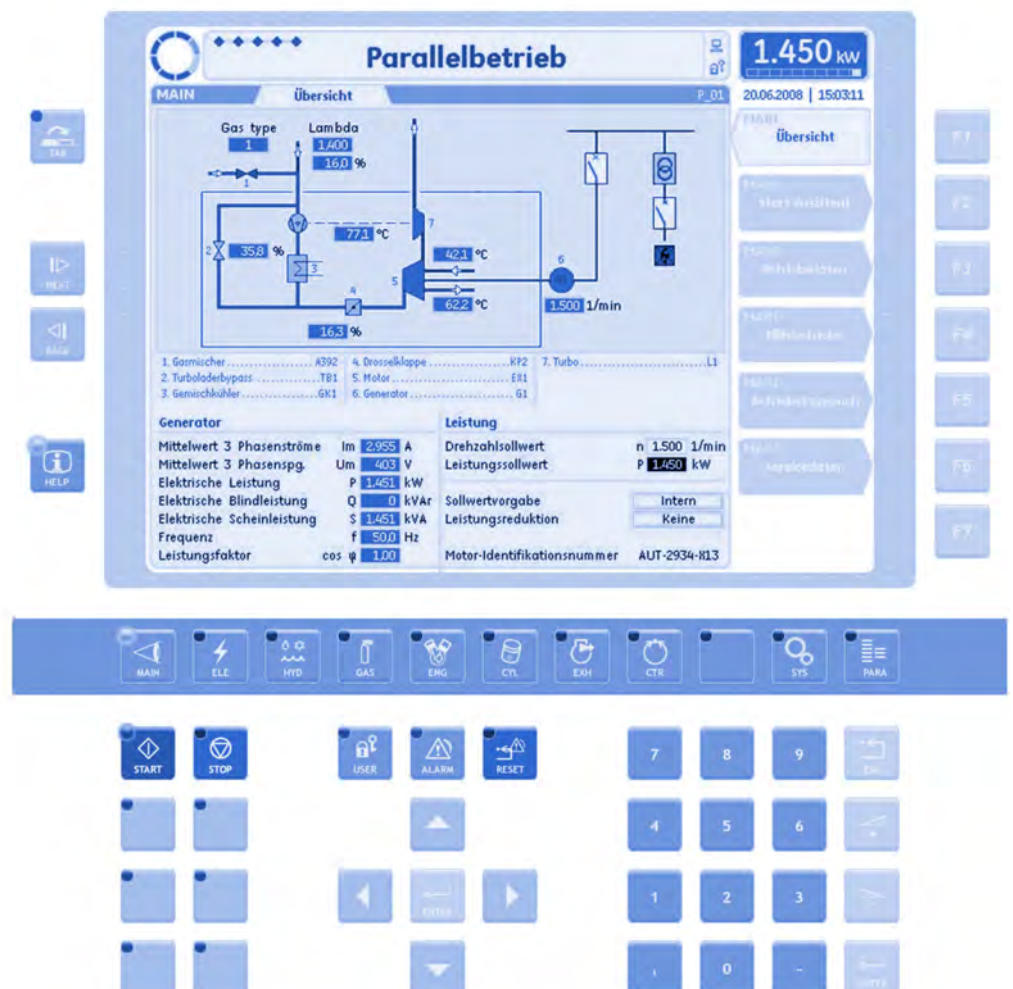


DIA.NE XT4 - Station control/master synchronisation



Revision history

Index	Date	Description/Revision summary	Creator <i>Auditor</i>
1	00.00.2010	Delivery	→ Footer ...

Original operating instructions

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1 Station control - operating and monitoring



1.1 Operator panel screen [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 screen]** 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 design, certain elements may or may be displayed and activated (operation enabled) or not displayed and deactivated (operation not enabled).



① Synchronisation selector switch

Selecting the type of synchronisation.

- **OFF [Off]:** Mains breaker/coupler breaker synchronisation is aborted/blocked
- **MANUAL [Man]:** Automatic synchronisation initiated and aborted by mains/coupler breaker On/Off.
- **AUTO [Auto]:** Fully automatic synchronisation.

② Mains breaker On/Off

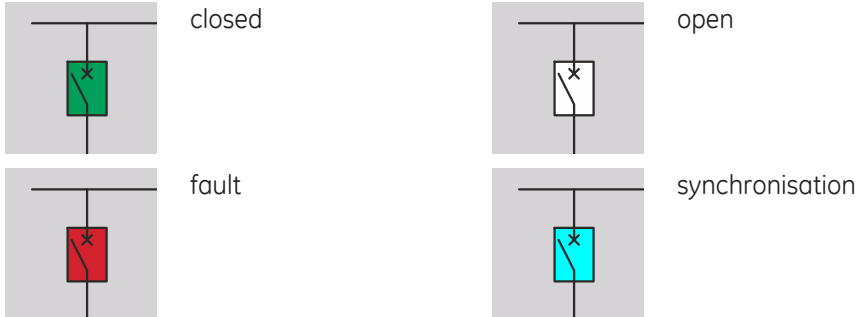
Mains breaker control. Control function depends on position of synchronisation selector switch. The precise function description can be found in the technical specification for the control system.



DIA.NE XT4 - Station control/master synchronisation

3 Mains breaker

Status display for mains breaker:

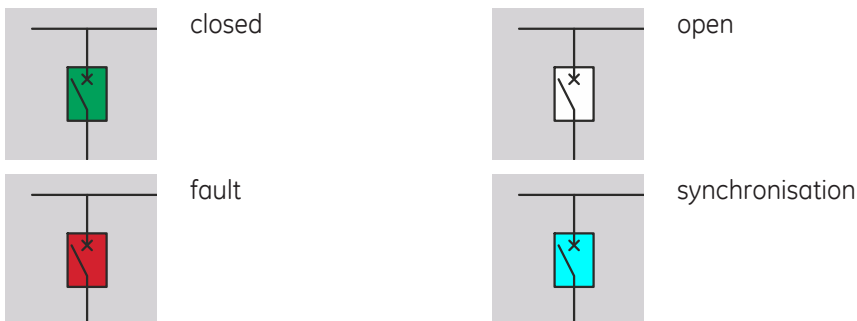


4 Coupler breaker On/Off

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

5 Coupler breaker

Status display for coupler breaker:



6 Locking the selector switch

Caution: This function is not a LOTO (Lock Out Tag Out) shutdown of the plant as part of the maintenance security.

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

Locks:



This display shows that the selector switch is not locked

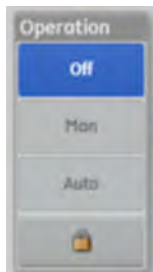
Pressing this button opens the locking dialogue.



DIA.NE XT4 - Station control/master synchronisation



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



The selector switch is then displayed as locked and changes in the selector switch position cannot be effected by other users.

Unlocking



Selector switch displayed as locked

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



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Enter your user code (login password) to unlock the switch and then press **[Unlock]**.

Breaking the lock

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



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

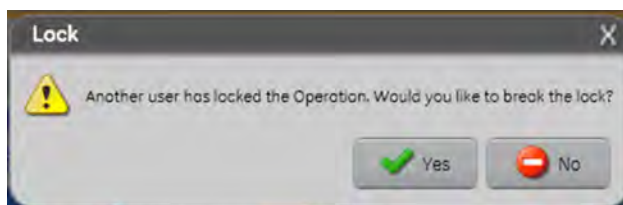


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The first user enters his user code (login password) **[User1]**.

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



DIA.NE XT4 - Station control/master synchronisation



The second user enters his user code (login password) **[User2]** and then presses **[Unlock]**.
The selector switch is then unlocked.

