DELOMATIC 400 GAS CHP Controller
OPERATOR'S MANUAL

Delomatic 400 Gas (DM 400 Gas)
Software 436729_008

- Functional Overview
- HMI Browser
- User Interface
- Status, Alarms and Messages

DEIF A/S · Frisenborgvej 33 · DK-7800 Skive
Tel.: +45 9614 9614 · Fax: +45 9614 9615
info@deif.com · www.deif.com

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This document relates to Delomatic 400 software version 436729_008 or earlier.

1. About this document

General purpose

This document is the operator's manual for DEIF's Delomatic 400, DM 400 Gas Combined Heat and Power (CHP) plant controller.
The general purpose is to give the user important information on how to carry out the daily operation of the unit.

Please make sure that this document is read in full before working with the DM 400 Gas controller and the other associated system hardware. Failure to do so may result in injury or danger of death and/or damage to system hardware

Intended users

This operator's manual is mainly intended for the daily user. This document will provide the operator with information regarding the functions of the DM 400 that will enable the operator to control and monitor those aspects of the CHP system which the DM 400 controls and monitors.

Contents/overall structure

The document is divided into chapters, and in order to make the structure simple and easy to use, each chapter will begin from the top of a new page.

Note that the software pages automatically update based on the parameter options which are activated for each individual system.
Consequently, the diagrams shown are for illustration purposes and the actual diagram displayed may differ as they will be system specific.
THIS IS NOT A FAULT.

2. Warnings and legal information

Legal information and responsibility

DEIF takes no responsibility for installation or operation of the generator set or any other hardware associated with the system. If there is any doubt about how to install or operate the any hardware controlled by the DM 400, the company responsible for the installation or the operation of this equipment must be contacted.

In order to obtain safe and trouble-free use of the DM 400 Gas, it is important that transport, storage, mounting and commissioning is done by authorised personnel and according to DEIF instructions.
Failure to comply will result in a loss of warranty and possible damage to the equipment.

Electrostatic discharge awareness

Sufficient care must be taken to protect the terminals against static discharges during the installation. Once the unit is installed and connected correctly, these precautions are no longer necessary.

Safety issues

Installing the unit requires work with dangerous currents and voltages. Therefore, the installation should only be carried out by authorised personnel who are appropriately qualified to do so.

Be aware of the hazardous live currents and voltages. Do not touch any AC measurement inputs as this could lead to injury or death.

If the Remote Start function is activated within the DM 400 controller, then additional safety measures must be taken to prevent the remote start function from operating whilst personnel are working on the plant. Failure to do so may result in the engine starting or attempting to start without warning and may cause injury, death and/or damage to equipment as a consequence.

Definitions

Throughout this document, a number of notes and warnings will be presented. To ensure that these are noticed, they will be highlighted in order to separate them from the general text.

Notes

The notes provide general information which will be helpful for the reader to bear in mind.

Warnings

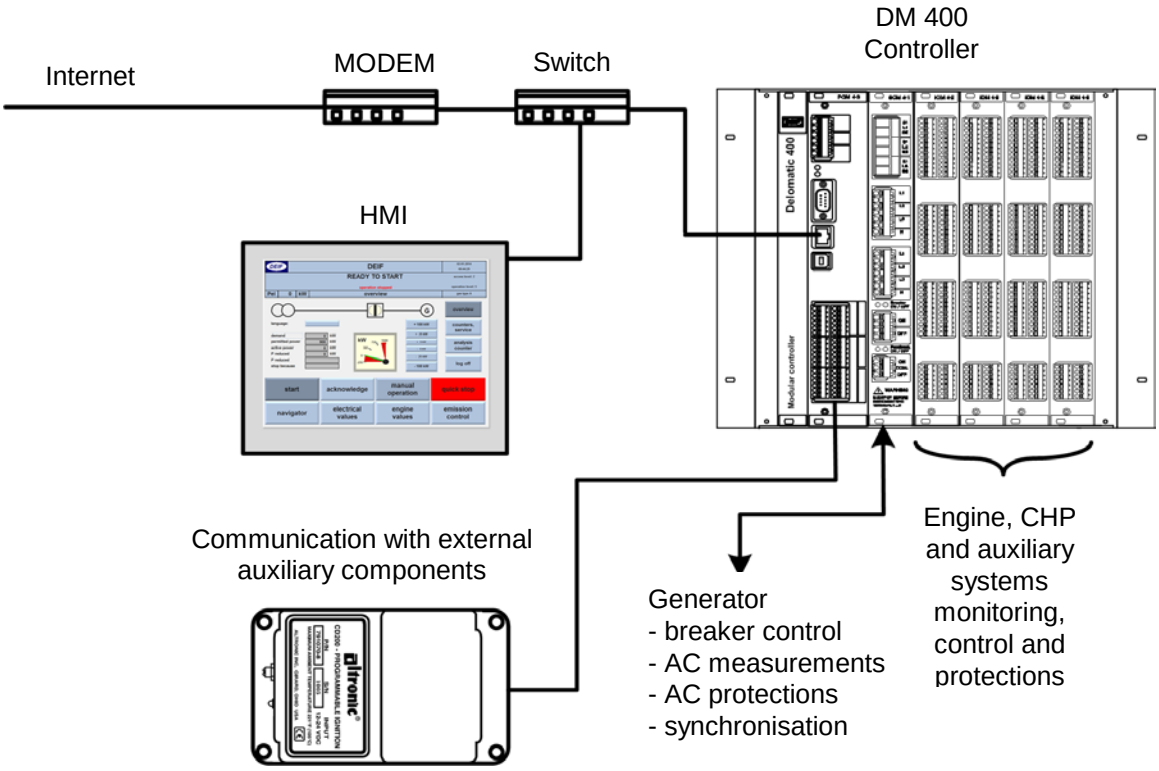
The warnings indicate a potentially dangerous situation which could result in death, personal injury or damaged equipment, if certain guidelines are not followed.

3. General overview

As a minimum, the DM 400 Gas system consists of a double-height (6 HE, 266 mm height) 19" rack mounted with the necessary I/O modules and a 12"-colour graphic touch screen operator interface (HMI).

The DM 400 Gas has a TCP/IP interface with a built-in webserver. This means that the graphical display screens are stored here and can be accessed from any computer via the internet, using a free of charge DEIF HMI Client software and thereby enabling remote control and monitoring from anywhere in the world.

Example of a possible system configuration:



Typically, only the HMI and DM 400 controller are within DEIF's scope of supply. The other components are shown for illustration purposes only.

The DM 400 controller is an extremely versatile unit and can be used in various system configurations. As a result of this, the terms GRID, MAINS and BUSBAR are used throughout this document and on the HMI and should be taken to be the primary incoming electrical supply to which the system being controlled by the DM 400 will synchronise, connect and operate in parallel.
If the system is used for an island-only application, then all references to the primary incoming electrical supply should be ignored

4. Functional overview

The **Delomatic DM 400 Gas control system** is designed for the control of a CHP plant driven by a gas engine.

The following functions are supported:

- Full engine control and monitoring (including associated external components for example ignition system, anti-knock system, subject to the functionality of this equipment)
- Full generator control monitoring and protections
- Synchronisation and breaker control
- Heating and cooling circuit control and monitoring
- Gas supply monitoring and adaptive control
- Overall system optimisation
- Data monitoring and recording

The integrated **visualisation software** enables simple operation of the complete system either via the HMI interface on site or via remote operation.
For remote operation purposes, a connection to the DM 400 can be established via RS-485 interface or network connection (TCP/IP).

The HMI interface provides

- Graphical representation of system values and status
- Real time trend curves of data
- Log books
- Recording of Run Hours, Power Generated (kWh), Maintenance counters plus the facility to configure additional counters

All of these functions are powerful tools available to the operator in order to

- provide a quick overview of the status of the plant
- enable adjustment of system parameters and set points
- assist in the quick identification of problems
- provide an indication of maintenance requirements
- help to identify where process or efficiency improvements can be made via system specific configurable parameters.

Access to these password-protected configurable parameters enables a simple adaptation of the controller to optimise the operation of the plant.

The DM 400 controller is a powerful and flexible device that is able to provide an extensive range of measurement, protection and control functions that include, but are not limited to:

Measurements

Engine

- Temperatures
  - Cooling water
  - Cylinders
  - Exhaust
  - Intercooler
  - Receiver/Mixture
  - Oil
- Pressures
  - Receiver/Mixture

  - Oil
  - Exhaust
- Lambda voltage (if lambda sensor is fitted)

Generator
- Generator-side voltages, 3-phase L1, L2, L3, N, measured directly up to 690 V_{rms} rated voltage
- Grid-side voltages, 3-phase L1, L2, L3, N, measured directly up to 690 V_{rms} rated voltage
- Currents L1, L2, L3 through current converters to 1 A or 5 A
- Active power per phase and total
- Reactive power per phase and total
- Four-quadrant counter for active power consumed/generated and reactive power consumed/generated
- Winding and bearing temperatures of the generator

Heating and Cooling
- Temperatures of the water circuits
- Water flow indicators

Gas
- Gas pressure and flow rate
- CH4 value

Miscellaneous
- Operating hours
- Circuit breaker switching operations
- Room temperature
- Pulse counter, configurable
- Additional plant measurements

Protection functions

Engine
- Over-temperature protection for all temperature inputs
- Over-/under-pressure protection for all pressure inputs
- Measurements of parameter values
- Recording and logging of measured values and conditions
- Overspeed
- Water flow
- Backfire indicator

Generator
- Grid protection (<U, >U, <f, >f, delayed over-voltage, under-voltage characteristic) according to BDEW/VEO guidelines
- Electrical safety functions for generator over-voltage and under-voltage, over-frequency and under-frequency, asymmetric current, overload, feedback, minimum load, over-current, thermal over-current, over-excitation, loss of excitation, vector jump, df/dt
- Grid protection/mains failure protection
- Generator protection
- Synchronisation

Heating and cooling
- Water level and flow rate monitor for cooling and heating circuit

Maintenance counters
- A number of operational and service counters are provided to assist efficient operation of the system.

Gas
- Integration with gas valve proving mechanism
- Integration with gas leak detection mechanism

Miscellaneous
- Support of a hardware safety chain with reset function according to VDE0116
- Wire break-proof monitoring of the circuit breaker position(s)
- Digital error messages from engine circuit breakers and automatic circuit breakers
- Emergency stop
- Integration with fire detection system
- Configurable inputs to enable protection of various functions with configurable message texts and fail classes
- Monitoring of external devices
- Fill level monitoring in external lubricating oil tanks (fresh oil min, used oil max.)
- Cylinder temperature monitoring

Control functions

Engine
- Fully automatic engine start/stop
- Regulation of the gas mixer
- Control of engine throttle for speed regulation with speed ramp on start-up
- Exhaust gas bypass control
- Optional control of (subject to capability of the external equipment)
    - Ignition system
    - Anti-knocking systems
- Engine after-run
- Power reduction function according to oil temperature, water temperature and exhaust temperatures
- Regulation of the mixture temperature through adjustment of a three-way valve and fan controller

Generator
- Synchronisation with voltage adaptation and time monitoring
- Power ramp function for gentle increase/decrease of power
- Power regulation
- Cos phi (Power Factor) regulation
- Automatic power reduction, based on various input conditions

Heating and Cooling
- Regulation of a hot water valve
- Emergency cooling circuit regulation with three-way valve and fan controller
- Heat circuit pump, engine cooling circuit pump and mixture cooling circuit pump operation
- Engine preheating

Gas
- Adjusting of mixer position, power adjustment as well as selection and de-selection according to CH4 value, gas level, gas pressure or grid supply
- Gas compressor

Miscellaneous
- Auxiliary unit start-up and after-run
- Regulation of the enclosure temperature
- Interval refilling of lubricating oil, optional

5. HMI browser

The DM 400 system has a unique user interface which enables the use of any standard Windows PC for the operation of the plant.

The DEIF HMI browser software driver is free to download from the DEIF website on www.deif.com.

The installation and use of the HMI browser are described in a separate document, **Delomatic 400 Gas and Hydro application notes for the HMI Browser**, the latest version of which can be downloaded from the DEIF website on www.deif.com.

If multiple operators are online simultaneously, they all see the same user interface at their own computer.

If the Remote Start function is activated within the DM 400 controller then additional safety measures must be taken to prevent the remote start function from operating whilst personnel are working on the plant. Failure to do so may result in the engine starting or attempting to start without warning and may cause injury, death and/or damage to equipment as a consequence.
It is recommended that a means, by which the remote start-up can be blocked, for example using a manual isolator, is implemented. This will enable remote access for diagnosis and visualisation purposes but prevents remote starting of the system when personnel are working on the equipment.

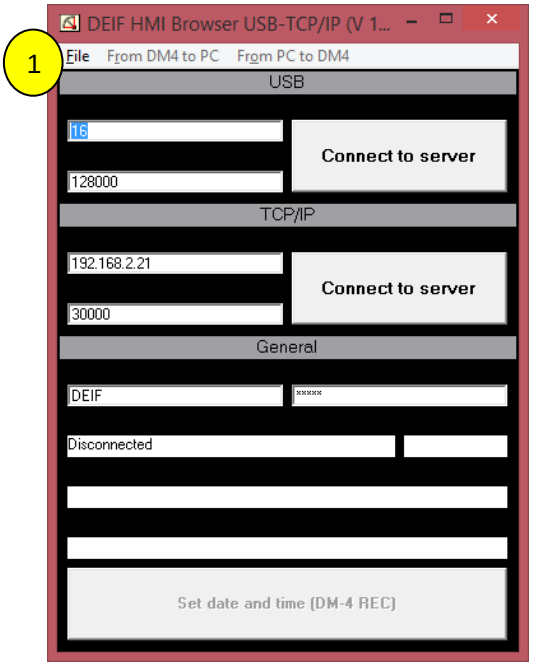
Once the HMI browser software has been loaded onto the HMI, this should be opened whilst the HMI interface has a connection to the DM 400 controller.

First steps

The HMI browser is started up by double-clicking the desktop icon.

Start-up window of the HMI browser will open.

Start-up window of the HMI browser:



Setup

The start-up window appears and before proceeding, it is recommended to set up the HMI display parameters.

Using the "**File"** menu option 1

It is possible to set the desired values for the HMI screen saver action time with the following options:

- Off
- 5 min
- 15 min – Recommended selection
- 30 min

The second option from the "**File"** menu is "Update Speed". It is possible to set the desired values for the HMI update speed with the following options:

- Normal
- Fast – Recommended selection

The final option in the "**File"** menu is "**Exit"**. This terminates the connection to the DM 400 and closes the HMI browser.

Connection to DM 400

The DM 400 can be connected using the TCP/IP option ONLY.

By pressing the corresponding "Connect to server" button, the operating window of the browser is shown. The user is then prompted to select the operating language for the system.
Once this has been selected, the overview page appears as shown on the following page.

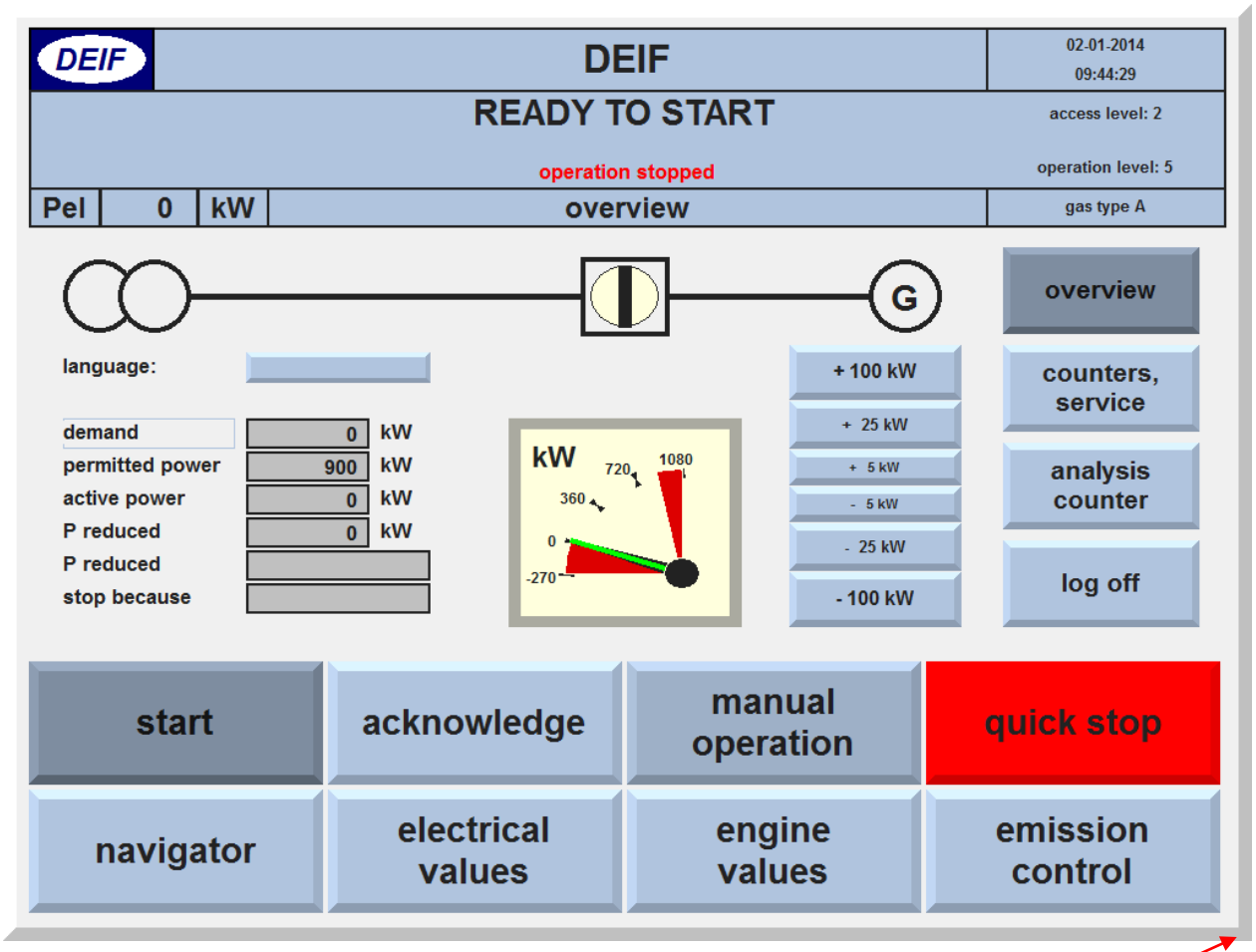
Set date and time

The date and time of the controller are set using the corresponding button of the HMI browser (in the start-up window) and has effect as soon as a connection has been established.
The system time should not be switched for daylight saving time, because the entries in the log are recorded based on time.
The transfer of the log books is based on a time comparison which only requests entries which are newer than the already queried entries.

The mechanism has the effect of only transmitting the entries which have not been saved on the PC yet.

Caution! Resetting the time can result in the loss of entries.

DM 400 overview page



Show or hide window frame

By clicking the bottom right corner of the operating window, the window frame is shown or hidden. When the window frame is switched off, the height of the window is adapted to the currently adjusted width so that the correct height/width ratio is provided.

6. User interface

The overview pages provide a quick glance at the current status of the plant.

Along with the function buttons, they also enable the direct selection of the most important pages and thus enable an effective operation of the plant.

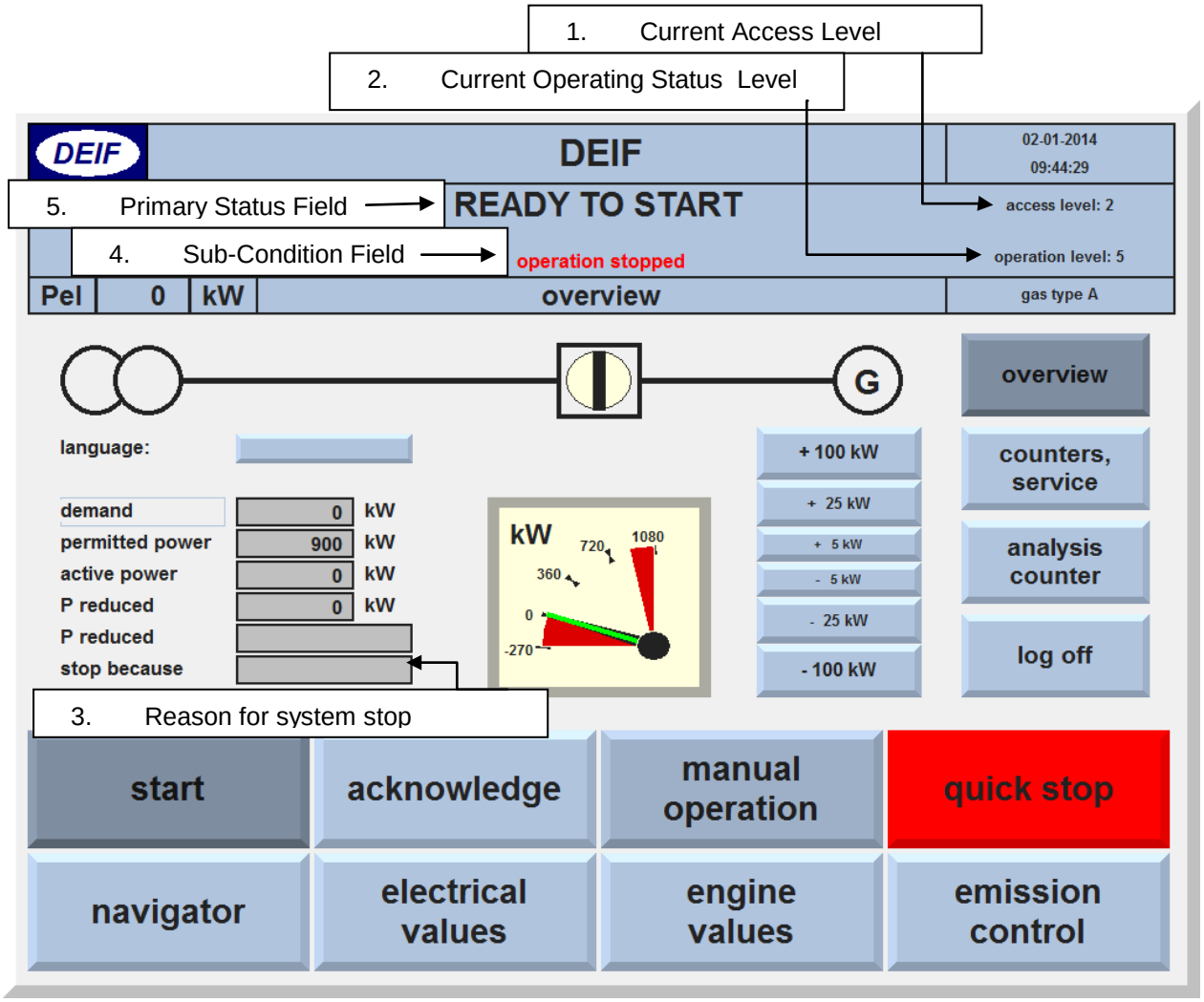
The pages are grouped thematically and can be quickly and easily reached through the menu guide or through a central 

button.

