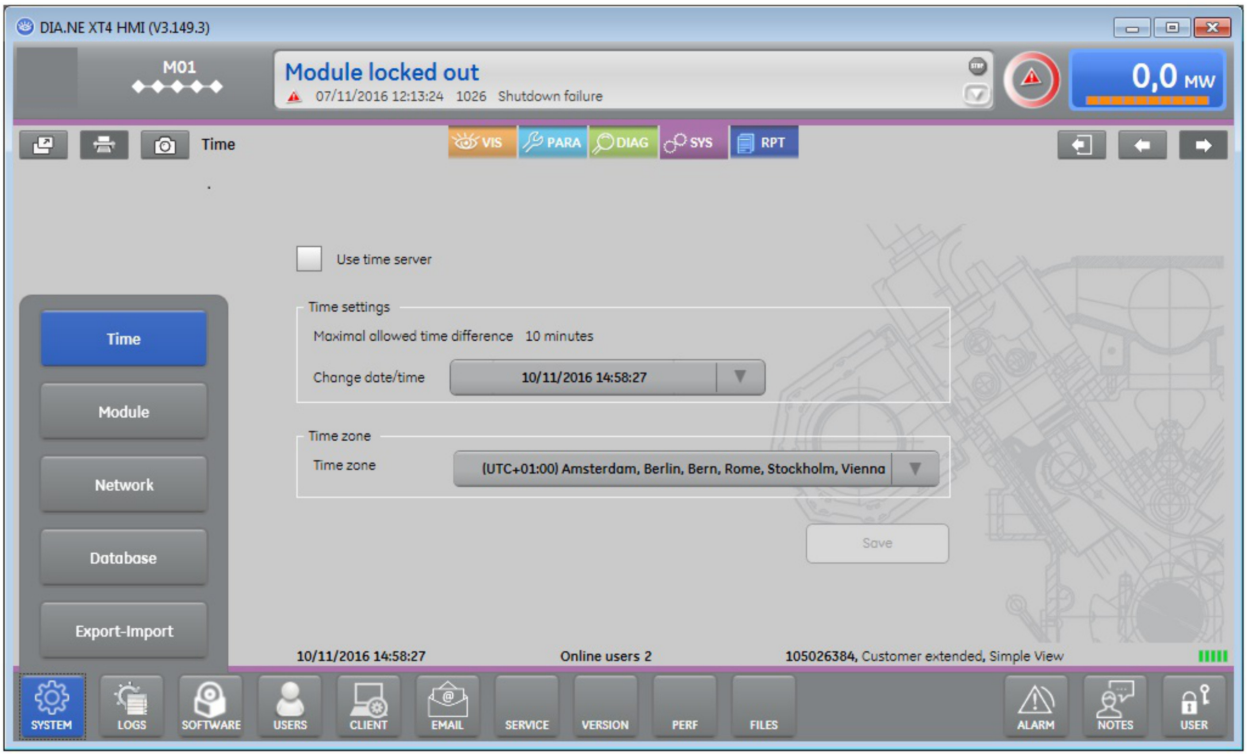
Information Settings for the contents (which counter, which measured values, which messages) and the layout cannot be changed for a specific user. These upgrades can only be implemented as order-specific upgrades.

17 System functions

The range of functions offered in this area depends on the user role of the currently logged in user. This area is therefore divided into user roles.

17.1 User role “Customer”

17.1.1 Setting the time



Press the **[SYSTEM - Time]** menu button at the bottom of the screen to open the dialogue box for setting the time.

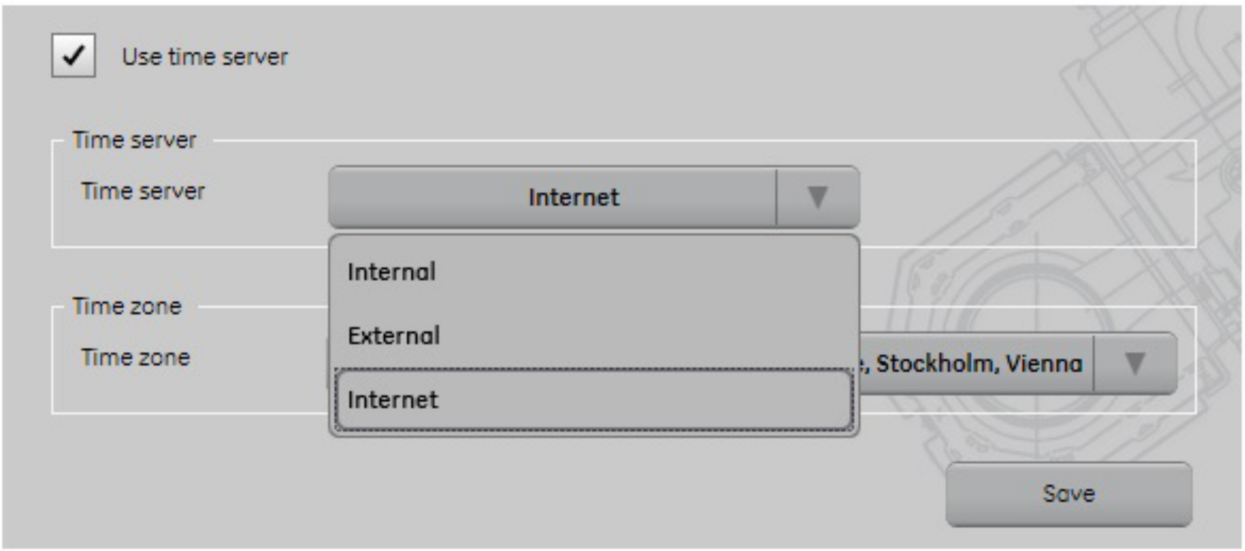
If no time synchronisation has been selected with **[Use time server]**, the time and time zone can be set manually using the two input fields for settings. Make sure before correcting the time that the correct time zone is set. After selecting the correct time zone, confirm this change with **[Save]** and then correct the time if necessary and confirm it with **[Save]** again.

The time can only be adjusted in small increments (maximum of 10 minutes) as safety precaution. Setting a time with a major difference to the actual time can result in data loss.

When the time zone and/or the time are changed, the DIA.NE XT4 HMI service restarts automatically. This does not affect engine operation.

If **[Use time server]** is activated, various options for selecting a particular time server can be selected. The correct time zone must also be set in this case. The time can then no longer be corrected manually, but is loaded automatically from the corresponding time server (synchronised).

[Internal]	The time is synchronised with another DIA.NE XT4 server in the network (controller). The number of the desired DIA.NE XT4 server must be selected. This option is used in multi-engine plants if no external time server (Internet or customer network) is available. All the engines in a multi-engine plant can then be synchronised with each other. In this case **[Use time server]** is not activated for the first engine, so allowing the time to be changed manually if required. **[Use time server]** is then activated on all the other engines in the plant and the first engine is selected as the time server.
[External]	The time is synchronised with an external time server in the network. The IP address of the time server must be entered. This option can be selected if a time server with a known IP address is available in the network.
[Internet]	The time is synchronised with time servers in the Internet. This option can be selected if a connection to the Internet exists (myPlant).



Note: The selected setting is activated with **[Save]**. Change the screen and return to the time setting screen, and check whether the settings are still there. If not, the set time server cannot be reached. Check whether the time server is available and whether the network connection to it is functioning. Further information can also be found in the system log.

17.1.2 Module settings

General settings for this unit (engine or station) are made in this dialog box. This is done by the commissioning technician during commissioning. The name of the unit (default "M01" for engine 1), the plant name and the selection for multi-engine plants can also be changed by users who are assigned the Customer role.

1 Unique name of the DIA.NE XT4 server for this unit.

2 Order number

3 Serial number of the unit (type plate)

4 Short name (max. 10 characters) of the unit displayed in the header. Default setting M01 for engine 1.

5 Number of the unit in the plant group. This also defines the unique IP address of the unit (e.g. 192.168.123.11 for M01) in the DIA.NE plant network.

6 Maximum number of simultaneously logged in users with user roles Customer or Advanced Customer. One user is included as standard. Additional users must be purchased.

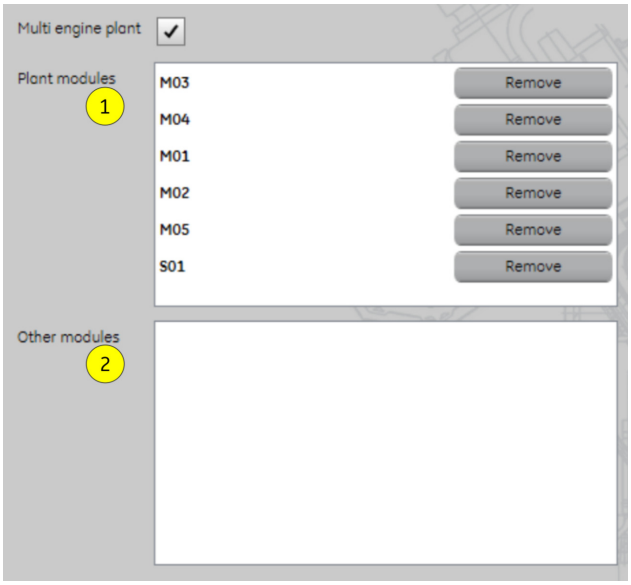
7 Name of the plant. In multi-engine installations, all units with the same name are automatically included in a plant group.

8 This selection must be activated so that this unit is visible in the plant group and information can be received from other units.

9 Pressing this button resets all changes that are not yet saved.

10 Pressing this button activates and saves all changes.

For multi-engine installations:



This display shows all units that are connected via network (DIA.NE network yellow) and have the same plant name. All units with the same plant name are automatically added to the group. With [Remove] they can be removed from the group and with [Add] they can be added again.

17.1.3 Network adapter settings

In this dialog box all settings for the customer network adapter (ETH 3 for IPC041, ETH1 for PC910) of DIA.NE XT4 are made.

1 If **[DHCP]** is enabled, the DIA.NE XT4 server obtains the network settings from a customer DHCP server on the customer network.

2 Manual, static definition of IP address, subnet mask and default gateway

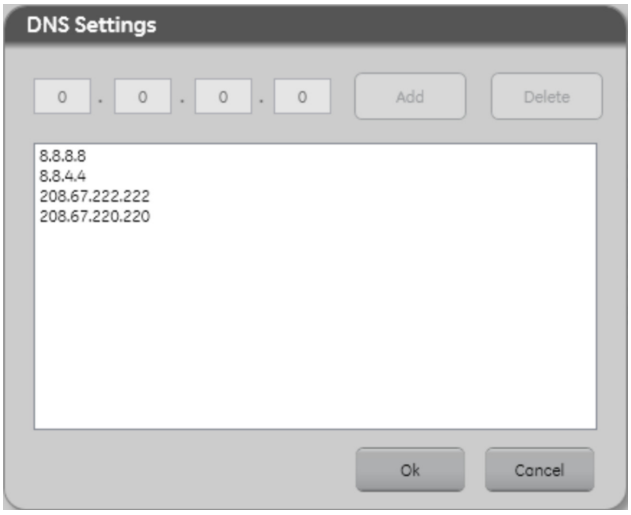
3 Static IP address for the DIA.NE XT4 server in the customer network

4 Static subnet mask for the DIA.NE XT4 server in the customer network

5 Static default gateway for the DIA.NE XT4 server in the customer network

6 DNR settings for myPlant connectivity

With this dialog box you can add and remove DNS server addresses. As a rule, these do not have to be changed. This list of DNS server addresses is already configured by default.



7 Activation of the OPC DA interface (optional). This additional function must be purchased. For test purposes, this option can be temporarily activated by the service technician. See section 16.

8 Activation of the B&R programming interface (only for service technicians)

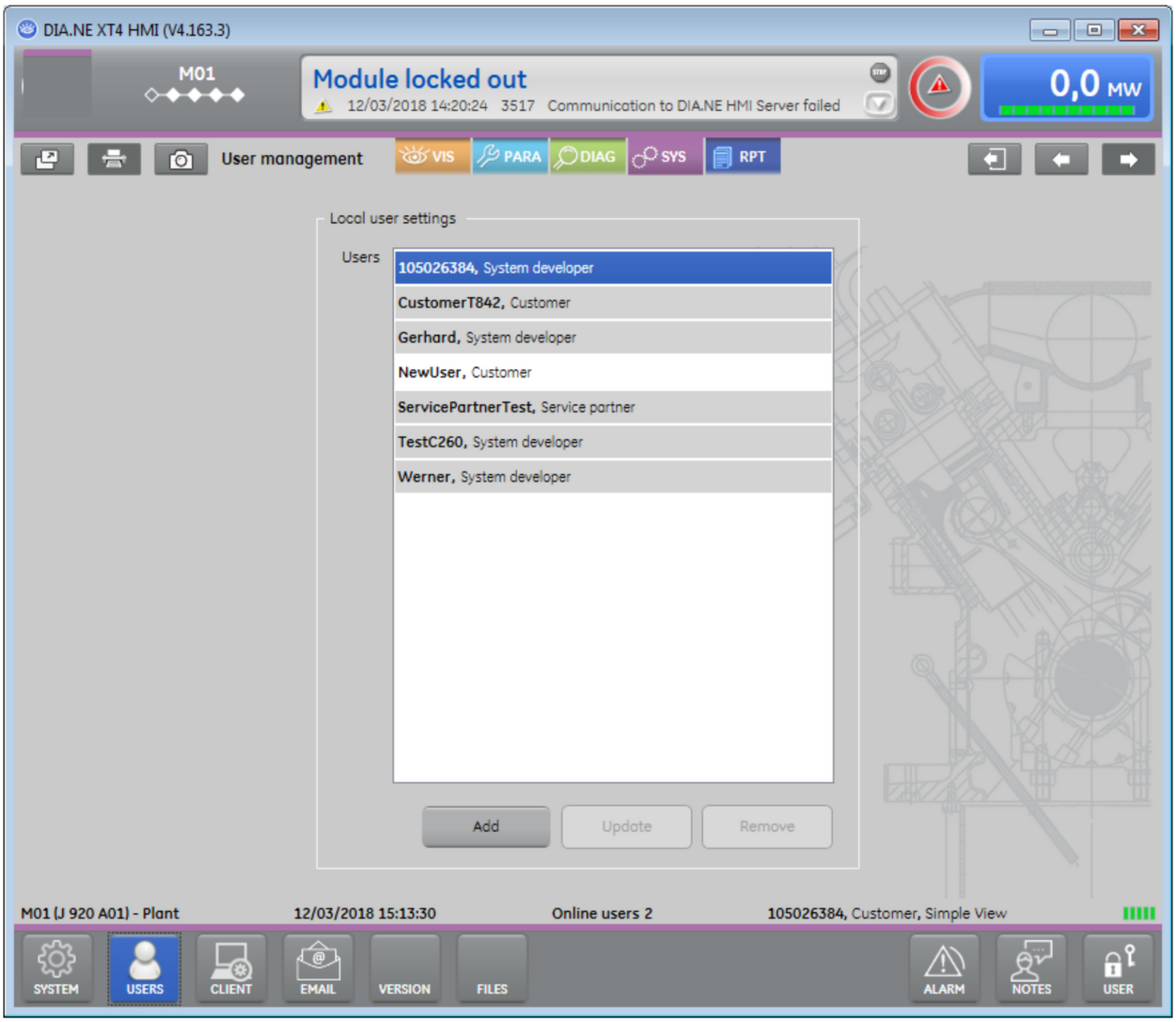
9 Activation of the B&R diagnostic interface (B&R System Diagnostic Monitor) (only for service technicians)

10 Linking of the B&R programming and diagnostic interface to ETH2 (yellow DIA.NE network) or ETH3 (blue network for customer connection or internet).

11 Use **[Save]** to apply and save the changes.

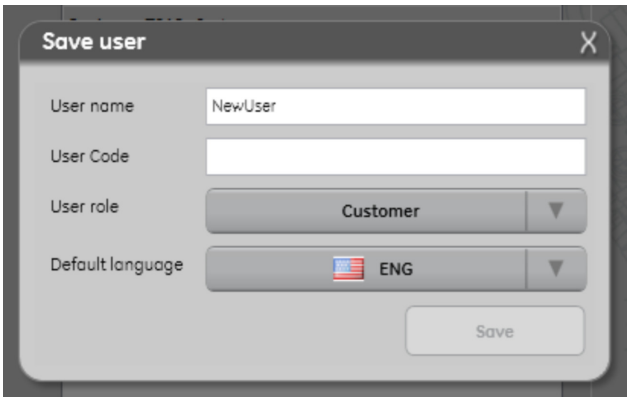
17.1.4 Local user management

The system differentiates between preconfigured users (e.g.: "CustomerA123"), users via license file or local system users, which are managed here. Local users can be added and deleted by the customer.



Add: Use **[Add]** to add new users. Enter a name and an access code (6-digit number) for the user and assign the corresponding user role. This access code can then be changed by the user. A default language for the user can also be selected in the dialog box.

You cannot assign higher user roles than your own. Only the roles Customer and Advanced Customer are available for these local users.

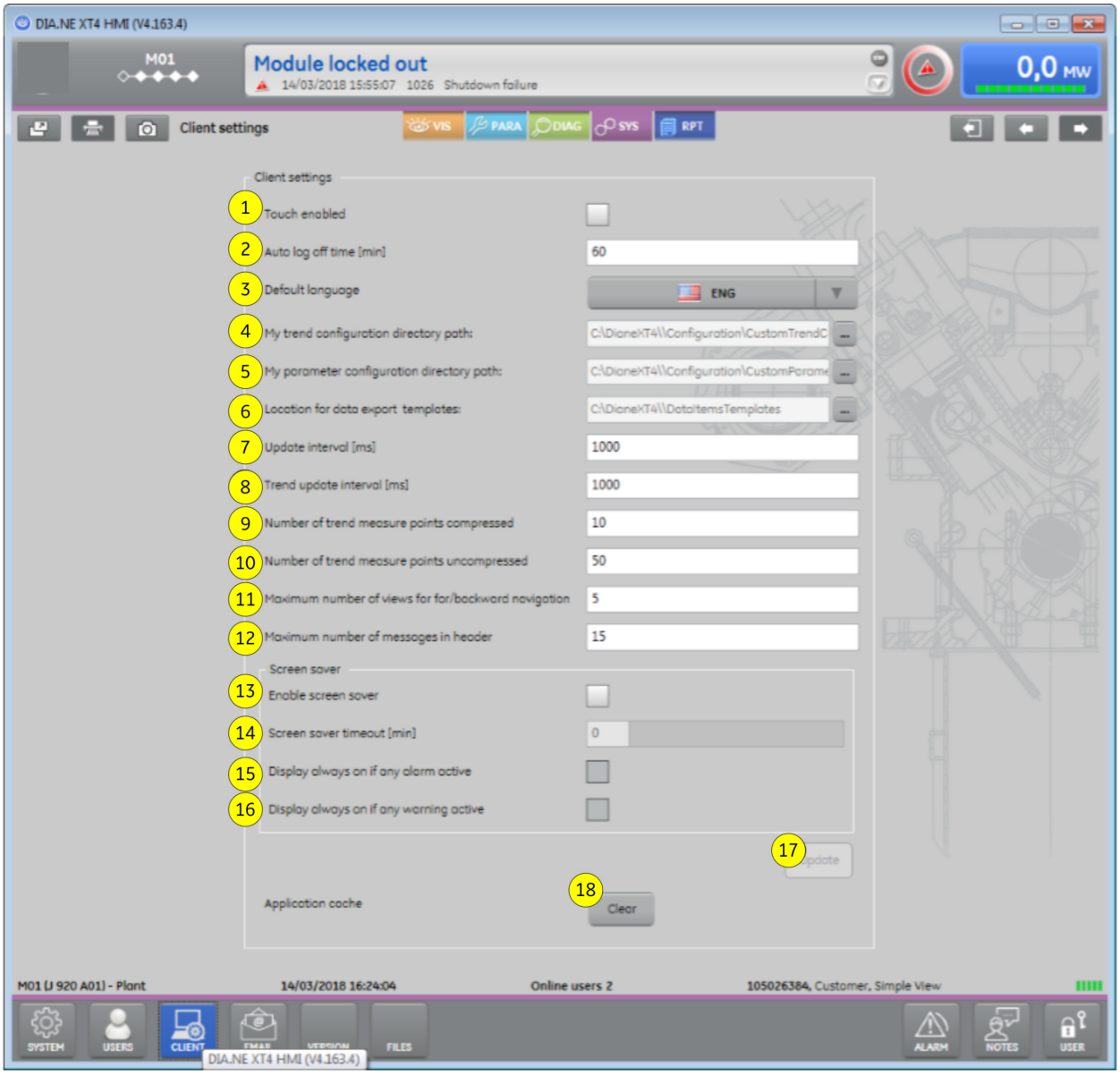


Update: Use **[Update]** to change the settings for the user selected in the list.

Remove: Use **[Remove]** to delete the selected user from the list.

17.1.5 Settings for the client

In this dialog box you can set various options for the client. These settings are only relevant for the currently open client and do not affect the server or other clients. If you open this dialog on the touch panel, the settings of the client are displayed on the local touch panel and changed. If you open the dialog on your remote PC, only the settings on your computer are changed. Changing of some settings on the local panel is disabled, depending on the user role.



1 This option activates the numeric touch input window for all numeric entries.

2 During this time (minutes) the user is automatically logged out of the system if no operation has taken place.

3 Setting the default language for new users.

4 Directory for storing local user-specific trend configurations

5 Directory for storing local, user-specific parameter configurations

6 Directory for storing local user-specific data export templates

7 Refresh interval for image information in milliseconds

8 Update interval for the online trend displays in milliseconds

9 Minimum number of measurement points for compressed data in the trend display. If the number of data points that have already been dynamically compressed exceeds twice this value, compression continues and the number of data points is halved (= this value).

10 Maximum number of data points in the trend display for uncompressed data. If the number of uncompressed data points in the display exceeds this value, the data is compressed to the number of points defined above [Number of trend measure points compressed] (averaging).

11 This number of last accessed images is cached and is available for easy back navigation with the buttons (buttons with arrows at the top right).

12 Maximum number of messages displayed in the message drop down list in the header.

13 Activation of display dimming

14 Time in minutes without operation until the display goes dark.

15 This option prevents dimming of the display when a fault (shutdown, red) is pending. In this case, the display remains switched on.

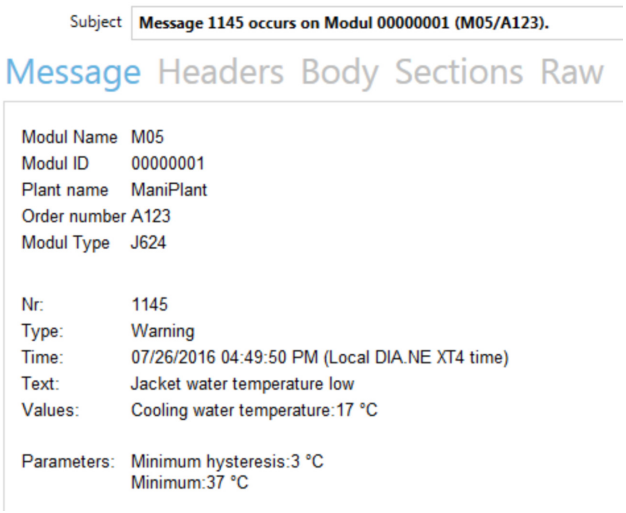
16 This option prevents dimming of the display when a warning (yellow warning) is present. In this case, the display remains switched on.

17 This button must be pressed after each change of one of the settings of this dialog so that the changes are effective and saved.

18 Loaded applications (visualisation configurations) are saved on the local computer, so that the necessary information is already available and does not have to be reloaded at the next call. This button can be used to delete the cached application of the currently connected system so that it can be reloaded. This is usually not necessary, but can be useful in the event of an error.