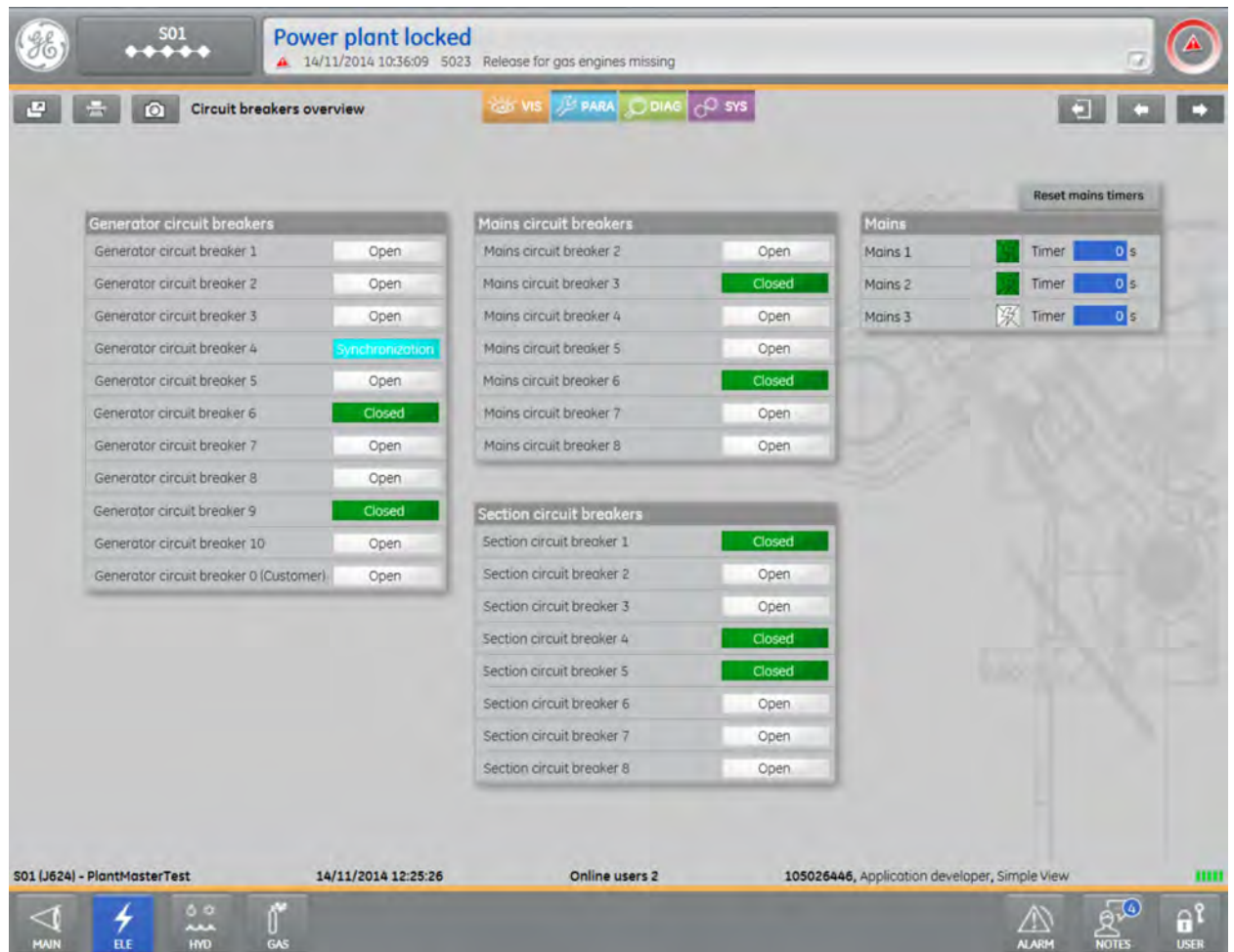
1.2 MAIN – overview of power breakers [Circuit breakers overview]

This screen provides an overview of the power breakers in the plant. Three statuses can be displayed for each power breaker: Breaker open (white), breaker closed (green) and synchronisation (light blue). The status of the mains is also displayed, with the relevant time components for the mains supply stabilisation time. The time components can be reset by pressing the "Reset mains supply stabilisation time" button.

The screen is visible when the appropriate system operation has been configured.



DIA.NE XT4 - Station control/master synchronisation



Operating mode of generator circuit breakers [Generator circuit breakers]

[Generator circuit breaker x]	Status of generator circuit breaker x
[Generator circuit breaker 0 (Customer)]	Status of generator circuit breaker 0 (on-site engine) (if fitted)

Operating mode of mains circuit breakers [Mains circuit breakers]

[Mains circuit breaker x]	Status of mains circuit breaker x
---------------------------	-----------------------------------

Operating mode of coupler circuit breakers [Coupler circuit breakers]

[Coupler circuit breaker x]	Status of coupler circuit breaker x
-----------------------------	-------------------------------------

Operating mode of mains [Mains]

[Mains x]	Status of mains x
[Mains stabilisation time]	Residual mains stabilisation time

1.3 MAIN – overview of feeder circuit breaker [Circuit breakers overview]

Overview of feeder circuit breakers in the plant Three statuses are displayed: Feeder circuit breaker open (white), feeder circuit breaker closed (green) and closing feeder circuit breaker enable (light blue).



DIA.NE XT4 - Station control/master synchronisation

The screen is visible when the appropriate system operation has been configured.



Feeder circuit breakers status & power [Feeder circuit breakers status & power]

[Feeder circuit breaker x]	Feeder circuit breaker x
	Feeder circuit power x (optional)

Additional displays

[Consumer power]	Consumer power installation
[Maximum additional load]	Maximum additional load
[Summary nominal generator power of running engines]	Summary nominal generator power of running engines

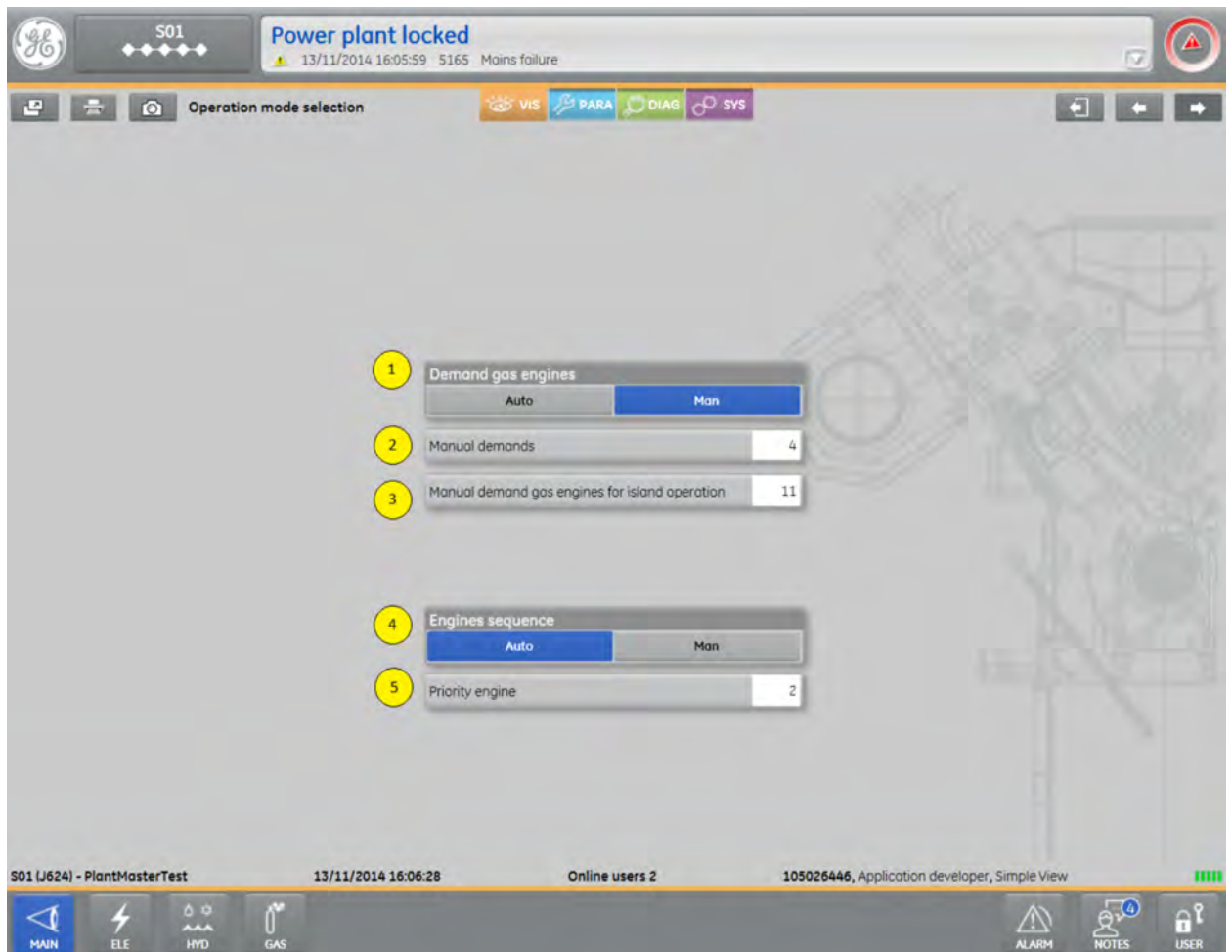
1.4 MAIN – Mode selection [Operation mode selection]

Mode selection for the system

The screen is visible when the appropriate system operation has been configured.



DIA.NE XT4 - Station control/master synchronisation



1 Demand from gas engines [Demand from gas engines]

Automatic or manual preselection of demand from number of gas engines

2

[Manual demands]

Manual demands
(Number of engines)

3

[Manual demand from gas engines for island operation]

Manual demands from gas engines
for island operation (number of engines)

4 Engine sequence [Engine sequence]

Operator selection of automatic gas engine sequence (according to operating hours) or manual (selection of priority engine).