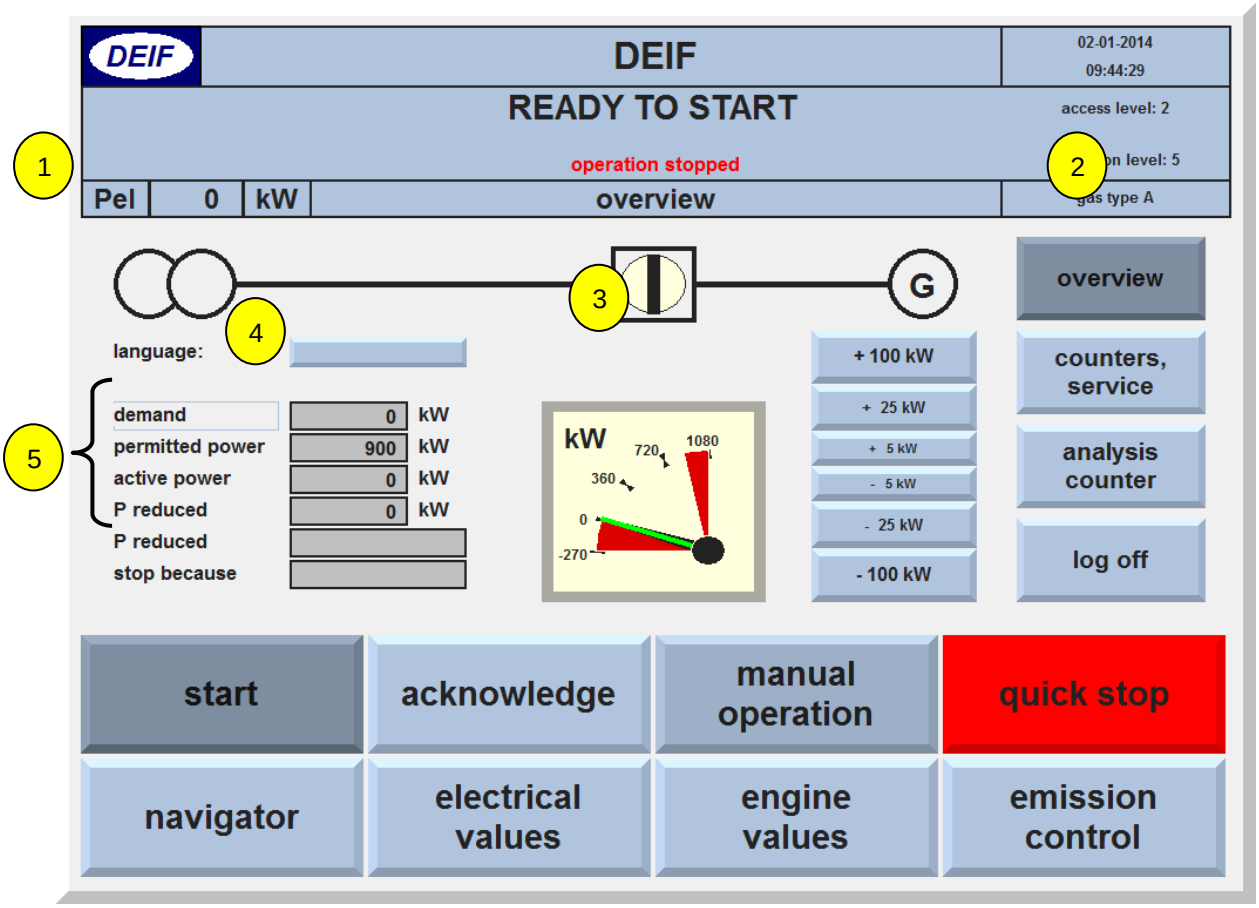
Please remember, that all push-button texts indicate the action that will be taken by pressing the button.
For example, if the button text shows "manual operation", this indicates that the system is currently in AUTOMATIC OPERATION mode, and by pressing this button, the operator will change the operating mode to MANUAL OPERATION.

Overview page

From the overview page, it is possible to see the status of the overall system quickly, and this information will be described in the following pages.

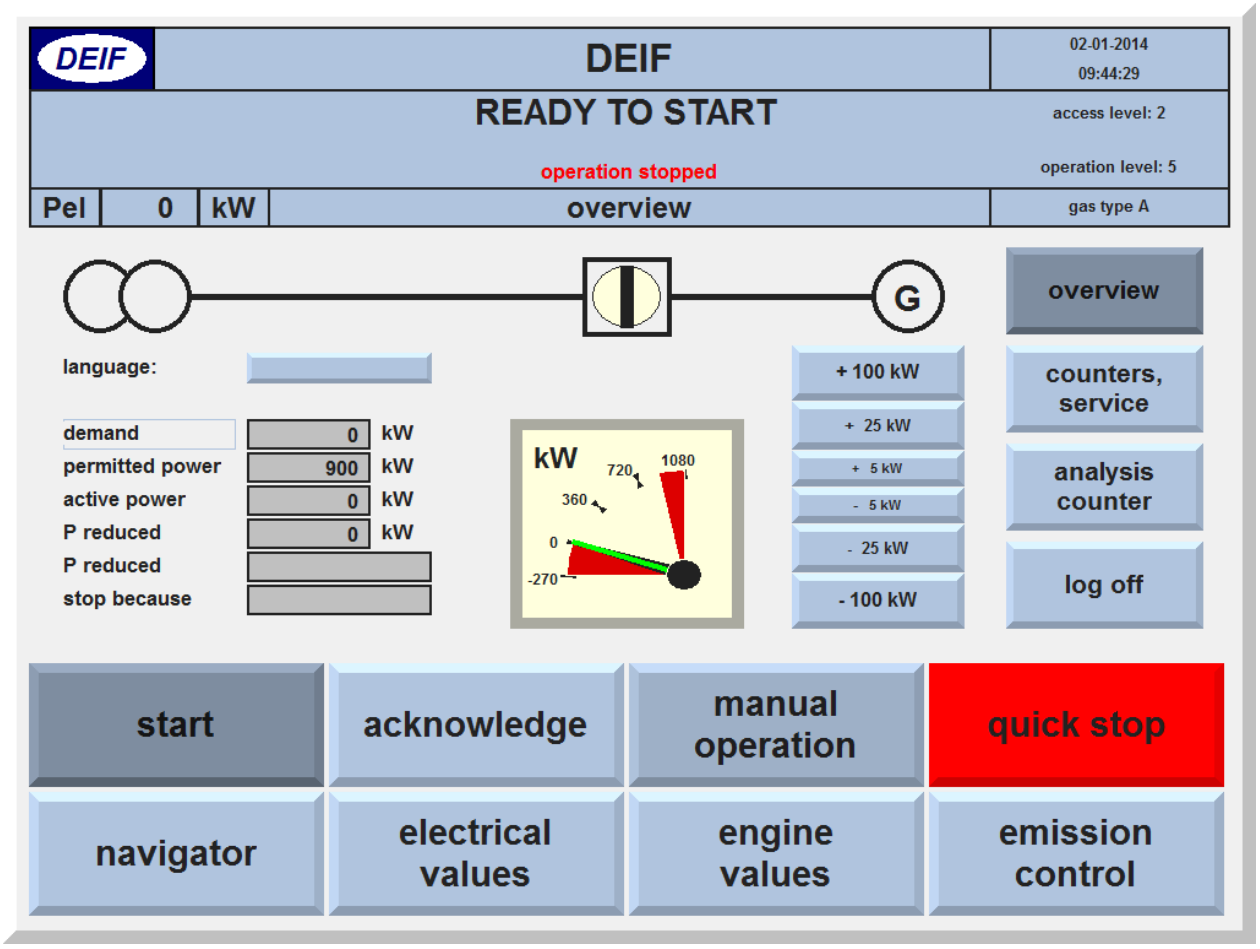


1. The "Primary Status Field" is shown at all times on all pages and has the same layout on each page. It provides an overview of the status of the overall system. See section 7.0 of this document for a list of the primary status options.
2. The "Sub-Condition Field" is also repeated on each page. See section 7.0 of this document for a list of the sub-condition status options.
3. The "Access Level Field" indicates the present access level based on the password entered.
4. The "Current Operating Status Level Field" indicates the current operating condition of the system. See section 7.0 of this document for a list of the operating status options.
5. The "Reason for system stop field" indicates what has caused the system to stop under a normal stop condition. If this condition is removed, this fault will auto-acknowledge, and the system will either attempt to restart or the next condition with an auto-acknowledge designation that is preventing a start attempt will appear.



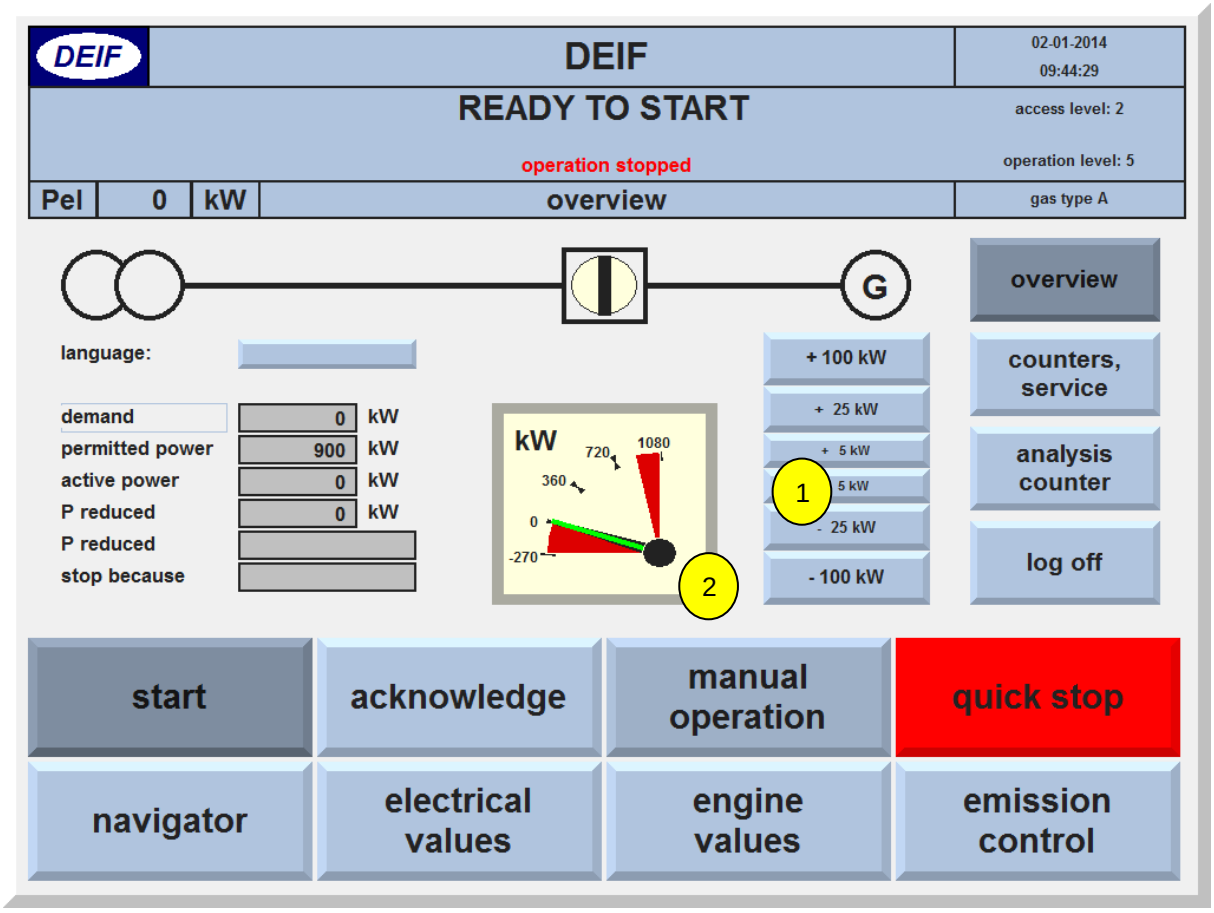
The information highlighted provides the following data:

1. Electrical power (kW) currently being generated.
2. The gas supply for the system (can be more than one possible gas supply)
3. An overview of the system connection configuration and breaker status.
4. The current operating language of the system. By clicking this button, it is possible to change the operating language to another from a list of options that will appear.
5. Power information providing values for:
   a. Demand (kW): the power value demanded by the operator or external power control set point request for the system. Indicated by the GREEN line on the moving pointer display.
   b. Permitted power (kW): the maximum power possible for the system to generate based on the status of the overall conditions of the system.
   c. Active power (kW): the instantaneous power value measured by the system.
   d. P reduced (kW): the amount by which the permitted power has been automatically reduced by the DM 400 due to the current operating conditions. The difference between the demand power and the permitted power values.
   e. P reduced – this is a text message indicating which parameter is requesting the reduction in output power. If this condition is removed, this message will disappear and the system will attempt to return to the demand power value or the next condition with an auto-acknowledge designation that is preventing operation at the demand power value will appear in this space.



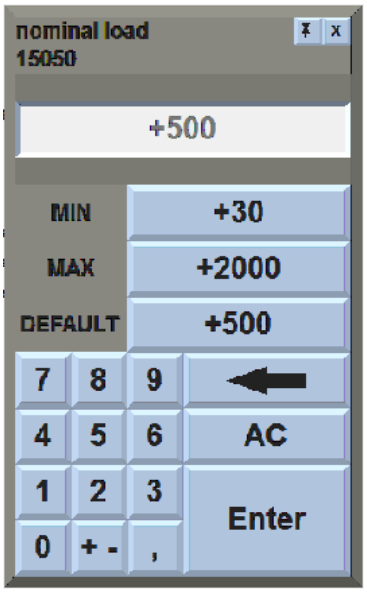
The following control functions can be selected by using the buttons on the overview page:

- Start/stop — Starts and stops the system using the normal procedures (including power down ramp and engine cool down and so on).
- Acknowledge — Acknowledgement of all pending alarms.
- Automatic/manual operation — Switch between manual and automatic operating mode. It is necessary to be in manual mode to enable the test pages.
- Quick stop — Fast shutdown on the system opens the generator circuit breaker and then stops the engine. Auxiliary systems continue to run and enter into their normal shutdown procedure. The "quick stop" button can be hidden with the selection of the appropriate parameter.
- Navigator — Go to navigator page 22
- Electrical values — Go to the electrical measurements page 36
- Engine values — Go to the engine (and ignition) pages 48
- Emission control — Go to the emission control setup pages 43



The information highlighted provides the following data:

1. The values of these buttons are fixed within the software and they increase or decrease the demand power value by the amount selected. This operation is limited to the maximum power rating of the system. The actual active power value will be limited by the permitted power value.
2. By clicking the moving pointer gauge another window opens which enables the demand power to be set at other values as shown in the typical example below (as each system is individual and so the MIN/MAX values may vary) :



The keypad which appears states the parameter name (in this case "Demanded Load" (kW)) and the parameter number, which will be set when the ENTER button is pressed.

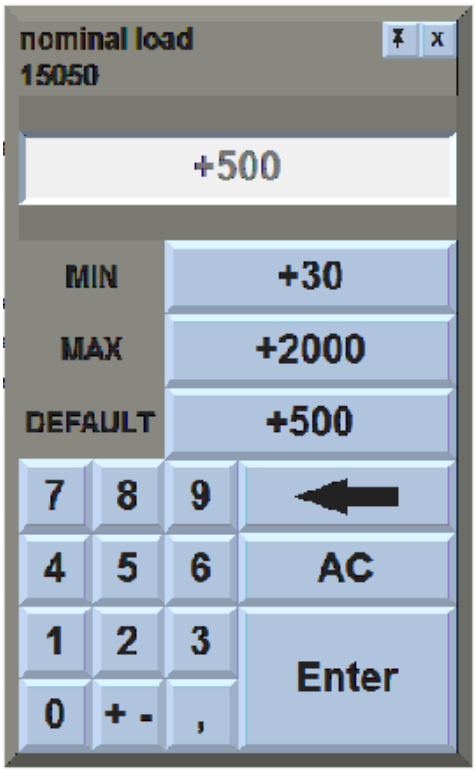
There are three "quick keys":

- MIN: the minimum allowable value
- MAX: the maximum allowable value
- DEFAULT: the system default value.

By pressing one of these "quick keys"' and selecting ENTER, the parameter is then set to this value.

Alternatively, the screen pointer can be used to enter the numerical value required and the parameter is set by pressing ENTER.

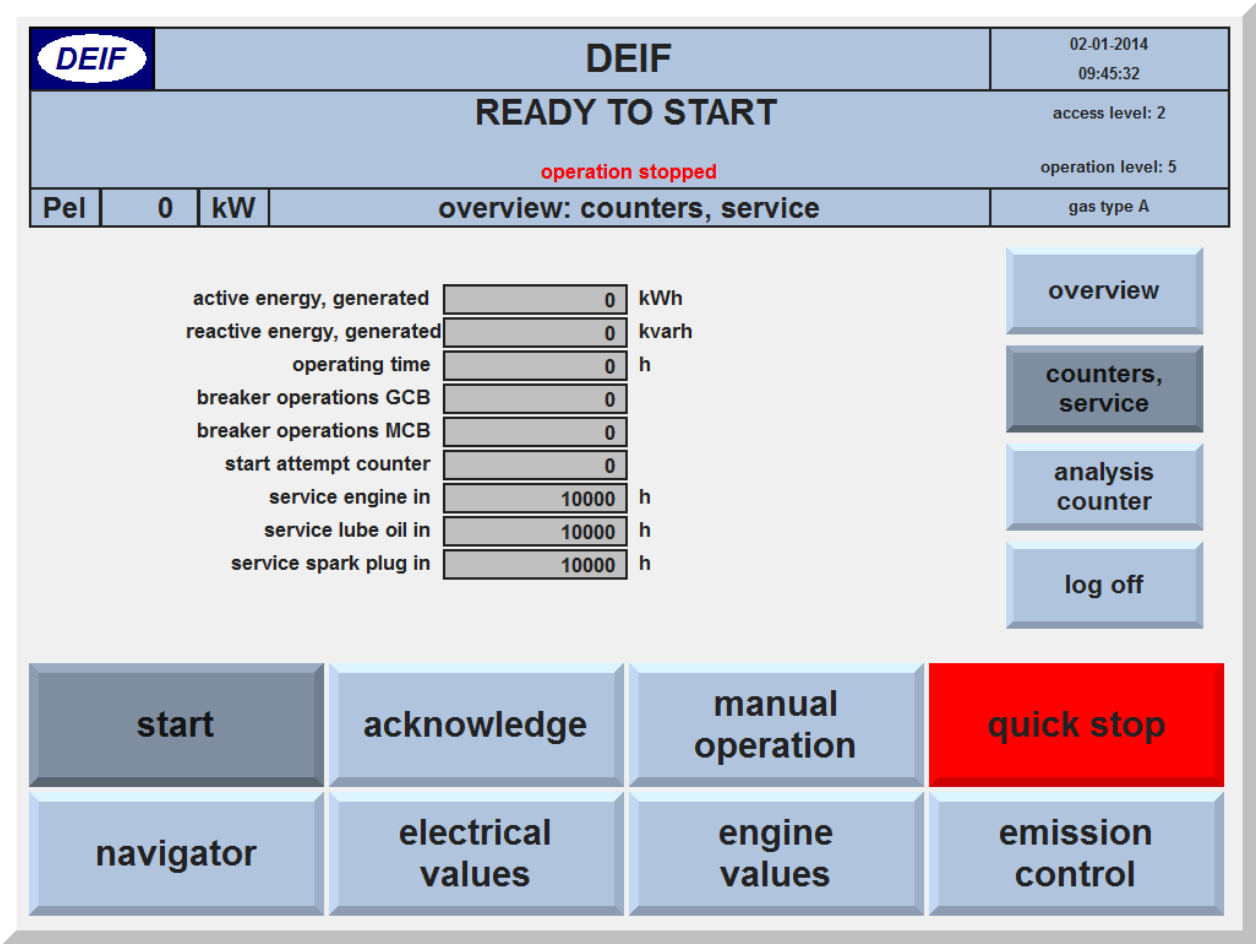
Parameter editor



- As a basic rule, only values within the range from MIN to MAX are permitted
- The first press of a key after opening the parameters editor releases the input field
- The leading symbol is always shown (+ or -)
- The comma displayed on the keypad represents the decimal point and can only be entered once, and only if the parameter to be changed has at least one decimal position (see display of the parameter on the page)
- No more than the permissible number of decimal places may be entered
- The DEFAULT value is the value to which the parameter is set if the factory setting is activated
- If a value outside of the permissible range (< MIN or > MAX) is entered, the MAX or MIN value is displayed when Enter is pressed. This can - if desired - be accepted with an additional press of Enter.
- To exit the parameters editor without changes, it can be closed with *x*.
- With the pin  it is possible to pin the parameter editor on top of the display.
  In other words, it is possible to enter a value without having to close the parameter editor. This function is useful in cases where a parameter must be determined through experimentation. When the editor is pinned on top, it can only be closed with *x*.
- All parameter changes are logged and can be viewed in the parameter changes log book (in each case with the old and new value displayed).