17.1.6 E-mail notification

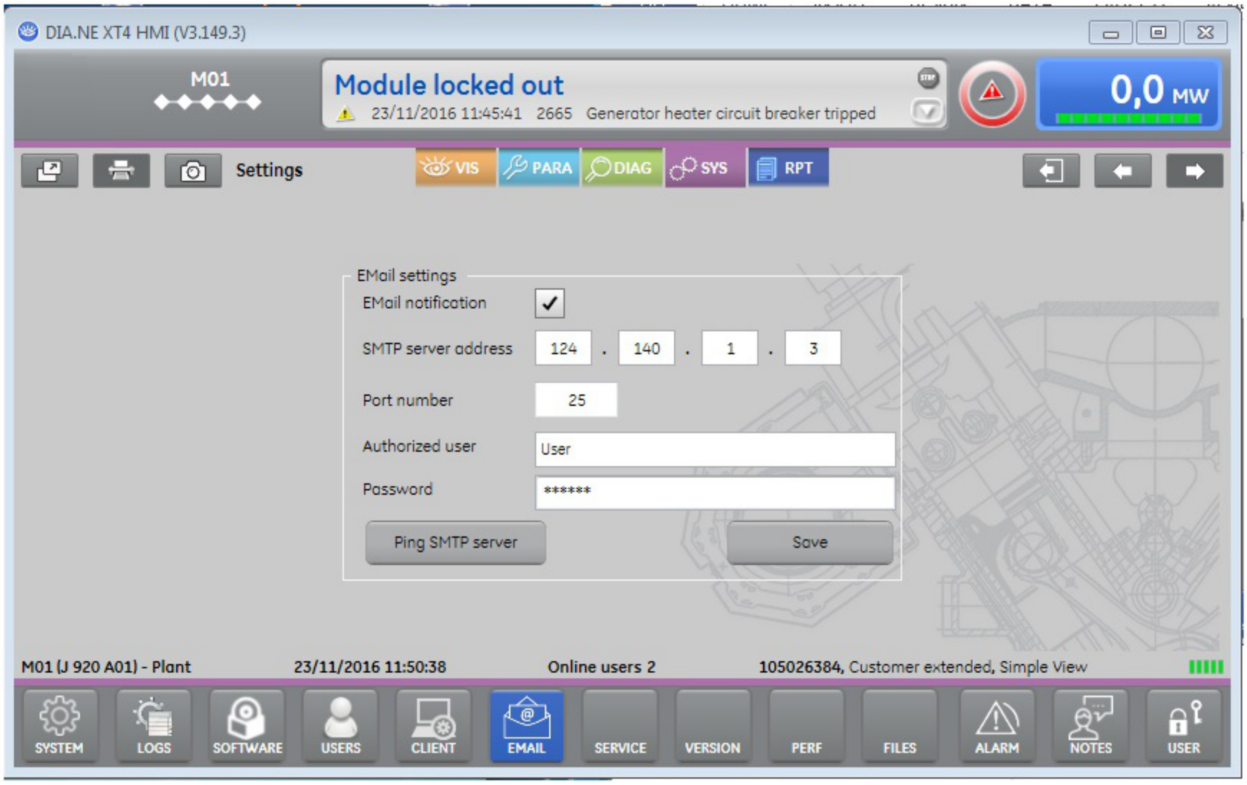
This functionality offers the possibility of sending an e-mail over an existing SMTP server to one or more addresses if a message is output (alarm, warning, operational message). The trigger for the e-mail as well as the recipients and necessary basic settings can be entered as described below. The e-mail contains all the available information regarding the trigger message.



Example: Contents of an e-mail

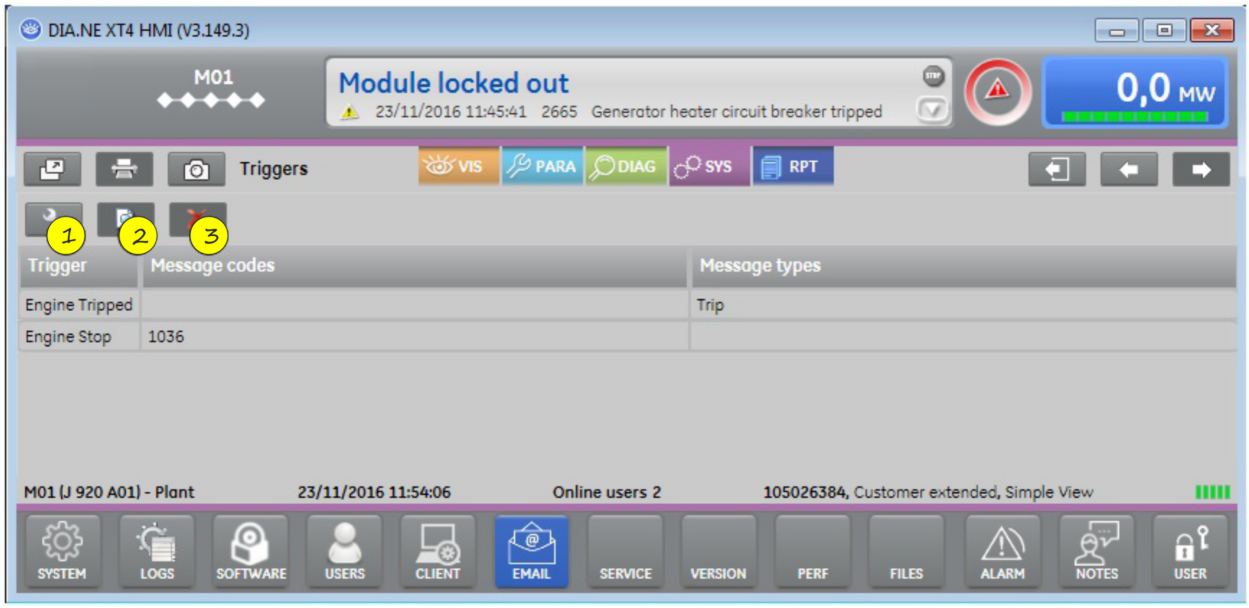
SMTP server configuration

[EMail notification] can be activated here, and the IP address and port as well as the user name and the password of the SMTP server can be entered. **[Ping SMTP Server]** can be used to test whether the specified SMTP server is functioning. Close the entry with **[Save]**.



Trigger conditions configuration

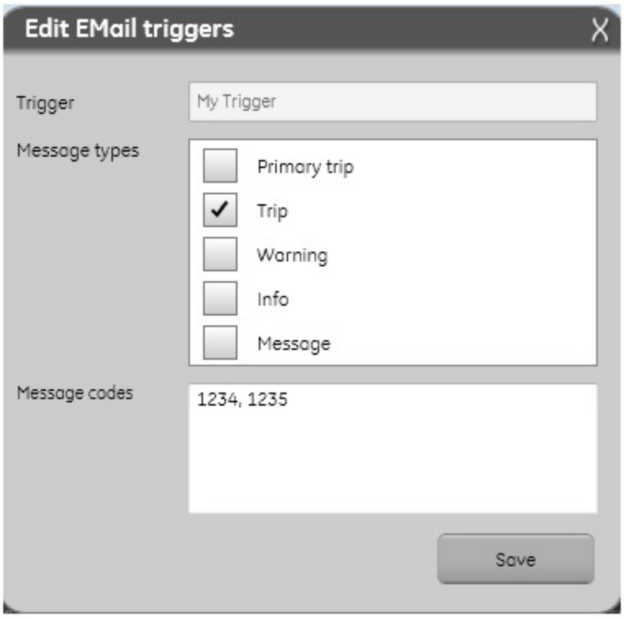
The triggers for e-mail notification are configured here. A number of triggers with different trigger conditions can be set up. These trigger conditions can then be selected for different recipients.



1 Setting up a trigger with specific trigger conditions

2 Processing (changing) the trigger selected in the list

3 Deleting the trigger selected in the list



The name of the trigger and trigger conditions are entered in this dialogue box. A message type and/or specific message numbers can be selected as a trigger condition. The message numbers must be entered individually, separated by a comma.

In the example shown, the trigger named "My Trigger" is always initiated if a **[Trip]** message or a message with the number 1234 or 1235 occurs.

Recipient configuration

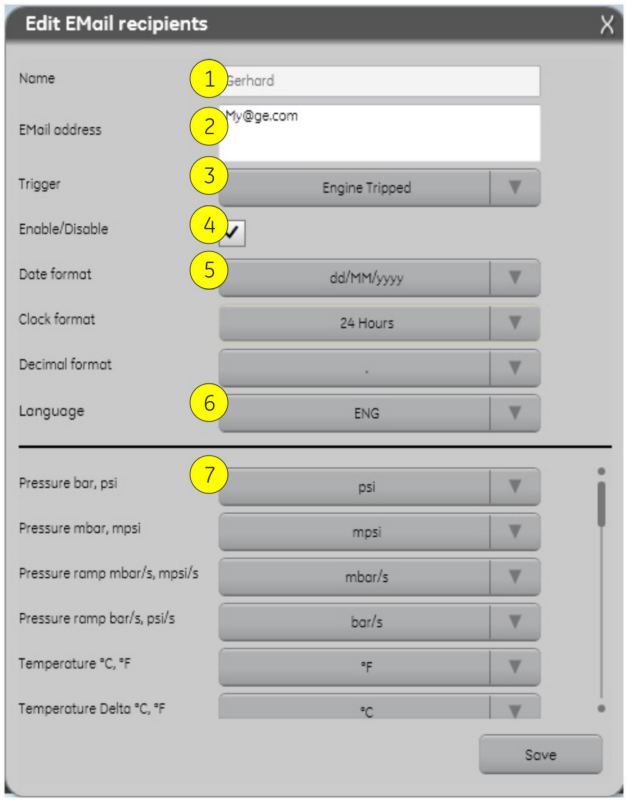
The recipients for the messages are set up here and their settings entered

1 Setting up a recipient

2 Editing (changing) the settings of the recipient selected in the list

3 Deleting the recipient selected in the list

The settings for the recipient are entered in the following dialogue box:



1 Name of the recipient

2 E-mail address of the recipient

3 Trigger condition

4 Enable or disable messages to this recipient

5 Format settings for the e-mail content

6 Language for the e-mail content

7 Units for the e-mail content

Note: If one recipient is intended to be notified in the event of more than one trigger, or if the message is to be sent to more than one e-mail address, more than one recipient must be set up for this (e.g. name 1, name 2, etc.).

17.1.7 SAFI diagnostics and update

This screen displays the main information about the SAFI system. The software (firmware) of the SAFI modules can be updated (Advanced Customer authorisation required).

1 Display of the hardware version for each device = cylinder pair

2 Display of the hardware option for each device = cylinder pair

3 Display of the firmware version for each device = cylinder pair

4 Display of the operating hours for each device = cylinder pair

5 Display of the serial number for each device = cylinder pair

6 Display of the production date for each device = cylinder pair

7 Display of the electronics temperature for each device = cylinder pair

8 Display of the tooth error for each device = cylinder pair

*) The tooth error shows any tooth on the flywheel ring gear on which a pickup error was detected.

9 Display of the knock filter software version for each device = cylinder pair

10 The software update is uploaded to all selected SAFI modules after pressing *[Start]* .

11 Start the selected SAFI software update. Use *[Stop]* to abort the current update process.

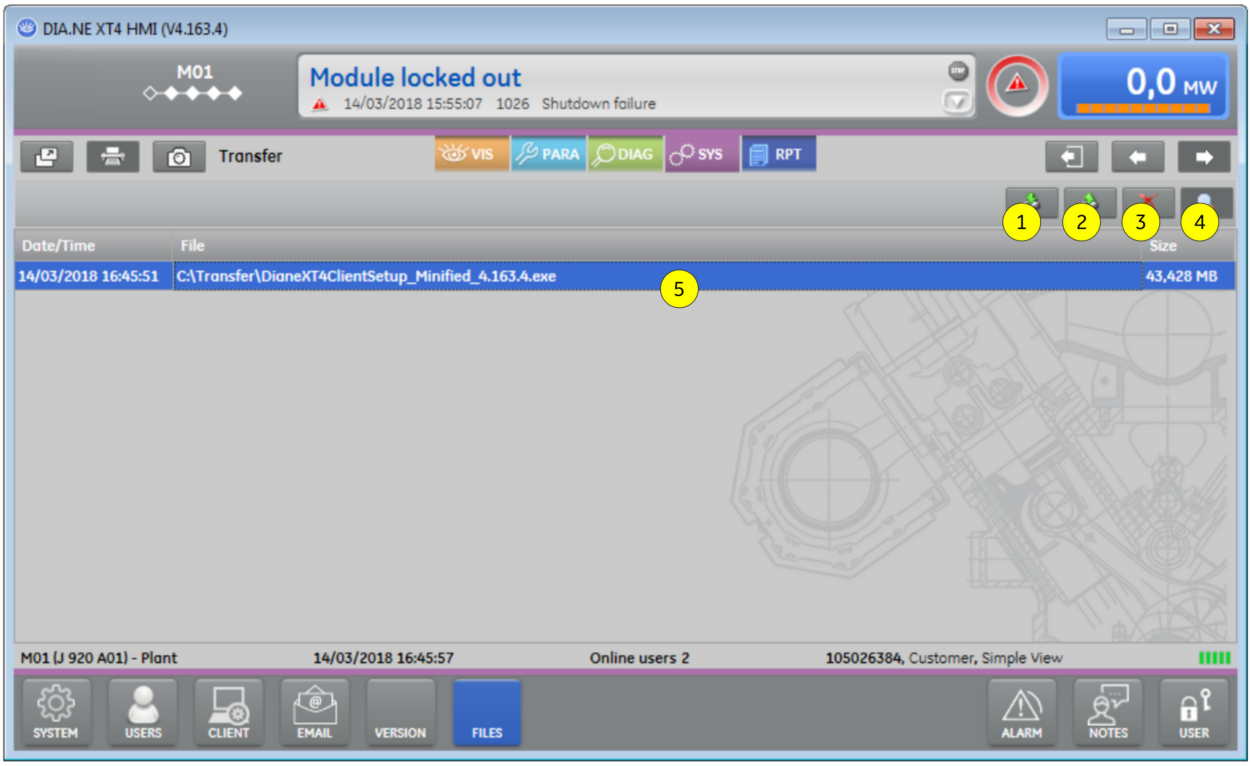
12 Select the desired *[Firmware version]* for the update. Up to 5 versions are available in the buffer.

13 Select the desired *[Proprietary Version]* for the update. Up to 5 versions are available in the buffer.

17.1.8 File Upload/Download

This area is used for uploading and downloading various files (e.g.: documents, images etc.) to the DIA.NE XT4 server. Depending on the user role, different areas are available.

[Transfer]	Upload/download of any files
[Upload]	Upload of any files
[Download]	Download of provided files
[CBM/PCMem]	Download of CBM/PCMem files
[CBM/Statistic]	Download of CBM/Statistic files
[Log Files]	Download of various log files
[DB Backup]	Download of database backup files



1 Download

2 Upload

3 Remove / Delete

4 File viewer. The content of certain file types (e.g.: PDF, BMP, JPG, PNG,...) can be displayed directly on the panel or the remote client.

5 List of available files in the selected area. Select a file to view, download or delete.

17.1.9 myPlant Settings and Diagnosis

This area is used to make the settings required for myPlant, to diagnose the connection to myPlant and to enable or block remote access to the system.

1 "Axeda" settings

"Axeda" is a software component that is required for remote access via myPlant to the DIA.NE XT4 server. This area indicates whether this component is running **[Running]** or stopped **[Stopped]**. In addition, the set IDs for the gateway **[Gateway ID]** and the device **[Device ID]** are displayed. The component can be re-started with the **[Restart]** button.

2 "Edge" settings

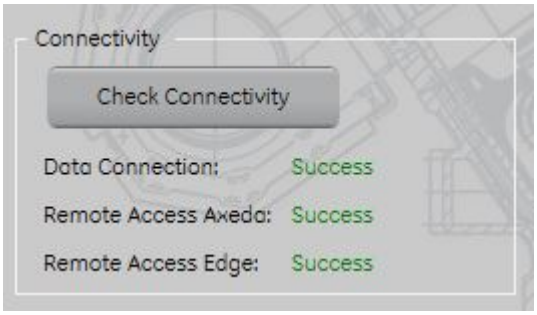
"Edge" is another software component that is required for remote access via myPlant to the DIA.NE XT4 server. This area indicates whether this component is running **[Running]** or stopped **[Stopped]**. In addition, the version **[Version]** is displayed. The component can be re-started with the *[Restart]* button.

3 Proxy settings

Here you can set whether a proxy server is required for the Internet connection or not, and the IP address of the proxy server. When using a proxy, the user name and password for access to the proxy server can be specified.

4 Connection check

The **[Check Connectivity]** button can be used to initiate a connection check to the myPlant control centre. This check may take a few minutes. Then the display shows whether all necessary connections were successful or not. For trouble-free functioning of the myPlant connection, all 3 test steps must run successfully.

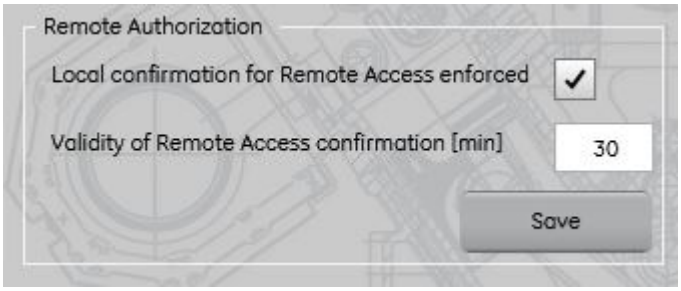


If an error occurs, the log file *[GE_MyPlantConnectivity.log]* can be exported using the "File Upload/Download" function and then analysed.

5 Remote access control

If remote access control is enabled, approval from a local user is required for each remote access to the DIA.NE XT4 via myPlant. With the telephone transmission of a one-time code, approval can then be granted by means of a handshake.

This access control can be activated with the checkbox **[Load confirmation for Remote Access enforced]**. Using **[Validity of Remote Access confirmation]**, you can set the default access time (duration of approval) in minutes. The **[Save]** button is used to accept and save these settings.



Note: This area is only displayed on the local panel on site! Only there can access control be activated/ deactivated and approval for the remote access granted.

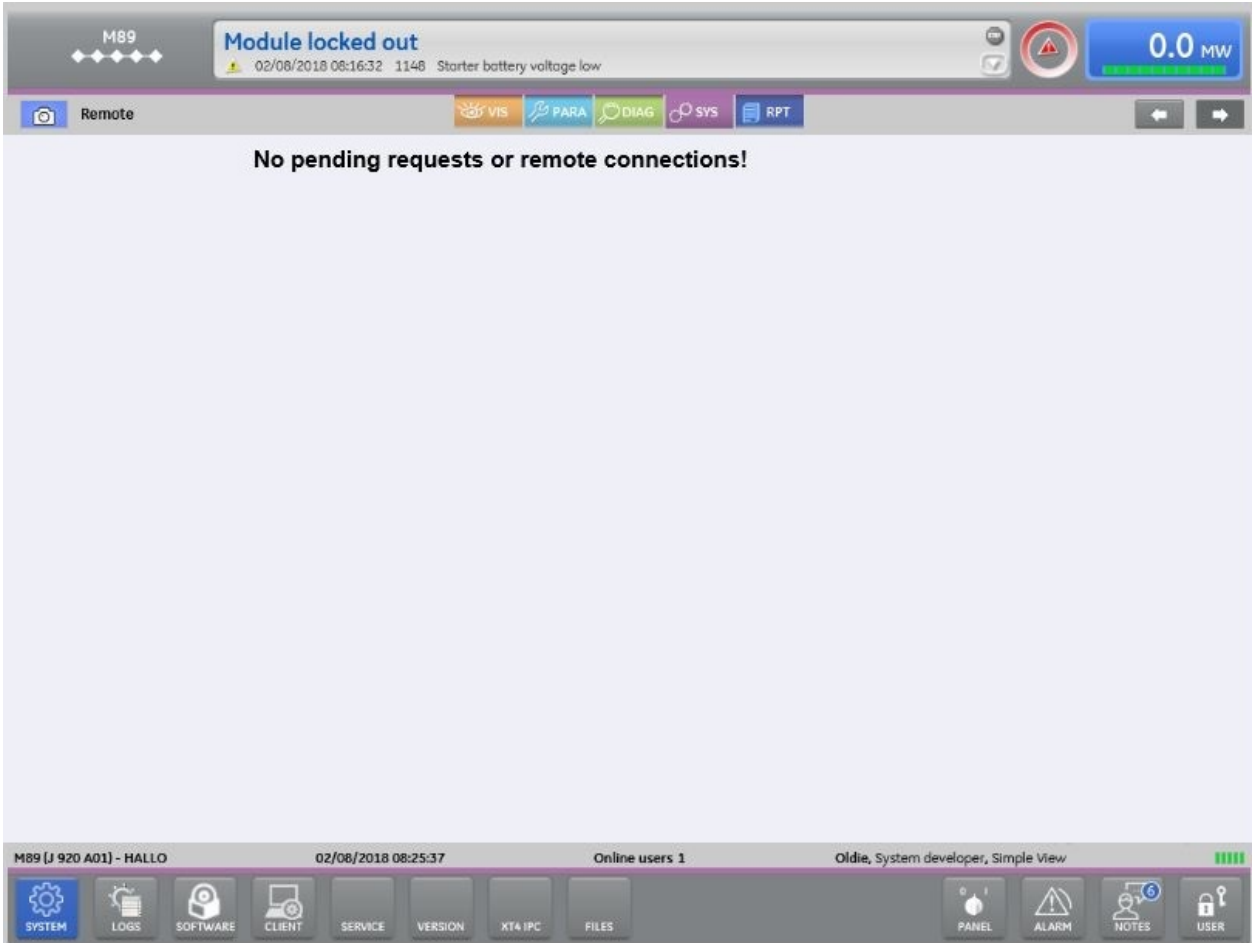
17.1.10 Remote access control

If remote access control is enabled, approval from a local user is required for each remote access to the DIA.NE XT4 via myPlant. With the telephone transmission of a one-time code, approval can then be granted by means of a handshake.

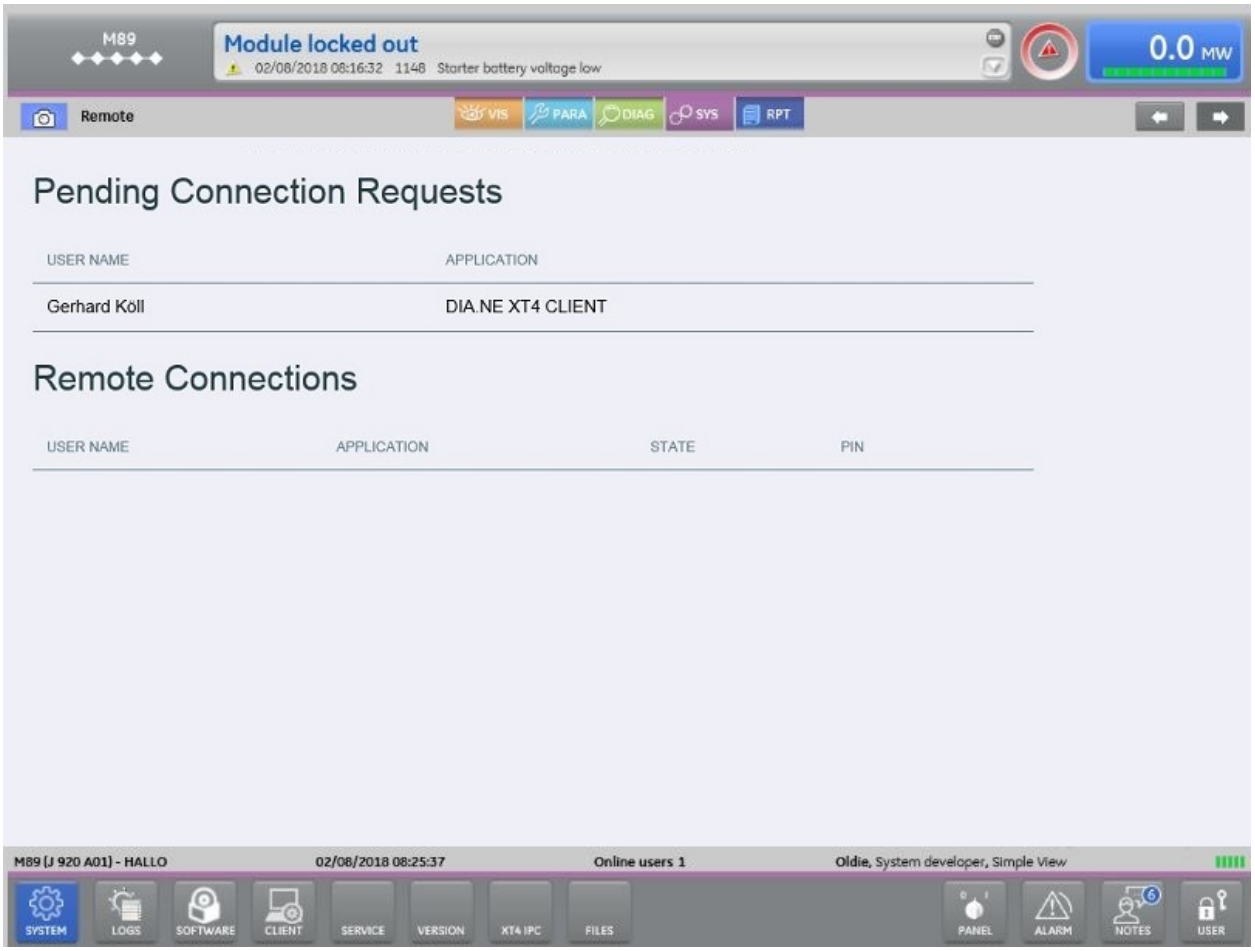
Note: This area is only displayed on the local panel on site! Only there can approval for the remote access be granted.