5 Priority engine

[Priority engine]

Selection of priority engine

1.5 MAIN – Operational data [Operating data]

Display of system operational data

The screen is visible when the appropriate system operation has been configured.



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1 Operating hours [Operating hours]:

Display	Description	User role for inputs
[Gas engine n]	Operating hour counter	Customer

The counter readings are stored in the control system.

2 Reserve counter [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.

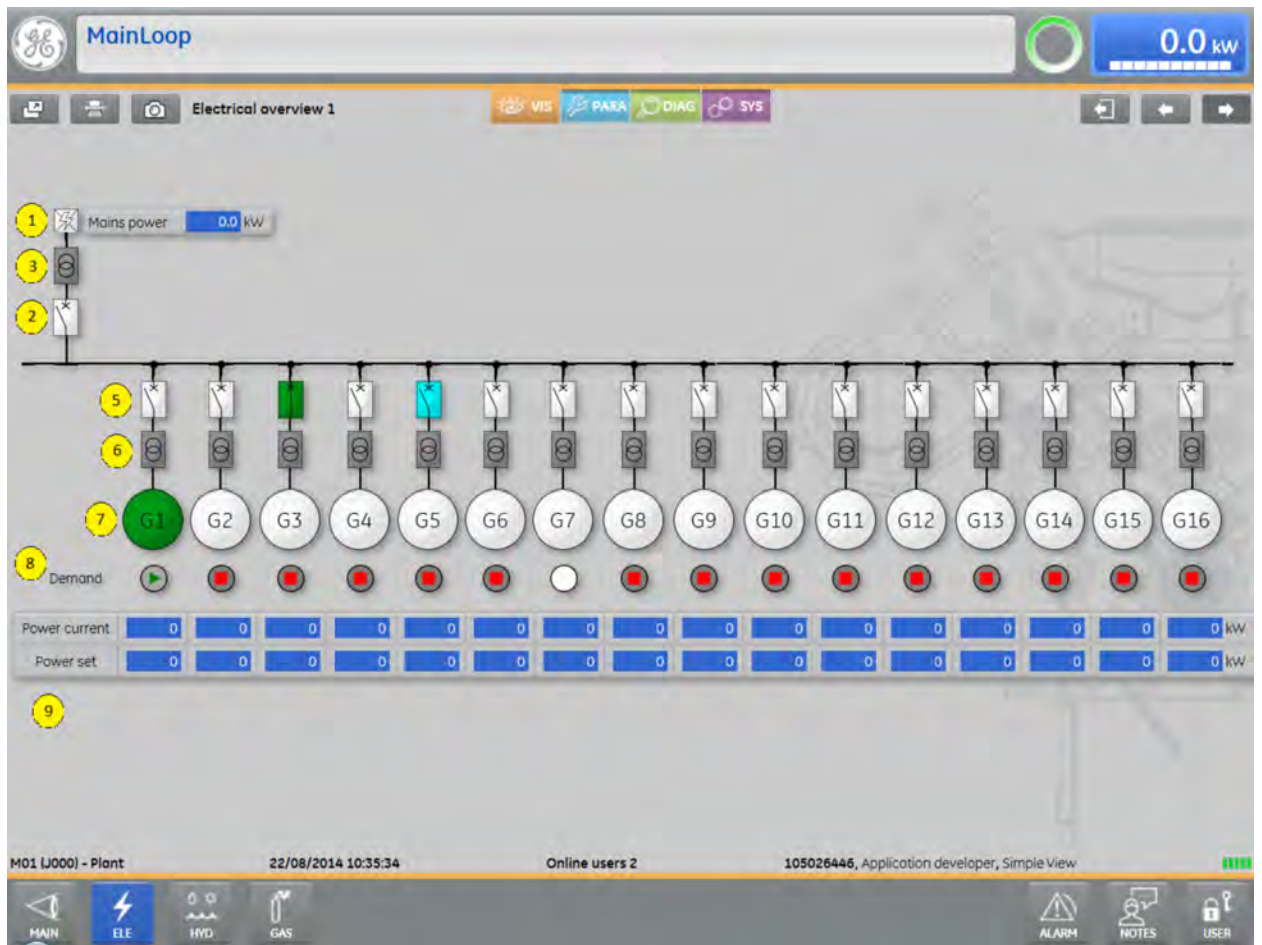
1.6 ELE – Electrical overview 1 [Electrical overview]

Display showing the electrical system overview screen (adapted to specific customer)

The screen is visible when the appropriate system operation has been configured.

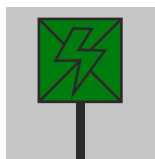


DIA.NE XT4 - Station control/master synchronisation

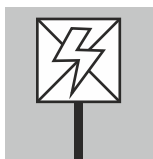


1 Mains power supply 1

Representation of mains status 1



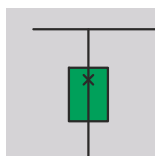
Mains OK



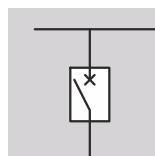
Mains failure

2 Mains circuit breaker 1

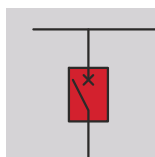
Status of mains circuit breaker 1



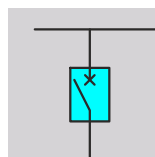
closed



open



fault



synchronisation

3 Transformer

Graphical representation of transformer mains supply



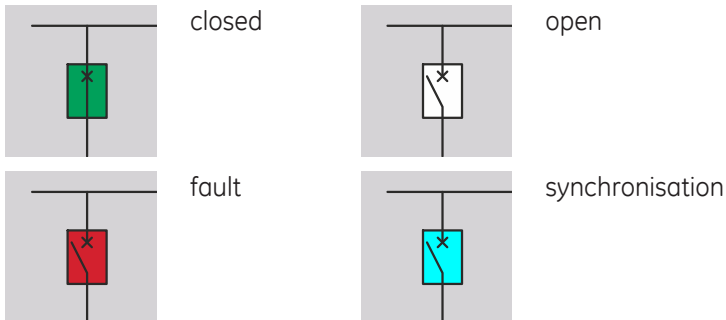
DIA.NE XT4 - Station control/master synchronisation

4 System interconnection power

Display showing system interconnection power for mains power supply 1

5 Generator circuit breakers

Display showing the status of the generator circuit breaker:



6 Transformer

Graphical representation of transformer between bus bar and generator

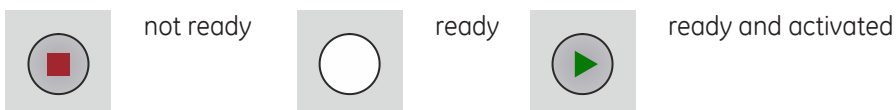
7 Generator

Graphical representation of a generator:



8 Activation

Status display for engine activation



9 Generator power

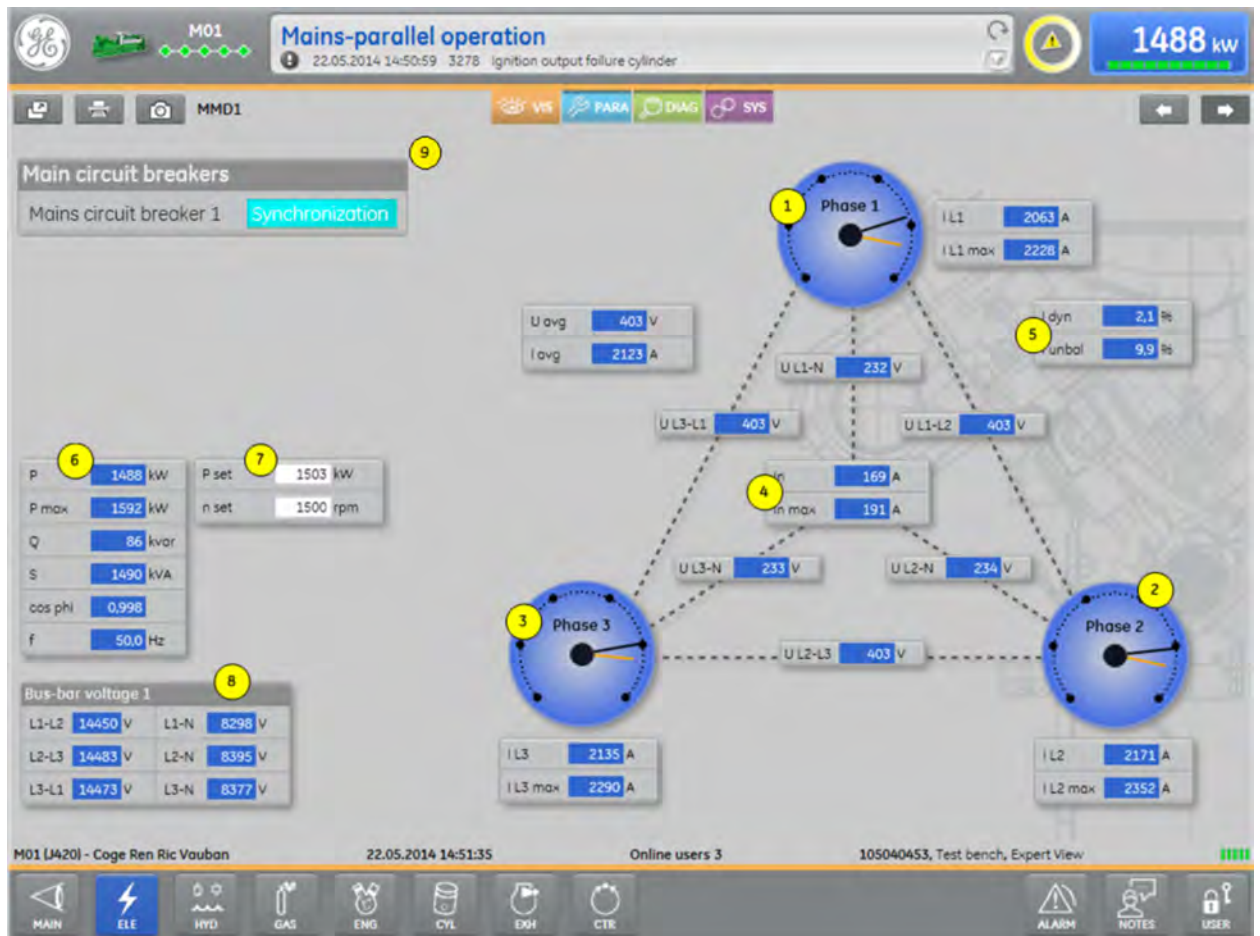
[Power current]	Power current
[Power set]	Power set