Counter, service page

The counters, service page is displayed if the "counters, service" button on the overview page is selected.



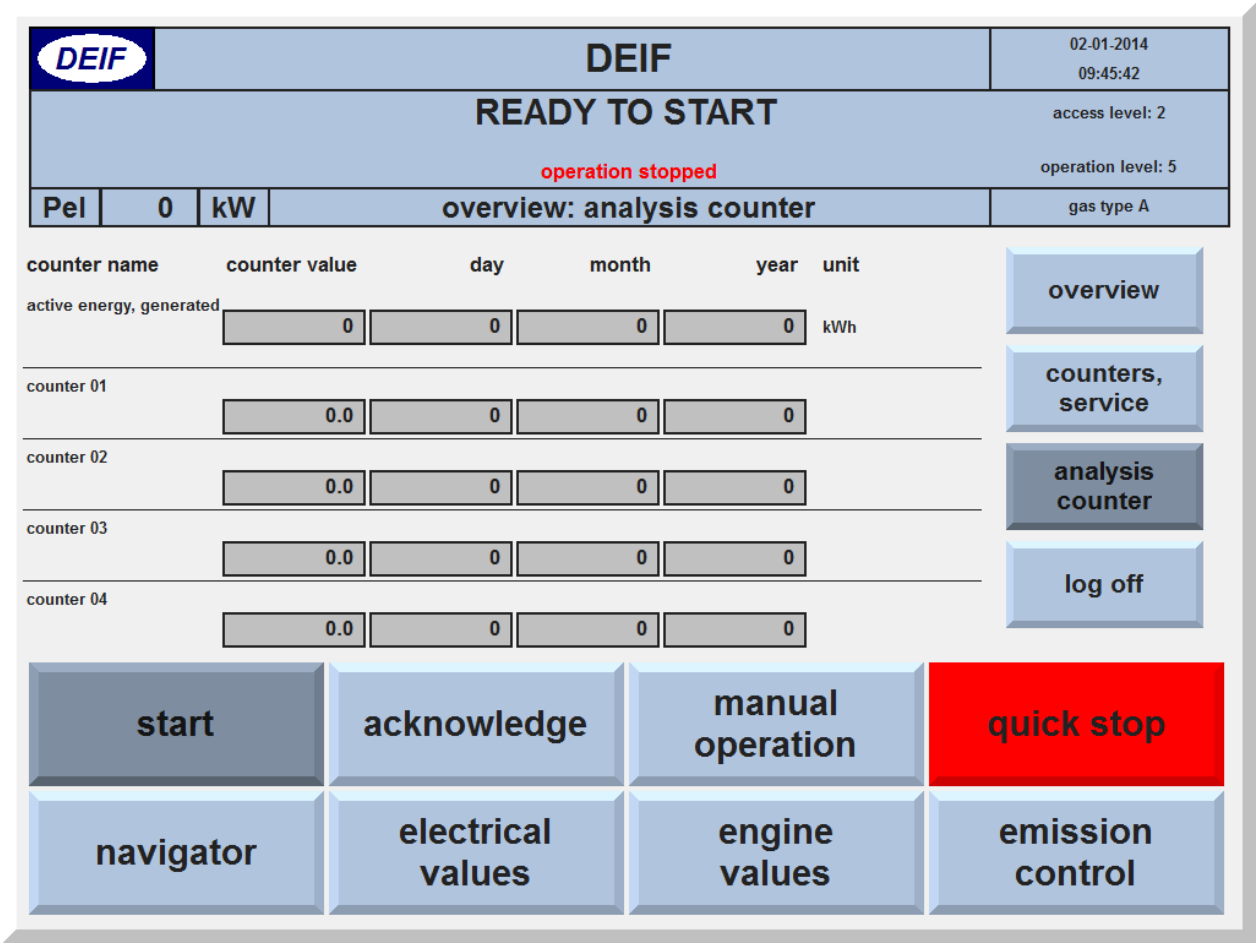
This page provides an overview of the standard system counters which are:

- Total active power generated (kWh)
- Total reactive power generated (kvarh)
- Operating time (running hours)
- The total number of operations for the Generator Circuit Breaker (GCB)
- The total number of operations for the Mains Circuit Breaker (MCB)
- The total number of start attempts that the system has made
- Countdown timer indicating the number of hours before the next engine service is scheduled
- Countdown timer indicating the number of hours before the next lube oil service is scheduled
- Countdown timer indicating the number of hours before the next spark plug service is scheduled

Each of these three service countdown timers can be reset after the completion of maintenance work through maintenance counter option on the parameters page.

Analysis counter page

The analysis counter page is displayed if the "analysis counter" button is selected either from the overview page or from the "counters, service" page.



In this page, the counters for the generated active energy and the configurable counters are displayed.

For each of these counters, in addition to the current counter status, the respective counter values

- for the current day
- for the current month and
- for the current year

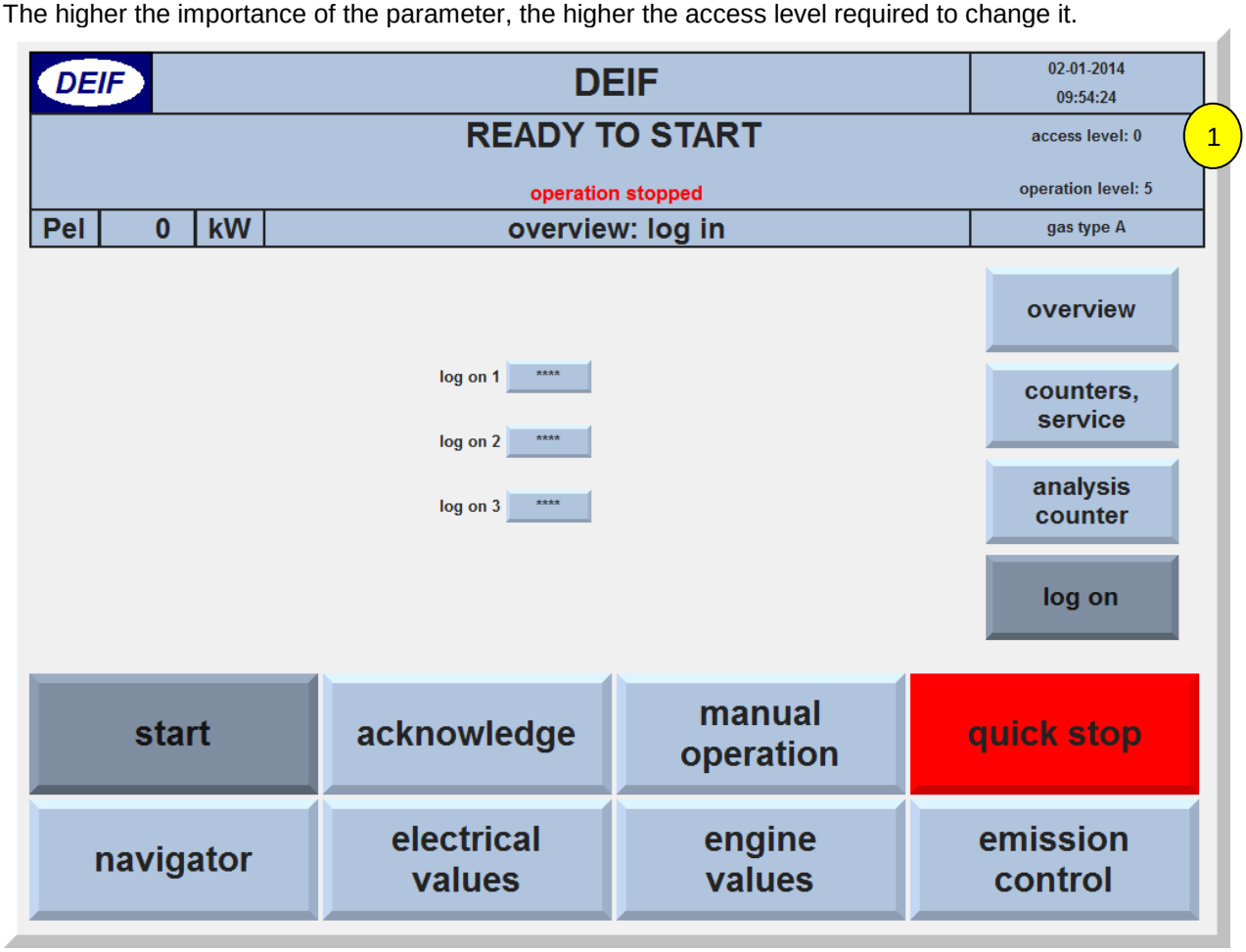
are shown.

Log in page

The log in page is displayed if the "log on" button is selected from any of the overview, counters, service or analysis counter pages. It is also possible to access the log in page by clicking the logo in the top left corner of the display.

The ability to change the system settings is depending on the current access level highlighted on the diagram by 1

If someone is already logged in, the current permission level will be higher than 0.
The higher the importance of the parameter, the higher the access level required to change it.



To log on to access level 1 (also known as operator) or access level 2 (also known as service), the corresponding button should be selected using the on-screen pointer, and the appropriate password should be entered using the keypad which appears.

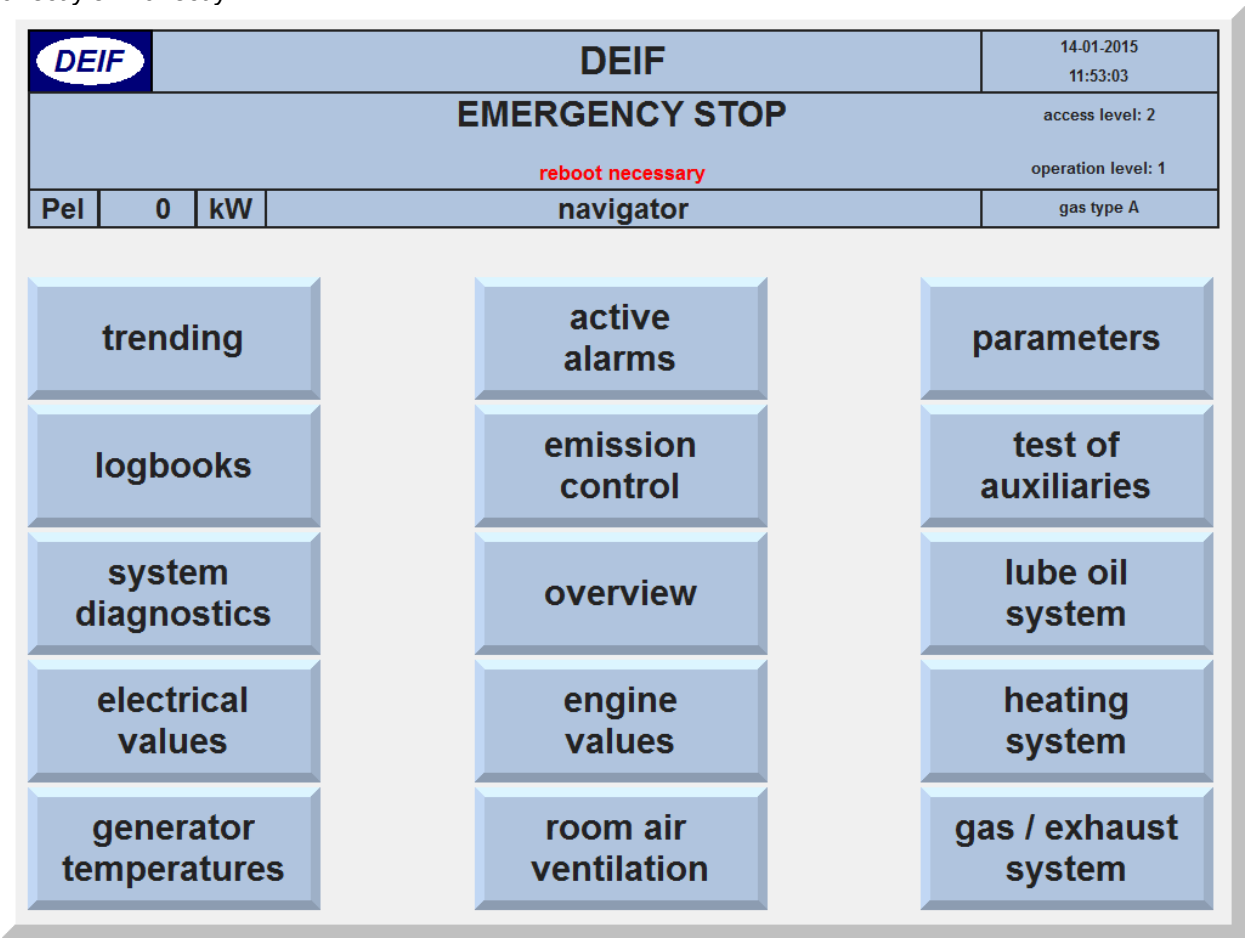
Passwords can be set via the parameters page, see section on page 74, and these should be recorded and kept in a safe please.
Log on level 3 is reserved for DEIF personnel only and cannot be changed.

The operator is automatically logged off after 30 minutes of time without operation.

Please remember, that all push-button text indicate the action that will be taken by pressing the button.
For example, if the button text shows log on, this indicates that the operator is currently in logged off and vice versa.

Navigator page

From the navigator page, it is possible to access all pages of the DM 400 software, either directly or indirectly.



Pressing the buttons on the navigator page opens the pages within the software that are connected to this theme.

Trending

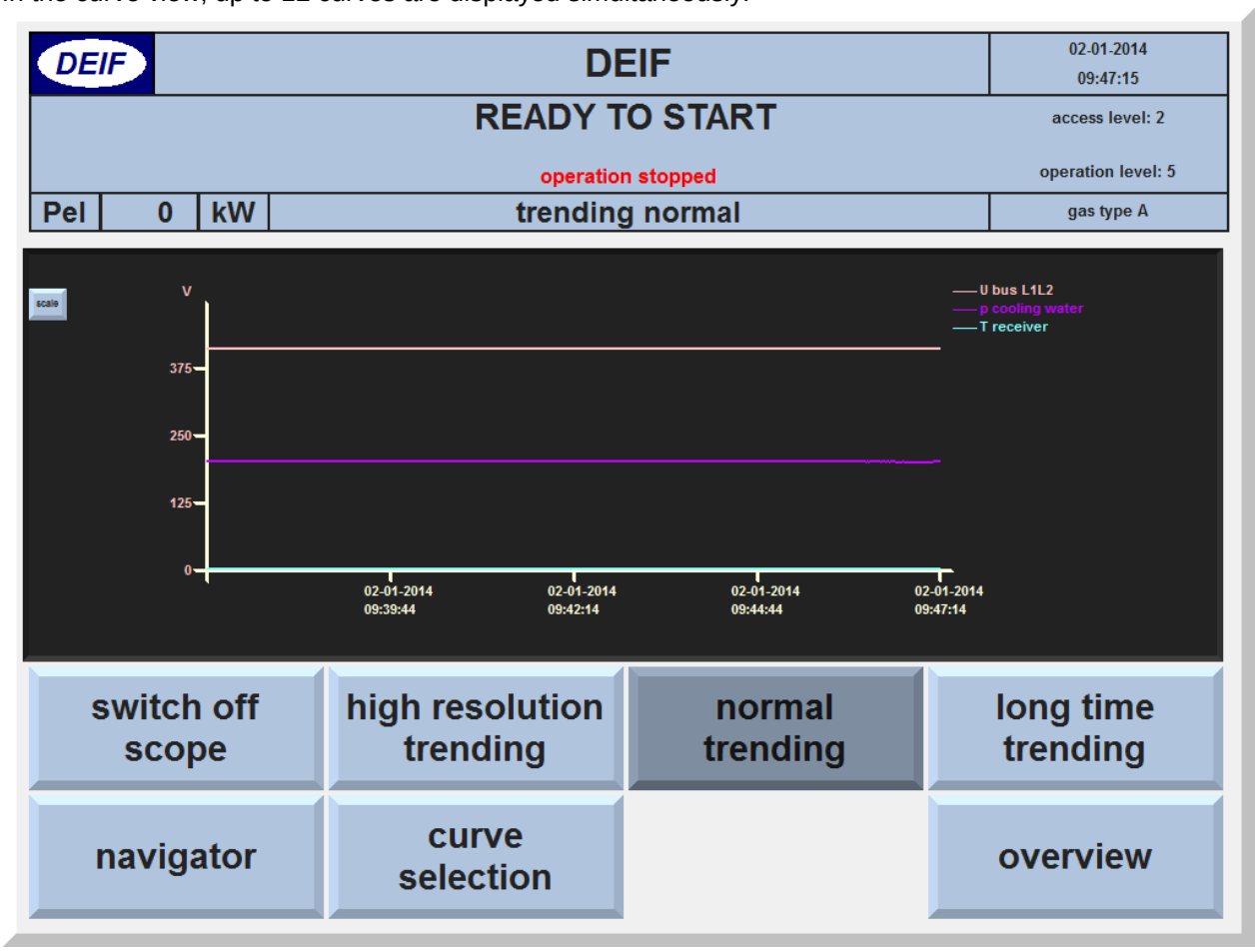
Trending information can be accessed via the "trending" button on the navigator page.
The trending functionality is a very useful aid for the effective analysis of the process history.
There is a choice of high-resolution, normal and long-term trending.
Trending is activated through the "switch on scope" button.
For each resolution, the values for 600 points in time are saved in a buffer on the DM 400.

Time interval of the trending data capture:

Trending type	Time interval of recording	Time interval of trending display (x axis)	Data automatically saved PC
High-resolution	40 msec	24 sec	No
Normal	1 sec	10 min	No
Long time	4 min	40 h	Yes

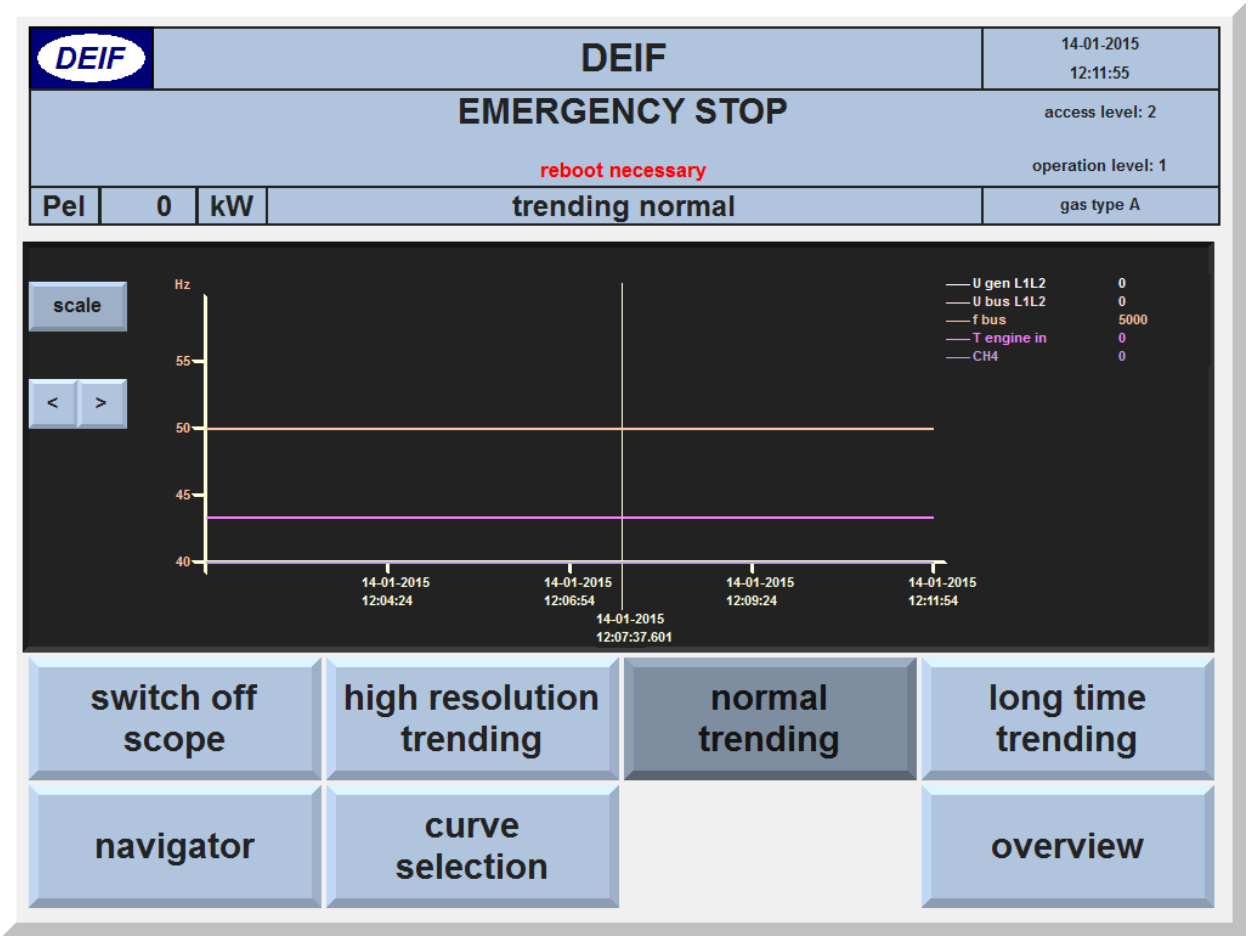
During long time trending, all data captured is written to the memory of any PC that is connected to the DM 400.