If access control is activated, you can use the navigation menu **[SYS – SYSTEM – Remote]** to display the following screen. All pending remote access requests are displayed here, and access can be granted or rejected.

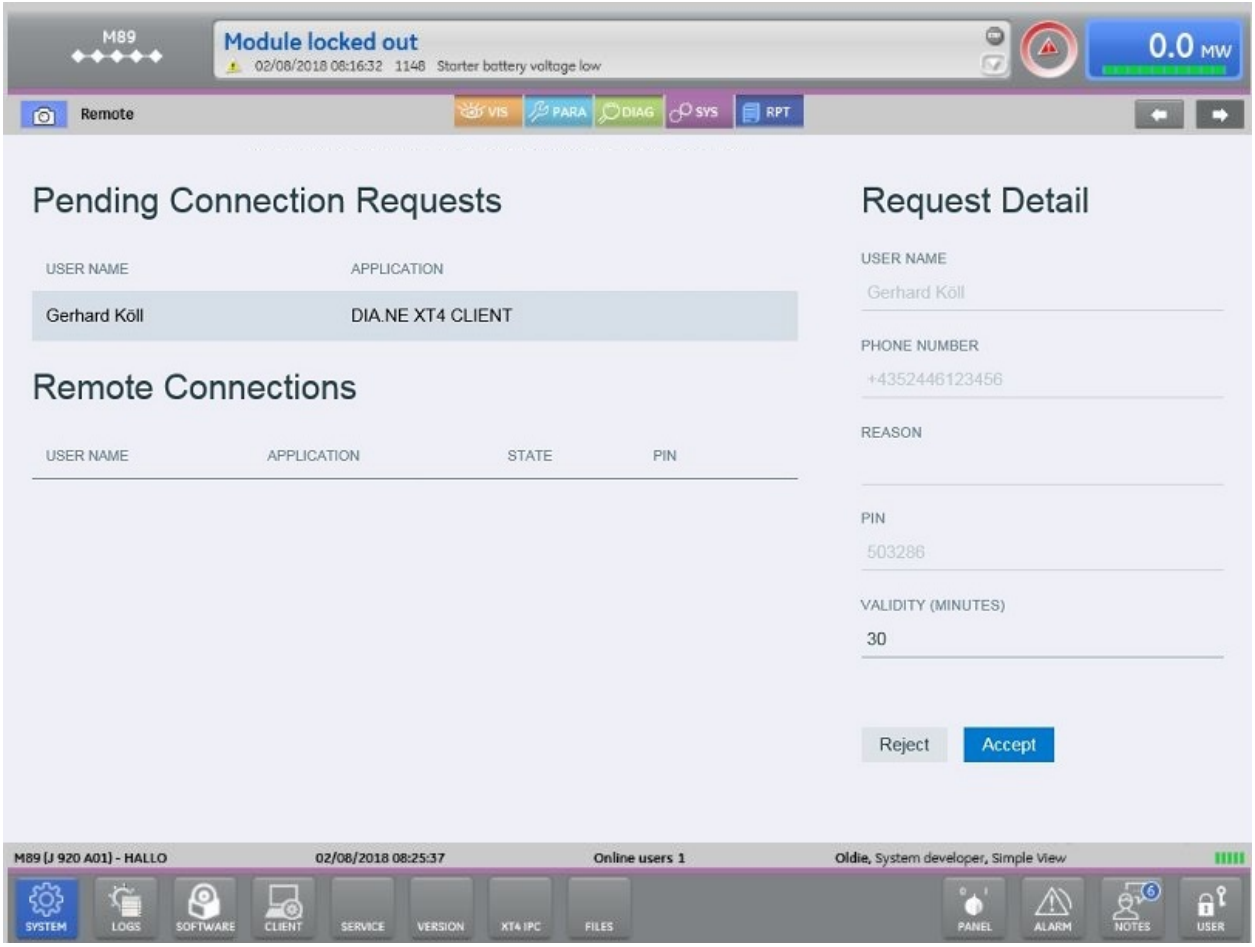
The display when there are no remote access requests.



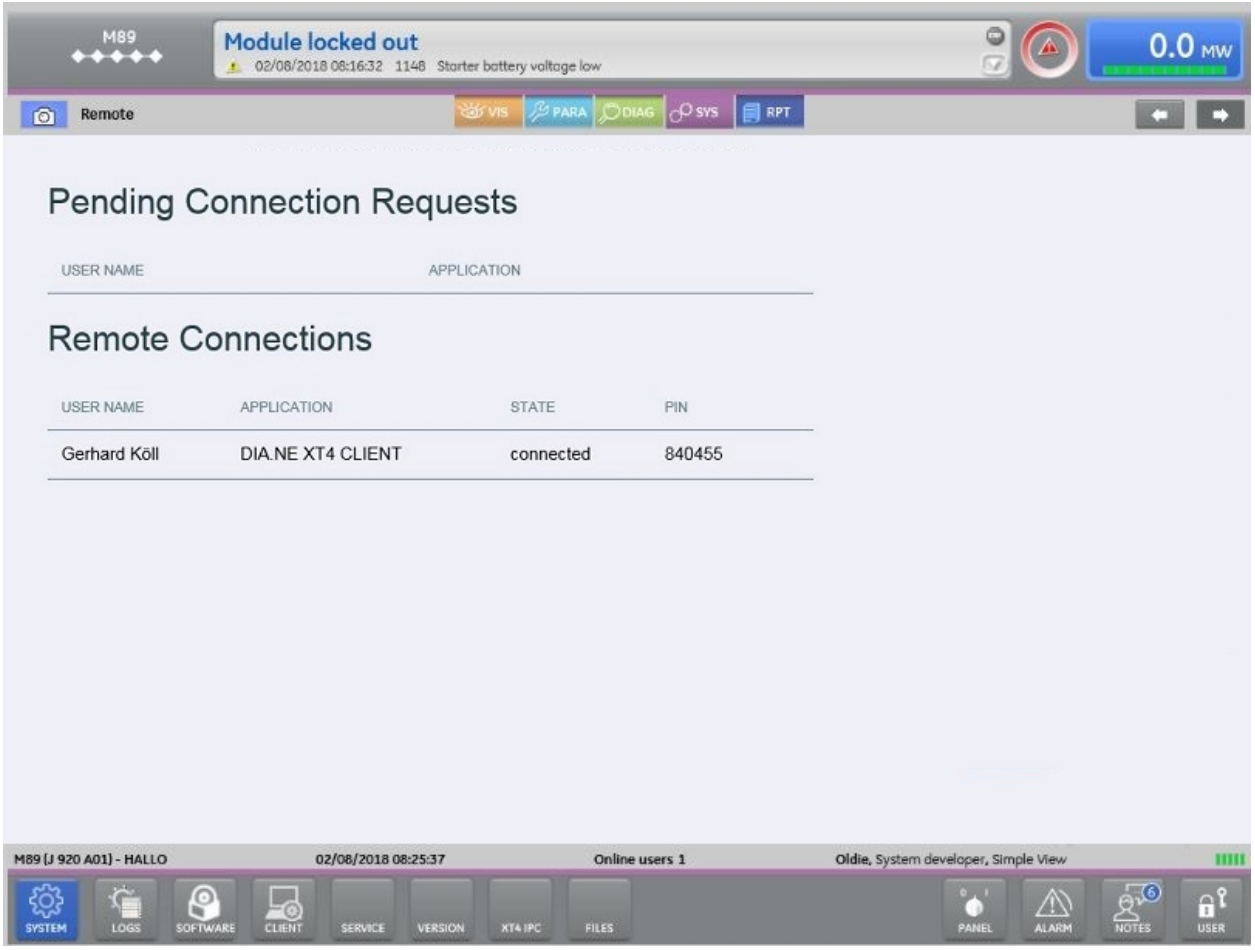
If a remote access request is sent via the remote access tool myPlantRemote, this is displayed with information about from whom **[USER NAME]** and with which application **[APPLICATION]** as follows:



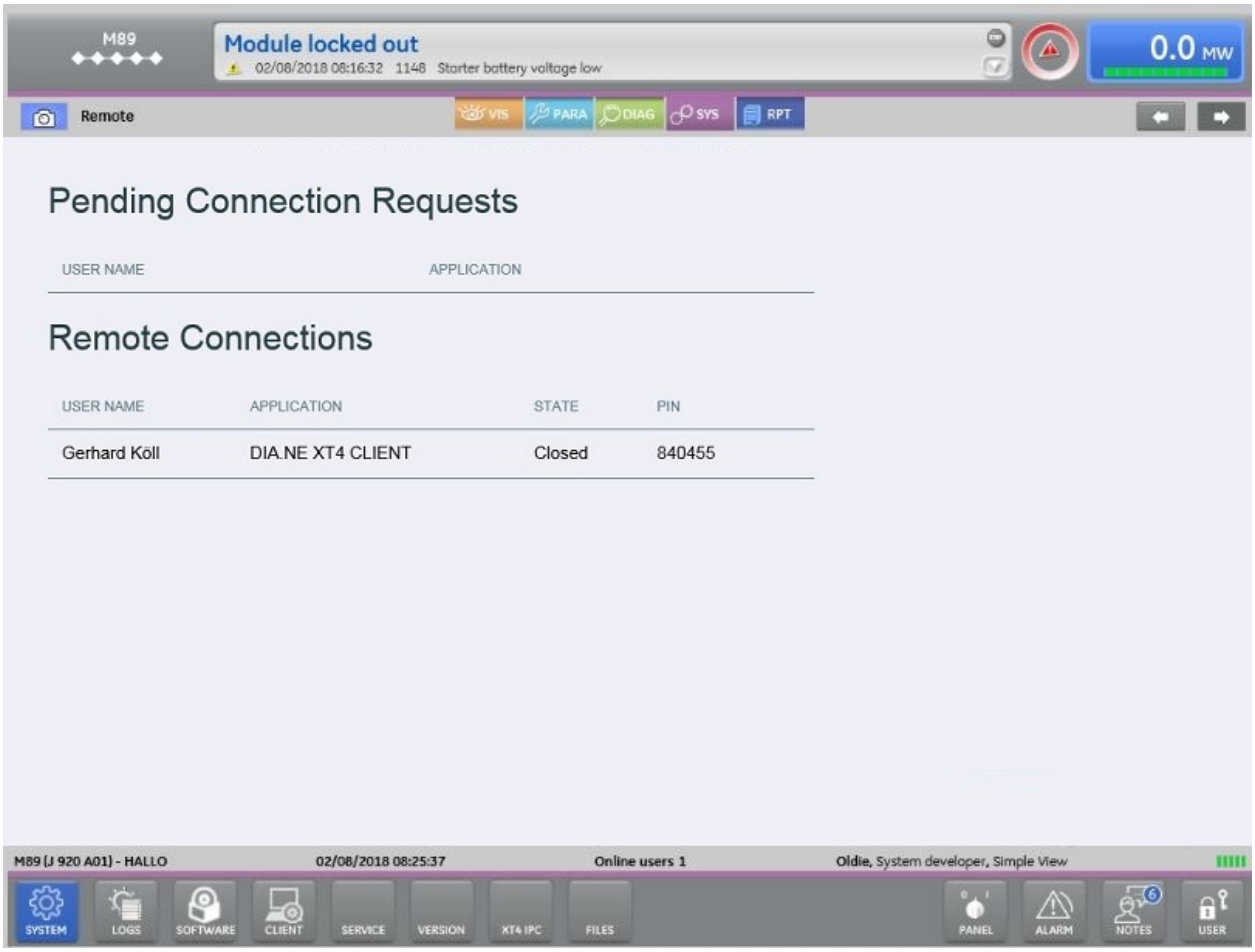
By selecting the line with the user who raised the request, the access can then be granted **[Accept]** or rejected **[Reject]**. The displayed PIN must then be passed on to the user by telephone. By entering this PIN in the remote access tool myPlantRemote, the remote plant can then be accessed for the specified time.



The display when the remote user has entered the PIN correctly and remote access is enabled. In addition to **[USER NAME]** and **[APPLICATION]**, the status **[STATE]** and the unlock code **[PIN]** are displayed.



The display when the remote user has ended the remote access:

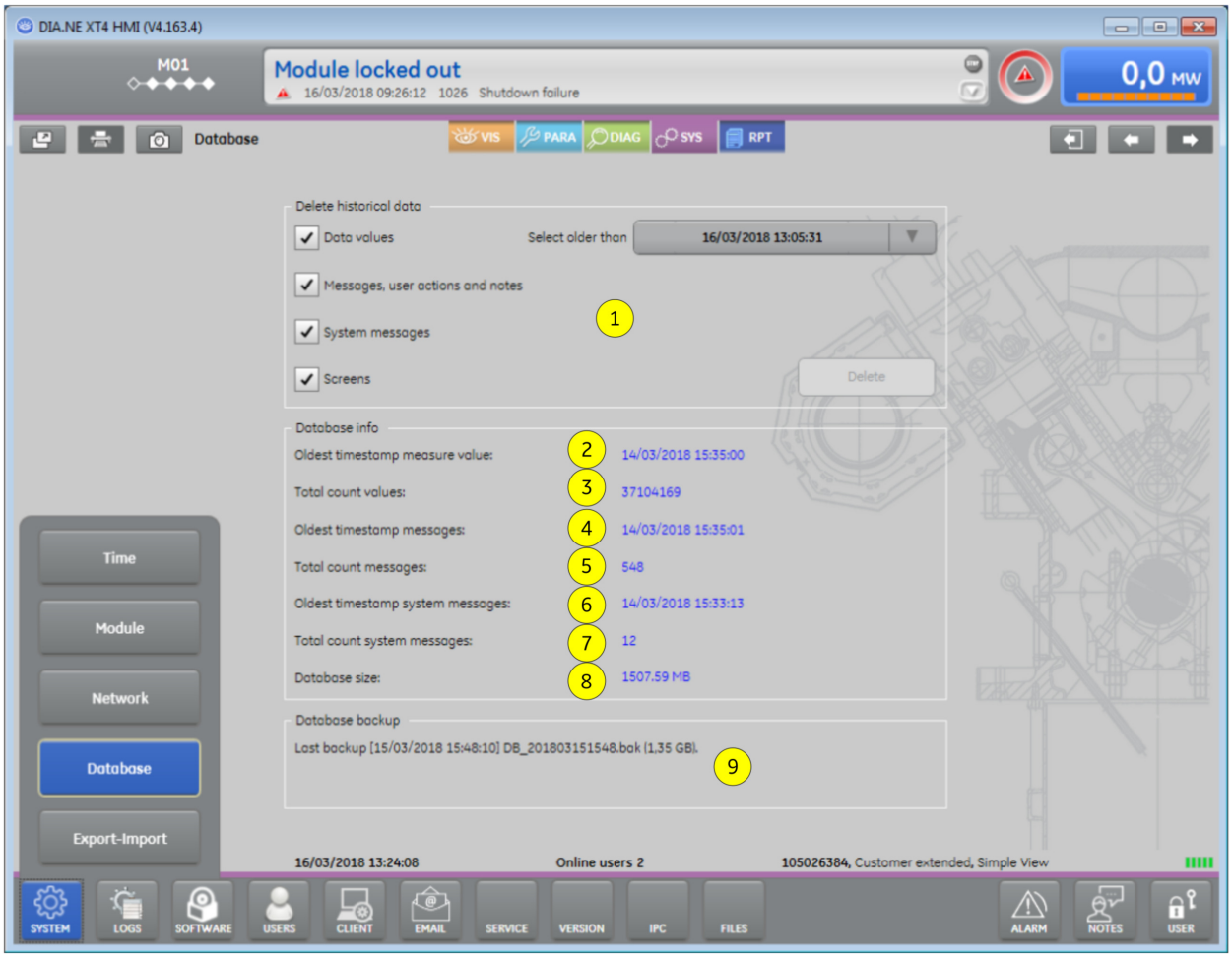


17.2 User role “Advanced Customer”

The following additional system functions are available for the user role Advanced Customer (15).

17.2.1 Database information

This screen displays various information from the database in which all historically recorded data is stored. Users with user role "Test Stand Technician" or higher can manually delete historical data. The system is designed in such a way that data is compressed when it reaches a certain age and then automatically deleted (see Section 5.5 "Data Recording"; manual deletion is therefore not necessary.



1 Selection of data (period and type of data) for deletion from the database. The **[Delete]** is enabled for user role Test Stand Technician or higher.

2 Display of time/date of the oldest entry of a measured value recording in the database

3 Display of the number of stored measurement records (each recorded change in value corresponds to one entry)

4 Display of time/date of the oldest entry of a recorded alarm message in the database

5 Display of the number of stored alarm messages (each alarm message recorded corresponds to one entry)

6 Display of time/date of the oldest entry of a recorded system message in the database

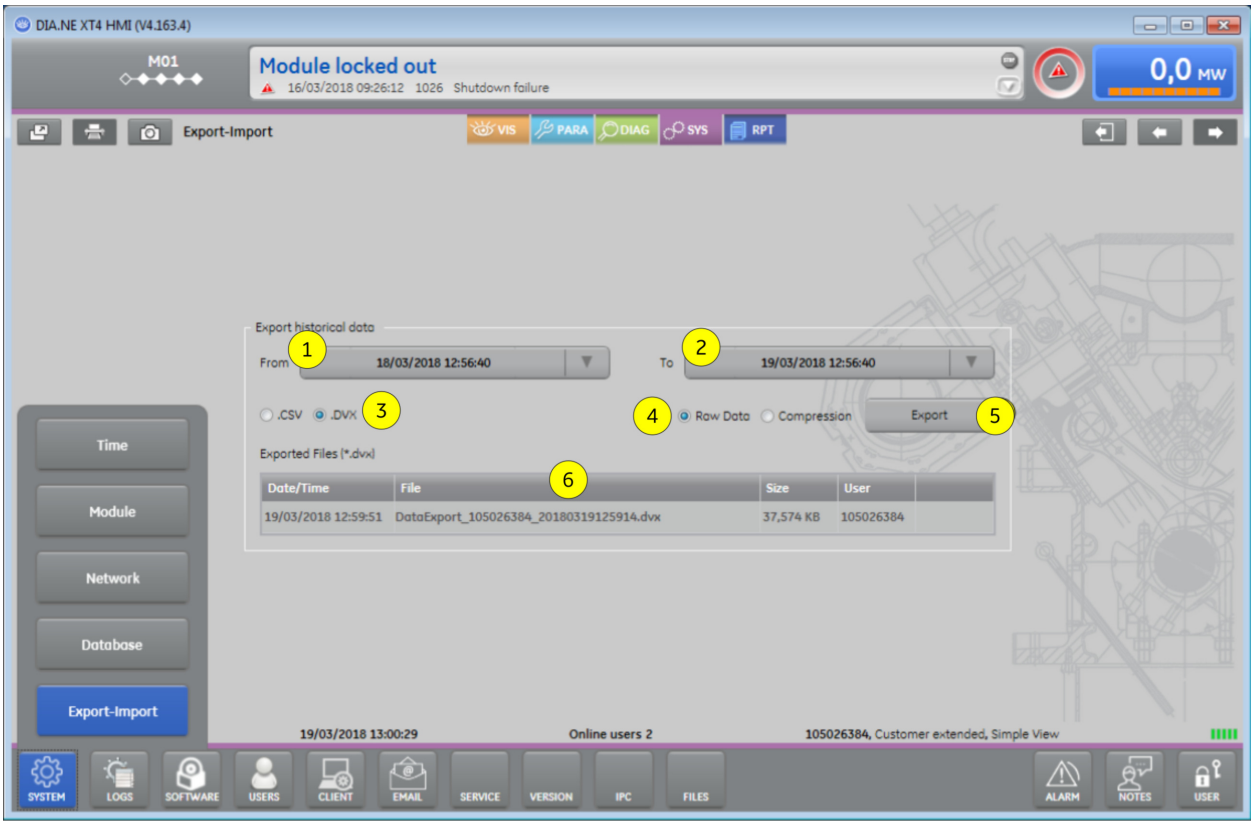
7 Display of the number of stored system messages (each recorded system message corresponds to one entry)

8 Display of the database size in MB. The database may not exceed a maximum size of 10,000 MB!

9 Display of time/date and size of the last database backup. Every 14 hours a backup is created which can be used to restore the data in the event of an error.

17.2.2 Data export and import

With these functions, all historically recorded data can be exported for data backup or offline diagnostics with external tools. Importing data to the DIA.NE XT4 server is only possible for users with the user role Service Technician or higher.



1 Selection of the time from when the data should be exported

2 Selection of the time until when the data should be exported

3 Selection of the data format for export

*.dvx
Own file format for exporting historical raw data. DVX data can be converted into various public formats using a DIA.NE Data Converter conversion tool. DVX data can also be imported directly on a DIA.NE XT4 server (e.g. for hardware replacement).

*.csv
Simple file format (comma-separated text file) for displaying the data in text-based editors or MS Excel. For technical reasons, only preprocessed data (averaging, adjustment of time intervals) can be exported in this format, not raw data. A time interval (minimum resolution 1 second) must be specified for data preprocessing.

4 For DVX data you can choose between raw data and compressed data. For raw data, the data is always exported with the highest available time resolution (100 ms) and without loss of information. When compressed data is selected, the amount of data is reduced by averaging based on the selected interval in seconds.

5 Start the data export (or continue to the next dialog box).

6 List of last data export files. The download can be repeated at a later time.

1 Switching between display of all measuring signals or only those already selected

2 Text filter for easy search of the necessary measurement signals

3 List of measurement signals to select and deselect for export. Only the selected (ticked) measurement signals are exported.

4 List of message types and actions to select and deselect for export. Only the selected (ticked) types are exported.

[Primary Trip]	Causal error messages of the "shutdown" type only, no secondary faults
[Trip]	All Shutdown type error messages
[Warning]	All Warning type error messages
[Message]	All Operational Message types
[Actions]	All operating actions such as control commands and setpoint changes
[Screens]	All image calls
[Incidents]	All events (engine shutdown during operation) for long-term storage of raw data

5 List of different system message priorities to select and deselect for export. Only the selected (ticked) priorities are exported.

6 Selection of existing templates (selection lists) for export. This allows you to select existing selection lists for reuse.

7 Select all measurement signals in the list for export

8 Deselect all measurement signals in the list for export

9 Delete a selected template (drop-down list)

10 Save the current selection in a template (selection list) for reuse. The selection list can be stored on your local PC for your own use or on the DIA.NE XT4 server for general use.