1.7 ELE multi-measurement device [MMD1]

The screen is visible when the appropriate system operation has been configured.



DIA.NE XT4 - Station control/master synchronisation



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



DIA.NE XT4 - Station control/master synchronisation

[In]	Neutral current
[In max]	Maximum neutral current
[Idyn]	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 output [kW]
[P max]	Maximum electrical power [kW]
[Q]	Reactive power [kvar]
[S]	Apparent power [kVA]
[cos phi]	Power factor (negative value = capacitive, positive value = inductive)
[f]	Frequency [Hz]

7

[P Set]	Set power [kW]
[n set]	Set speed [rpm]

8

Bus-bar voltage 1 [**Bus-bar voltage 1**]

[L1-L2]	Voltage L1-L2
[L2-L3]	Voltage L2-L3
[L3-L1]	Voltage L3-L1
[L1-N]	Voltage L1-N
[L2-N]	Voltage L2-N
[L3-N]	Voltage L3-N

9

Mains circuit breakers/Coupler circuit breakers [**Mains circuit breakers/Coupler circuit breakers**]

[Mains/Coupler circuit breaker x]	Display showing which mains circuit breaker/coupler circuit breaker is being synchronised.
-----------------------------------	--

1.8 ELE - Synchronisation [Synchronization] (optional)

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



DIA.NE XT4 - Station control/master 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:

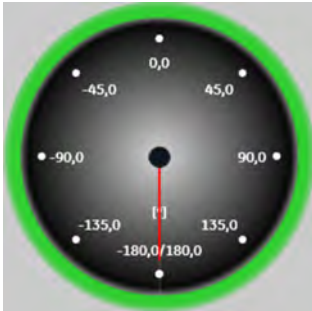


This connection condition is satisfied if the synchronisation pointer is within the permissible phase position (green).

Synchronisation completed



DIA.NE XT4 - Station control/master synchronisation



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 1 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 $+180,0^\circ$) 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:

$$50\% < U < 125\% \text{ of nominal voltage } U_N$$



DIA.NE XT4 - Station control/master synchronisation

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

6 Mains circuit breakers/Coupler circuit breakers [**Mains circuit breakers/Coupler circuit breakers**]

[Mains/Coupler circuit breaker x]	Display showing which mains circuit breaker/coupler circuit breaker is being synchronised.
-----------------------------------	--

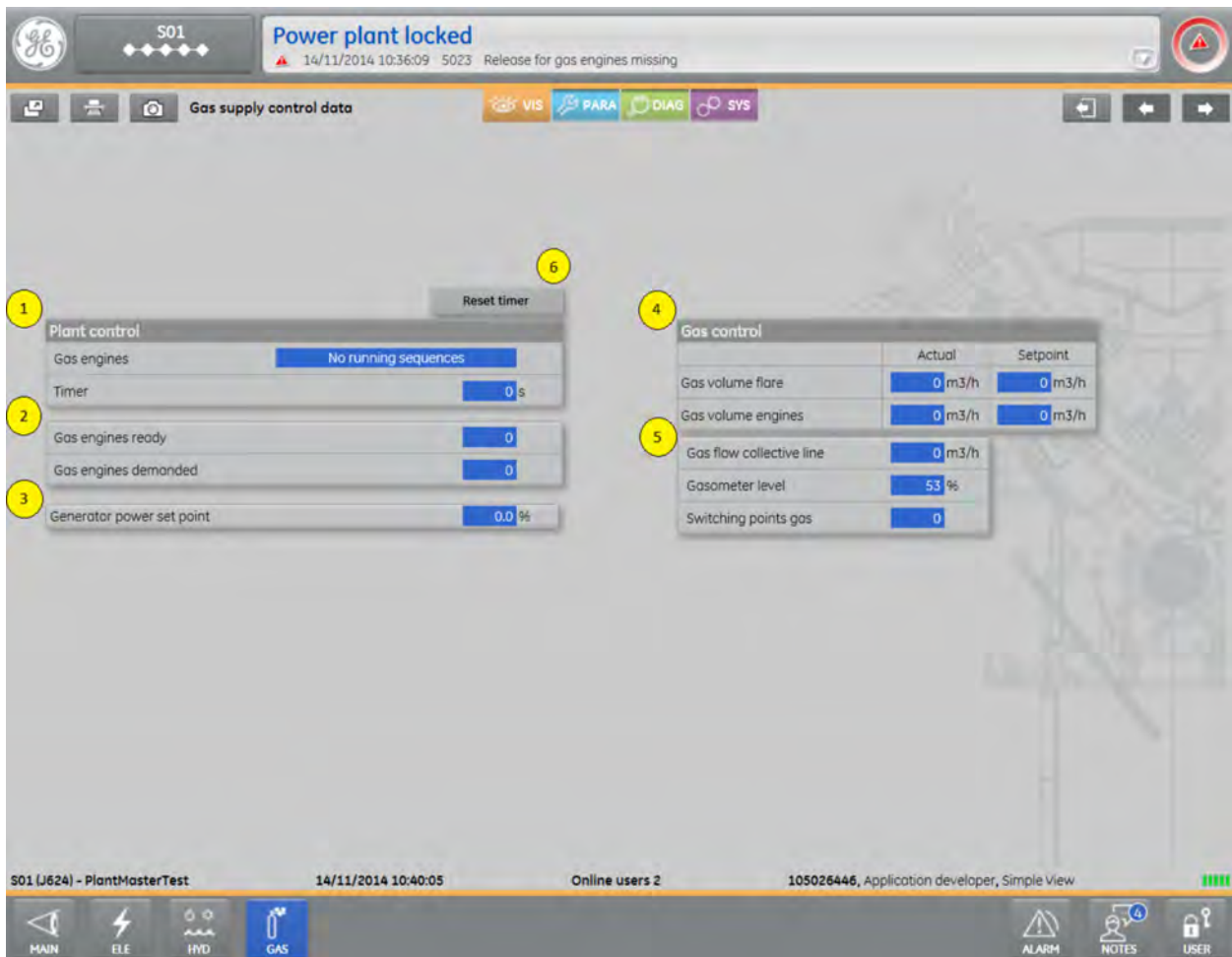
1.9 Electrical control [Electrical control]

This screen shows the electrical control data for the system.

The screen is visible when the appropriate system operation has been configured.