In the curve view, up to 12 curves are displayed simultaneously:



The "scale" button to the left of the vertical axis scrolls through the axis labels and units for each of the displayed curves in turn.
With the "switch off scope" button, the recording of the values is stopped and the display is not updated, so that data can be analysed conveniently.

Trending – measuring points on the display



Clicking the display pointer on the trending display brings up a measuring point, and the values for the parameters that have been selected are displayed for this measuring point.
The measuring point can me moved either by clicking at another position within the display or by using the arrow buttons  .

Trending – saving of data

The saving of data to the PC HMI hard drive is automatic under long time trending conditions.

The saving of 600 sets of data under high resolution or normal trending conditions (every 4 ms and 1 s respectively) would cause the PC HMI memory space to become full very quickly and this is not an automatic function. This can be done manually, and it is described in the HMI browser for PC application notes which is available for download from the DEIF website on www.deif.com.

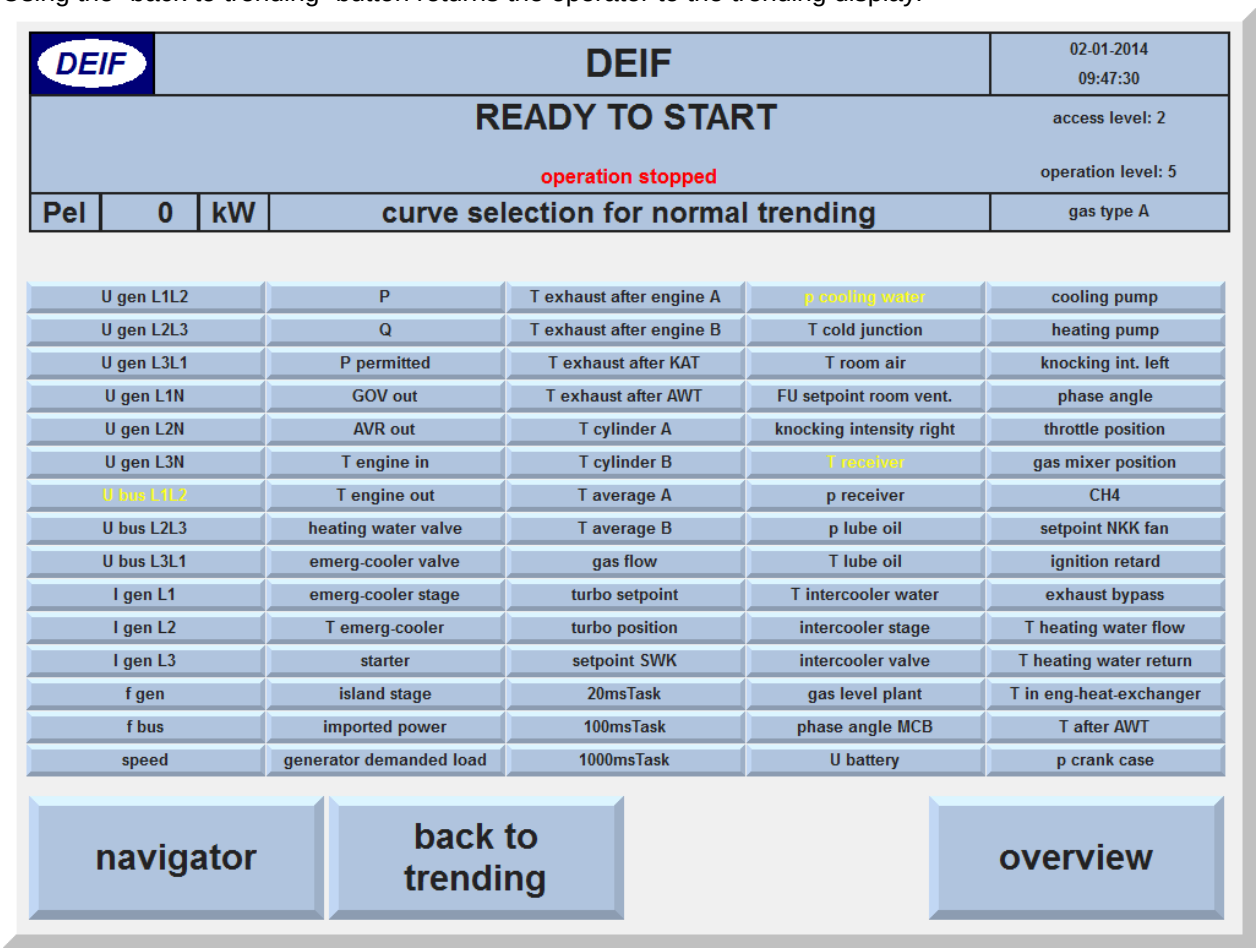
It is recommended as part of the routine maintenance program, that the data saved in the PC HMI memory space is regularly copied and removed from the PC HMI memory and stored in a safe location.

Curve selection

With the curve selection page, it is possible for the operator to select and deselect the data points to be represented as curves on the trending display by clicking the required parameters listed on the display.

Up to a maximum of 12 trending curves can be selected for display.
Parameters that have been selected are highlighted in yellow.

Using the "back to trending" button returns the operator to the trending display.



Regardless of which parameters have been selected for display, all of the values listed are recorded while scope is running.

Log books

The DM 400 log books are accessible via the navigator page.

The following events are recorded in the log books as the abbreviations shown:

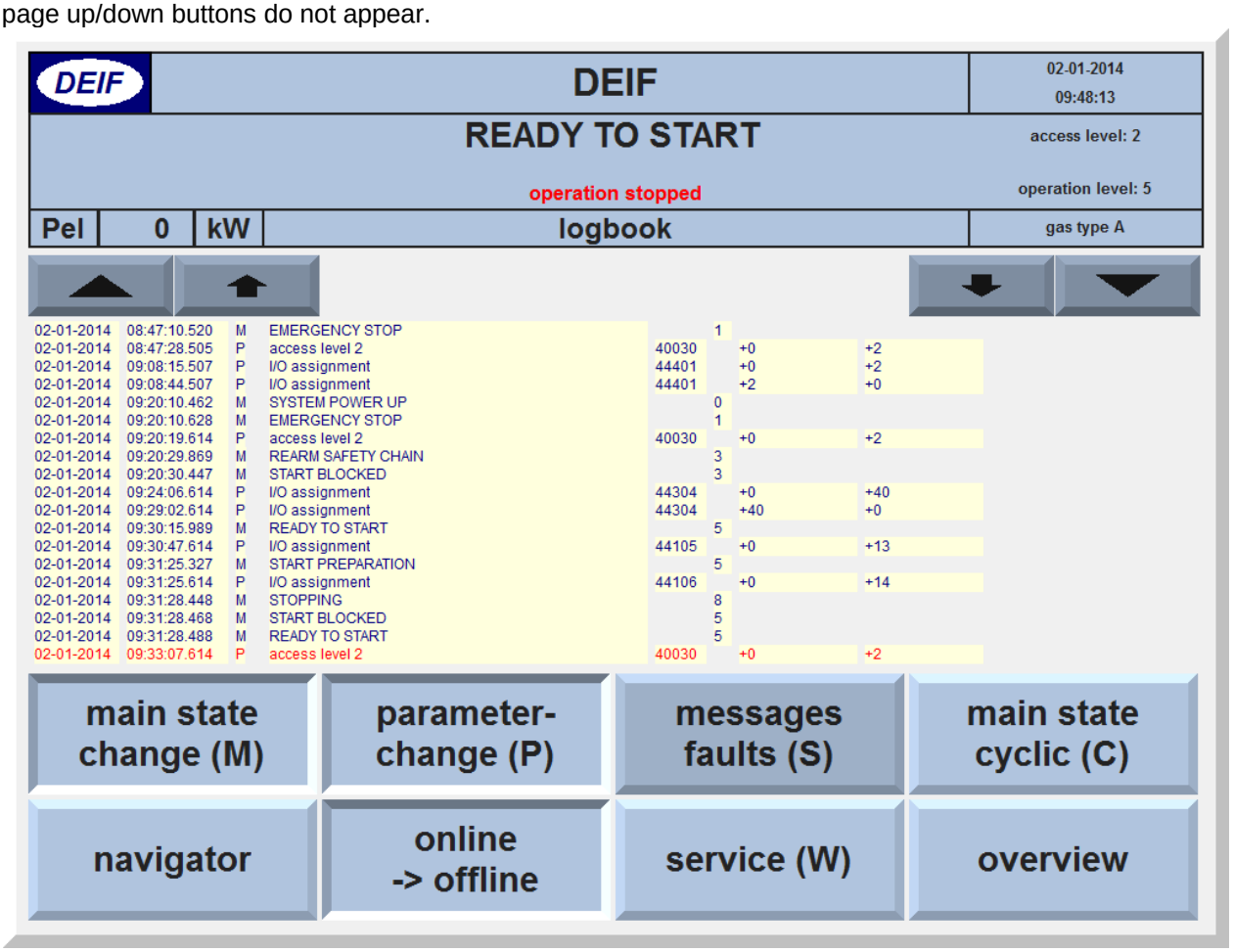
- M: status change - an event where the primary status condition changes
- P: parameter change - an event where a parameter value has been changed
- S: messages/faults - an event where an error or fault message has been displayed
- C: cyclical statuses - a cyclic, scheduled log of certain data values
- W: service - log of service calls and an indication once these have been completed

Individual or multiple log books can be selected by selecting or deselecting the corresponding buttons on the logbook page. The entries are shown sorted chronologically.

In online mode, the most current data is always shown, with the latest entry at the bottom.
In offline mode ("offline ->online" button is not pressed), it is possible to trace events in the past.

When the log books are offline, it is possible to scroll the data using the buttons.

When the page up/down buttons are selected  , one line of text is always retained from the previous page.
Up to 19 lines of data can be viewed on one page. If there are less than 19 lines of data, the page up/down buttons do not appear.



Main State change (M)

The selection of "main state change (M")) displays an event where the primary status condition has changed.

The information is displayed in the format of: **Date, Time, Event Type (M), Status, and Stop Level**

Number of entries: 250

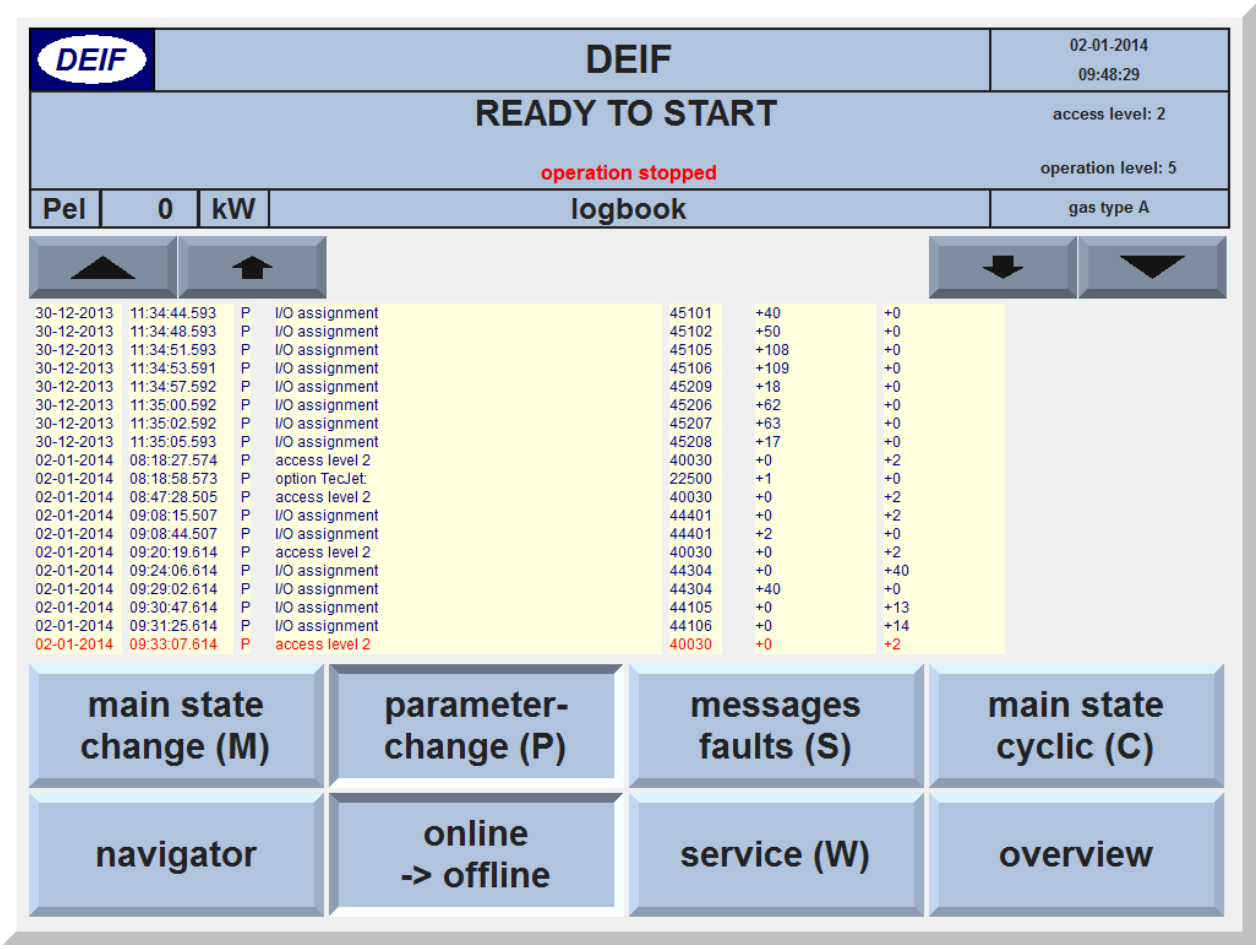
Parameter change (P)

Each change of a parameter is saved, and the history of these changes can be viewed with this button.
The information is displayed in the format of: **date, time, event type (P), parameter text, parameter number, old value and new value**

The parameter number is logged, and is also shown in the parameter editor. Since the number is unique, mix-ups are avoided, even if a familiar language is not selected. Both the old and the most recently set value for this parameter are logged.

Specifics:
The logins are also saved in this log book (operator login, service login, master login). The valid access level before and after the login is recorded here.

Number of entries: 250



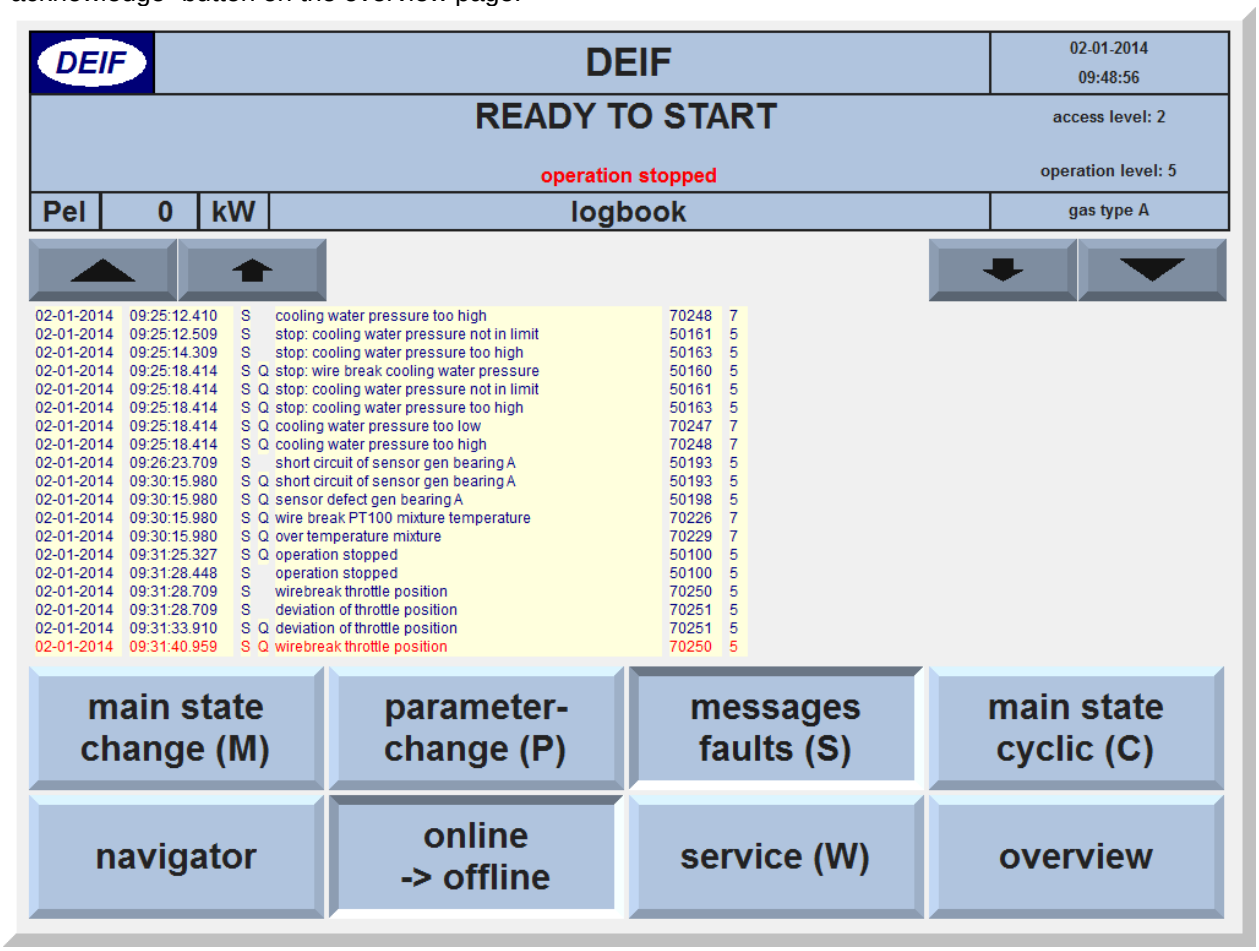
Messages faults (S)

For messages faults (error messages), there is an entry for each when the event occurs (S) and when it is acknowledged (Q)

The information is displayed in the format of: **date, time, event type [S], message acknowledged [Q], message text, message number, stop level**

Number of entries: 250

Note: all currently pending messages can be shown through the "active alarms" page from the navigator and can be acknowledged there, if necessary.
A general acknowledge function for all active fault conditions can also be completed via the "acknowledge" button on the overview page.