11 Start of data export

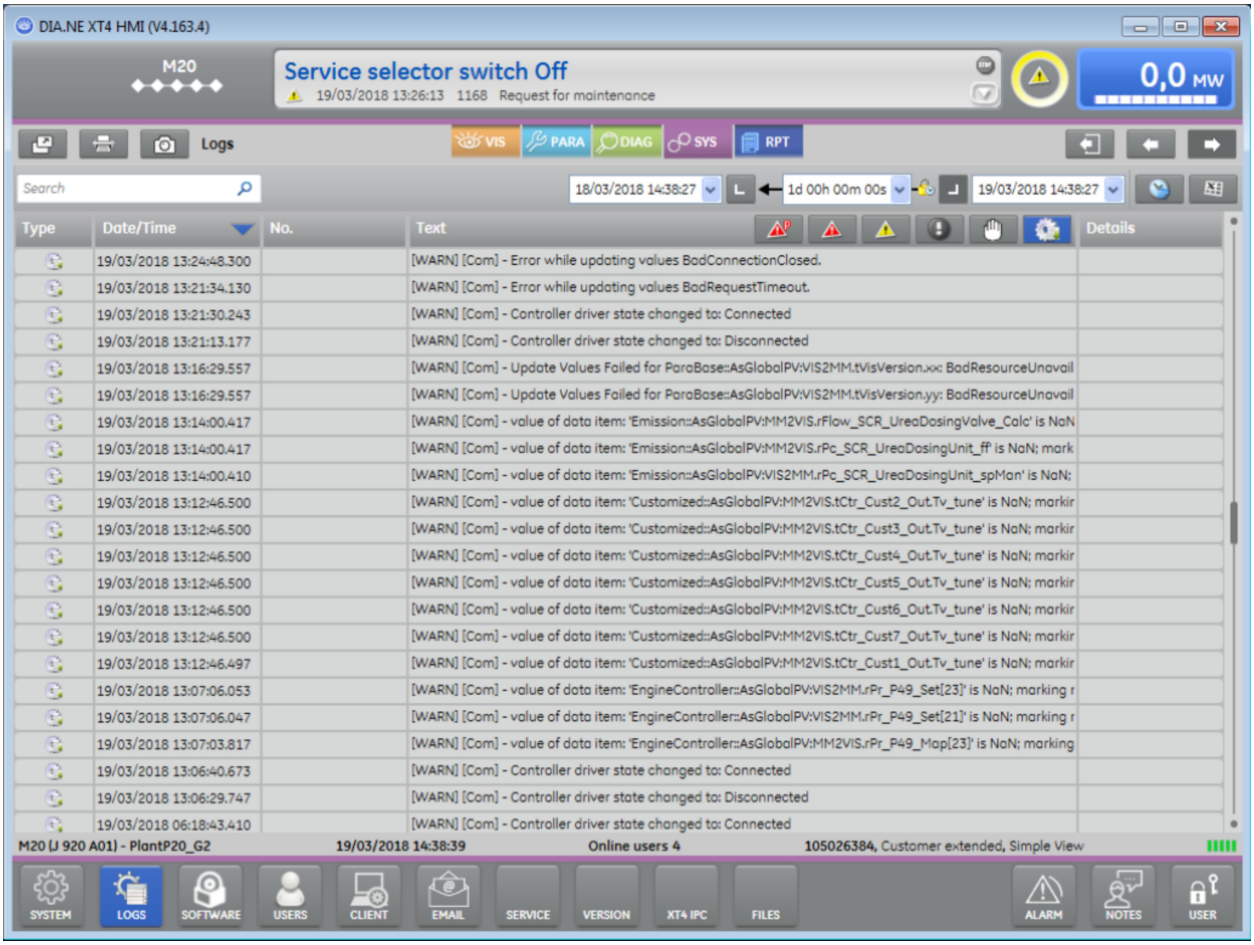
Depending on the amount of data, the data export can take several minutes. Once the export file has been created, it is made available for download to your PC.

17.2.3 Display of system messages

The system log messages can be displayed here. The functionality of the display corresponds to the message history Display of the alarm management (Section 13.2) and is described in detail there.


When this filter is activated, all system messages are displayed.

System messages contain notifications (errors, warnings, information) from the DIA.NE XT4 system, which are recorded and can be useful for troubleshooting.



17.2.4 Software information

This screen is used to manage the various software components of DIA.NE XT4. The version statuses are displayed, components can be updated, and older versions can be restored.

1 Display name **[Name]** and version **[Version]** of the default HMI configuration. This configuration contains all order-independent components (images, data points, texts, objects,...) of the visualisation.
Download **[Download]** and restore **[Restore]** is only possible with user role Service Technician or higher.

2 Display name **[Name],** version **[Version]** and order number **[Order]** of the order-specific HMI configuration. The required minimum version of the default configuration is also displayed **[Default Reference].** This order-specific HMI configuration contains all order-specific components (images, data points, texts, objects,...) of the visualisation.
Download **[Download]**, Restore**[Restore]** and Remove **[Remove]** is only possible with user role Service Technician.

3 Display of the HMI runtime component version (visualisation system)

4 Display of the version **[Version]** of the system state of delivery **[Initial Server Image]**

5 Display of the order number **[Order Number]** that is stored in the control program. This must match the job number of the job-specific HMI configuration (see 2).

6 Select a *.UPD file to update one or more software components. For details see the following point ⇨ Installing software updates

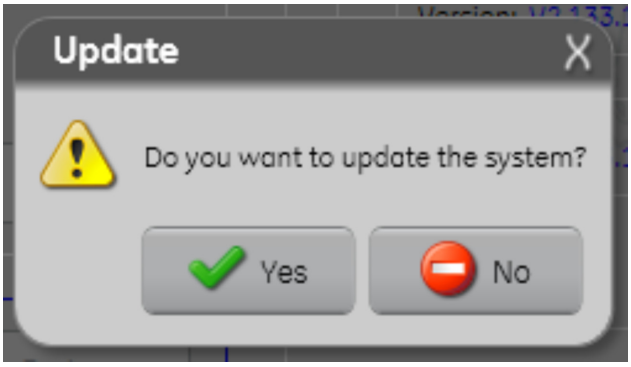
7 You can use **[Snapshot]** to create a backup or restore point of the complete control software. With **[Restore]**, these manually generated backup copies and automatically created backups of the control software can be easily restored. However, this function is only available with user role Service Technician or higher.

17.2.5 Installing software updates

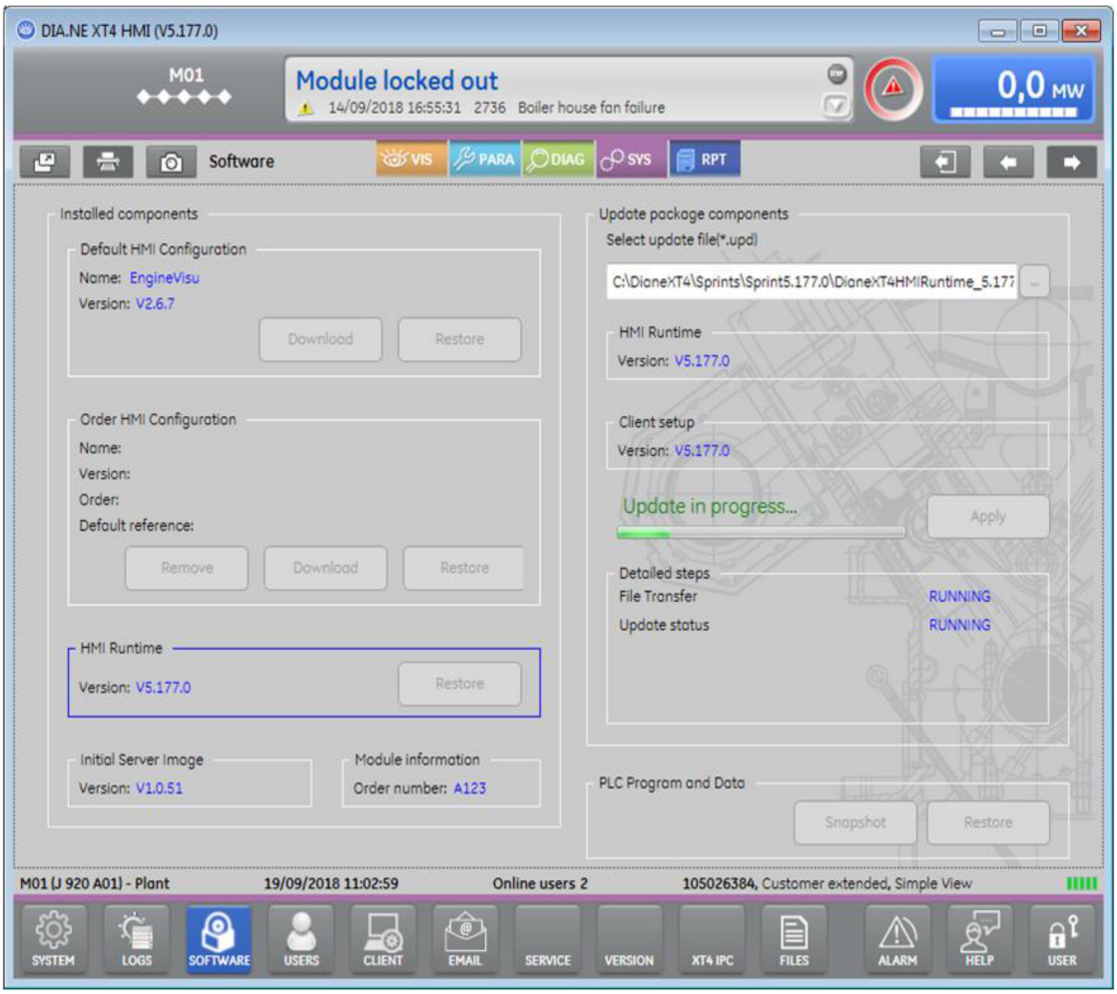
Open the Software Update window on the HMI Client **[SYS/SOFTWARE]**and select the appropriate update file **[.upd]**.

The components and versions contained in the update package are then displayed below the respective file. In this example, the **HMI Runtime and the Client Setup V5.177.0.** With **"Accept"**, the update package starts to load onto the DIA.NE XT4 server.

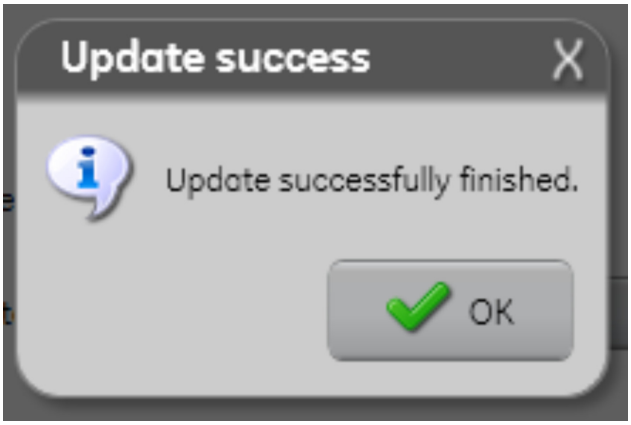
The update-related question must be answered with **"Yes"**.



The progress of the update is shown in the **[Update in progress]** bar. Under **[Detailed steps]** the necessary steps are displayed with their respective statuses.



When the update is complete, the following message appears:



Please acknowledge this message. If necessary, the IPC and the client automatically restart on the notebook. This depends on the content of the update package. A manual restart of the IPC is not necessary.

17.2.6 CAN bus diagnostics

This screen is used for diagnostics of the DIA.NE XT4 CAN bus system. The error counters for the various CAN bus devices (multi measuring transducer, ignition, TECJET, KLS98 and MONIC) are displayed.

1 Display of the active CAN interface on the X20 IO system

2 Status displays for the CAN bus connection

[OPEN STATUS] The status of the start of communication with the CAN controller is displayed here. A value other than 0 indicates an error. For details see **TA 1531-0012 –**CAN Bus on the Jenbacher engine.

[ERROR NUMBER] The error number serves as additional information in case of a problem with the OPEN STATUS call. A value other than 0 indicates an error. For details see **TA 1531-0012 –**CAN Bus on the Jenbacher engine.

[INIT STATUS] The status of the initialisation of the CAN controller is displayed here. A value other than 0 indicates an error. For details see **TA 1531-0012 –**CAN Bus on the Jenbacher engine.

3 Resetting the error counter

4 Status displays of the CAN bus devices

[INIT STATUS] The status of the initialisation of communication with the relevant CAN device is displayed here. A value other than 0 indicates an error. For details see **TA 1531-0012 –**CAN Bus on the Jenbacher engine.

[MAIN STATUS] The status of the cyclical processing of communication with the relevant CAN device is displayed here. A value other than 0 indicates an error. For details see **TA 1531-0012 –**CAN Bus on the Jenbacher engine.

[EVENT STATUS] Status of the read command used for totalling errors.

0	Message from the CAN controller: Status is OK
1	Writing to the CAN controller is in progress
2	Reading from the CAN controller is in progress
64	Request sent to the CAN controller but no answer from Controller
128	Error message from the CAN controller: No answer received from device

If the value is something other than 0 for a short period, this does not mean that an error has occurred.

[ERRORS CURRENT] Current status of the error counter for the device concerned. Please note that the error counter can accept a maximum value of 25. Once the counter reaches 25, the engine is shut down with the appropriate error message. The error counters are increased by one per second in which no data were successfully exchanged. The only exception is fast TECJET communication. In this case, shutdown is triggered by an error count of 8 when the engine is running. An error count of 8 means that a TECJET could not be activated for 8 times 10 milliseconds (= 80 milliseconds).

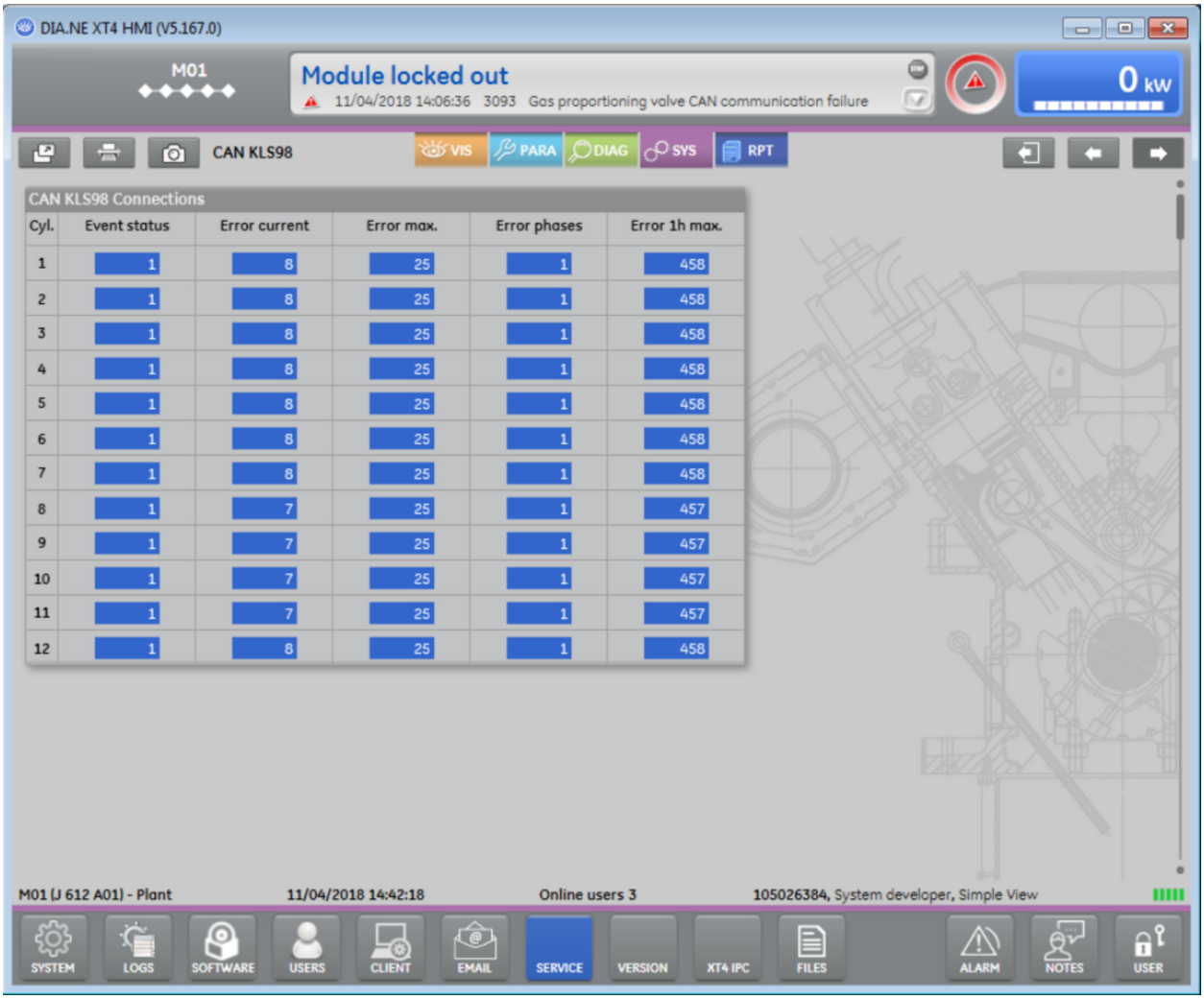
[**ERRORS MAX**] Maximum count of the error counter for the relevant device since the last reset. If communication starts to function properly again after an incident, the current counter is reset to zero. The maximum value of the counter is stored here. The counter can be reset to 0 by pressing 3.

[ERRORS PHASES] If the current error count (ERRORS CURRENT) exceeds 5, the error phase counter increases by 1. If communication functions again after this, the current counter is reset to 0, completing an error phase. The next time 5 is exceeded, the counter will again increase by 1. In other words, each failure of a device is totalled for 5 seconds. In the case of fast communication with the TECJETs, the threshold above which an error phase is detected is 3 (i.e. 30 milliseconds). This monitoring system can determine whether misfiring occurs during communication with a CAN bus participant without an error message already having been issued. The counter can be reset to zero by pressing the 3 key.

[ERRORS 1h MAX] This counter is increased by one for each second during which an error exists in a device. In the case of fast communication with the TECJETs this happens every 10 milliseconds. The purpose of the counters is to indicate whether there has been an hour in the history in which a massive transfer error has occurred. They can also indicate whether short misfires have occurred below the phase counter threshold value.

17.2.7 CAN bus diagnostics KLS 98

This screen is used for detailed diagnostics of the KLS 98 CAN bus devices.



Cyl.	Event status	Error current	Error max.	Error phases	Error 1h max.
1	1	8	25	1	458
2	1	8	25	1	458
3	1	8	25	1	458
4	1	8	25	1	458
5	1	8	25	1	458
6	1	8	25	1	458
7	1	8	25	1	458
8	1	7	25	1	457
9	1	7	25	1	457
10	1	7	25	1	457
11	1	7	25	1	457
12	1	8	25	1	458

CAN bus diagnostics KLS 98

[EVENT STATUS] Status of the read command used for totalling errors.

0	Message from the CAN controller: Status is OK
1	Writing to the CAN controller is in progress
2	Reading from the CAN controller is in progress
64	Request sent to the CAN controller but no answer from Controller
128	Error message from the CAN controller: No answer received from device

If the value is something other than 0 for a short period, this does not mean that an error has occurred.

[ERRORS CURRENT] Current status of the error counter for the device concerned. Please note that the error counter can accept a maximum value of 25. Once the counter reaches 25, the engine is shut down with the appropriate error message. The error counters are increased by one per second in which no data were successfully exchanged.

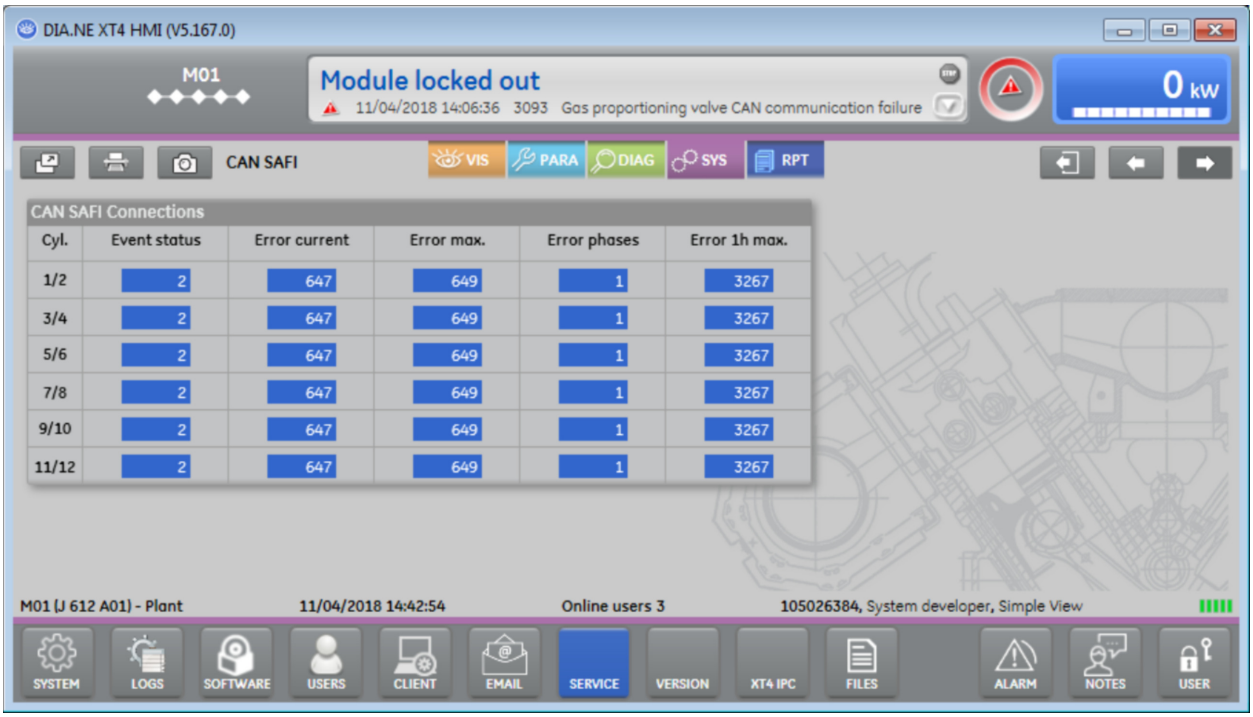
ERRORS MAX Maximum count of the error counter for the relevant device since the last reset. If communication starts to function properly again after an incident, the current counter is reset to zero. However, the maximum value of the counter is secured.

[ERRORS PHASES] If the current error count (ERRORS CURRENT) exceeds 5, the error phase counter increases by 1. If communication functions again after this, the current counter is reset to 0, completing an error phase. The next time 5 is exceeded, the counter will again increase by 1. In other words, each failure of a device is totalled for 5 seconds.

[ERRORS 1h MAX] This counter is increased by one for each second during which an error exists in a device. In the case of fast communication with the TECJETs this happens every 10 milliseconds. The purpose of the counters is to indicate whether there has been an hour in the history in which a massive transfer error has occurred. They can also indicate whether short misfires have occurred below the phase counter threshold value.

17.2.8 CAN bus diagnostics SAFI

This screen is used for detailed diagnostics of the SAFI CAN bus devices.



[EVENT STATUS] Status of the read command used for totalling errors.

0	Message from the CAN controller: Status is OK
1	Writing to the CAN controller is in progress
2	Reading from the CAN controller is in progress
64	Request sent to the CAN controller but no answer from Controller
128	Error message from the CAN controller: No answer received from device

If the value is something other than 0 for a short period, this does not mean that an error has occurred.

[ERRORS CURRENT] Current status of the error counter for the device concerned. Please note that the error counter can accept a maximum value of 25. Once the counter reaches 25, the engine is shut down with the appropriate error message. The error counters are increased by one per second in which no data were successfully exchanged.

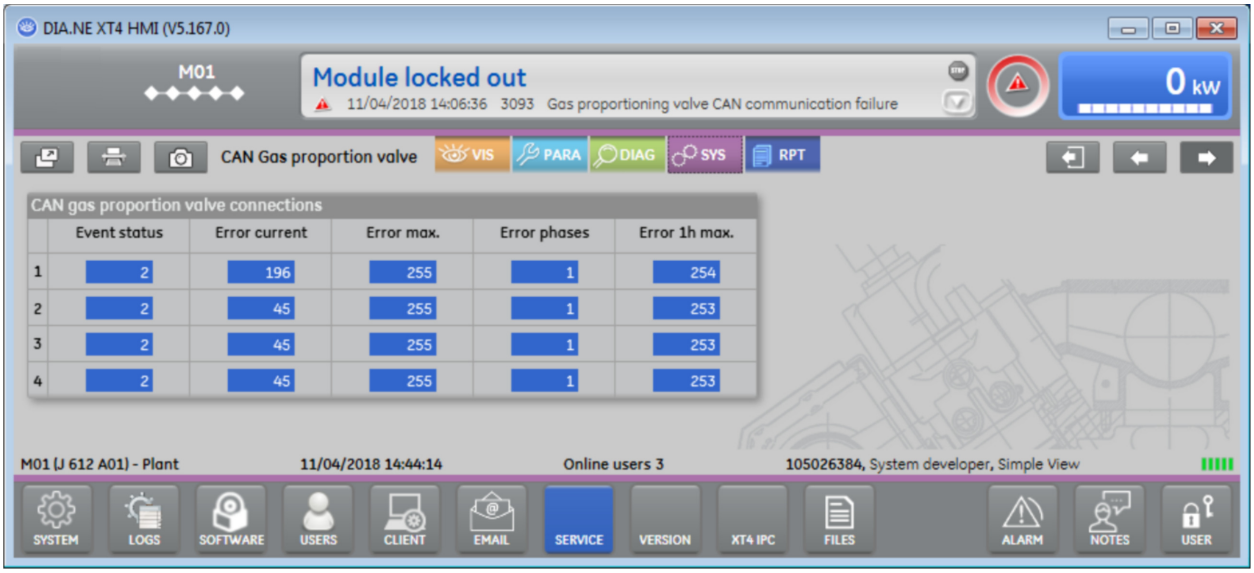
ERRORS MAX Maximum count of the error counter for the relevant device since the last reset. If communication starts to function properly again after an incident, the current counter is reset to zero. However, the maximum value of the counter is secured.