DIA.NE XT4 - Station control/master synchronisation



1 Plant control data [Plant control data]

[Gas engine switching-on/off sequences]	Status of engine switching-on/off programme <ol style="list-style-type: none">1. No switching-on/off2. Switching-off programme3. Switching-on programme
---	---

[Timer]	Interval period for engine switch-on/off [s]
---------	--

2	
[Gas engines ready]	Number of gas engines ready
[Gas engines demanded]	Number of gas engines demanded

3	
[Power set point]	Power set point

4 Electrical data [Electrical data]

[Electrical mains power import]	Actual data and set data Electrical mains power import/export [kW]
[Generator power]	Actual data and set data Generator total power [kW]
[Consumer power]	Consumer power [kW]



[Switching points for electrical output]

Switching points for electrical output

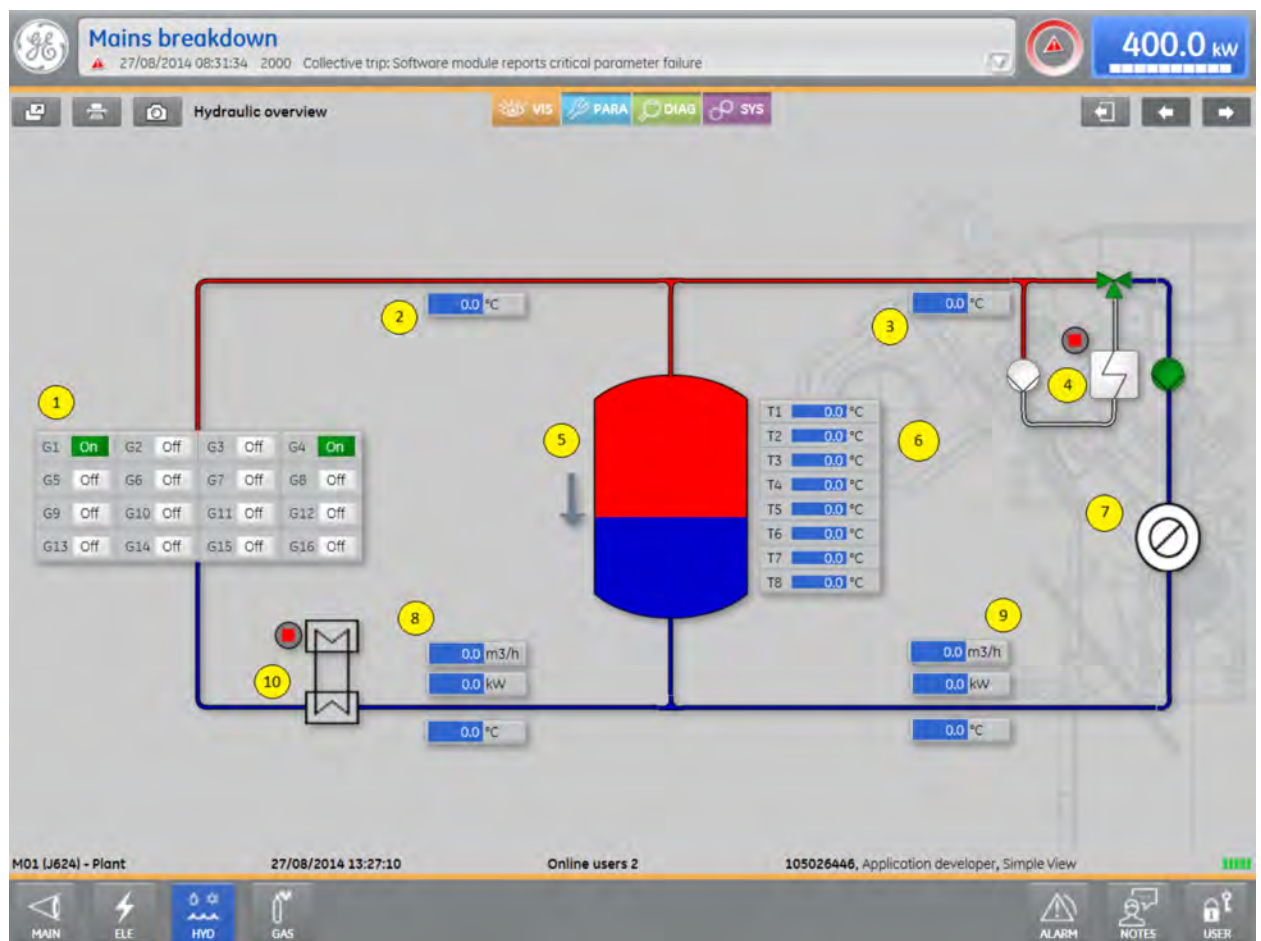
5 Reset times

Button for resetting the interval period.

1.10 Hydraulic overview [Hydraulic overview]

This screen shows the hydraulic layout of the system.

The screen is visible when the appropriate system operation has been configured.



1 Gas engine status

Status display for gas engine operation on/off per gas engine.

2 Heating water supply temperature in gas engine circuit

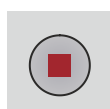
Display showing the heating water temperature in the gas engine circuit (in °C or K).

3 Heating water supply temperature in consumer circuit

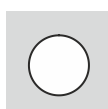
Display showing the heating water temperature in the consumer circuit (in °C or K).

4 Peak-load boiler

Status display showing peak-load boiler activation On/Off



not ready



ready



ready and activated



DIA.NE XT4 - Station control/master synchronisation

5 Heat storage unit

Schematic diagram of the heat storage unit The fill level of the unit is indicated by a change of colour between red and blue. The arrow next to the heat storage unit indicates the trend of the storage medium separation layer.

6 Storage temperatures

Display showing individual storage temperatures (in °C or K) in the heat storage unit The number of storage sensors depends on the system.

7 Heat consumers

Graphical representation of the heat consumers.

8 Heat water return measurement values, gas engines circuit

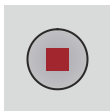
Display showing flow rate [m³/h], thermal output [kW] and temperature [°C or K] of the heating water return in the gas engine circuit.

9 Heating water return, consumer circuit

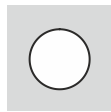
Display showing flow rate [m³/h], thermal output [kW] and temperature [°C or K] of the heating water return in the consumer circuit.

10 Emergency cooling system

Status display showing emergency cooling system activation On/Off



not ready



ready



ready and activated

The amount by which the maximum return temperature is exceeded is also displayed: **T > T max**

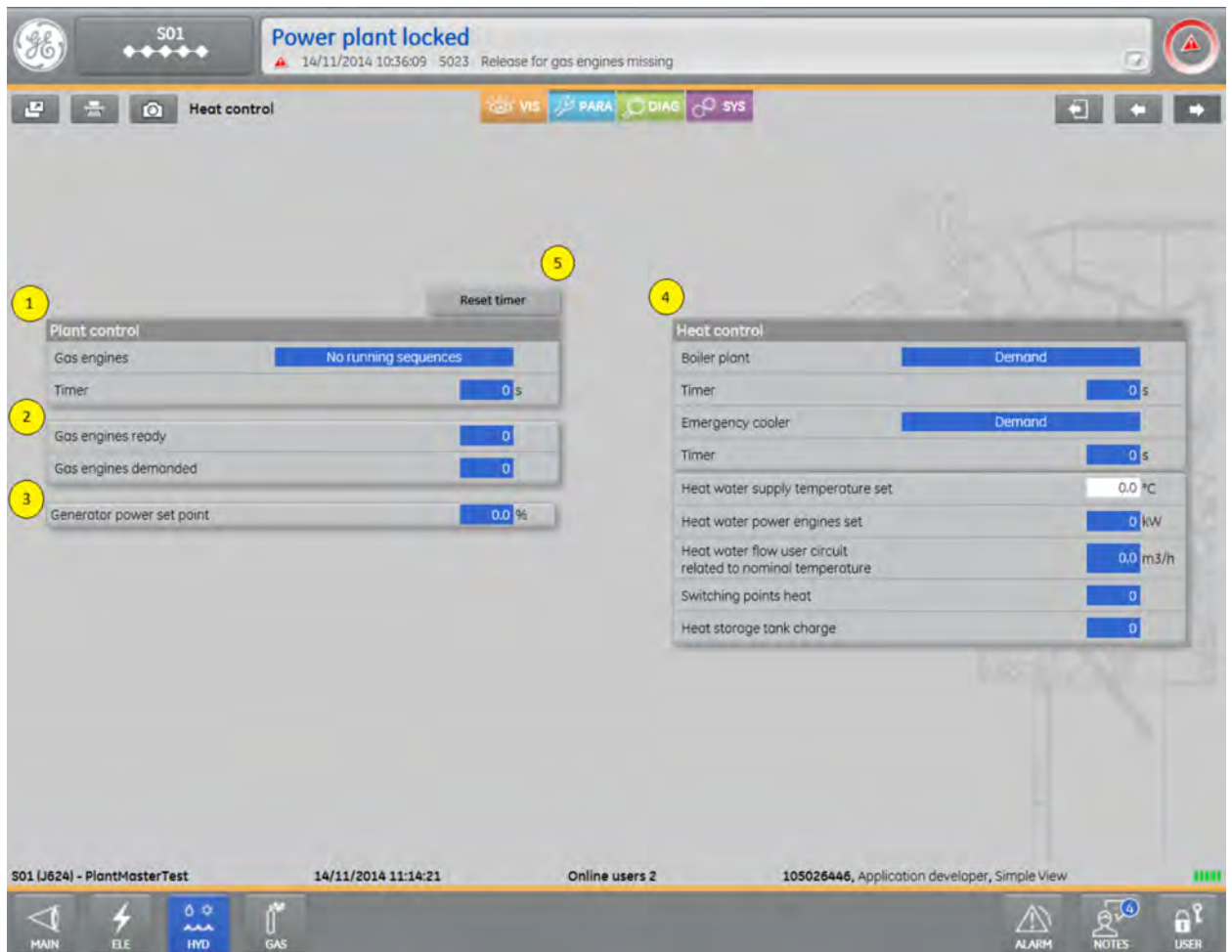
1.11 Heat circuit control [Heat control]

Display showing the heat circuit control data.