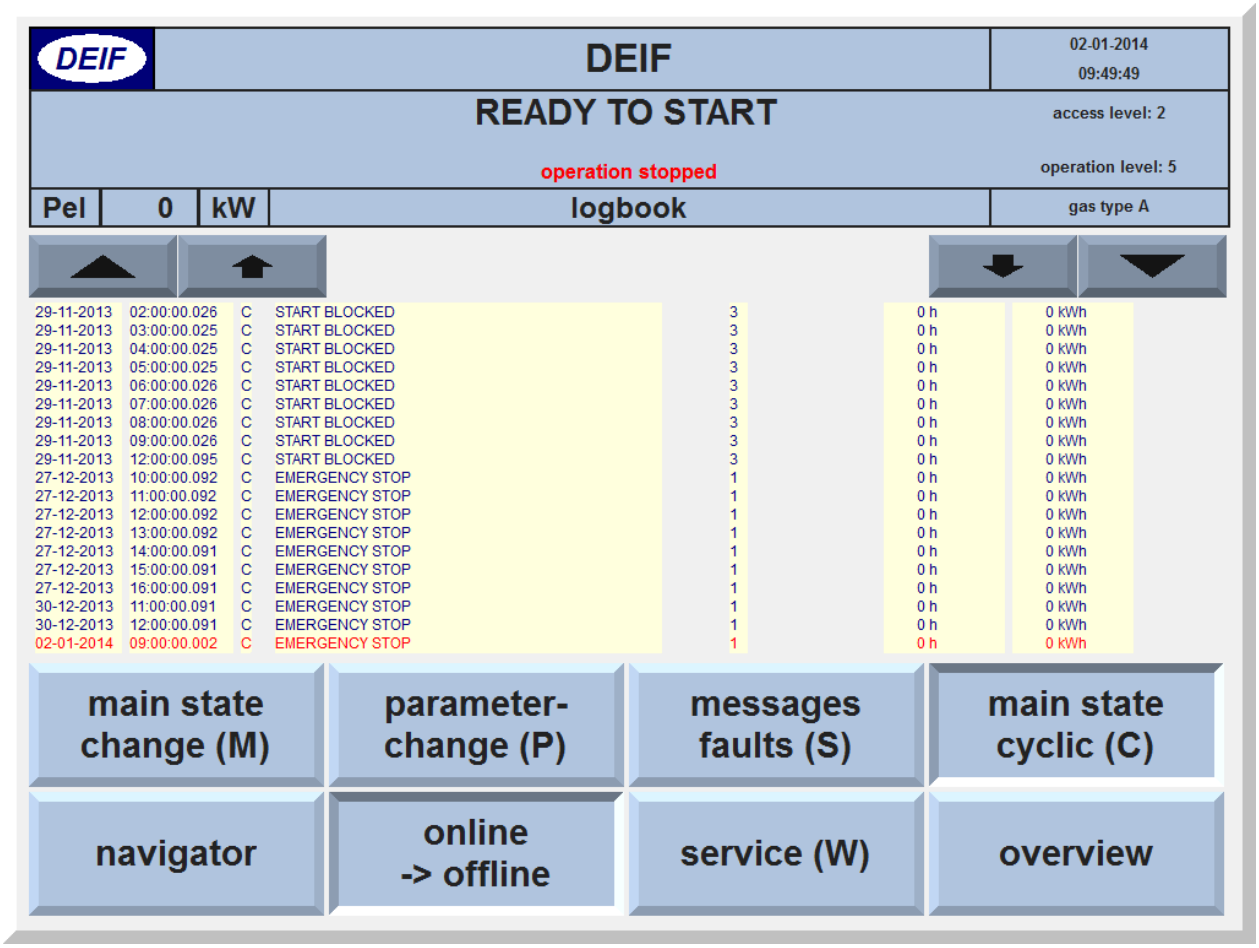


Main state Cyclic (C)

This page displays the log in which the primary status of the system, the operating hours and the generated energy are recorded each full hour.

The information is displayed in the format of: **date, time, log book type (C), primary status, stop level, operating hours, generated kWh**

Number of entries: 250



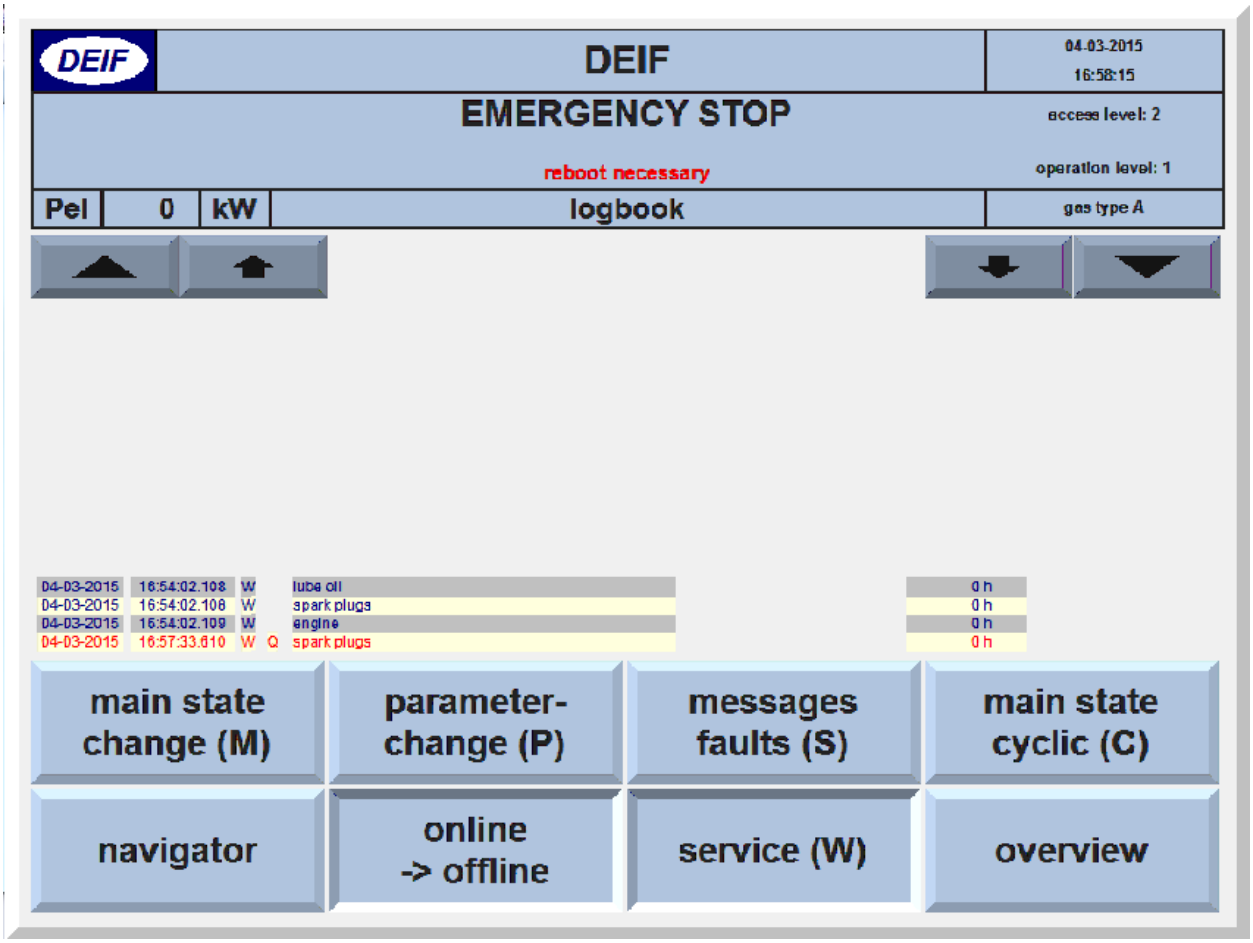
The main state cyclic log book is intended for use in the support of the production of periodic reports to analyse the efficiencies of the system.

Service (W)

In the service log book, the service due events and their acknowledgements are saved with a time stamp.
The resetting of the maintenance counter is treated as an acknowledgement. An acknowledgement entry is identified with a "Q".

The information is displayed in the format of: **date, time, event type [W] and acknowledgement [Q], maintenance event text, operating hours**

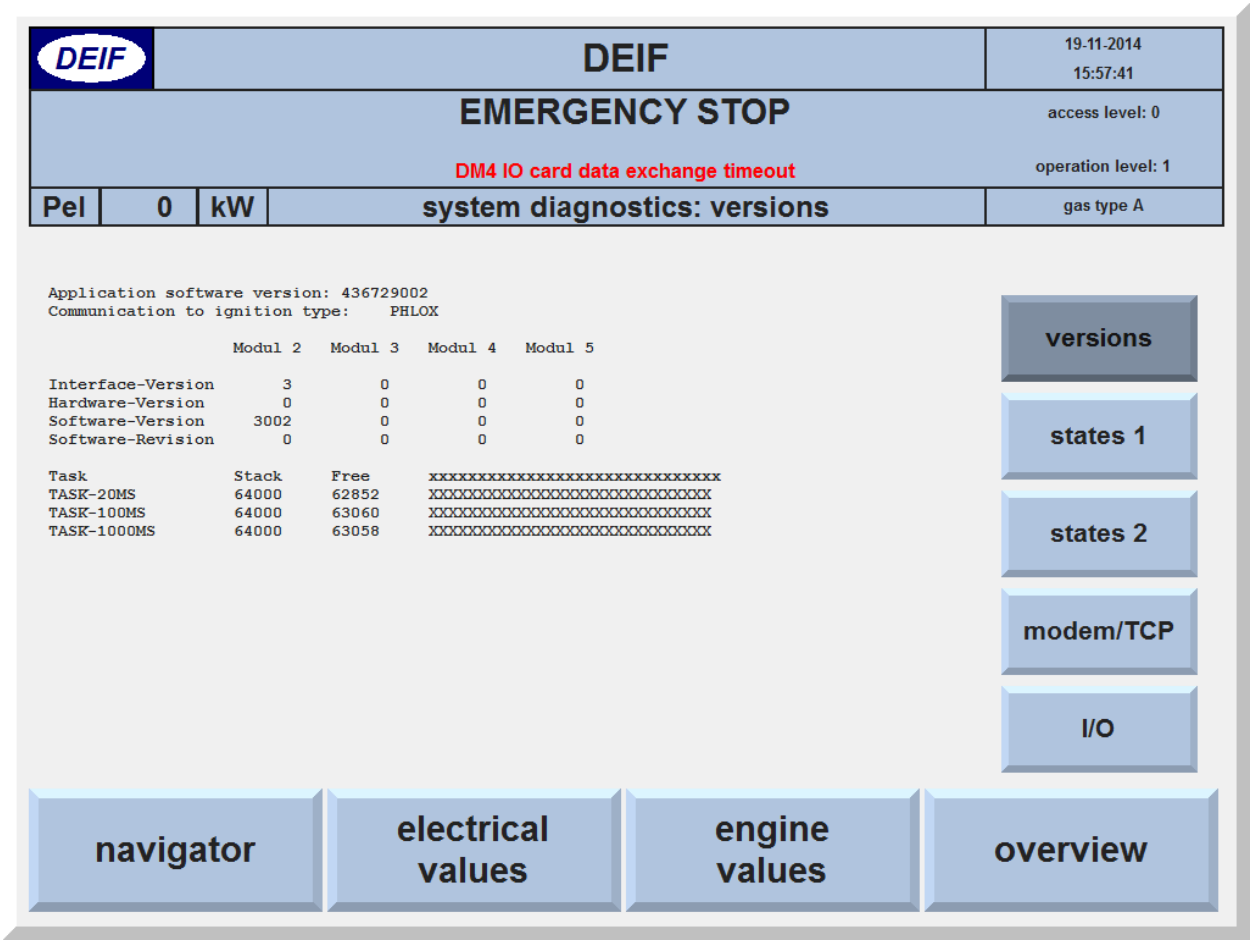
Number of entries: 200

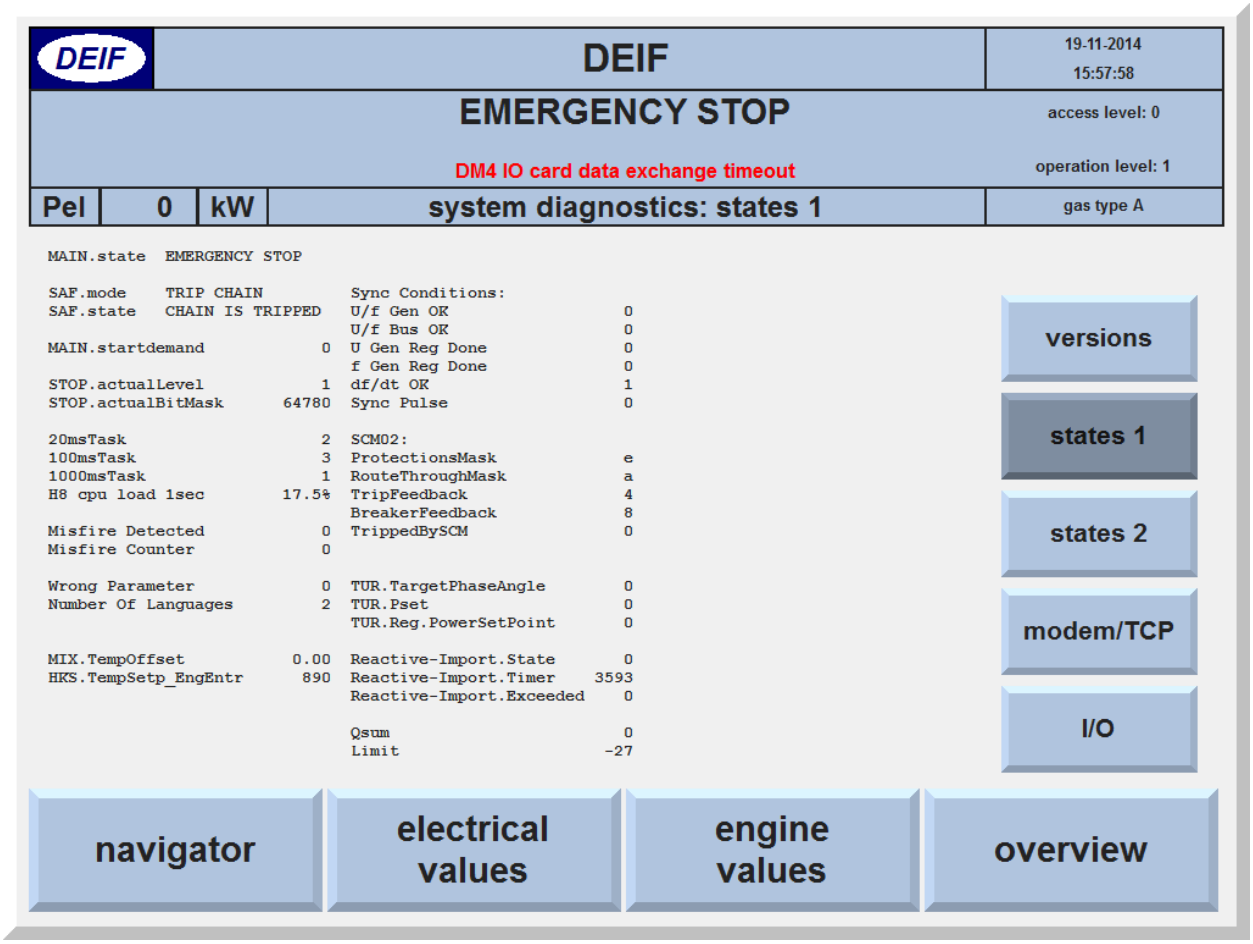


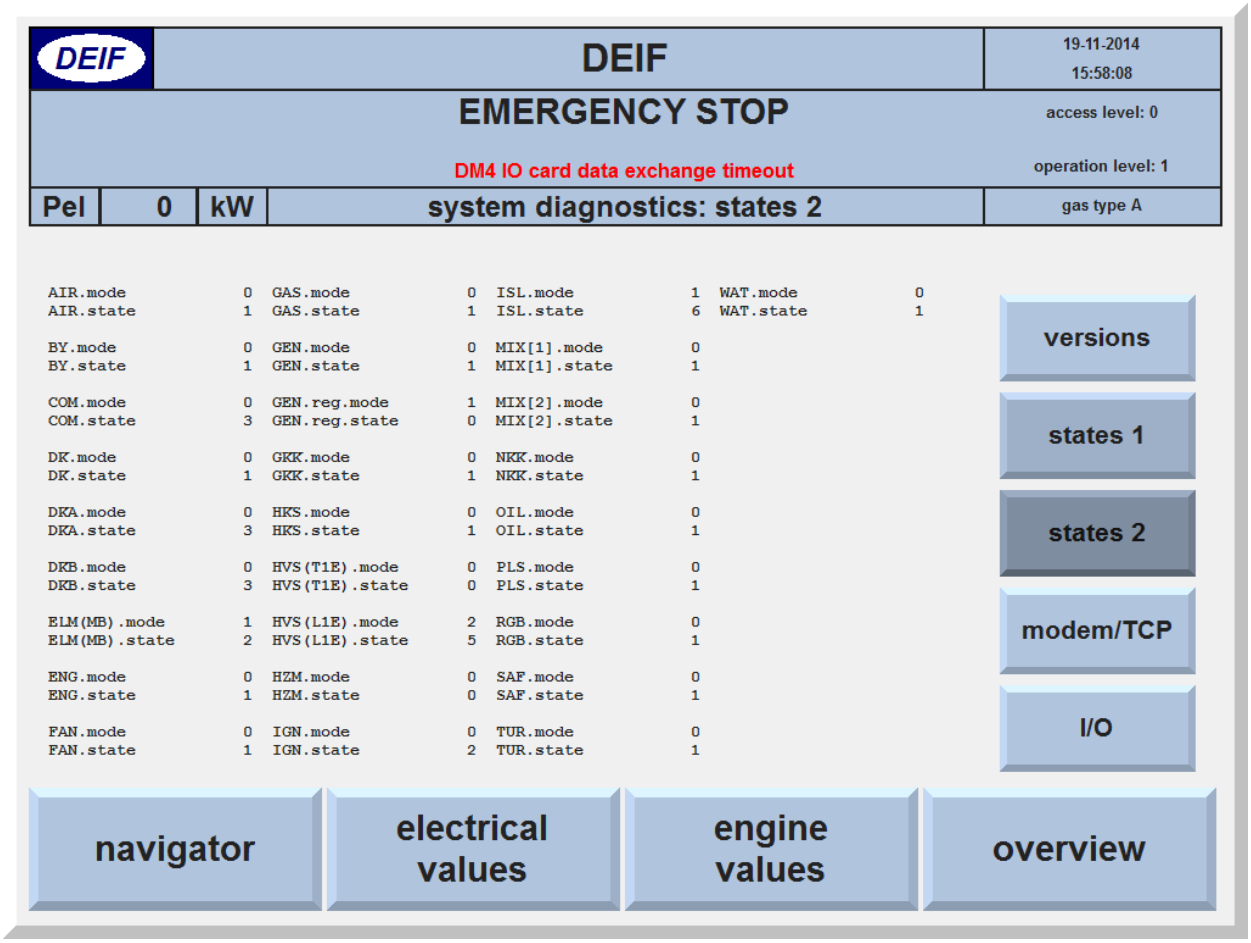
System diagnostics pages

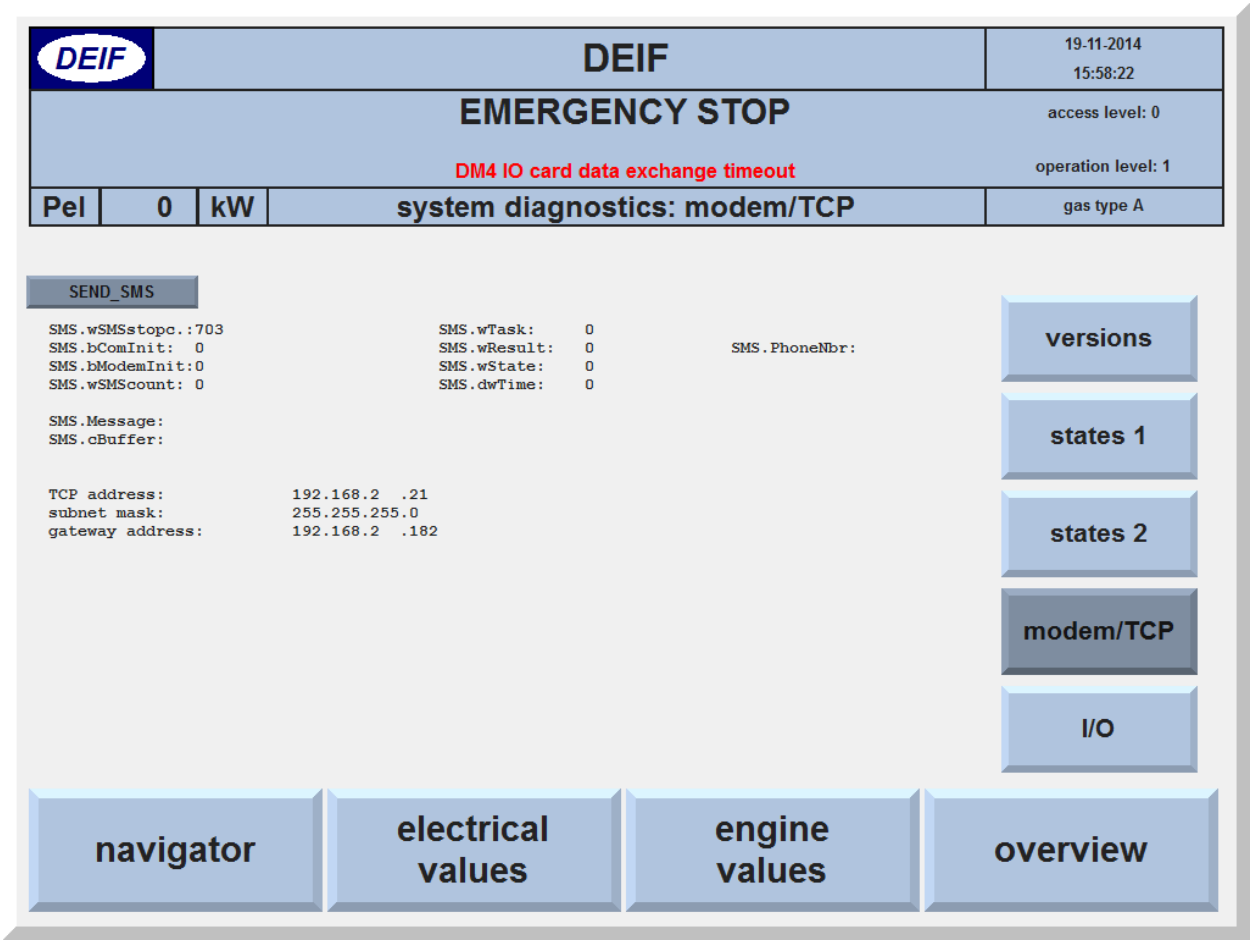
The system diagnostics pages contain information relating to the system configuration, software versions and real time status of the DM 400 system.