[ERRORS PHASES] If the current error count (ERRORS CURRENT) exceeds 5, the error phase counter increases by 1. If communication functions again after this, the current counter is reset to 0, completing an error phase. The next time 5 is exceeded, the counter will again increase by 1. In other words, each failure of a device is totalled for 5 seconds.

[ERRORS 1h MAX] This counter is increased by one for each second during which an error exists in a device. In the case of fast communication with the TECJETs this happens every 10 milliseconds. The purpose of the counters is to indicate whether there has been an hour in the history in which a massive transfer error has occurred. They can also indicate whether short misfires have occurred below the phase counter threshold value.

17.2.9 CAN bus diagnostics gas proportioning

This screen is used for detailed diagnostics of the gas proportioning valve CAN bus devices.



[EVENT STATUS] Status of the read command used for totalling errors.

0	Message from the CAN controller: Status is OK
1	Writing to the CAN controller is in progress
2	Reading from the CAN controller is in progress
64	Request sent to the CAN controller but no answer from Controller
128	Error message from the CAN controller: No answer received from device

If the value is something other than 0 for a short period, this does not mean that an error has occurred.

[ERRORS CURRENT] Current status of the error counter for the device concerned. Please note that the error counter can accept a maximum value of 25. Once the counter reaches 25, the engine is shut down with the appropriate error message. The error counters are increased by one per second in which no data were successfully exchanged.

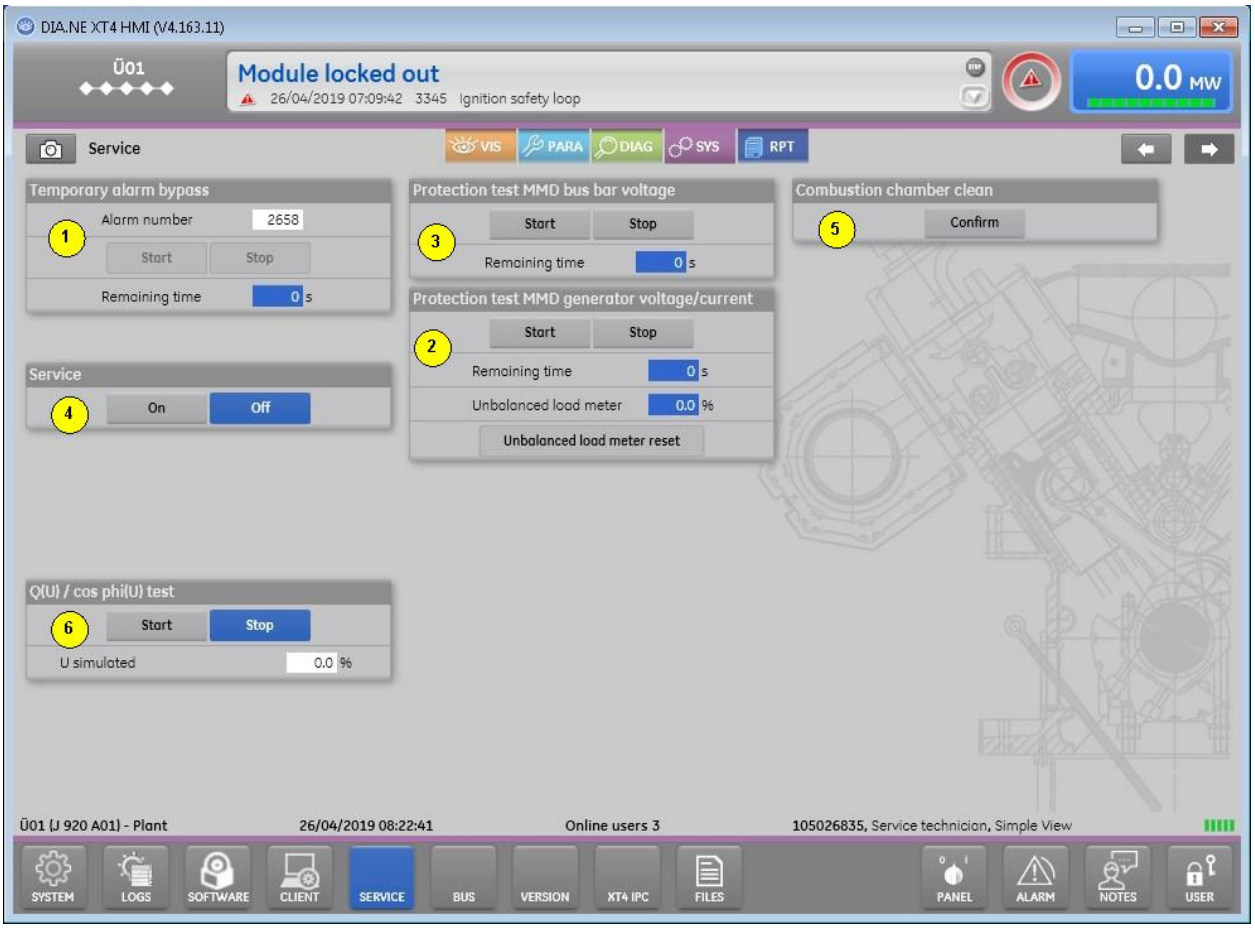
ERRORS MAX Maximum count of the error counter for the relevant device since the last reset. If communication starts to function properly again after an incident, the current counter is reset to zero. However, the maximum value of the counter is secured.

[ERRORS PHASES] If the current error count (ERRORS CURRENT) exceeds 5, the error phase counter increases by 1. If communication functions again after this, the current counter is reset to 0, completing an error phase. The next time 5 is exceeded, the counter will again increase by 1. In other words, each failure of a device is totalled for 5 seconds.

[ERRORS 1h MAX] This counter is increased by one for each second during which an error exists in a device. In the case of fast communication with the TECJETs this happens every 10 milliseconds. The purpose of the counters is to indicate whether there has been an hour in the history in which a massive transfer error has occurred. They can also indicate whether short misfires have occurred below the phase counter threshold value.

17.2.10 Service

This screen is used to activate the Service mode and to perform various tests.



1 The ByPass alarm can be used to enter an alarm message **[Alarm Number]** whose triggering is then suppressed for a specified time **[Remaining Time]** . This is required to perform certain tests during commissioning. The ByPass alarm can be activated with user role Service Technician or higher.

2 This indicates that the MMU protection check for generator voltage/current has been activated and will continue to run for a specified time **[Remaining Time]** . Activation is possible with user role "Advanced customer" or higher.

In addition, the unbalanced load counter of the multi measuring transducer is displayed, which can also be reset via a button.

3 This indicates that the MMU protection check for busbar voltage has been activated and will continue to run for a specified time **[Remaining Time]**. Activation is possible with user role "Advanced customer" or higher.

4 Activate service mode. During maintenance and service work, the Service operating mode should be activated so that the times for the availability calculation can be correctly taken into account.

5 **[Combustion chamber clean]**
This button resets the function "Boost pressure compensation due to ageing of the combustion chamber" caused by deposits. It must be pressed when the combustion chamber has been cleaned or replaced (e.g. piston replacement for the entire engine). See TA 1503-0043.

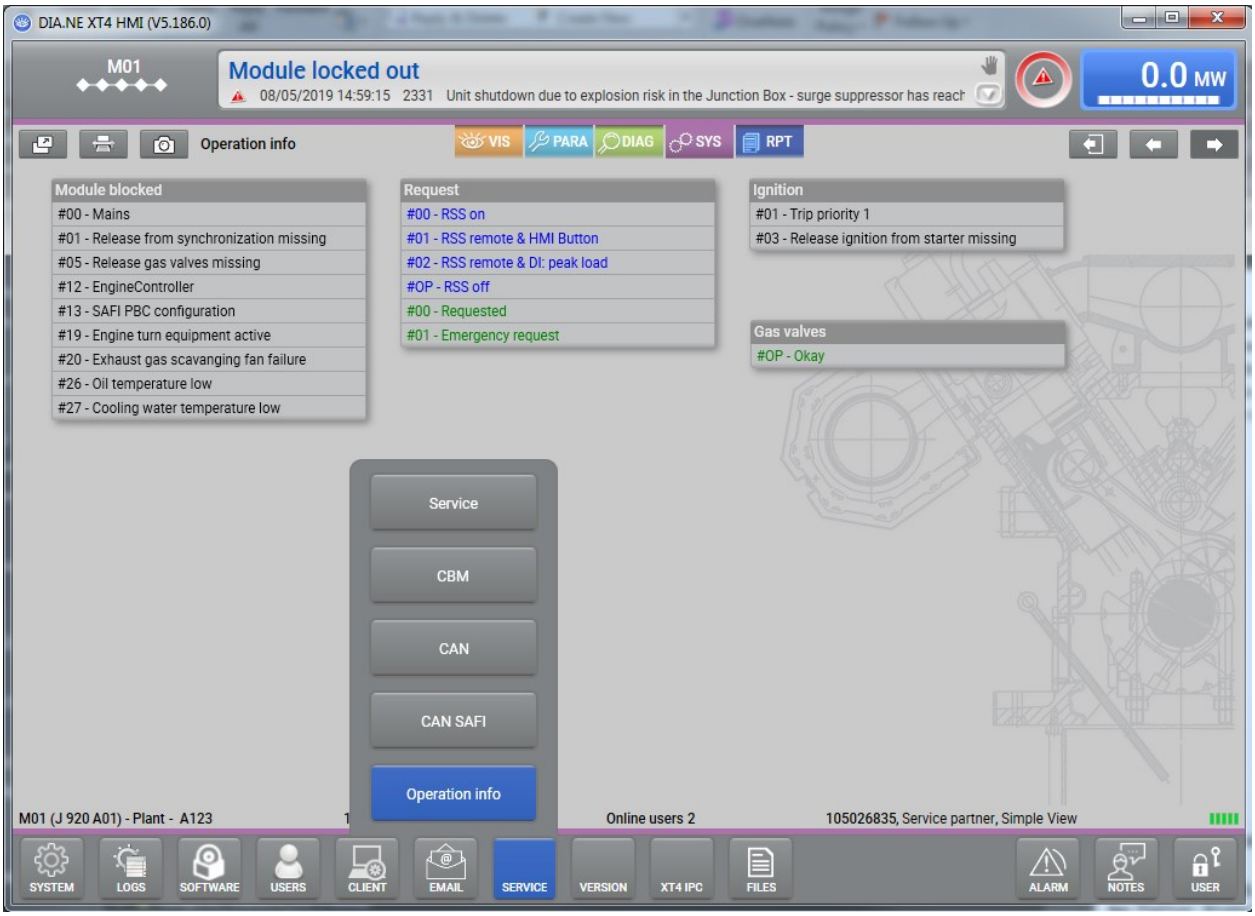
6 This indicates that the Q(U) / cos phi(U) test has been activated and the voltage **[U simulated]** is simulated. Activation is possible with user role Service Technician or higher.

17.2.11 Service Operating State Info

This screen provides additional information on the operating state of the engine. The screen can be activated with parameter 14361 *[Engine/Engine data/Additional operating status information active]* and is available from user role Service Partner or above.

There are corresponding displays for the following situations:

Module locked out, Start preparation, Synchronisation enable, Request, Ignition, Gas valves and Automatic start enable. These are subdivided into their individual terms to facilitate troubleshooting.



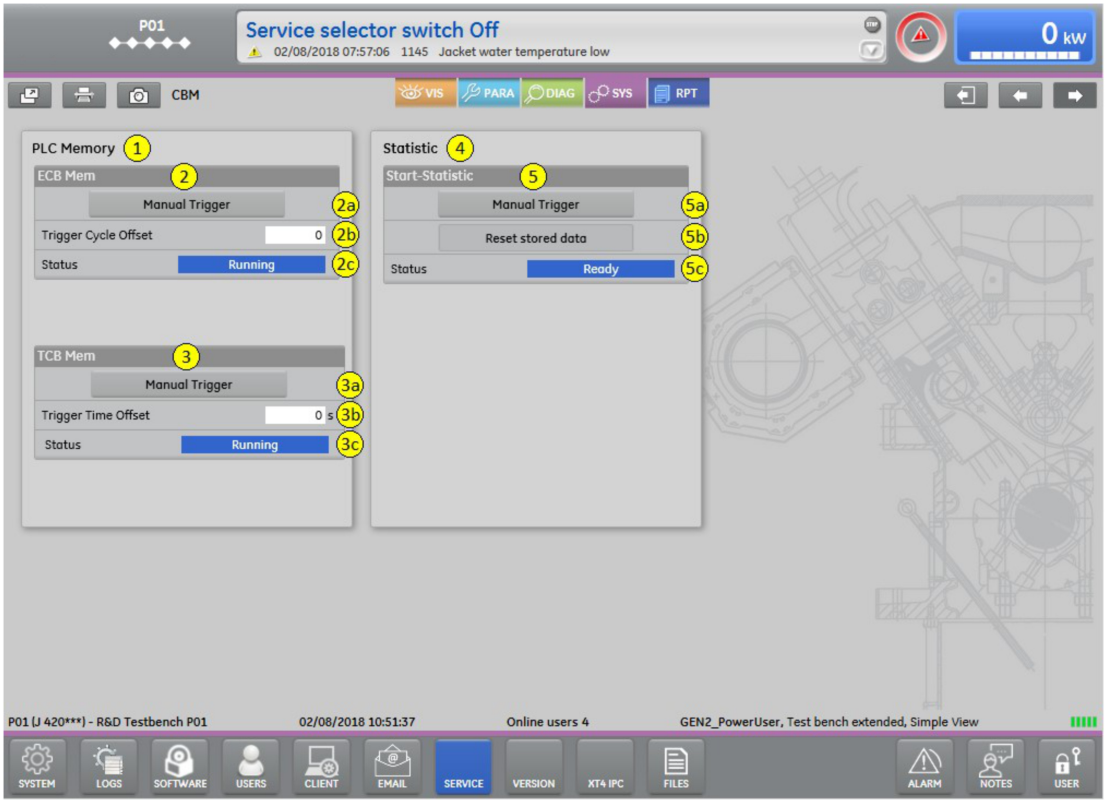
17.2.12 CBM

The CBM screen can be found under Service/CBM. On this screen you can create PLC memory and statistics files, which can be downloaded and evaluated via the HMI client.

Overview screen

① PLC memory is divided into two functions: ECB Mem ② stands for "Engine Cycle Based Memory", i.e. data is recorded with the engine cycle time. On the other hand, TCB Mem ③ stands for "Task Cycle Based Memory", i.e. data is recorded at 10 ms intervals.

④ Statistics contains the Start statistics ⑤, which records the last 100 starts and saves them regularly. In addition, a statistics file can also be created manually using the *[Manual Trigger]* button.



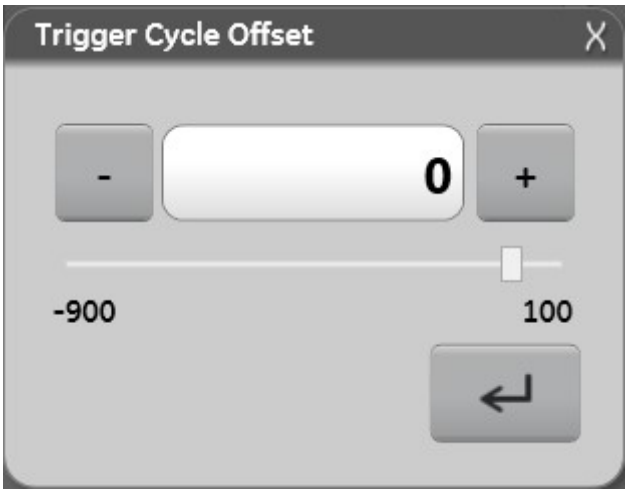
ECB Mem

② ECB Mem records relevant data over 1000 engine cycles (1500 rpm -> 1 engine cycle = 80 ms). This function was formerly known as PBCMem.

The function can be triggered by various trigger methods, which can be switched on and off via parameters (Engine / Monitoring / Controller files/ ECB):

No.	Name	Value	Unit
14210	ECBMem active	☐	
14225	Alarm trigger	☑	
14226	Gridcode trigger	☑	
14227	Misfire trigger	☑	
14228	Lambda friction monitoring trigger	☑	
14185	SFKW trigger	☑	

With the button ②a an ECB Mem file can be triggered manually, and the trigger position within the recording can be shifted using the "Trigger Cycle Offset" ②b.



The default setting 0 means that 900 cycles before the trigger and 100 after it are recorded.

-900 means that 1000 cycles after the trigger are recorded.

+100 means that 1000 cycles before the trigger are stored in the file.

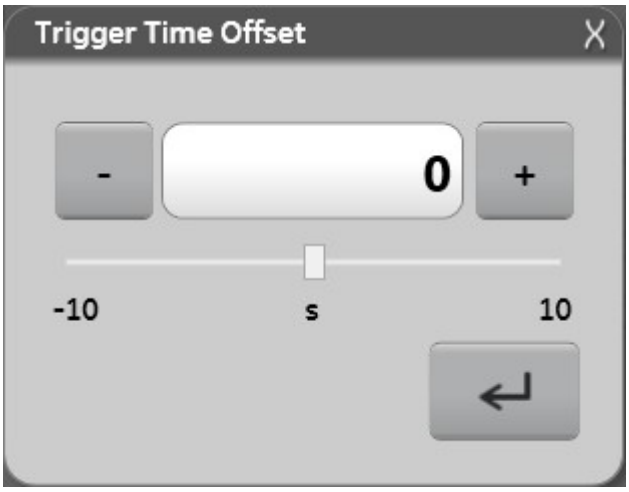
②c The current status of the function is displayed here. (see ③c, same functionality)

TCB Mem

③ TCB Mem records relevant data for 20 s. The function can be initiated by various triggers, which can be switched on and off via parameters (Engine / Monitoring / Controller files / TCB):

No.	Name	Value	Unit
14209	TCBMem active	☑	
14220	Alarm trigger	☐	
14221	Gridcode trigger	☐	
14222	Main circuit breaker trigger	☐	
14223	Generator circuit breaker trigger	☐	
14219	Lambda friction monitoring trigger	☑	

With the button ③a, a TCB Mem file can be triggered manually, and the trigger position within the recording can be shifted using the "Trigger Time Offset" ③b.



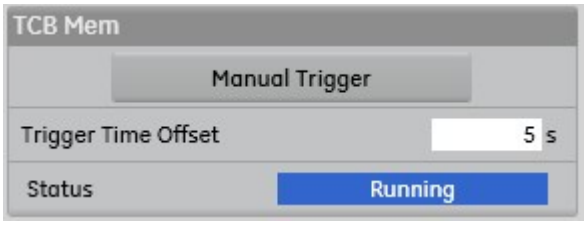
The default setting 0 s means that 10 s before the trigger and 10 s after it are recorded.

-10 s means that 20 s after the trigger are recorded.

+10 means that 20 s before the trigger are stored in the file.

③c The current status of the function is displayed here.

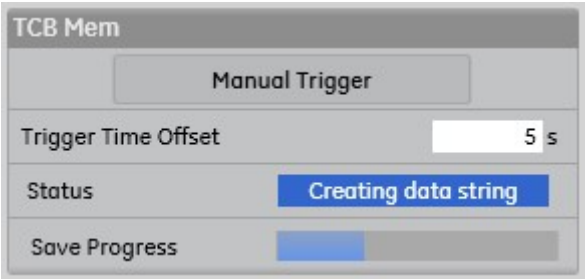
The normal status is *[Running]*.



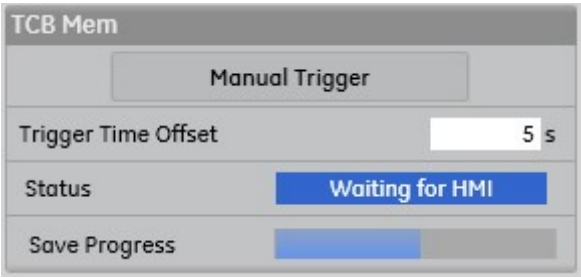
As soon as the trigger is activated, the last data are collected, the status message *[Waiting]*appears, as well as the Save progress bar.

If TCB Mem and ECB Mem are triggered at the same time, the status *[Locked]* may appear. The system waits until one function finishes and then continues with the other one.

Once all data has been recorded, the creation of the data string begins.



After the DianeXT4 has saved the data string, it waits for the HMI to make the file available for download. The function then returns to its normal operating status.



Start statistics

⑤ The Start statistics records 100 engine starts. Several start-critical times are measured. These are also displayed under MAIN/Statistics in the top left quadrant.

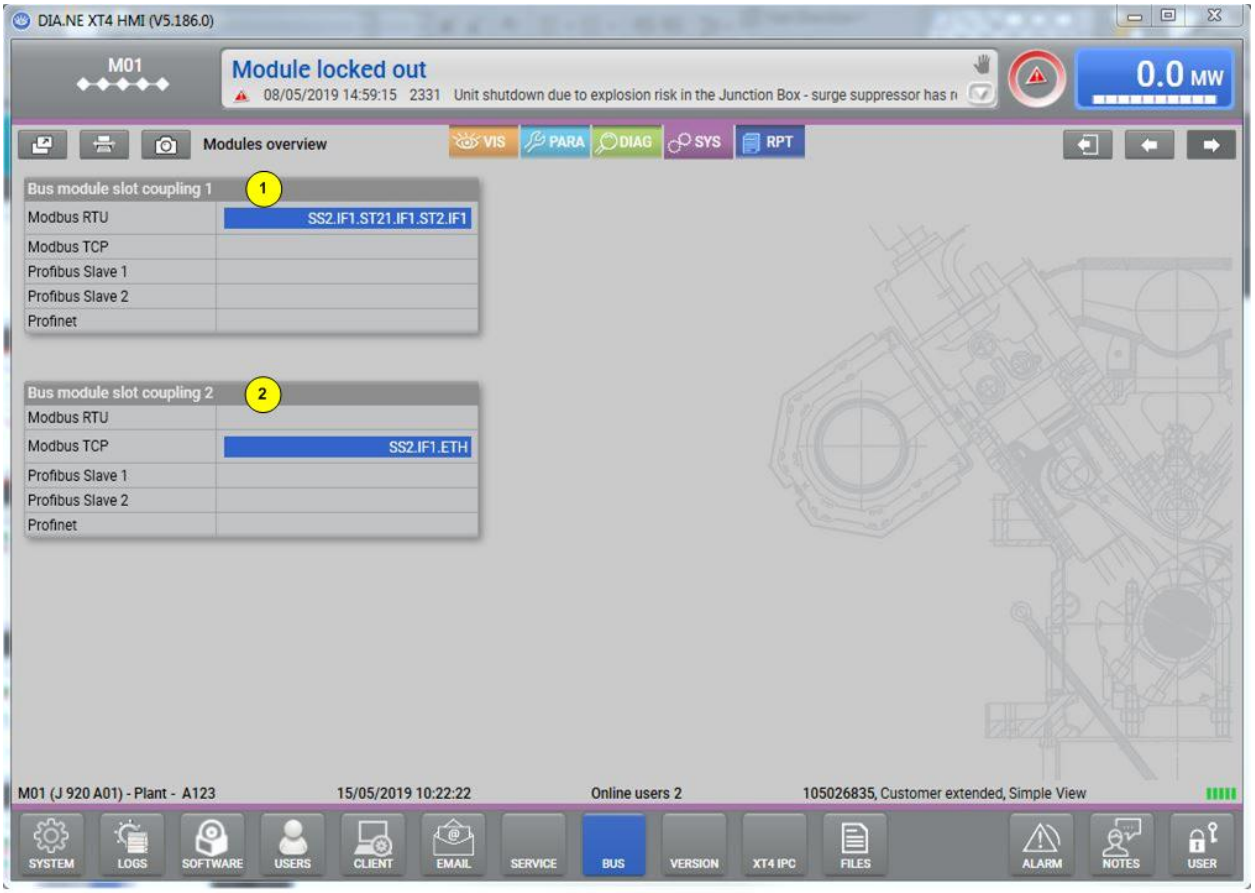
The button ⑤a can be used to manually trigger a Start statistics file.