The screen is visible when the appropriate system operation has been configured.



DIA.NE XT4 - Station control/master synchronisation



1 Plant control data [Plant control data]

[Gas engine switching-on/off sequences]	Status of engine switching-on/off programme 1. No switching-on/off 2. Switching-off programme 3. Switching-on programme
---	--

[Timer]	Interval period for engine switch-on/off [s]
---------	--

2

[Gas engines ready]	Number of gas engines ready
[Gas engines demanded]	Number of gas engines demanded

3

[Power set point]	Power set point
-------------------	-----------------

4 Heat circuit data [Heat circuit data]

[Boiler plant]	Status of boiler plant demand
[Timer]	Boiler plant time delay [s]
[Emergency cooler]	Status of emergency cooler demand
[Timer]	Emergency cooler time delay [s]



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[Heating water supply temperature set]	Heating water supply temperature set [°C or K] (entry field)
[Heating water output for engines set]	Heat output for engines set [kW] (calculated)
[Heating water flow in consumer circuit related to nominal temperature]	Heating water flow in consumer circuit related to nominal temperature
[Switching points for heat]	Switching points for heat
[Heat storage unit charge]	Heat storage unit charge

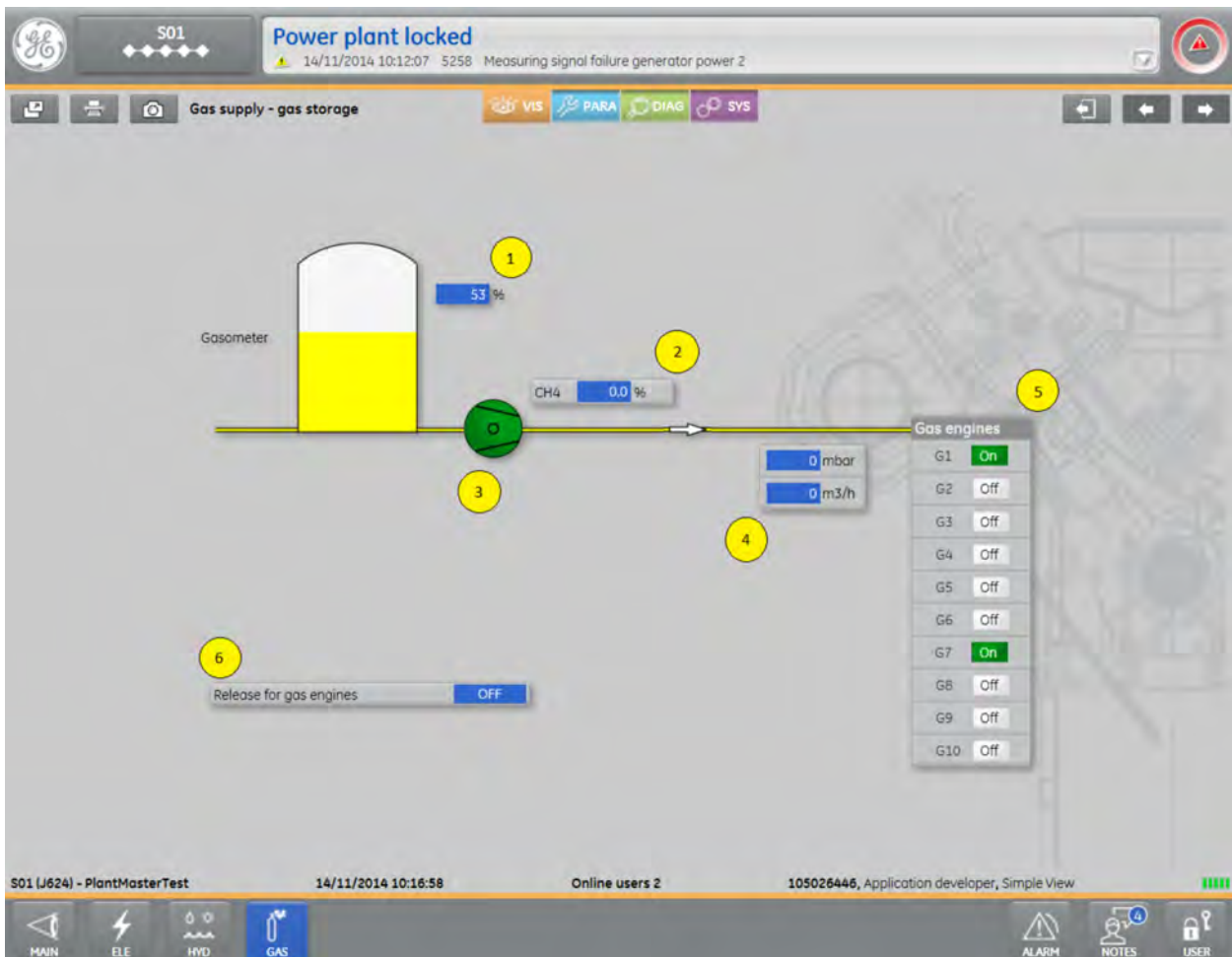
5 Reset times

Button for resetting the interval period.

1.12 Gasometer [Gas supply - gas storage]

This screen provides an overview of the gas supply to the plant with gasometer

The screen is visible when the appropriate system operation has been configured.



1 Gasometer [Gasometer], [Vgasom]

Graphical representation of the gasometer with numerical display of gasometer filling level.

2 CH₄ [CH4]

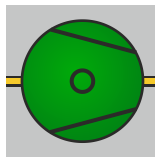
Display showing the gas CH₄ content.

3 Gas compressor

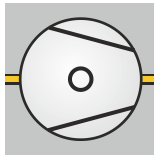


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Display showing status of gas compressor:



Operation
On



Operation
Off

4 Gas pressure and gas flow

Display showing the current gas pressure [mbar] and gas flow [m3/h] in gas engines.

5 Gas engines **[Gas engines]**

Display showing operation on/off per gas engine.