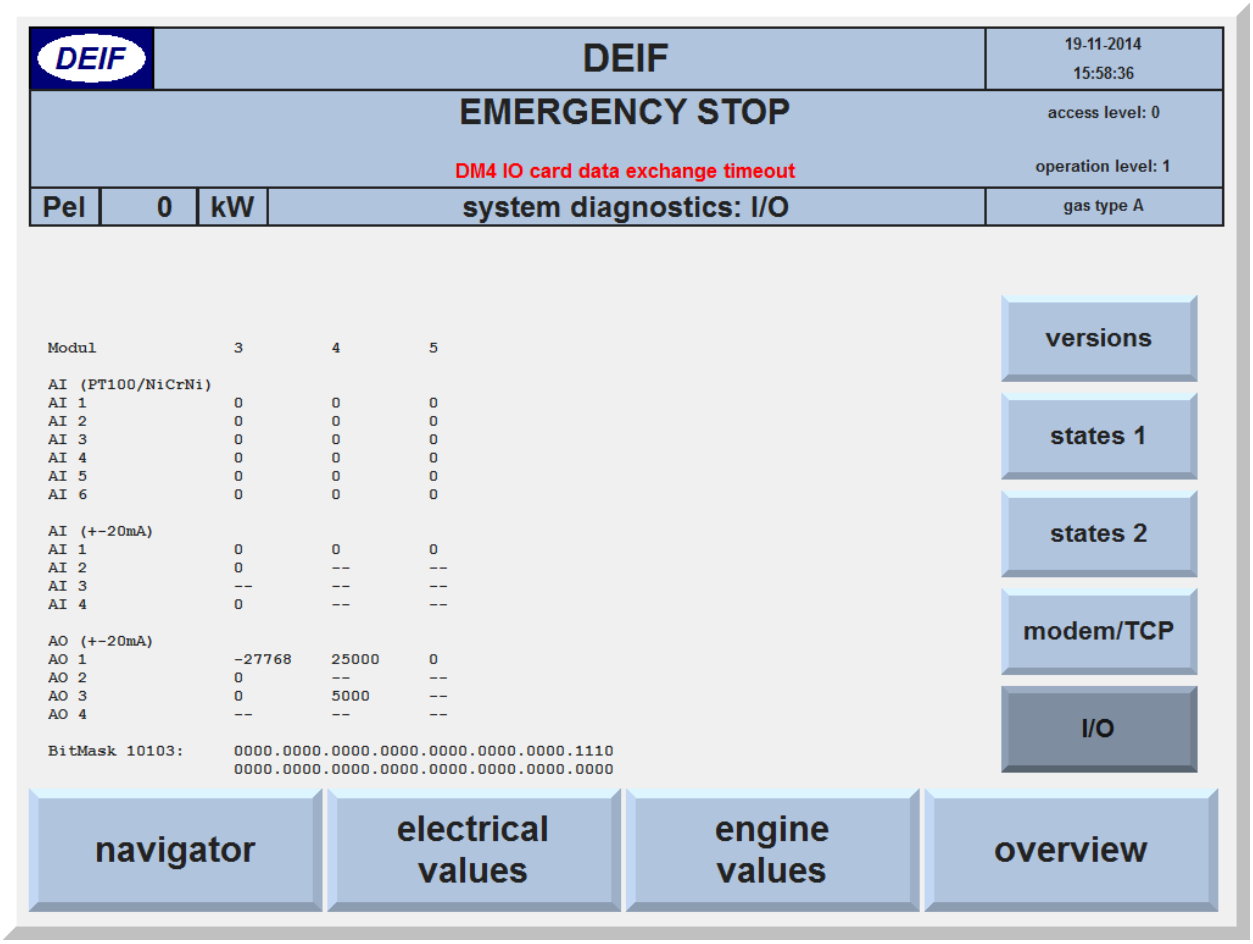
This information is primarily for use by engineers for trouble shooting purposes and the information contained in the following pages is designed as an overview only.




DEIF
DEIF
19-11-2014
15:57:58
EMERGENCY STOP
access level: 0
DM4 IO card data exchange timeout
operation level: 1
Pel
0
kW
system diagnostics: states 1
gas type A
MAIN.state EMERGENCY STOP
SAF.mode TRIP CHAIN
SAF.state CHAIN IS TRIPPED
MAIN.startdemand 0
STOP.actualLevel 1
STOP.actualBitMask 64780
20msTask 2
100msTask 3
1000msTask 1
H8 cpu load 1sec 17.5%
Misfire Detected 0
Misfire Counter 0
Wrong Parameter 0
Number Of Languages 2
MIX.TempOffset 0.00
HKS.TempSetp_EngEntr 890
Sync Conditions:
U/f Gen OK 0
U/f Bus OK 0
U Gen Reg Done 0
f Gen Reg Done 0
df/dt OK 1
Sync Pulse 0
SCM02:
ProtectionsMask e
RouteThroughMask a
TripFeedback 4
BreakerFeedback 8
TrippedBySCM 0
TUR.TargetPhaseAngle 0
TUR.Pset 0
TUR.Reg.PowerSetPoint 0
Reactive-Import.State 0
Reactive-Import.Timer 3593
Reactive-Import.Exceeded 0
Qsum 0
Limit -27
versions
states 1
states 2
modem/TCP
I/O
navigator
electrical values
engine values
overview


DEIF
DEIF
19-11-2014
15:58:08
EMERGENCY STOP
access level: 0
DM4 IO card data exchange timeout
operation level: 1
Pel
0
kW
system diagnostics: states 2
gas type A
AIR.mode 0
AIR.state 1
BY.mode 0
BY.state 1
COM.mode 0
COM.state 3
DK.mode 0
DK.state 1
DKA.mode 0
DKA.state 3
DKB.mode 0
DKB.state 3
ELM(MB).mode 1
ELM(MB).state 2
ENG.mode 0
ENG.state 1
FAN.mode 0
FAN.state 1
GAS.mode 0
GAS.state 1
GEN.mode 0
GEN.state 1
GEN.reg.mode 1
GEN.reg.state 0
GKK.mode 0
GKK.state 1
HKS.mode 0
HKS.state 1
HVS(T1E).mode 0
HVS(T1E).state 0
HVS(L1E).mode 2
HVS(L1E).state 5
HZM.mode 0
HZM.state 0
IGN.mode 0
IGN.state 2
ISL.mode 1
ISL.state 6
MIX[1].mode 0
MIX[1].state 1
MIX[2].mode 0
MIX[2].state 1
NKK.mode 0
NKK.state 1
OIL.mode 0
OIL.state 1
PLS.mode 0
PLS.state 1
RGB.mode 0
RGB.state 1
SAF.mode 0
SAF.state 1
TUR.mode 0
TUR.state 1
WAT.mode 0
WAT.state 1
versions
states 1
states 2
modem/TCP
I/O
navigator
electrical values
engine values
overview


DEIF
DEIF
19-11-2014
15:58:22
EMERGENCY STOP
access level: 0
DM4 IO card data exchange timeout
operation level: 1
Pel
0
kW
system diagnostics: modem/TCP
gas type A
SEND_SMS
SMS.wSMSstopc.:703
SMS.bComInit: 0
SMS.bModemInit:0
SMS.wSMScount: 0
SMS.wTask: 0
SMS.wResult: 0
SMS.wState: 0
SMS.dwTime: 0
SMS.PhoneNbr:
SMS.Message:
SMS.cBuffer:
TCP address: 192.168.2 .21
subnet mask: 255.255.255.0
gateway address: 192.168.2 .182
versions
states 1
states 2
modem/TCP
I/O
navigator
electrical values
engine values
overview


DEIF
DEIF
19-11-2014
15:58:36
EMERGENCY STOP
access level: 0
DM4 IO card data exchange timeout
operation level: 1
Pel
0
kW
system diagnostics: I/O
gas type A
Modul 3 4 5
AI (PT100/NiCrNi)
AI 1 0 0 0
AI 2 0 0 0
AI 3 0 0 0
AI 4 0 0 0
AI 5 0 0 0
AI 6 0 0 0
AI (+-20mA)
AI 1 0 0 0
AI 2 0 -- --
AI 3 -- -- --
AI 4 0 -- --
AO (+-20mA)
AO 1 -27768 25000 0
AO 2 0 -- --
AO 3 0 5000 --
AO 4 -- -- --
BitMask 10103: 0000.0000.0000.0000.0000.0000.0000.1110
0000.0000.0000.0000.0000.0000.0000.0000
versions
states 1
states 2
modem/TCP
I/O
navigator
electrical values
engine values
overview

Electrical values – pointer instruments

The electrical values pages can be reached through the overview page and the navigator page. The pointer instruments page can be displayed from the electrical values pages.

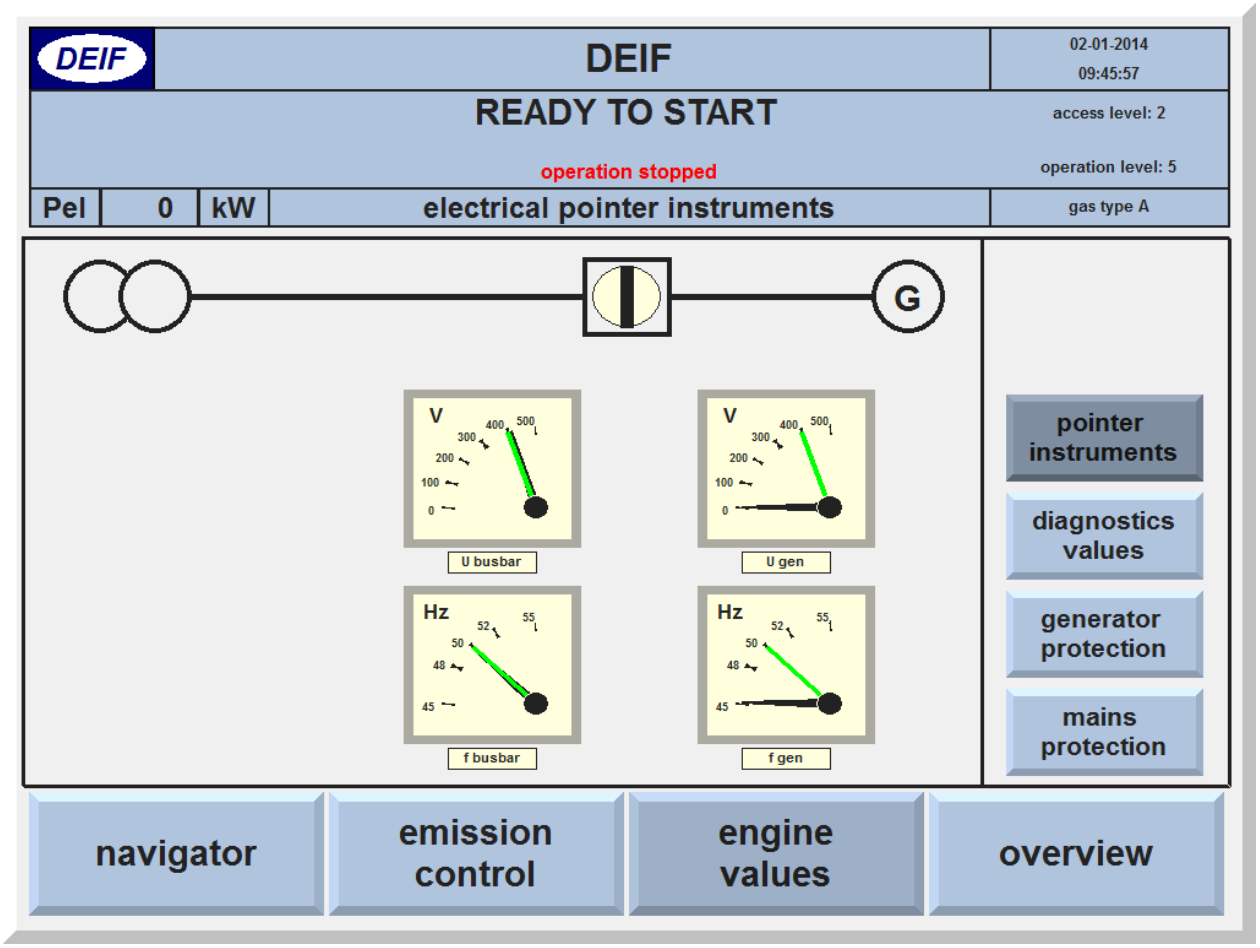
Depending on the configuration of the system, the pointer instruments page will display at least two and possibly three pairs of moving pointer instruments which are:

1. Mains voltage and frequency
2. Busbar voltage and frequency (if applicable)
3. Generator voltage and frequency

If the system is operating in mains parallel mode, then data relating to

- the current
- power
- cos phi (Power Factor)

are visualised in the form of pointer instruments

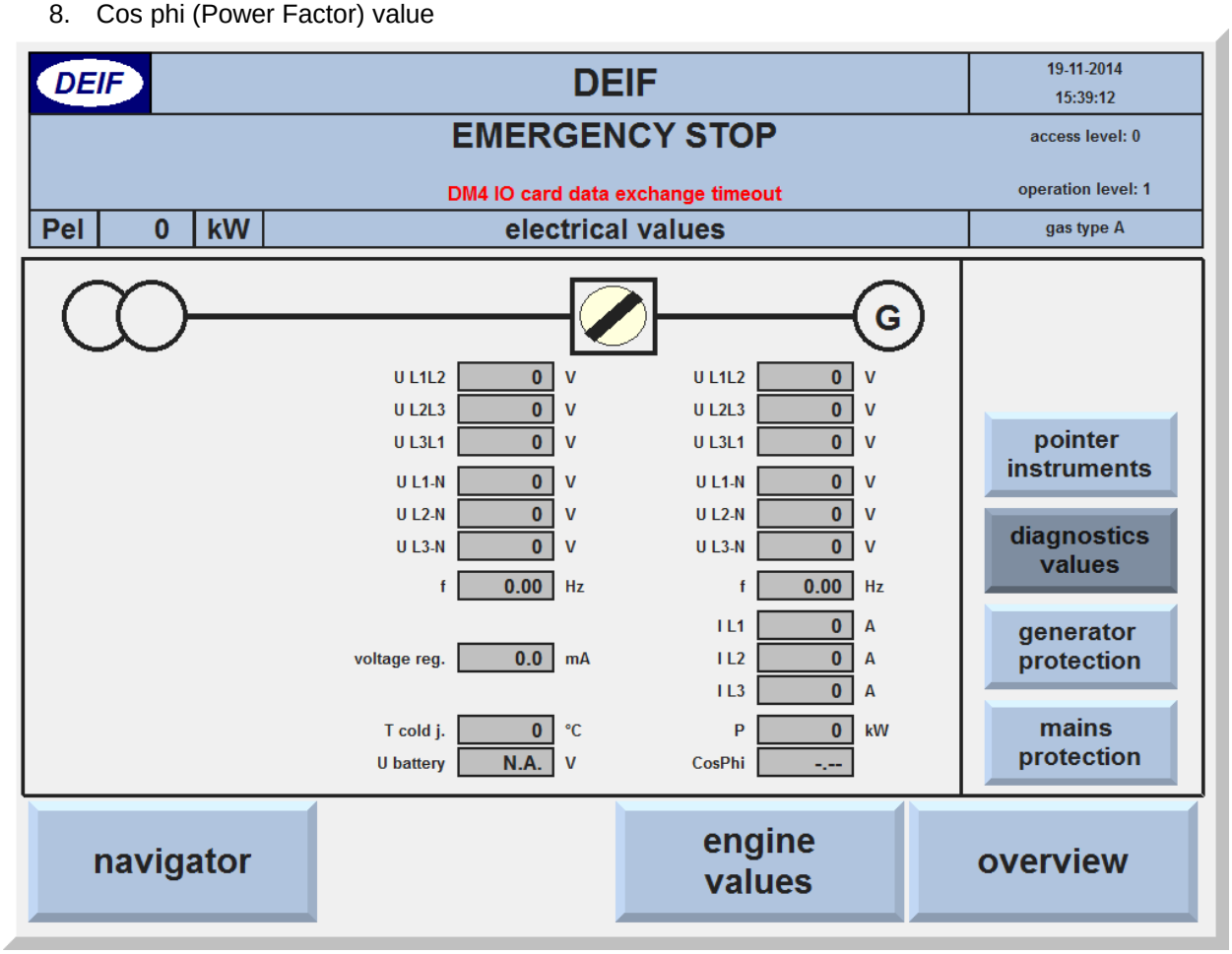


Electrical values – diagnostics values

The diagnostics value page can be displayed from the electrical values pages.

Depending on the configuration of the system, the diagnostic values page will display at least two and possibly three columns of data, which are:

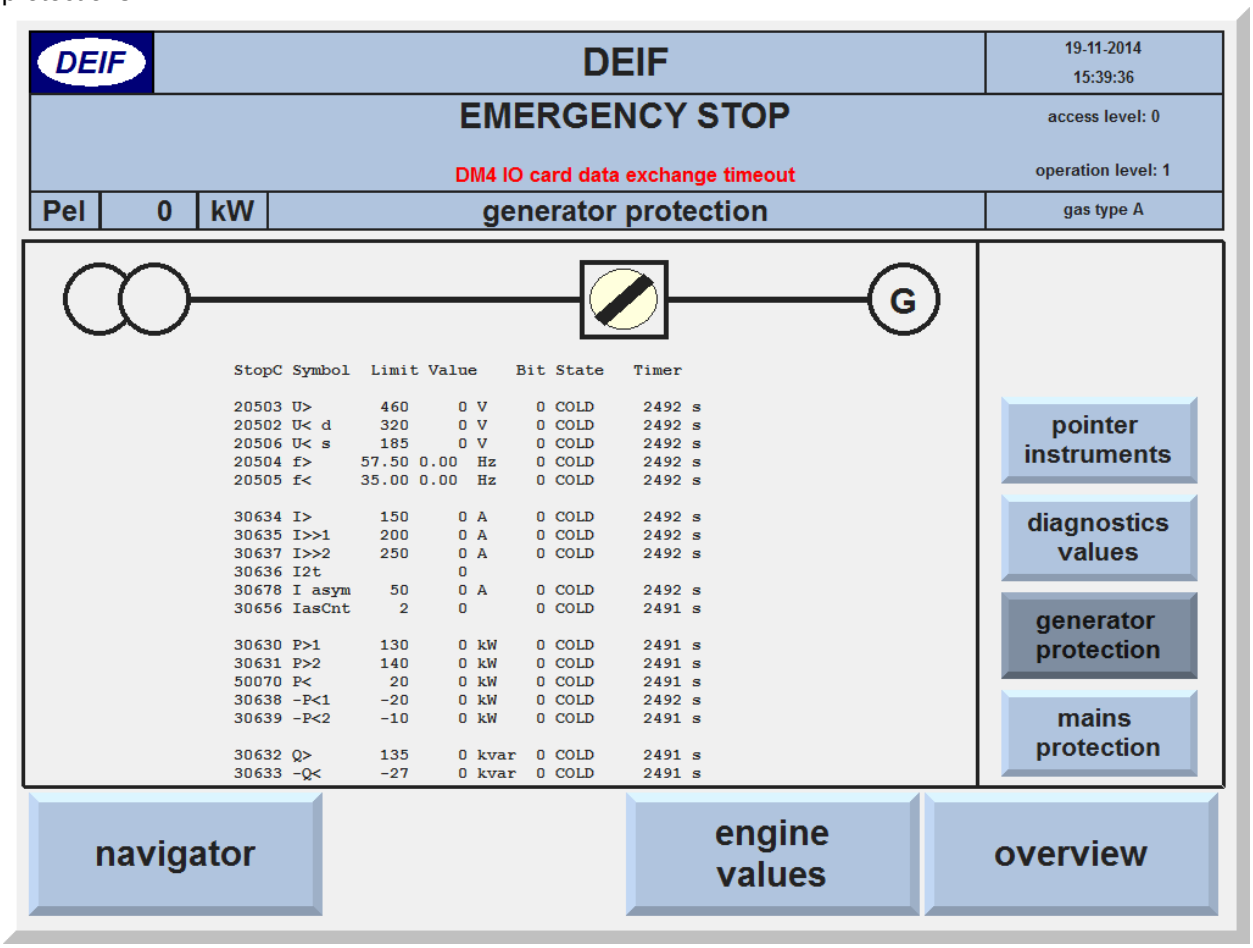
1. Mains voltage (phase–phase and phase-neutral) and frequency
2. Busbar voltage (phase–phase and phase-neutral) and frequency (if applicable)
3. Generator voltage (phase–phase and phase-neutral), phase currents and frequency
4. Voltage regulator output (mA)
5. Cold junction temperature (°C)
6. Battery voltage (V)
7. Active power value (kW)
8. Cos phi (Power Factor) value



Electrical values – generator protection

The generator protection page can be displayed from the electrical values pages.