The button ⑤b can be used to delete all saved Start statistics from the DianeXT4.

⑤c The current status of the function is displayed here. (see ③c, same functionality, but the function does not run in the background, so here you just see *[Ready]*)

17.2.13 BUS - Module Overview

This screen shows the actively used bus systems, depending on the parameters 10178 [Engine/Coupling/Type of coupling 1] and 10180 [Engine/Coupling/Type of coupling 2].



a

1 **Bus module slot coupling 1 Bus module slot coupling 1**

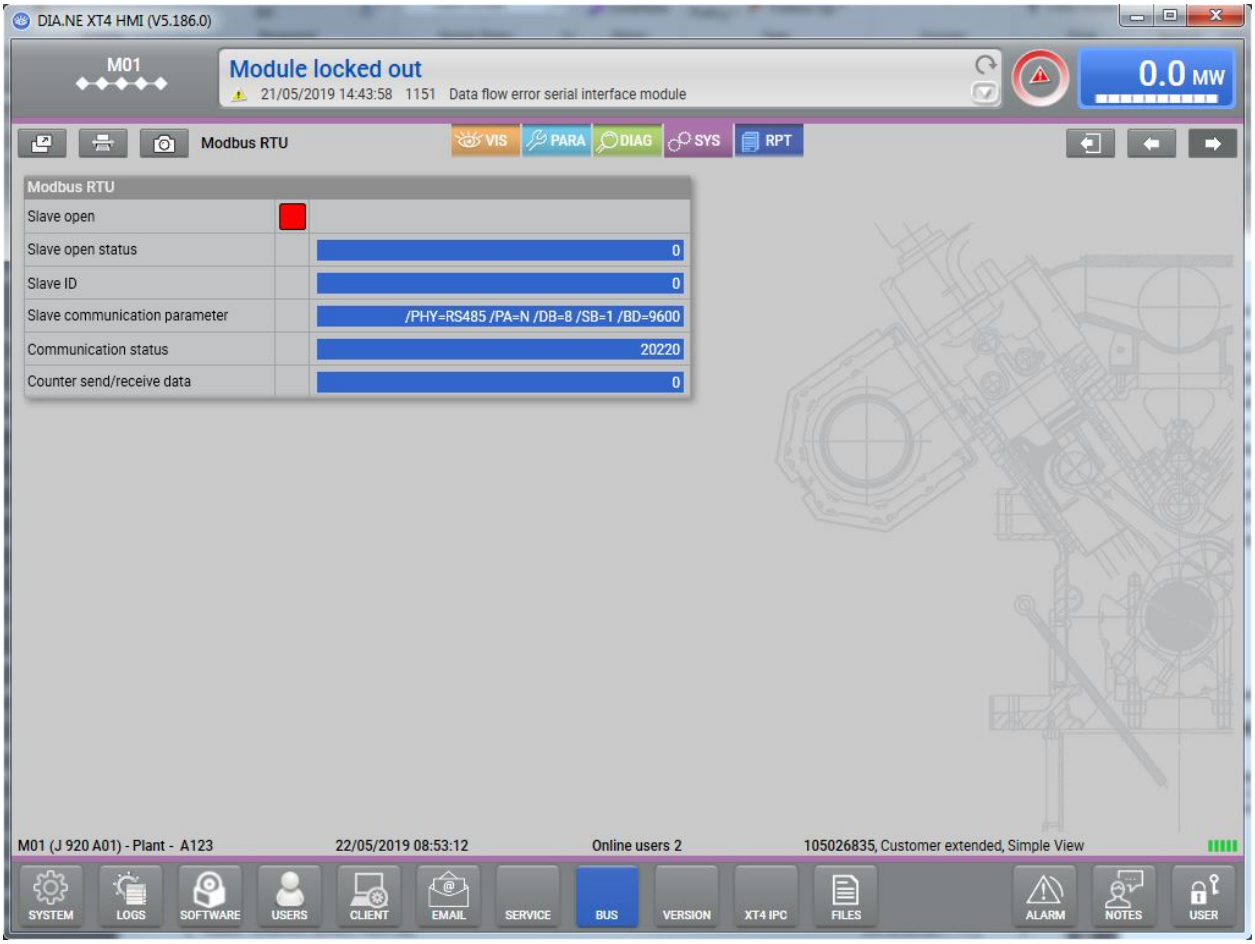
The hardware address (X20 bus card shown) is displayed for each active bus coupling. This can be used to check whether the hardware address matches the node number (X20 bus card).

2 **Bus module slot coupling 2 Bus module slot coupling 2**

The hardware address (X20 bus card shown) is displayed for each active bus coupling. This can be used to check whether the hardware address matches the node number (X20 bus card).

17.2.14 BUS - Modbus RTU

This screen shows the status of the Modbus RTU. The image is displayed when one of the two parameters 10178 *[Engine/Coupling/Type of coupling 1]* or 10180 *[Engine/Coupling/Type of coupling 2]* is set to 2.



[Slave open]	Open slave: Status Green: Jenbacher Modbus RTU slave ready for communication. Status Red: See help text under *[Slave open status]* for more troubleshooting information.
[Slave open status]	Open slave status Status must be 0, if not see B&R help → *DRV_mbus – Error numbers*
[Slave ID]	Slave ID
[Slave communication parameter]	Slave Communication Parameter
[Communication status]	Communication status See help text under *[Communication status]* for more troubleshooting information: 20220 Cause: timeout error Corrective measures: Check connection parameters and frequency of calls, check communication devices and connections 20291 Cause: Check the entire communication (baud rate, stop bit, ...) via the interface used, check terminators, check lines, replace connections if necessary
[Counter send/receive data]	Counter send/receive data. The value increases when the communication is active.

17.2.15 BUS - Modbus TCP

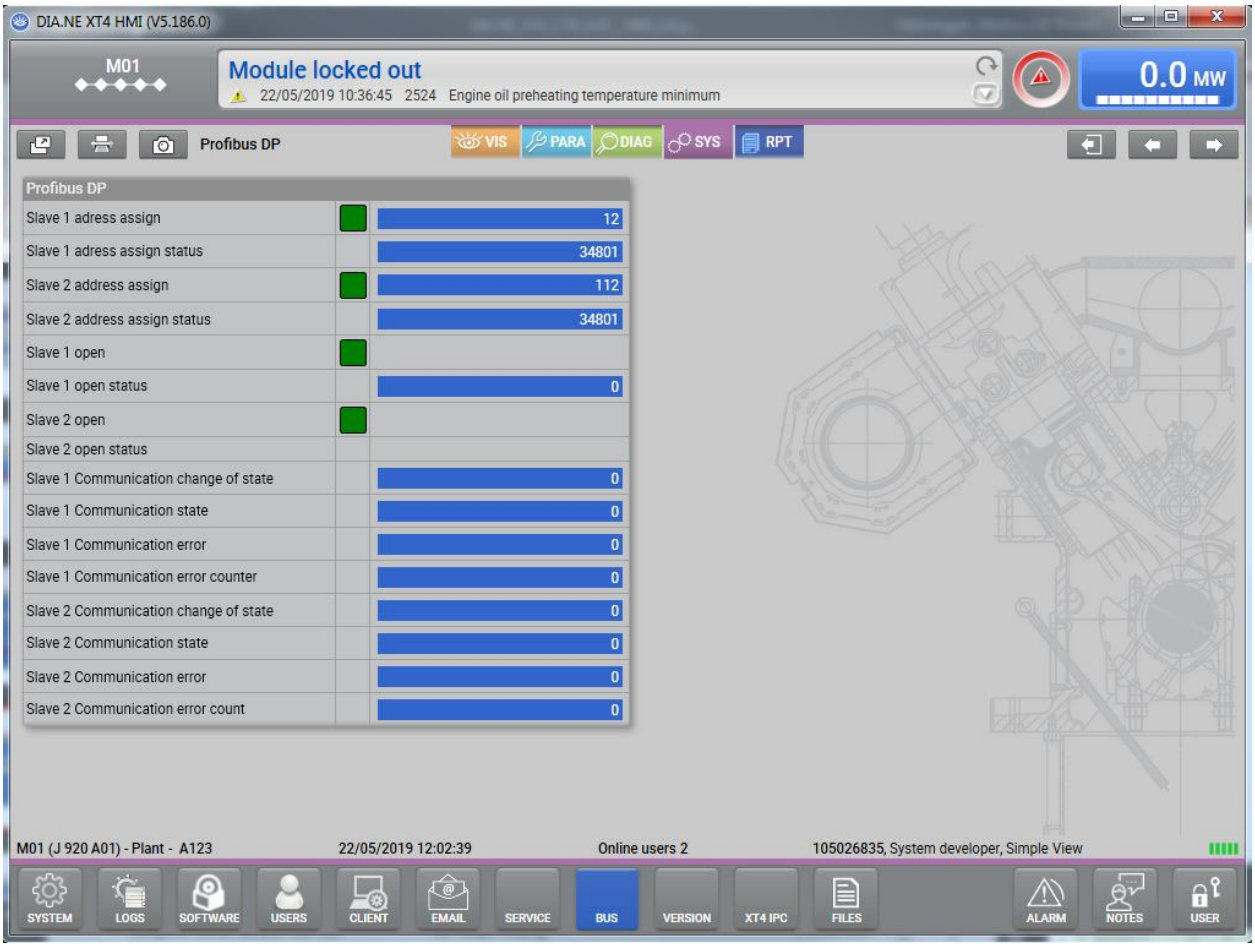
This screen shows the status of the Modbus TCP. The image is displayed when one of the two parameters 10178 *[Engine/Coupling/Type of coupling 1]* or 10180 *[Engine/Coupling/Type of coupling 2]* is set to 3.

[IP address assign]	Assign IP address. The display is green if the address assignment was successful. If the display is red, see help text under "IP address assign status".
[IP address assign status]	Status must be 65535, if not see B&R Help
[Subnet mask assign]	Assign subnet mask. The display is green if the address assignment was successful. If the display is red, see help text under "Subnet mask assign status".
[Subnet mask assign status]	Status must be 65535, if not see B&R Help
[Slave open]	Open slave: Status Green: Jenbacher Modbus TCP slave ready for communication. Status Red: See help text under *[Slave open status]* for more troubleshooting information.
[Slave open status]	Status must be 0, if not see B&R Help
[Number of masters/clients are connected]	Number of connected masters/clients
[Number of masters/clients currently served]	Number of master/clients currently served
[Time spent waiting for response from master]	Waiting time for response from master
[Client/master IP address]	Client/master IP address

[Modbus function code]	Executed Modbus function code
[Slave/Server Debug Message]	Slave/server debug message
[Slave/Server communication status]	Slave/server communication status
[Counter receive status]	Counter received data. The value increases when the communication is active.
[Counter send status]	Sent data counter. The value increases when the communication is active.
[Port open retries]	Number of retries to open the port
[Current step executed by slave FuB]	Step currently executed by slave FuB
[Slave status]	Slave status
[Client port connection 1 - 5]	Client port connection 1 - 5
[Client IP - address connection 1 - 5]	Client IP - address connection 1 - 5
[Client message connection 1 - 5]	Client message connection 1 - 5

17.2.16 BUS - Profibus DP

This screen shows the status of the Profibus DP. The image is displayed when one of the two parameters 10178 *[Engine/Coupling/Type of coupling 1]* or 10180 *[Engine/Coupling/Type of coupling 2]* is set to 4 or 5.

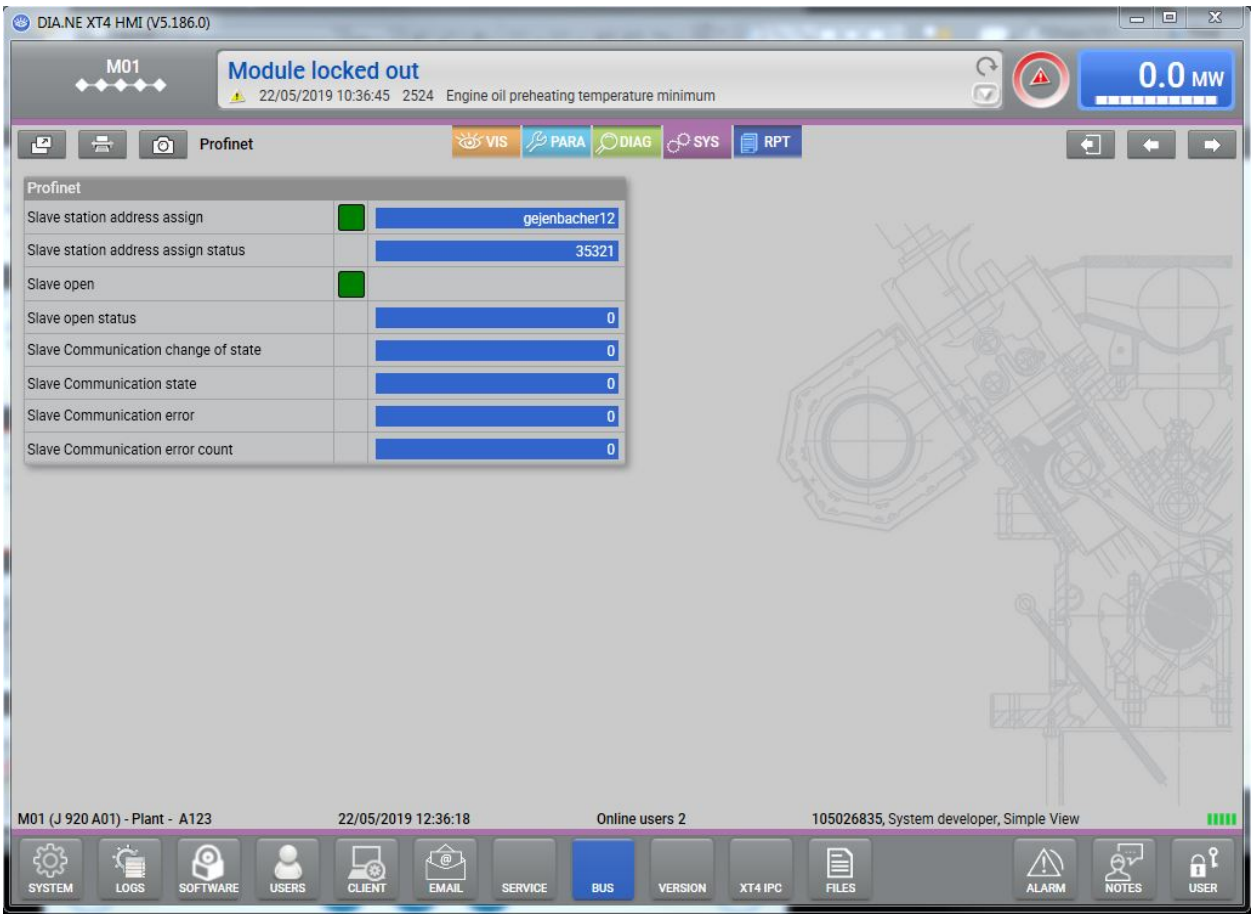


[Slave 1 (2) address assign]	Assign slave 1 (2) address. The display is green if the slave address assignment was successful. If the display is red, see help text under "Slave 1 (2) address assign status".

[Slave 1 (2) address assign status]	Status must be 65534, if not see B&R Help
[Slave 1 (2) open]	Open slave 1: Status Green: Jenbacher Profibus DP slave ready for communication. Status Red: See help text under *[Slave 1 (2) open status]* for more troubleshooting information.
[Slave 1 (2) open status]	Status must be 65534, if not see B&R Help
[Slave 1 (2) Communication change of state]	Slave 1 (2) communication change of state
[Slave 1 (2) Communication state]	Slave 1 (2) communication state
[Slave 1 (2) Communication error]	Slave 1 (2) communication error
[Slave 1 (2) Communication error count]	Slave 1 (2) communication error counter

17.2.17 BUS - Profinet

This screen shows the status of the Profinet. The image is displayed when one of the two parameters 10178 *[Engine/Coupling/Type of coupling 1]* or 10180 *[Engine/Coupling/Type of coupling 2]* is set to 6.



[Slave station address assign]	Assign slave station address. Status Green: Station address successfully assigned. Status Red: See help text under *[Slave station address assign status]* for more troubleshooting information.
[Slave station address assign status]	Status must be 65534, if not see B&R Help

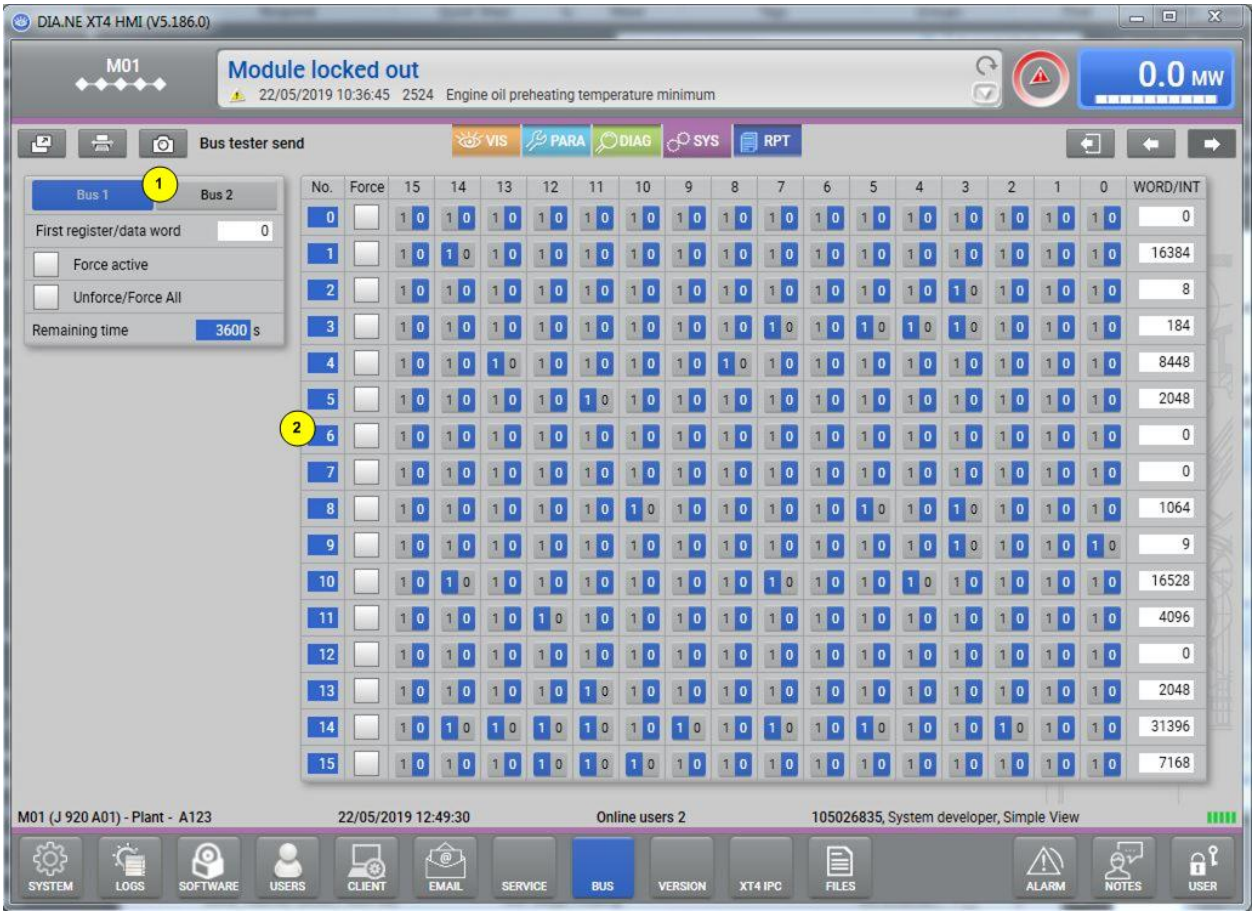
[Slave open]	Open slave: Status Green: Jenbacher Profinet ready for communication. Status Red: See help text under *[Slave open status]* for more troubleshooting information.
[Slave open status]	Open slave status
[Slave Communication change of state]	Slave communication change of state
[Slave Communication state]	Slave communication state
[Slave Communication error]	Slave communication error
[Slave Communication error count]	Slave communication error counter

17.2.18 BUS - Send bus tester

This screen can be used to test the respective active bus systems (Modbus RTU, Modbus TCP, Profibus DP or Profinet).

The image is displayed when one of the two parameters 10178 [Engine/Coupling/Type of coupling 1] or 10180 [Engine/Coupling/Type of coupling 2] is greater than 0.

Forcing of decimal values (WORD/INT) or single bits (0-15) is possible.



1

[Bus 1/Bus 2]	Selector switch between bus coupling 1 or 2. Only one coupling can be tested. When switching between bus 1 and bus 2, the start register is reset for the display, and all forced values are set to unforced.

[First register/data word]	Defines the first register/data word to be displayed. If the bus system to be tested is Modbus RTU or Modbus TCP, the first register is 0. If the bus system to be tested is Profibus or Profinet, the first data word is 1
[Force active]	General activation of the bus test function.
[Unforce/Force All]	*[Force] or [Unforce] all registers/data words, including those that are not currently displayed.*
[Remaining time]	Shows the remaining active time of the bus tester (see parameter 14377). The time starts when [Force active] is set.

2

[No]	The corresponding registers/data words are displayed, depending on the setting under *[First register/data word]*.
[Force]	*Here individual registers/data words can be selected for forcing. [Force] must be activated in order to set values.*
15 | 14 | ..... | 2 | 1 | 0	Setting individual bits. Bit and integer are automatically synchronised.
[WORD/INT]	Setting integer values. Bit and integer are automatically synchronised.

17.2.19 BUS - Bus tester receive

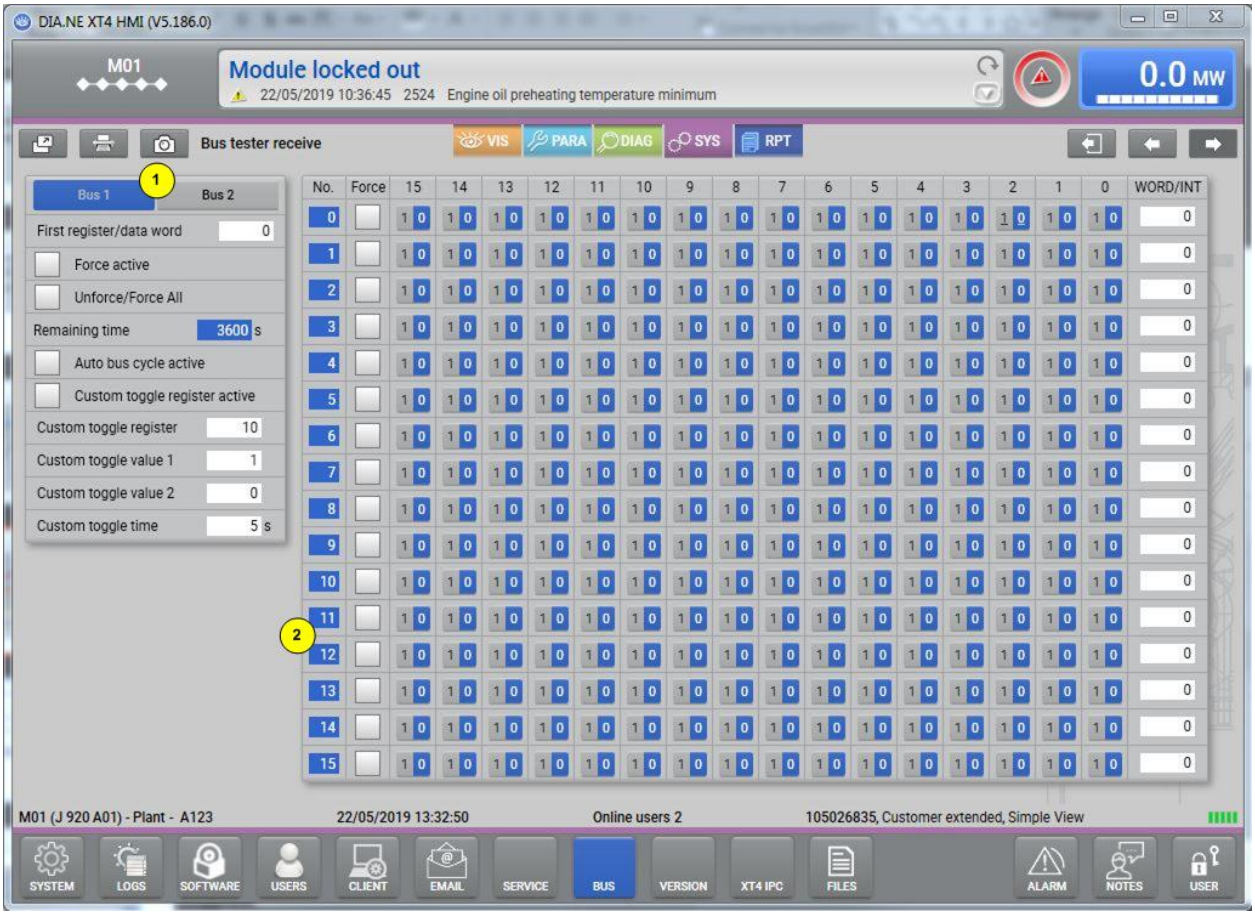
This screen can be used to test the respective active bus systems (Modbus RTU, Modbus TCP, Profibus DP or Profinet).