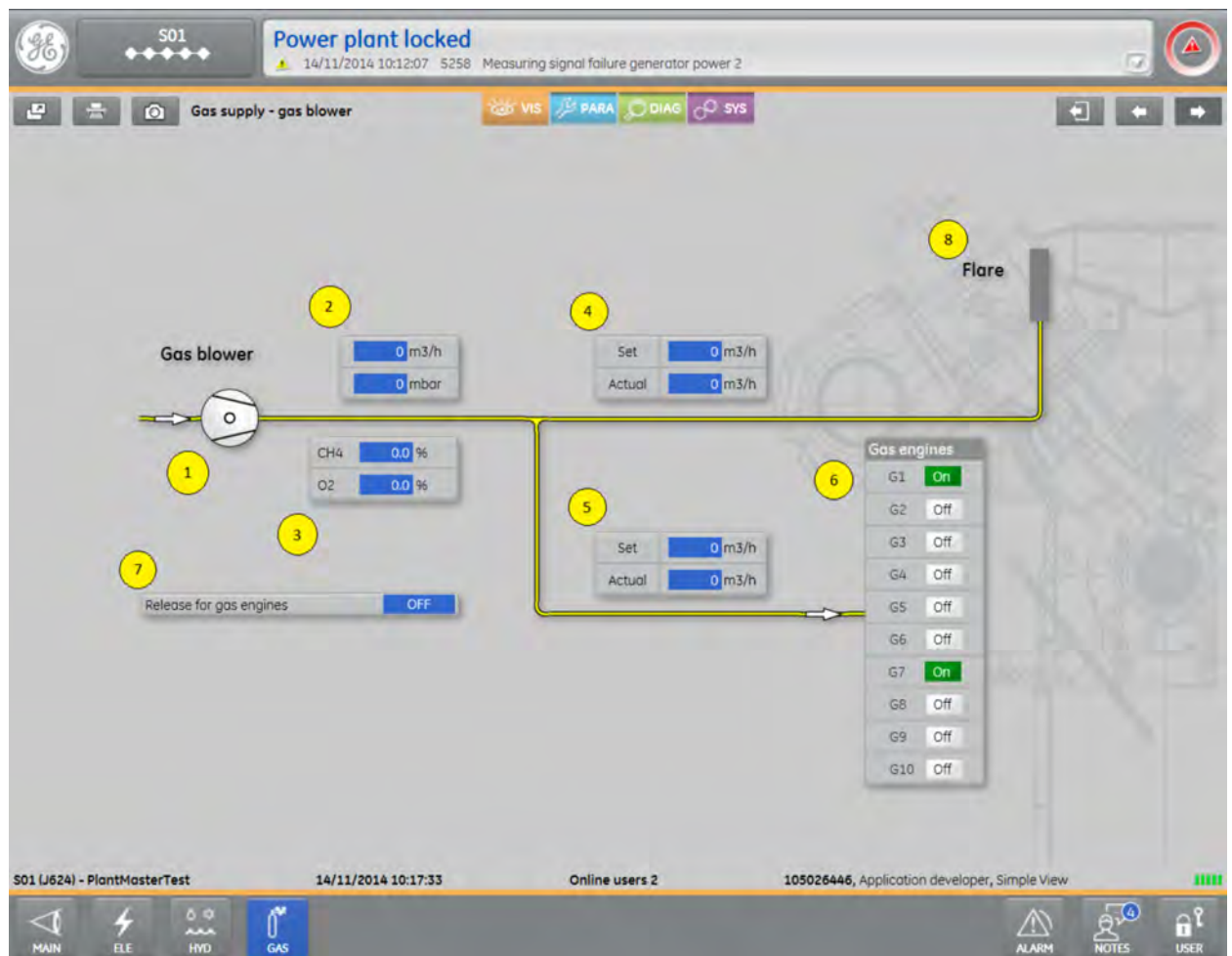
6 Gas engine enable

Display showing gas engine enable On/Off (from gas pre-processing).

1.13 Gas supply - gas compressor [Gas supply - gas blower]

This screen provides an overview of the gas supply to the plant with gas compressor.

The screen is visible when the appropriate system operation has been configured.

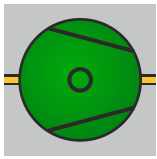


1 Gas compressor

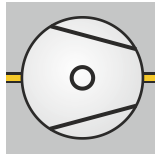
Display showing status of gas compressor:



DIA.NE XT4 - Station control/master synchronisation



Operation
On



Operation
Off

2

Gas pressure and gas flow in manifold

Display showing the gas flow [m³/h] and gas pressure [mbar] in the manifold.

3

CH₄ and O₂ content

Display showing the CH₄ and O₂ content of the gas.

4

Flare gas volume

Display showing the set flare volume [*Volume set*] and current flare volume [*Volume current*].

5

Gas pressure and gas flow in gas engines

Display showing the current gas pressure [mbar] and gas flow [m³/h] in gas engines.

6

Gas engines **[Gas engines]**

Display showing operation on/off per gas engine.

7

Gas engine enable

Display showing gas engine enable On/Off (from gas pre-processing).

8

Flare

Graphical representation of the flare.

1.14 Power limitation [Power limitation]

This screen shows the relevant power limitations data according to gasometer level, gas pressure and CH₄ content.

The screen is visible when the appropriate system operation has been configured.



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1 Generator power limitation by gasometer level **[Generator power limitation by gasometer level]**

[Gasometer level]	Gasometer level
[Pgen = 50% at volume]	Gasometer level at 50% of rated generator power (entry field)
[Pgen = 100% at volume]	Gasometer level at 100% of rated generator power (entry field)
[Limitation by gasometer level]	Limitation by gasometer level

2 Generator power limitation by gas pressure **[Generator power limitation by gas pressure]**

[Gas pressure in engines]	Gas pressure in engines
[Pgen = 50% at volume]	Gas pressure at 50% of rated generator power (entry field)
[Pgen = 100% at volume]	Gas pressure at 100% of rated generator power (entry field)
[Limitation by gas pressure]	Limitation by gas pressure

3 Generator power limitation by CH4 **[Generator power limitation by CH4]**

[CH4]	CH4 content
[Pgen = 50% at CH4]	CH4 content at 50% of rated generator power (entry field)



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[Pgen = 100% at CH4]	CH4 content at 100% of rated generator power (entry field)
[Limitation by CH4]	Limitation by CH4

1.15 Gas flow reduction [Gas flow reduction]

This screen shows the relevant gas flow reduction data according to gas pressure and CH4 content. The screen is visible when the appropriate system operation has been configured.

The screenshot displays the 'Gas flow reduction' screen. At the top, there's a status bar with 'S01', 'Power plant locked', and a timestamp '14/11/2014 10:36:09'. Below this is a navigation bar with icons for VIS, PARA, DIAG, and SYS. The main area contains two data entry panels. Panel 1, 'Gas flow reduction by gas pressure', has fields for 'Gas pressure engines' (0 mbar), 'X1 (-> Y1)' (0 mbar), 'X2 (Y2 = 0)' (0 mbar), 'Y1' (0 m3/h), and 'Reduction by gas pressure' (0 m3/h). Panel 2, 'Gas flow reduction by CH4', has fields for 'CH4' (0.0 %), 'X1 (-> Y1)' (0.0 %), 'X2 (Y2 = 0)' (0.0 %), 'Y1' (0 m3/h), and 'Reduction by CH4' (0 m3/h). The bottom status bar shows 'S01 (J624) - PlantMasterTest', '14/11/2014 14:23:00', 'Online users 2', and '105026446, Application developer, Simple View'. Navigation icons for MAIN, ELE, HYD, GAS, ALARM, NOTES, and USER are at the bottom.

1 Gas flow reduction by gas pressure [Gas flow reduction by gas pressure]

[Gas pressure in engines]	Gas pressure in engines [mbar]
[X1]	Gas pressure X1 [mbar] (entry field)
[X2]	Gas pressure X2 [mbar] (entry field)
[Y1]	Gas flow Y1 [m3/h] (entry field)
[Gas flow reduction by gas pressure]	Gas flow reduction by gas pressure [m3/h]

2 Gas flow reduction by CH4 content [Gas flow reduction by]

[CH4]	CH4 content [%]
[X1]	CH4 content X1 [%] (entry field)
[X2]	CH4 content X2 [%] (entry field)
[Y1]	Gas flow Y1 [m3/h] (entry field)



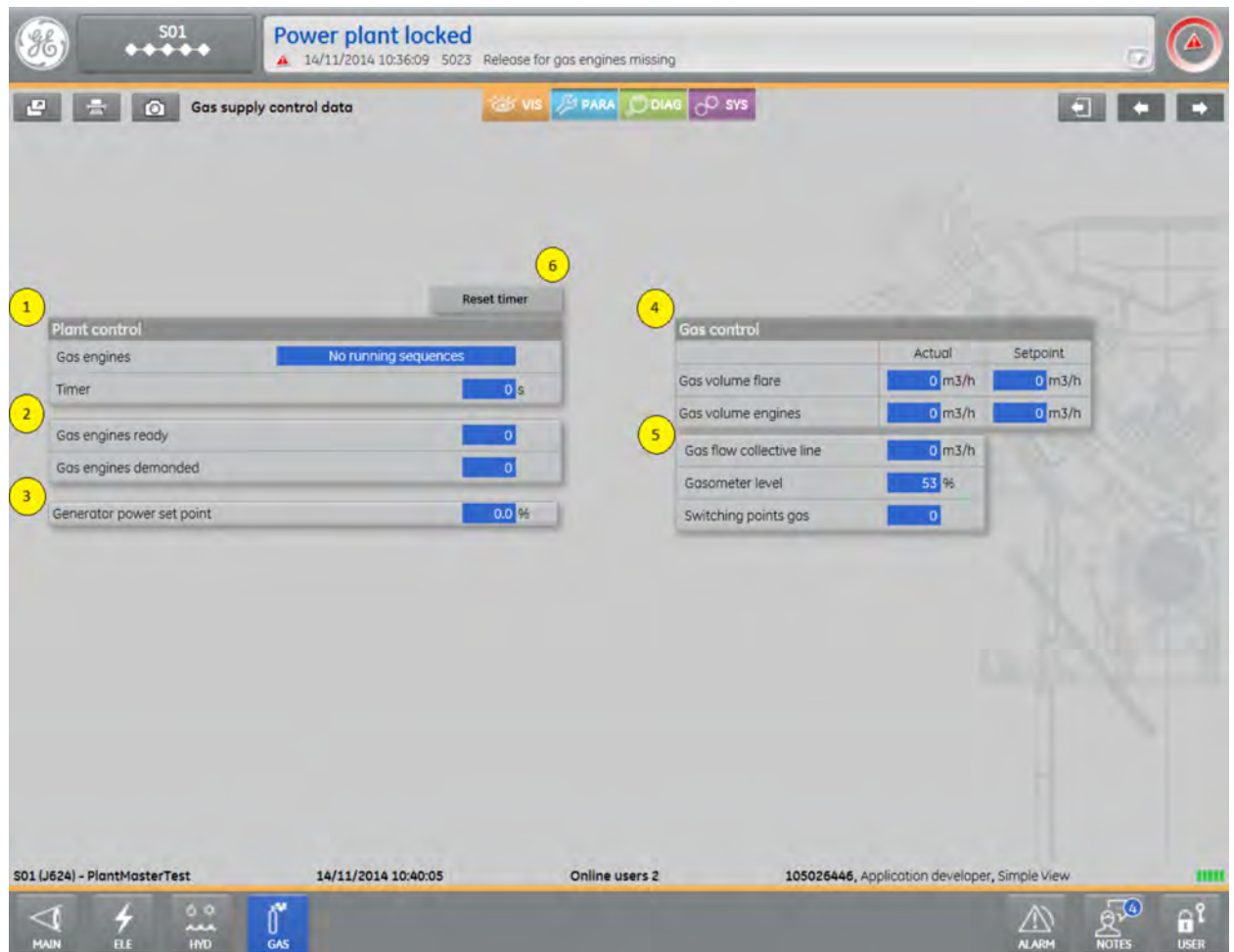
[Reduction by CH4]

Gas flow reduction by CH4 content [m3/h]

1.16 Gas control data [Gas supply control data]

Representation of gas control data.