The generator protection page displays the settings and current status of the generator protections



The generator protection data consists of:

StopC — Stop Condition alarm number

Symbol — Mnemonic symbol of the protection type

Limit — Parameter limit for the value column

Value — Actual value measured or calculated within the DM 400

Bit — Is an indication that shows which phase is causing the fault (using binary code)

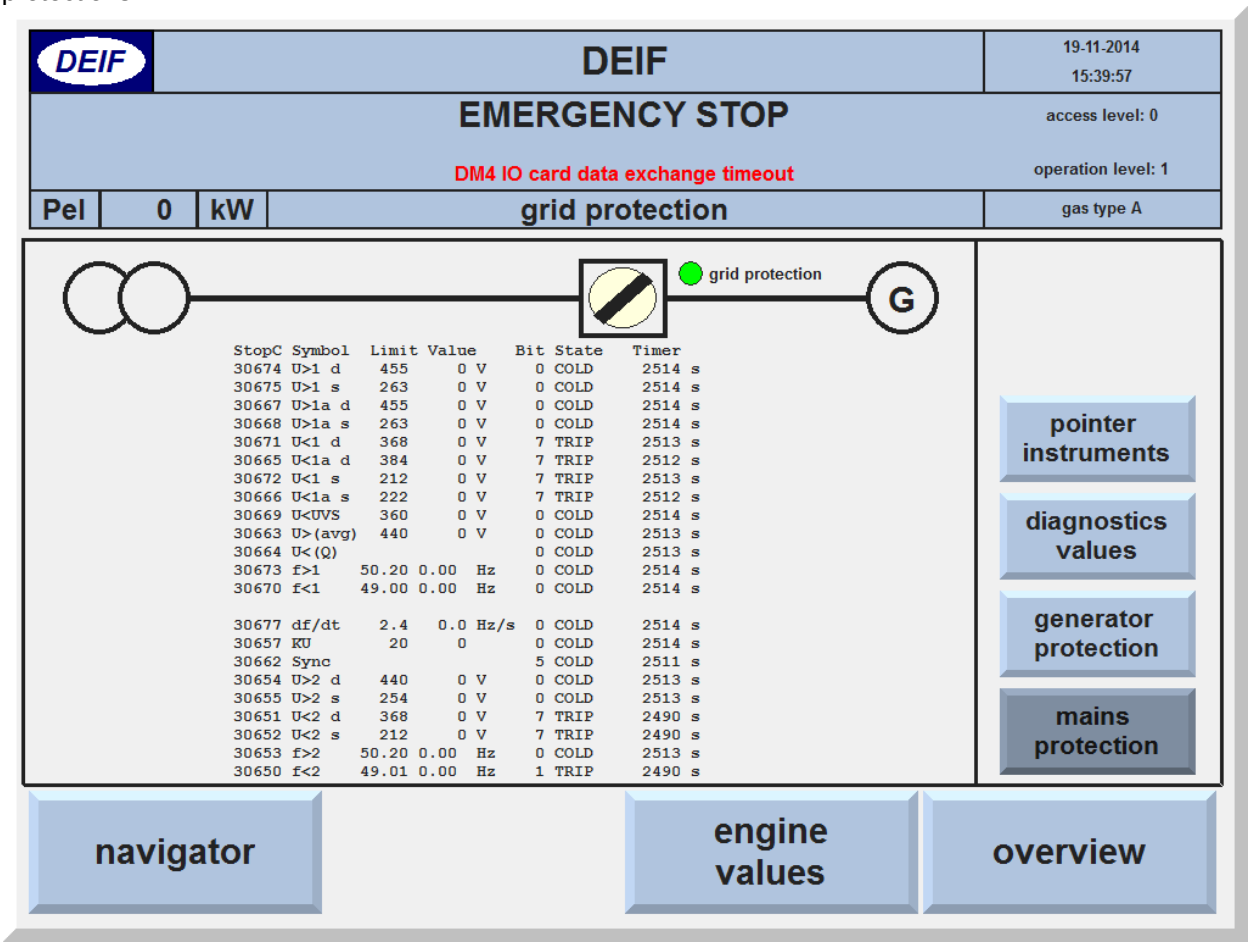
State — Current parameter state

- COLD: not activated
- HOT: parameter limit has been exceeded and waiting for any associated time delay to expire
- REC: an auto acknowledge condition has occurred and is now in the process of recovering back to the COLD state
- TRIP: the parameter limit has been exceeded, any associated time delay has expired and therefore a warning or fault condition is present.

Timer — The duration for which the current state has existed, in seconds.

Electrical values – mains (grid) protection

The mains (or grid) protection page can be displayed from the electrical values pages.
The mains (or grid) protection page displays the settings and current status of the mains protections

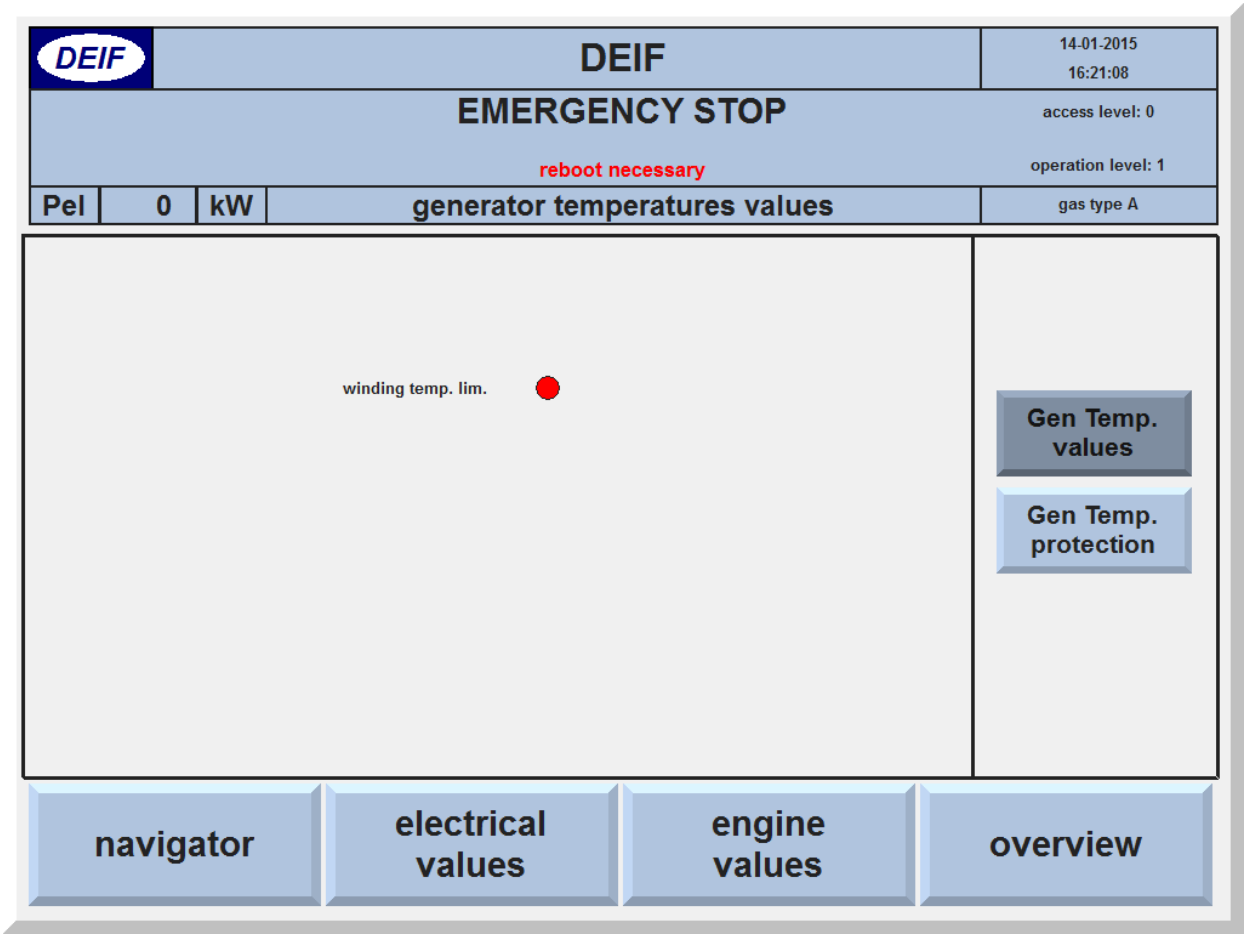


The grid protection data consists of:

StopC	Stop Condition alarm number
Symbol	Mnemonic symbol of the protection type
Limit	Parameter limit for the value column
Value	Actual value measured or calculated within the DM 400
Bit	Is an indication that shows which phase is causing the fault (using binary code)
State	Current parameter state COLD: not activated HOT: parameter limit has been exceeded and waiting for any associated time delay to expire REC: an auto acknowledge condition has occurred and is now in the process of recovering back to the COLD state TRIP: the parameter limit has been exceeded, any associated time delay has expired and therefore a warning or fault condition is present.
Timer	The duration for which the current state has existed, in seconds.
Grid protection indicator	Green = which circuit breaker would trip if a grid protection fault occurred.

Generator temperatures

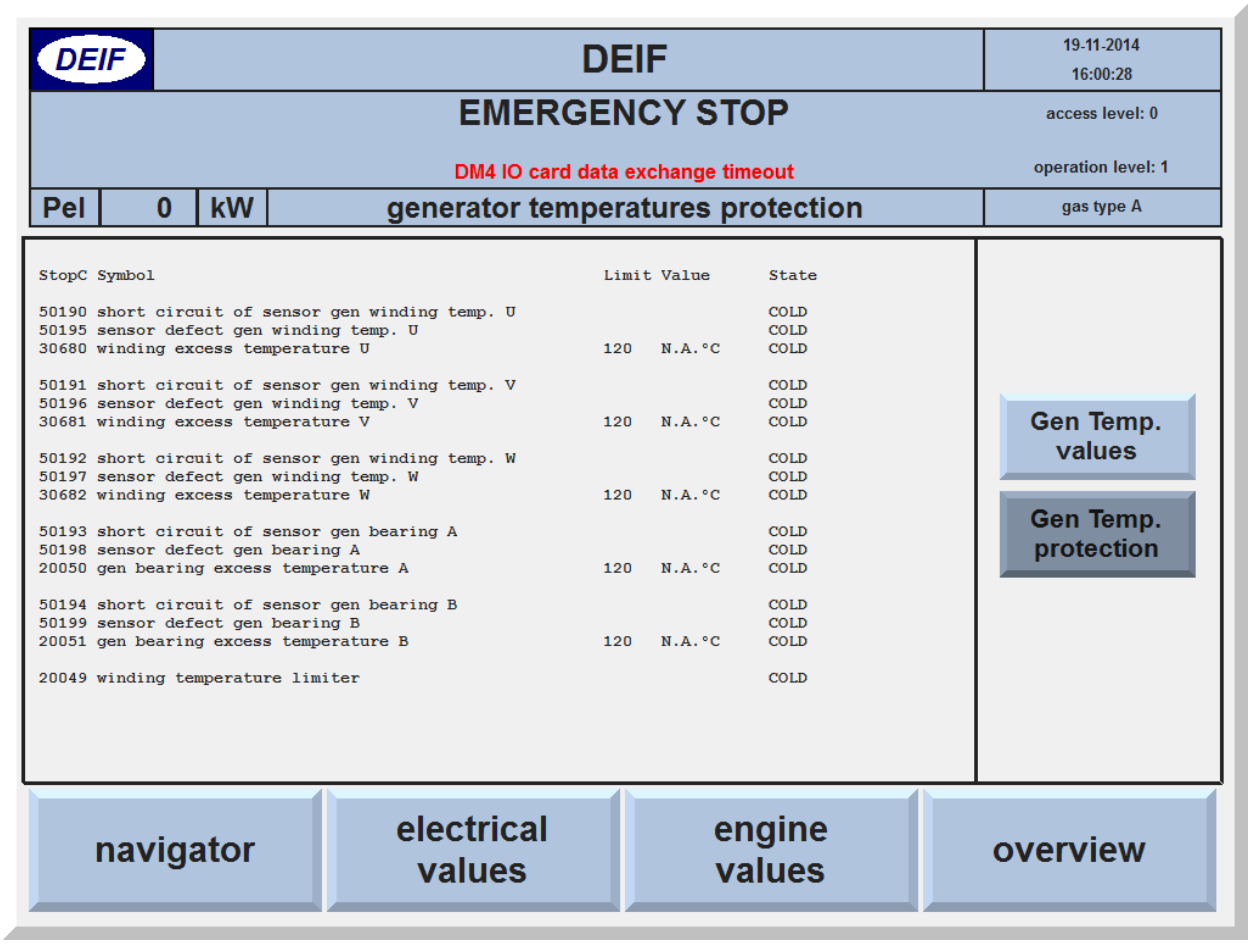
The generator temperature values page gives a graphical indication of the status of temperature measurements and the generator winding and bearing temperatures (if assigned) of the generator.



A red indicator indicates that the parameter limit has been exceeded.

Generator temperature protection

The generator temperature values page gives an indication of the status and temperature measurements being taken from the generator itself.



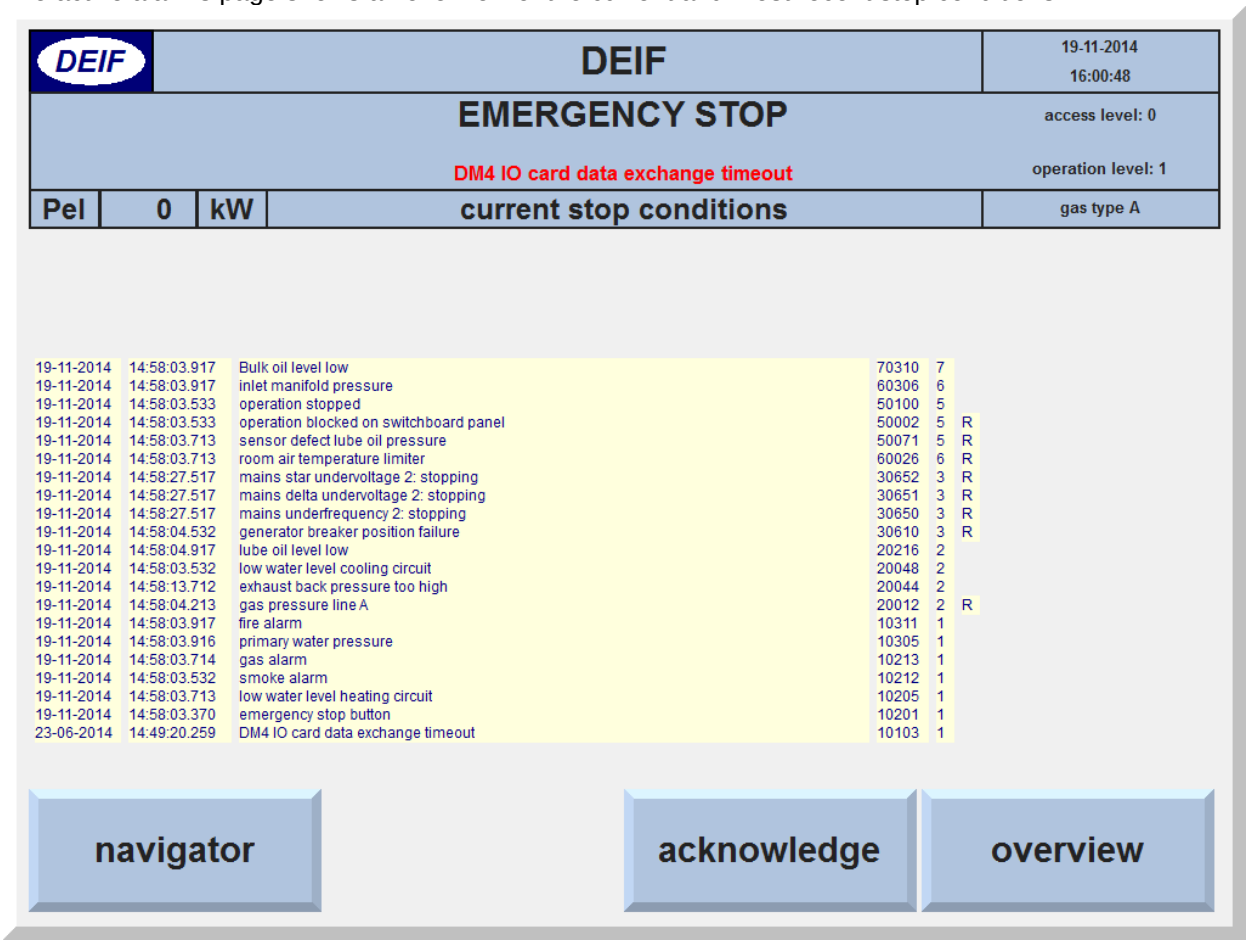
The generator temperature protection data consists of:

StopC — Stop Condition alarm number
Symbol — Parameter text
Limit — Parameter limit for the value column
Value — Actual value measured or calculated within the DM 400
State — Current parameter state

COLD: not activated
HOT: parameter limit has been exceeded and waiting for any associated time delay to expire
REC: an auto acknowledge condition has occurred and is now in the process of recovering back to the COLD state
TRIP: the parameter limit has been exceeded, any associated time delay has expired and therefore a warning or fault condition is present.

Active alarms

The active alarms page shows an overview of the current and most recent stop conditions.



The data is presented in the following format:

The date and time of the most recent stop condition
The parameter text for the stop condition
The stop condition code.
The stop level (1-8)
Action taken indicator, where R = a regular stop function where the generator circuit breaker is open and the engine is stopped. Auxiliary systems continue to run and enter into their normal shutdown procedure.

Note: all currently pending stop conditions can be acknowledged through the "acknowledge" button on this page, if necessary.
A general acknowledge function for all active fault conditions can also be completed via the "acknowledge" button on the overview page.

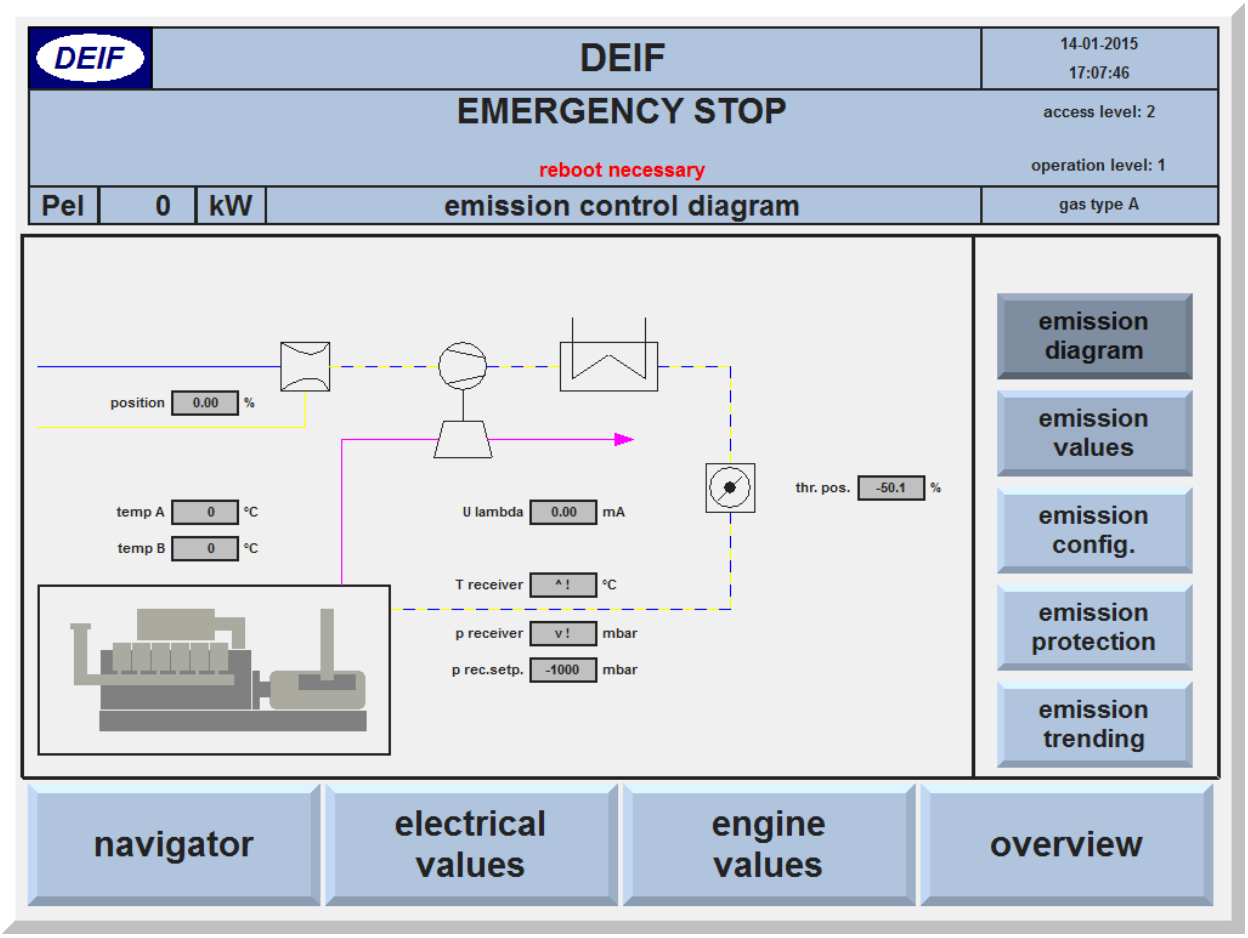
Emission control

The emission control functionality and how to configure this is described in a separate emission control application note. The following pages provide a summary of the pages that can be viewed via the HMI only.