The image is displayed when one of the two parameters 10178 *[Engine/Coupling/Type of coupling 1]* or 10180 *[Engine/Coupling/Type of coupling 2]* is greater than 0.

Forcing of decimal values (WORD/INT) or single bits (0-15) is possible.

PLEASE NOTE:

The engine can be started via the bus tester by setting *[Auto bus cycle active]* to TRUE, bit 0 to TRUE from the first register/data word (IF 701), operating mode selector switch to AUTO and request selector switch to REMOTE.



1

[Bus 1/Bus 2]	Selector switch between bus coupling 1 or 2. Only one coupling can be tested. When switching between bus 1 and bus 2, the start register is reset for the display, and all forced values are set to unforced.
[First register/data word]	Defines the first register/data word to be displayed. If the bus system to be tested is Modbus RTU or Modbus TCP, the first register is 0. If the bus system to be tested is Profibus or Profinet, the first data word is 1
[Force active]	General activation of the bus test function.
[Unforce/Force All]	*[Force] or [Unforce] all registers/data words, including those that are not currently displayed.*
[Remaining time]	Shows the remaining active time of the bus tester (see parameter 14377). The time starts when *[Force active]* is set.
[Auto bus cycle active]	Activates the clock signal (interface list no. 708)
[Custom toggle register active]	Here toggling of two values for a register/data word can be activated.
[Custom toggle register]	Selection of register/data word
[Custom toggle value 1]	Toggle value 1
[Custom toggle value 2]	Toggle value 2
[Custom toggle time]	Time between toggle value 1 and 2

2

[No]	The corresponding registers/data words are displayed, depending on the setting under *[First register/data word]*.

[Force]	*Here individual registers/data words can be selected for forcing. [Force] must be activated in order to set values.*
15 | 14 | ..... | 2 | 1 | 0	Setting individual bits. Bit and integer are automatically synchronised.
[WORD/INT]	Setting integer values. Bit and integer are automatically synchronised.

17.2.20 Controller software versions

This screen shows the version releases and status information of all controller software modules. It is used to check version releases and for diagnostics.

1 Name (description) of the software module

2 Currently installed version of the software module

3 Debug status

1 to 999 = OK / 1234 = system startup / > 2000 = error status

Debug status, detailed information from the module owner on request.

4 Status information indication whether the software module is running (green) or not (white)

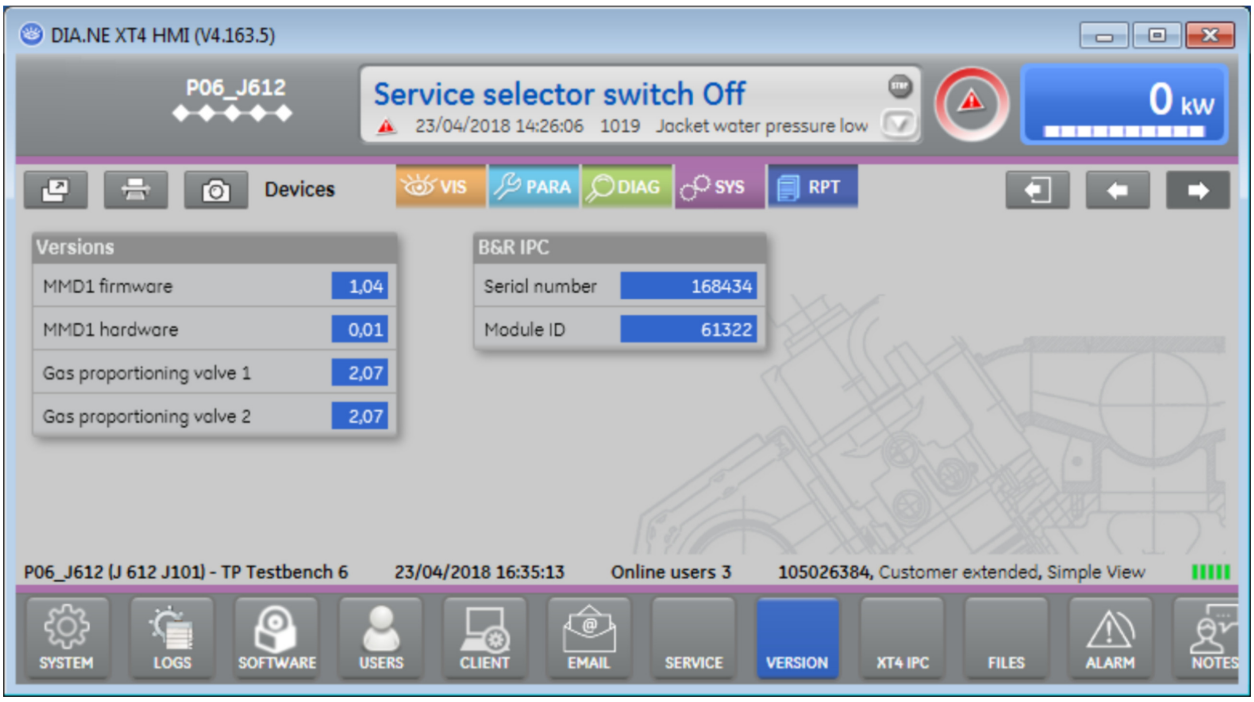
All modules must normally be in operation → green status indicator

5 Status information indicating whether all the parameters required for the software module are loaded (plausibility check)

green = OK / red = parameter not loaded correctly (error) / white = no parameter plausibility check required

6 Basic version (delivery version) of the software module

17.2.21 Hardware component versions



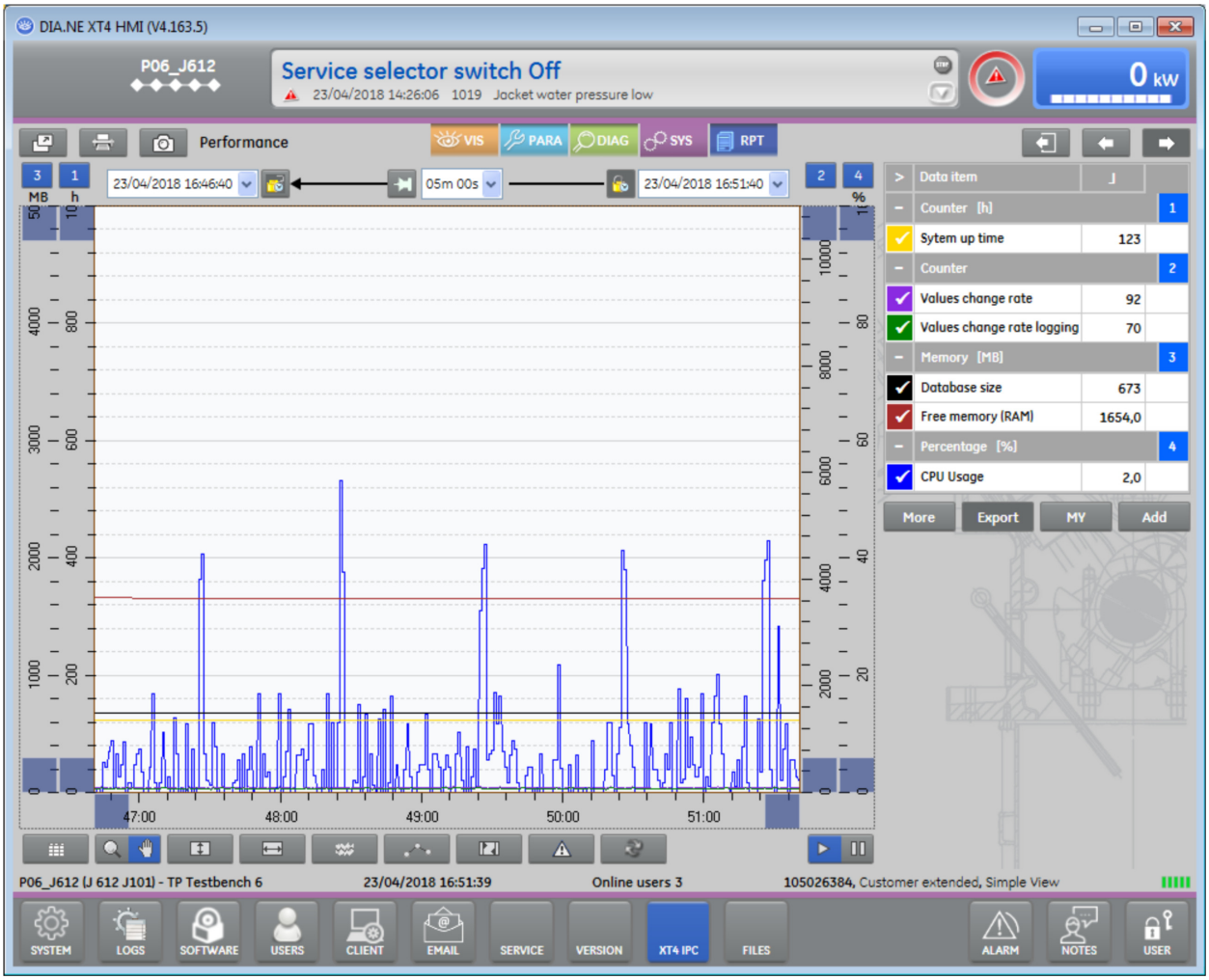
This screen shows the versions of the different hardware components such as

- Multi measuring transducer hardware and firmware version
- Ignition hardware and software version
- Gas proportioning valve 1 to 4
- KLS 98
- MONIC
- B&R IPC serial number and module number

Depending on the engine type and design, only the existing components are displayed.

17.2.22 System diagnostics trends

In this menu item the following system information is displayed as a line graph (trend) over time. This is used for diagnostics of the DIA.NE XT4 system.



Performance

This screen shows the following system performance data:

[System Up Time]	Display of the operating hours of the DIA.NE XT4 system (IPC)
[Values Change Rate]	Data rate of change, Number or data changes per second which the system has to process.
[Values Change Rate Logging]	Data change rate for data recording, number of data changes per second which the system must record historically in the database.
[Database Size]	Size of the database in MB. Normal value 5000 MB max., critical value greater than 8000 MB
[Free Memory (RAM)]	Free memory in MB Normal value greater than 500 MB free memory, critical value less than 200 MB
[CPU Usage]	Utilization (in percent) of the total processor power available for the visualisation (Windows). Normal value for engine operation less than 50%, critical value greater than 90% over several hours.

Drive C

This screen shows the following information of the internal data carrier (SSD or CFast):

[Power Cycle Count]	Average number of erase operations of the data carrier blocks. This type allows a very high number of up to 30,000 delete operations. The Average Erase Count cannot be displayed for all media types.
[Power Cycle Count]	umber of system power-up operations
[Disk Write Performance]	Data write rate in kB/s to the data carrier, normal value during engine operation approx. 50 kB/s
[Powe On Hours]	Operating hours of the data carrier
[Free Disk Space]	Free disk space, normal value greater than 30 GB, critical value less than 2 GB.
[Wearness / Lifetime]	expected lifetime in percent. Normal value greater than 70%, critical value less than 10% The Average Erase Count cannot be displayed for all media types.
[Disk Temperature]	Temperature of the data carrier. Normal value approx. 40 °C, critical value greater than 60 °C

Status

This screen shows the following IPC status (Panel PC DIA.NE XT4) :

[IPC NumberBurnOn]	Display of IPC power-on operations
[IPC Operation Hours]	Operating hours of the IPC
[Temperature IPC Board]	Temperature in °C of the measuring point on the CPU board
[Temperature IPC CFast]	Temperature in °C of the measuring point on the CFast adapter
[Temperature IPC Chipset]	Temperature in °C of the measuring point on the chipse
[Temperature IPC Power Supply]	Temperature in °C of the measuring point on the power supply
[Temperature IPC Processor]	Temperature in °C of the measuring point on the CPU

18 Alarm management system

The message display can be opened with the 

button in the menu bar at the bottom right, or by clicking on the alarm symbol  . This displays the list of all current outstanding messages.

18.1 Current alarm message display

The current message display shows all the current outstanding messages. An outstanding message gives information about the current state of the plant. Messages are characterised by their type (primary alarm, alarm, warning, information and operational message), the time of occurrence, the unique message number and a corresponding message text.

Messages are sorted in chronological order of occurrence. The most recent message appears at the top of the list. Messages can be filtered by message type. You can acknowledge messages (remote acknowledgement) provided that you have the necessary authorisation. The message list displayed can be copied as a PDF file and printed. The displayed messages can also be exported to an MS Excel file (*.xls) for further processing. Additional information such as cylinder number, causes and corrective measures is available for some messages.

1 **Characterisation by message type:**

There are various types or classifications of messages. These are marked by an appropriate icon and have the following meanings.

Alarm: Alarm messages indicate failures and trigger automatic engine or plant component shut-downs. The cause must be remedied and the alarm message then reset. The engine can then be restarted.

Primary alarm: If several alarm messages occur at the same time, a primary alarm can be determined as the causative alarm on the basis of certain patterns derived empirically from a large number of plants. This is marked with a "P" for primary in the alarm symbol, as shown.

Warning: Warnings indicate unusual operating conditions but do not trigger automatic engine or plant component shut-downs directly. The cause of the warning must be remedied as soon as possible. Some warnings are followed by a corresponding alarm message after a certain period of continued operation if the cause is not remedied, and the engine is tripped automatically.

Information: Information shows unusual operating conditions that are not critical, however. The engine or plant part can be continued in operation with remedying the cause in such cases. Remedying the cause is advised at the next opportunity.

Operational message: Operational messages indicate normal operating conditions.

2 **Time stamp:**

Display of the point in time (date and time) when the message event occurred. The time is shown to millisecond precision. The message events are sorted by this time stamp. The most recent message appears at the top of the list.

3 **Message No.:**

Error message has a unique message number.

4 **Message text:**

Every message is described by a message text.

5 **Message type filter options:**

The filter options can be set by clicking on the corresponding button with the icon for the message type in question. Buttons marked in blue indicate that messages of that message type are displayed in the list.

6 **Message acknowledgement:**

 Messages that are no longer outstanding can be acknowledged with this button.

Messages of the types "Alarm", "Primary Alarm" and "Warning" must be acknowledged. They therefore remain active until the fault is rectified and the acknowledgement button pressed.

Caution: Acknowledgement can only be carried out when the user is logged in (with the "Customer" user role at least). Messages of the "Alarm" or "Primary Alarm" type can only be acknowledged in "Off" mode (operating mode selector position).

Error messages can generally only be acknowledged on the panel itself. In these cases, the button for remote control (DIA.NE XT4 HMI Client) is not visible.

"Remote acknowledgement" can also be ordered as an option. If this is the case, the acknowledgement button is also visible on the remote control (DIA.NE XT4 HMI Client). Even then, only certain alarm messages can be acknowledged remotely. Critical alarms still need to be acknowledged locally in this case for safety reasons. Such critical alarms that cannot be acknowledged remotely remain active in the remote control despite pressing the acknowledgement button, and the engine cannot be restarted.

7 **... Switch on the message history**

8 **... Switch on help information (causes and corrective measures)**

9 **... Export the message list to an MS Excel file (*.xlsx) (* only on the PC client)**

Additional information messages:

	05/03/2014 12:31:48.338	2103	Engine oil pressure measuring signal failure
	05/03/2014 12:31:48.338	2104	Jacket water pressure measuring signal failure
	05/03/2014 12:31:47.373	1145	Jacket water temperature low
			Values : Cool water temperature : 0.0 °C
	05/03/2014 12:31:47.373	1175	Mains failure
	05/03/2014 12:31:47.373	3093	Gas proportioning valve CAN communication failure

Additional information that is available can be brought up by selecting the message line for this message. This additional information can include the cylinder number for cylinder-specific messages or certain measured values at the time the message occurred. If additional information is available, the line is automatically expanded as shown above.

18.2 Message history display

This display shows the historic message events stored in the database for a specific time period. When the message history is switched on, the alarms and warnings of the last 24 hours are displayed, sorted by chronological order. The most recent message appears at the top of the list. The desired time range can be freely selected. In addition to functions already described in the current message display, a text filter for the message text is also provided here as well as various sorting and grouping functions.

1 Text filter for message text:

If a text is entered, the message list is filtered and only those messages that include the entered text are displayed.

2 Time selection bar

The desired time span for the displayed messages can be changed by entering times. After activating the display, a time period of the past 24 hours is selected as the default. The time range can be freely changed by changing the desired times, however.

3 ... Back to the current message display

4 Sorting

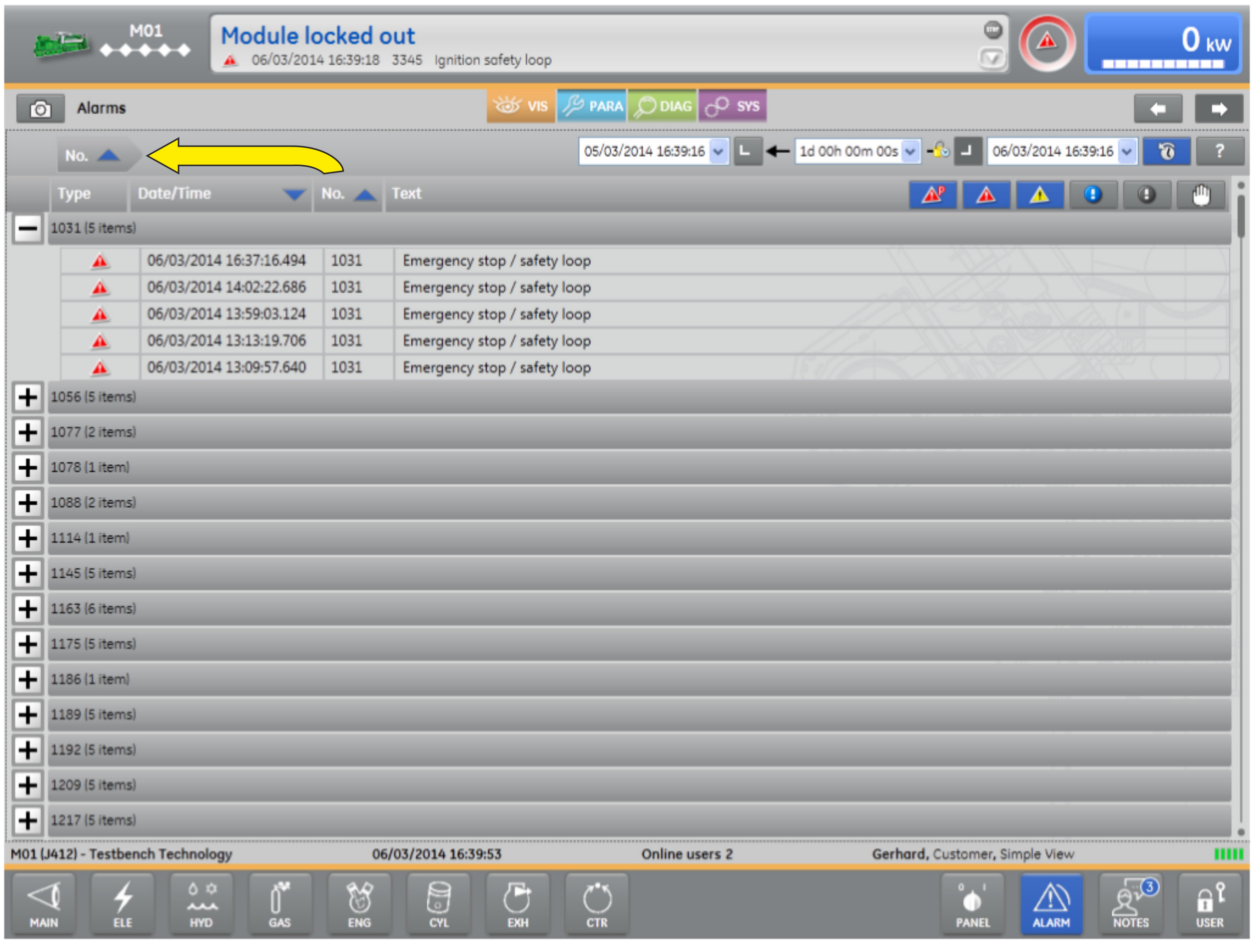
The sort order can be selected by clicking in the header of the desired column **[Type], [Date/Time]** *or* **[No.]**. you can continue to edit the file accordingly. you can continue to edit the file accordingly. An arrow symbol indicates the sorting currently set. Sorting can be carried out in ascending and descending order by the time the message occurred, the message type or the message number.

.... Example: Sorting in descending order by message number

5 Additional display of user actions

 ... The recorded user actions in the list can be displayed with this button in addition to the messages. All value changes, control commands and user registrations are recorded and can be displayed in this list. The associated information such as user, old value, new value, etc. is shown for each user action.

Grouping



Groups can be arranged by the information in a particular column by dragging the column header **[Type], [Date/Time]** *or* **[No.]** to the top of the list (see the yellow arrow). The message frequency over a particular time period can therefore be easily displayed by grouping by message number. If more than one column header is dragged to this area, multiple grouping can be displayed.

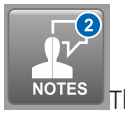
19 Message portal

The message portal can be opened with the 

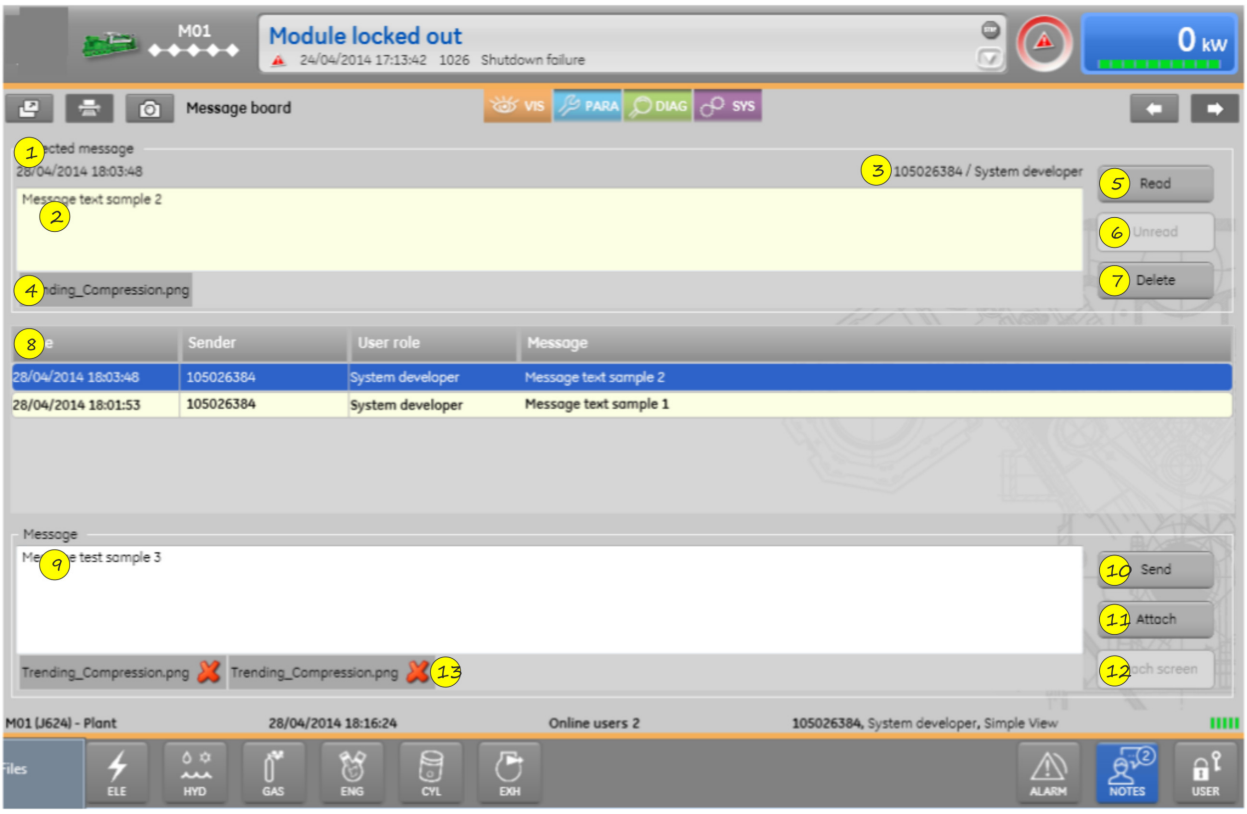
button at the bottom right of the menu bar.