The screen is visible when the appropriate system operation has been configured!



1 Plant control data [Plant control data]

[Gas engine switching-on/off sequences]

Status of engine switching-on/off programme

1. No switching-on/off
2. Switching-off programme
3. Switching-on programme

[Timer]

Interval period for engine switch-on/off [s]

2

[Gas engines ready]

Number of gas engines ready

[Gas engines demanded]

Number of gas engines demanded

3

[Power set point]

Power set point

4 Gas control data [Gas control data]



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[Gas volume flare]	Actual data and set data for gas flow to flare [m3/h]
[Gas volume in engines]	Actual data and set data for gas volume in engines [m3/h]

5 Gas flow reduction [Gas flow reduction]

[Gas flow in manifold]	Gas flow in ,manifold [m3/h]
[Gasometer level]	Gasometer level [%]
[Switching points for gas]	Switching points for gas

6 Reset times

Button for resetting the interval period.

1.17 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]

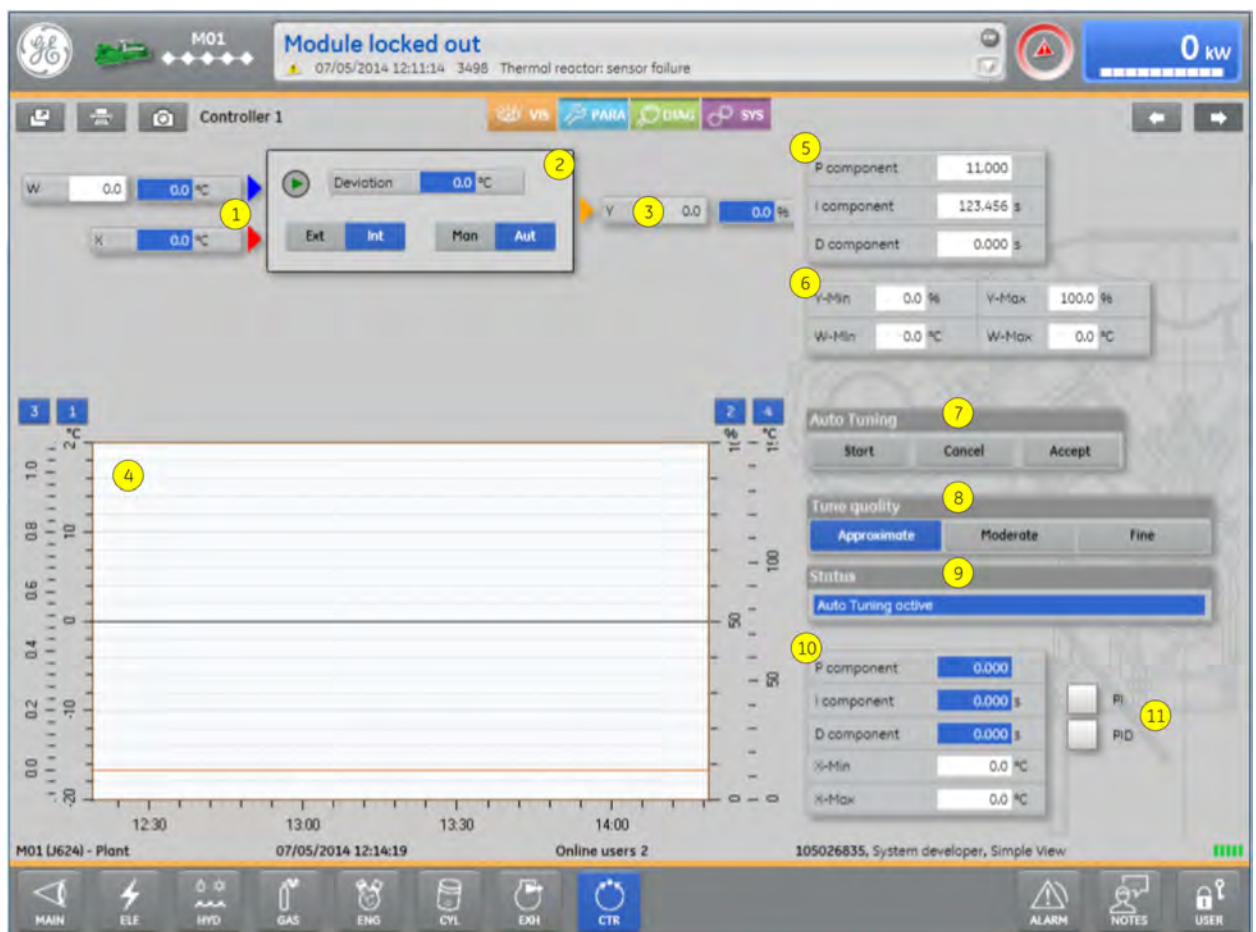


- 4 Actual value [X]
- 5 Control variable [Y]
- 6 Bar display

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

1.18 CTR – Plant controller (optional)

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 function. 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 role (the default is "Advanced customer").
[X]	Actual value

- 2

	The symbol denotes an active controller and the symbol an inactive controller.
[Deviation]	Controller deviation



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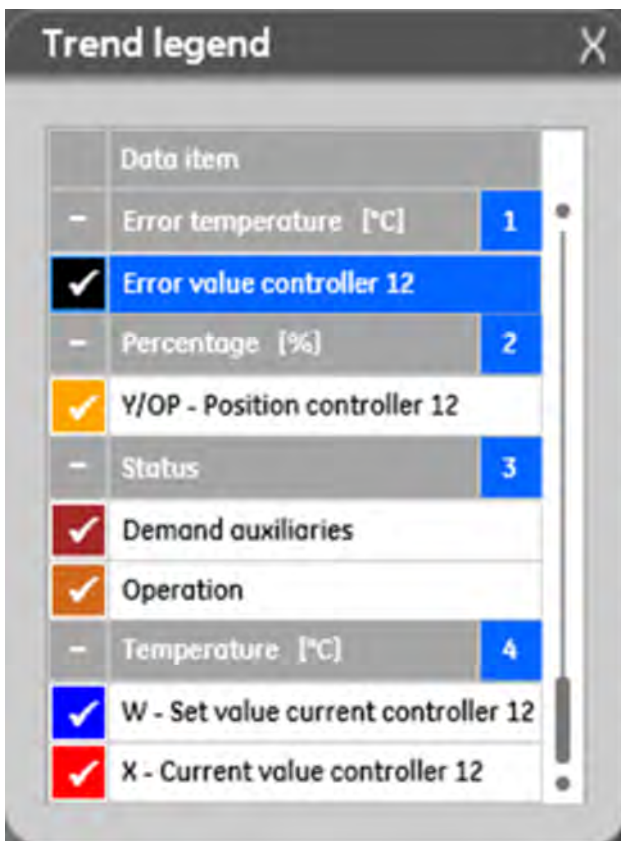
[AUT/MAN]	This button switches the controller between "Automatic" and "Manual" modes. In manual mode, you can change the control variable [Y] by hand. The default user role is "Service Technician". The controller must be active.
[INT/EXT]	This button switches the controller between using an internal and external set value. The default user role is "Service Technician".

3 Output variable

[Y]	Control variable. An entry can only be made in "Manual" mode and as from the corresponding user role (the default is "Service Partner").
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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]	Integral component/Integral time
[D component]	Differential component/Derived time

6 Control variable and set point limitation



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[Y-max]	Maximum control variable limiter
[Y-min]	Minimum control variable limiter
[W-max]	Maximum set point limiter
[W-min]	Minimum set point 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 "Auto Tuning 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



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[D component]	Display showing the calculated differential component / derivative time
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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.