A message can be written to all users logged in to the controller (DIA.NE XT4 server) using the portal. It can also be used for leaving a message for the subsequent users. A message can also contain image information.

Note: Every message is visible to every user. There are no restricted read rights for messages depending on authorisation roles.



The blue circle with number indicates that one or more unread messages are present, The number corresponds to the number of unread messages. In this case there are 2 unread messages.



1 **Time stamp of the selected message**

Shows when the message was written.

2 **Text of the selected message**

Shows the written message text.

3 **User name and user role of the selected message**

Shows who wrote the message.

4 **Display of images attached to the file**

Shows the images (file names) attached to the message. Double clicking on the corresponding file shows the image.

5 **... Button for marking a message as read**

6 **... Button for marking a message as unread**

7 **Button for deleting a message**

This enables written messages to be deleted. Messages can only be deleted by their author (user who wrote the message).

8 **List of all written messages**

All written messages are displayed in list form with their time stamp, the author's user name and user role, and message text (abbreviated). The desired message can be selected in the list. It is then highlighted in blue. The "Yellow" background indicates that the message is still unread, in other words has not yet been marked as "read".

The last 100 messages are stored.

9 **Message text input area (* only on PC client)**

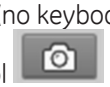
The desired message text can be entered here.

10 **... Button for sending the message**

11 **Button for attaching image information to the message (* only on PC client)**

Click on this button to select and attach an image file to the message. More than one image can be attached. Supported file types are *.png, *.jpg and *.bmp. The file must not exceed a maximum size of 500 kB.

12 **Button for attaching screenshots to the message (* only on the panel)**

Message texts cannot be created on the panel (no keyboard), but screenshots can be sent as messages. To do this, click on the button with the camera symbol  on the displayed image at the top left edge of the screen. You can then send this image as a message with the button **[Attach screen]**.

13 **... Delete attached image**

20 Remote control with DIA.NE XT4 HMI software

DIA.NE XT4 HMI software is available for remote operation and observation of the plant. After installation on a PC with the MS Windows operating system, a connection can be established with the plant (DIA.NE XT4 server) through an existing network and visualisation opened. Except for certain specific functions that can only be carried out locally on site for safety reasons, DIA.NE XT4 HMI offers by remote control the full scope of functions that would be available locally with the touch panel. The myPlant™ option also allows remote control to be effected through Internet. Application cases for DIA.NE XT4 HMI are remote error diagnosis, plant monitoring in a control room, or plant monitoring from home or while travelling. Requests for the plant can also be activated and deactivated with DIA.NE XT4 HMI using the remote request option.

20.1 System requirements

The following requirements on the PC must be met before the DIA.NE XT4 HMI software can be installed and used.

Display:	Minimum resolution 1024 x 768
Input:	Keyboard with mouse or touch screen
Operating system:	Windows 7, Windows 8, Windows 10;
Graphics card:	Support for DirectX 9.0 or higher, and at least 64 MB graphics memory
Memory:	1 GB RAM minimum
Free hard disk capacity:	100 MB
Network:	If there is a firewall between DIA.NE XT4 server and Remote client, the TCP – Port 4330 must be enabled.

20.2 Installation

The file for installing the DIA.NE XT4 HMI software on your computer can be downloaded from https://www.innio.com/.

The latest version of the DIA.NE XT4 HMI software is always available there. When updating the program, proceed in the same way as for the initial installation.

Start the file with a double click and follow the installation instructions.

The path "C:\DianeXT4\Client" is selected as the installation directory by default. However, this can be changed during the installation if required.

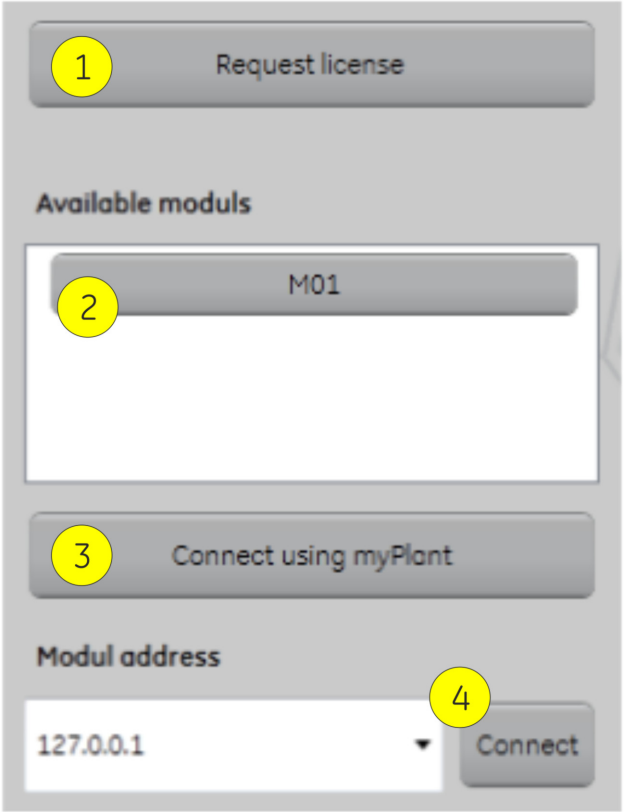
20.3 Start

After the installation, the starting symbol for the DIA.NE XT4 HMI program will be on your desktop. Double-click this symbol to start the program.

The program can also be started by double-clicking the file C:\DianeXT4\Client\GE.Diane.Client.exe in Windows Explorer.

20.4 Establishing the connection

After starting, the dialogue box for establishing the connection with the controller (DIA.NE XT4 server) of the plant appears.



1 **Requesting a user license**

If no user licence is held (only for global users), one can still be requested or updated at this stage through myPlant™ without establishing a connection with a DIA.NE XT4 server.

2 **Establishing the connection with the Connect button**

All the controllers (DIA.NE XT4 servers) found automatically in the local network are displayed in this list with their module names. "M01" is standard for module or engine 1. The connection is established by clicking once on the corresponding button.

3 **Establishing a connection (remote connection) through Internet (myPlant™)**

A connection with the plant can be established through Internet with myPlant™ (option). After the myPlant™ connection with the plant has been achieved, the DIA.NE XT4 connection for remote control of the plant can be established. Further documentation on how to establish a remote connection with myPlant™ can be found in the help area of the myPlant™ web application.

4 Establishing a connection by entering the IP address

Alternatively, the connection can be established by entering the IP address and pressing the **[Connect]** button. This is necessary if the controller (DIA.NE XT4 server) is not found on the network automatically for technical reasons associated with the network.

192.168.123.11 is for example the address for the first module or engine. 192.168.123.12 for the second, etc.

20.5 User registration

After the DIA.NE XT4 HMI program has started and the connection to the controller (DIA.NE XT4 server) has been established, the following window appears for the user registration. Appropriate authentication is still required for remote access using DIA.NE XT4 HMI.

All the local users of the plant and all the licence (global) users are displayed on the PC. Select your user and then enter your 6-digit user code. The visualisation start screen is then shown.

The display can be updated with **[Refresh]**.

A licence can be requested or updated directly with **[Request licence]**. This requires an Internet connection from your computer.

20.6 Configuration of the connection dialogue box

This dialogue box for connecting with the plant can be modified by the user. The **ConfigurableStartup.xml** file in the program directory (C:\DianeXT4\Client) is provided for this.

You can edit this file with an editor and make the required modifications as described.

<StartupScreenConfiguration>

<ShowRequestLicense>true</ShowRequestLicense>

"true" ... "Request License" button is shown

"false" ... "Request License" button is not shown

<ShowDiscoveredEngines>true</ShowDiscoveredEngines>

"true" ... automatic search and display of the found modules is run

"false" ... no automatic search and display of the found modules is run

<!--<EngineList>

A list of predefined modules (engines) with their name and address can be configured here.

A connection button is shown for each entry.

<EngineInfo> ... Module 1

<Name>M01</Name> ... Name

<EndPointAddress>192.168.123.11</EndPointAddress> ... IP address

</EngineInfo>

<EngineInfo> ... Module 2

<Name>M02</Name> ... Name

<EndPointAddress>192.168.123.12</EndPointAddress> ... IP address

</EngineInfo>

.....

</EngineList>-->

<ShowConnectUsingMyPlant>true</ShowConnectUsingMyPlant>

"true" ... "Connect using myPlant" button is shown

"false" ... "Connect using myPlant" button is not shown

<ShowConnectUsingAddress>true</ShowConnectUsingAddress>

“true” ... "Connect" button and IP address input are shown

“false” ... "Connect" button and IP address input are not shown

</StartupScreenConfiguration>

21 OPC interface (optional)

21.1 General

OPC is a standard interface for accessing Windows-based ICT applications. OPC is currently based on the Microsoft Distributed Component Object Model (DCOM).

Various process values are provided at an OPC interface on the DIA.NE XT4 server. The DIA.NE XT4 server acts the OPC server in this case.

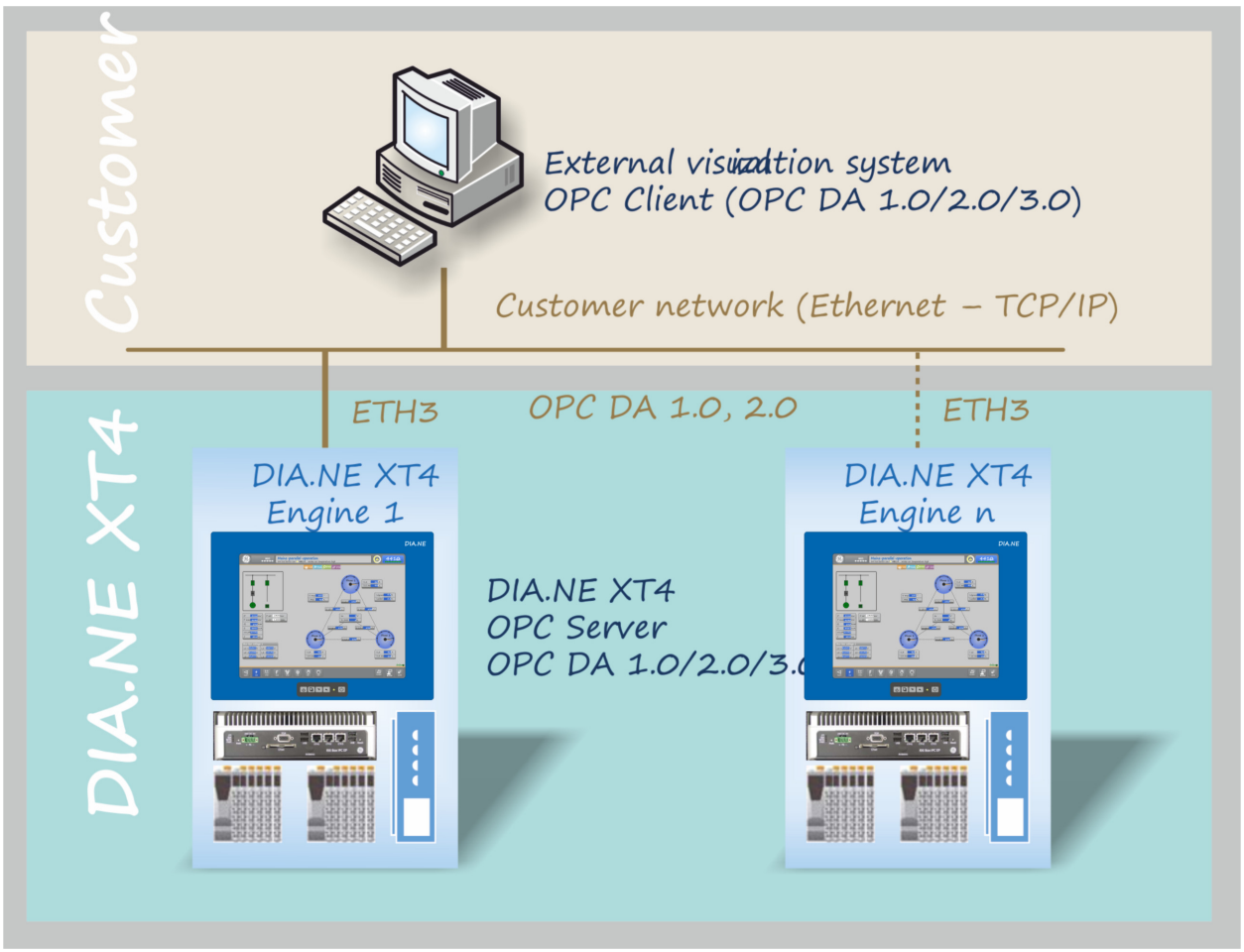
The OPC server supports the OPC Data Access specification, versions 1.0, 2.0 and 3.0, for access to the process data.

This interface is responsible for integrating (displaying) data from our plant in external visualisation or control and systems. These systems must be provided with a suitable OPC interface (OPC Client). The interface is not suitable for time-critical and safety-technical functions.

The DIA.NE XT4 OPC server provides our customers with a convenient way of integrating data from our plant in an existing visualisation or control system.

To enable OPC communication, the external program (OPC client) must be connected over a network to the ETH3 customer interface of the DIA.NE XT4 server.

21.2 Networking diagram



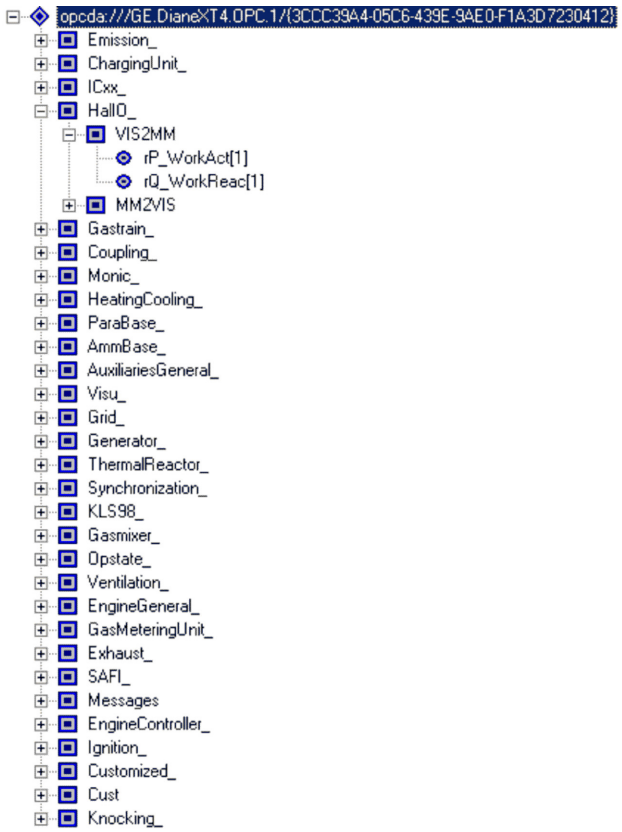
21.3 Data

All the data points available on the OPC server are automatically listed when browsing automatically. The process data offered can only be read, however. An authorisation to write within the dataset defined can only be obtained by concluding a special agreement.

OPC server

- Data Access V1
  - GE.DianeXT4.OPC.1
    - {3CCC39A4-05C6-439E-9AE0-F1A3D7230412}
    - GE.DianeXT4.OPC.1
    - GE.DianeXT4.OPC
- Data Access V2
  - GE.DianeXT4.OPC.1
    - {3CCC39A4-05C6-439E-9AE0-F1A3D7230412}
    - GE.DianeXT4.OPC.1
    - GE.DianeXT4.OPC
- Data Access V3
  - GE.DianeXT4.OPC.1
    - {3CCC39A4-05C6-439E-9AE0-F1A3D7230412}
    - GE.DianeXT4.OPC.1
    - GE.DianeXT4.OPC

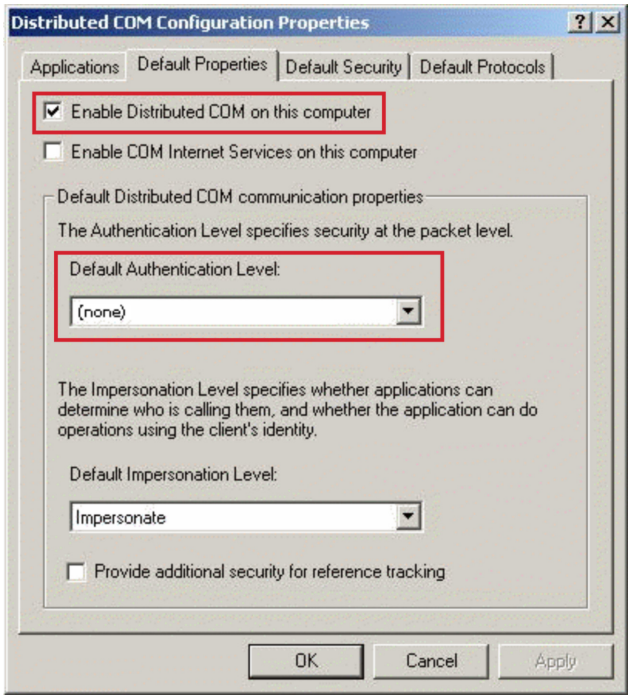
OPC data items (sample):



The data available can be taken from the interface list. The data offered include measurement values for generator power, oil pressure, oil temperature, cooling water pressure, cooling water temperature, cylinder and collective exhaust gas temperatures, various counter readings, all error messages and warnings, and various operating notifications informing you on the installation condition.

21.4 DCOM Settings

The OPC Client (customer control system) can only request data from the DIA.NE WIN server (OPC server) if DCOM is activated on the client computer (Enable Distributed COM on this computer) and the DCOM authentication level (Default Authentication Level) is set to "None". You can set the DCOM settings on your system using the "Dcomcnfg" program. You must have administrator rights on the computer to be able to run this program.



When Windows XP is running on the client computer, a few security settings (Windows XP software firewall, DCOM limitations) must be in place as they are required for communication via DCOM. For information on the use of OPC under Windows XP and detailed information on OPC, go to "www.opcfoundation.org".

21.5 Specification text

The OPC data interface of the DIA.NE XT4 INNIO Jenbacher GmbH & Co OG visualisation and control system for the customer's plant management system via ETHERNET 100/1000Base-T.

Software interface:

Supported OPC specifications: OPC DA 1.0, 2.0 and 3.0

Access right: read

Data item update refreshment rate: 100 ms

OPC is based on the Microsoft Distributed Component Object Model (DCOM). All DCOM limitations therefore also apply to this interface!

Data transmitted:

The data offered include measurement values for generator power, oil pressure, oil temperature, cooling water pressure, cooling water temperature, cylinder and collective exhaust gas temperatures, various counter readings, all failure messages and warnings, and various operational messages on the installation condition.

Limit of supply INNIO Jenbacher GmbH & Co OG :

Interface 100/1000Base-T with RJ45 at the controller in the module control cabinet.

What is OPC?

Nowadays, OPC does not merely stand for "Object Linking Embedding for Process Control" – i.e. applying the standardised Windows interface OLE or DCOM (Distributed Component Object Model) to exchange process data – but is interpreted more and more as "Openness, Productivity and Connectivity", symbolising the new opportunities arising with it.

22 Appendix

22.1 Tips concerning this user manual

Options

Not all of the pages or display and entry fields listed in this documentation are necessarily available for your engines.

Depending on the number of engines, engine type, number of cylinders and module and control system configurations, the DIA.NE XT4 system will only display the screens that are relevant to your engines.

If you have any questions concerning the configuration of your modules, please contact our Sales or Service Department (www.gejenbacher.com).

Reference texts

[text]

The text in the screens is always in English. Where a description refers directly text in a screen, it will be placed within square brackets and shown in bold type.

22.2 Replacing the battery in the ICP041

The battery has a service life of 2 - 5 years. When the battery charge status display (LED) turns RED on the controller, the battery needs to be replaced.

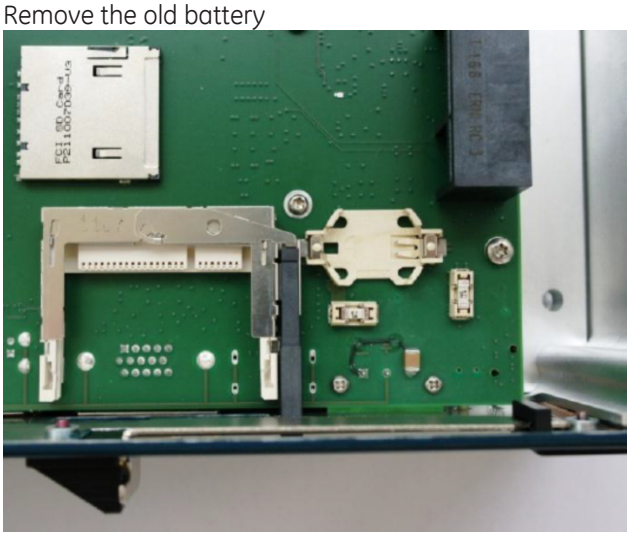
 ... battery charge display

Lights up GREEN	➔ normal operation
Lights up RED	➔ charge below the limit value, replace the battery.

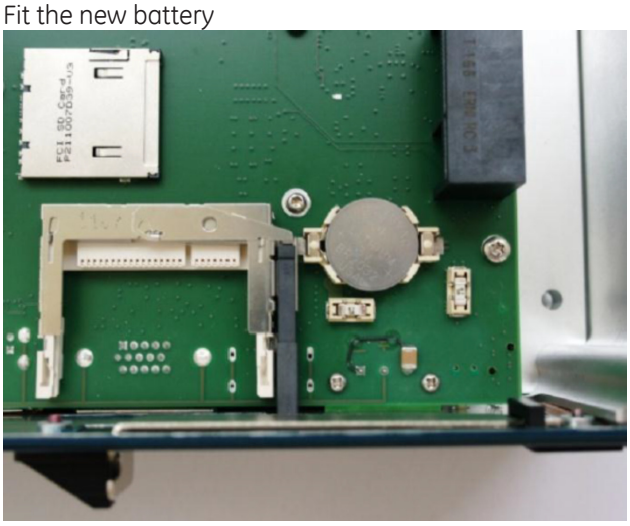
Proceed as follows:

1. Bring the engine to a standstill
2. Switch off or unplug the power supply to the controller
3. Open the controller cover (4 screws)

4. Remove the old battery



5. Fit the new battery



6. Refit the cover and connect the power supply

22.3 Replacing the battery in the Panel PC910

The lithium battery (3 V, 950 mAh) buffers the internal real-time clock (RTC) It is located on the back of the Panel PC. The battery is installed in a battery holder, making it very easy to replace.

The battery's buffer time is at least 4 years (at 50°C, 8.5 µA for the components being supplied and a self-discharge of 40%). If an SRAM interface option has been installed, this lifespan is reduced to 2½ years. The battery has a limited service life and should be replaced regularly (after the specified service life at the latest).