The "emission control" button opens up access to a number of other pages relating to set up of the system relating to emissions.

Access to change the parameters on these pages is password-protected and so the following pages provide an explanation of the data that is being displayed only.

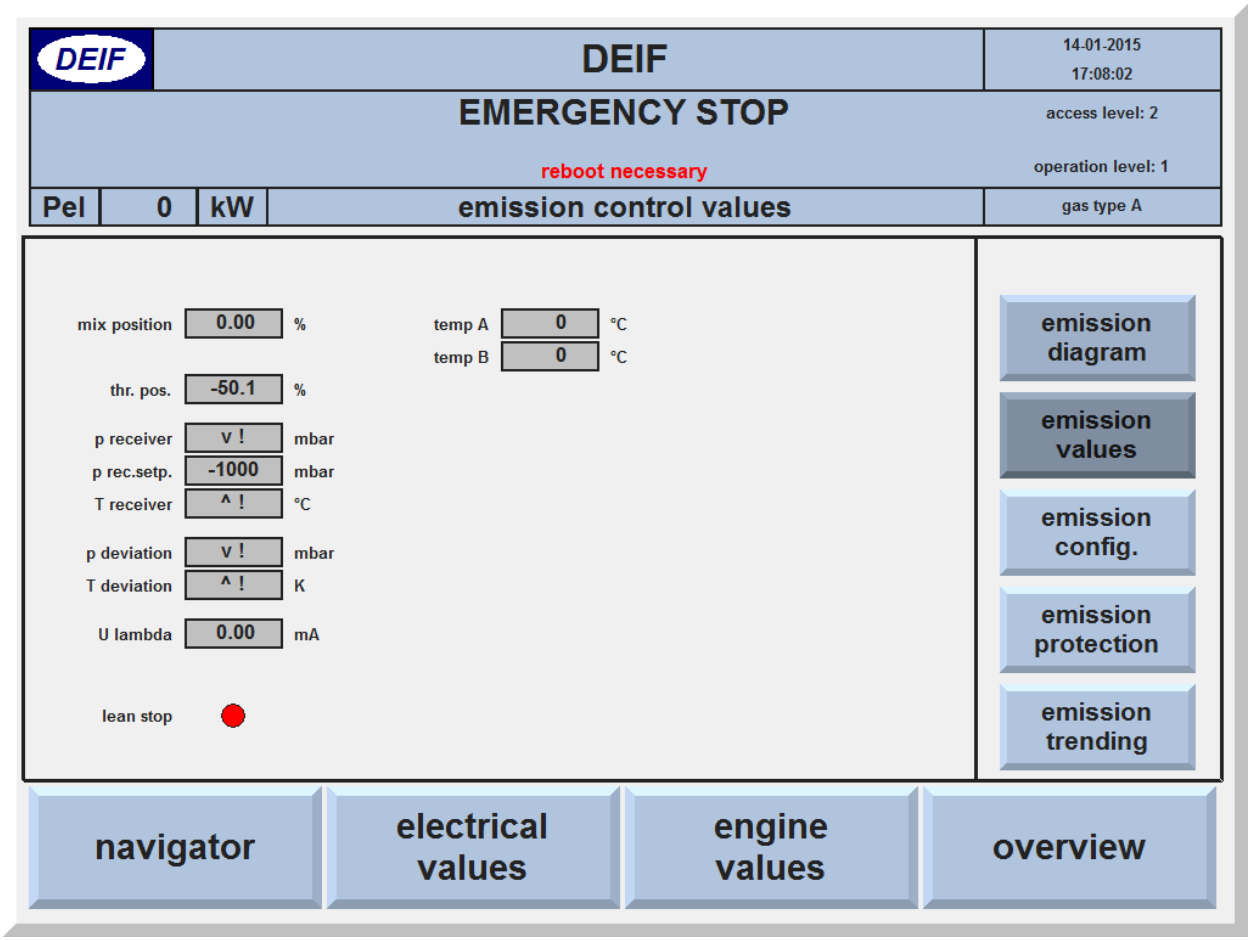
Emission control diagram



This page presents the following data:

Position	The relative position of the gas mixer valve (0 % [fully closed] -100 % [fully open])
Temp A	The present measured value of bank A exhaust temperature (°C)
Temp B	The present measured value of bank B exhaust temperature (°C)
U Lambda	The present measured voltage from the Lambda sensor (if fitted)
T receiver	The present measured temperature of the mixture in the receiver (°C)
P receiver	The present measured pressure of the mixture in the receiver (mbar)
P rec. setp.	The set point for the pressure of the mixture in the receiver (mbar)
Thr. Pos.	The relative position of the throttle valve (0 % [fully closed] -100 % [fully open])

Emission control values

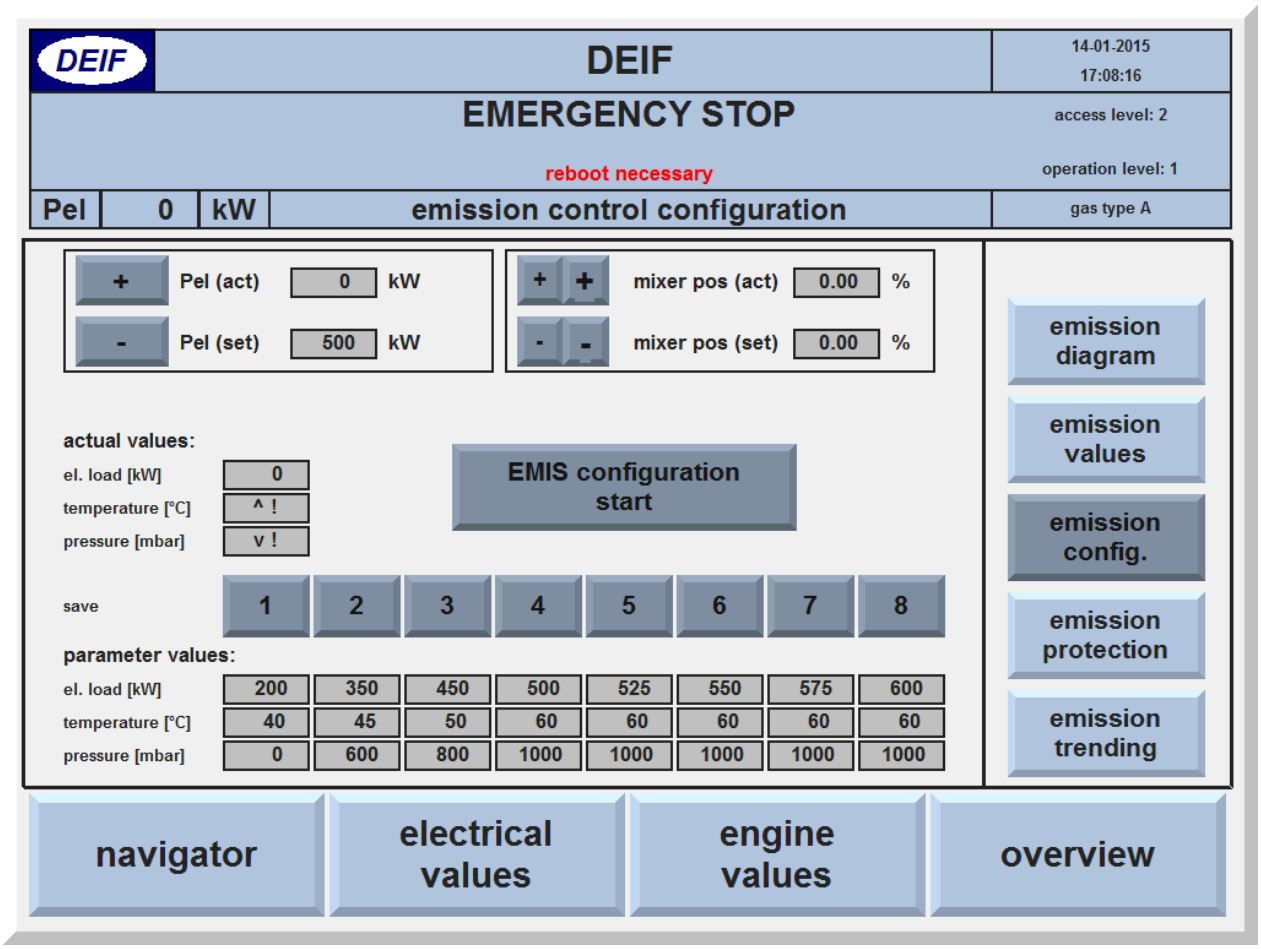


This page presents the following data:

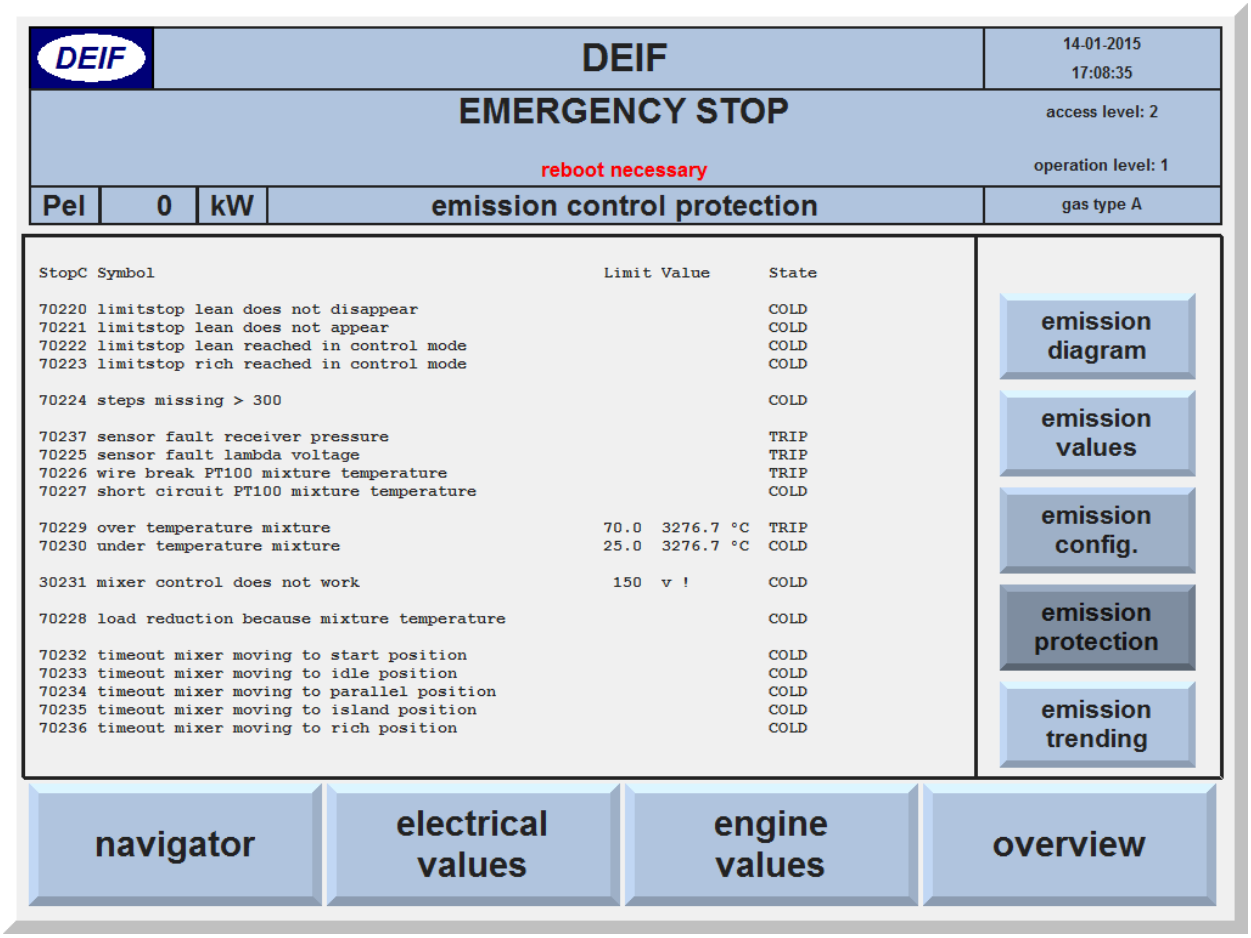
Mix Position	The relative position of the gas mixer valve (0 % [fully closed] -100 % [fully open])
Thr. Pos.	The relative position of the throttle valve (0 % [fully closed] -100 % [fully open])
P receiver	The present measured pressure of the mixture in the receiver (mbar)
P rec. setp.	The set point for the pressure of the mixture in the receiver (mbar)
T receiver	The present measured temperature of the mixture in the receiver (^{o}C)
P deviation	The amount by which the measured pressure of the mixture in the receiver differs from the set point value (mbar)
T deviation	The amount by which the measured temperature of the mixture in the receiver differs from the set point value (K)
U Lambda	The present measured voltage from the Lambda sensor (if fitted)
Temp A	The present measured value of bank A exhaust temperature (^{o}C)
Temp B	The present measured value of bank B exhaust temperature (^{o}C)
Lean Stop	A red indicator indicates that the limit stop position of the gas mixer has been reached

Emission control configuration

The emission control functionality and how to configure this is described in a separate emission control application note.
This example page taken from the HMI is for illustration purposes only as this is not a feature that an operator should need to adjust during everyday operation. Consequently, no descriptions are provided.



Emission control protections

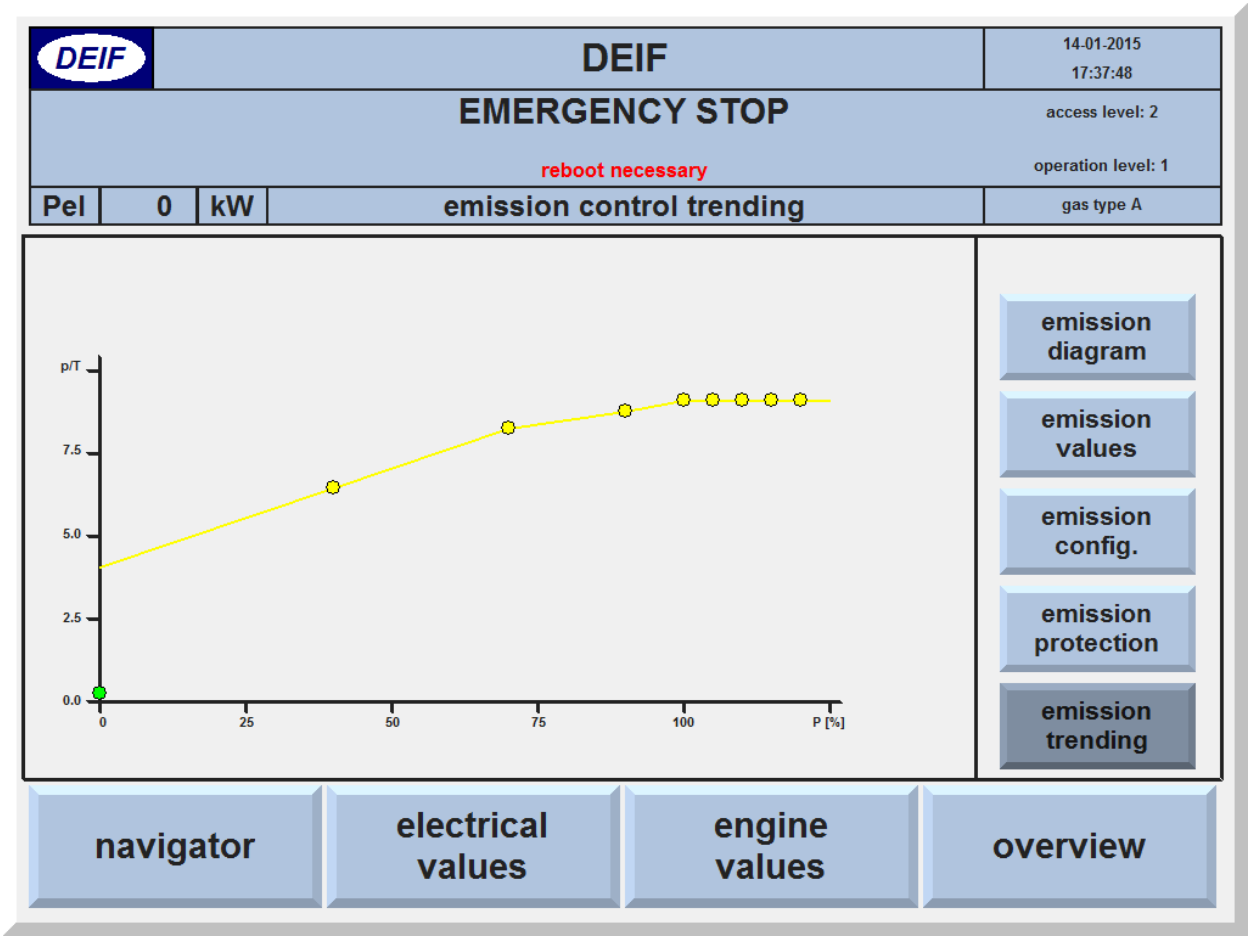


The emission control protection data consists of:

StopC	Stop Condition alarm number
Symbol	Parameter text
Limit	Parameter limit for the value column
Value	Actual value measured or calculated within the DM 400
State	Current parameter state

COLD: not activated
HOT: parameter limit has been exceeded and waiting for any associated time delay to expire
REC: an auto acknowledge condition has occurred and is now in the process of recovering back to the COLD state
TRIP: the parameter limit has been exceeded, any associated time delay has expired, and therefore a warning or fault condition is present.

Emission trending

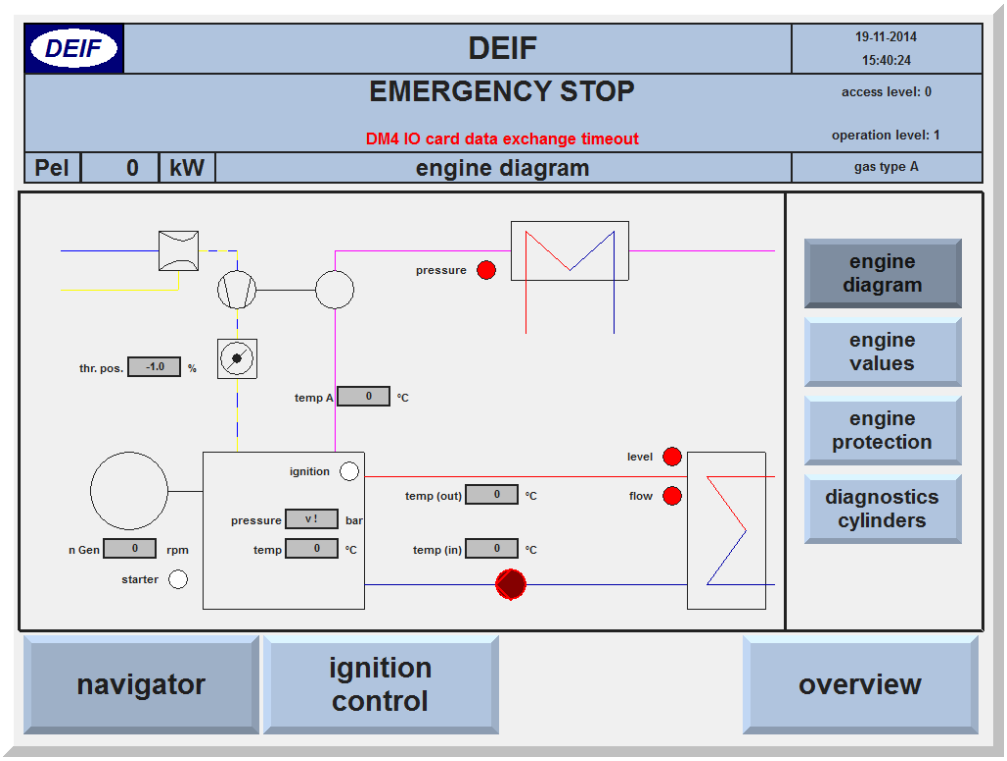


This page provides a graphical representation of the relationship between the emissions across full power range of the generator.
The desired values are indicated by the yellow line whilst the actual value is indicated by the green dot.
The DM 400 system will automatically and continuously adjust the appropriate system parameters in order to position the green dot on the yellow line and thus achieve the defined emission setting when the emission control function is active.

Engine values

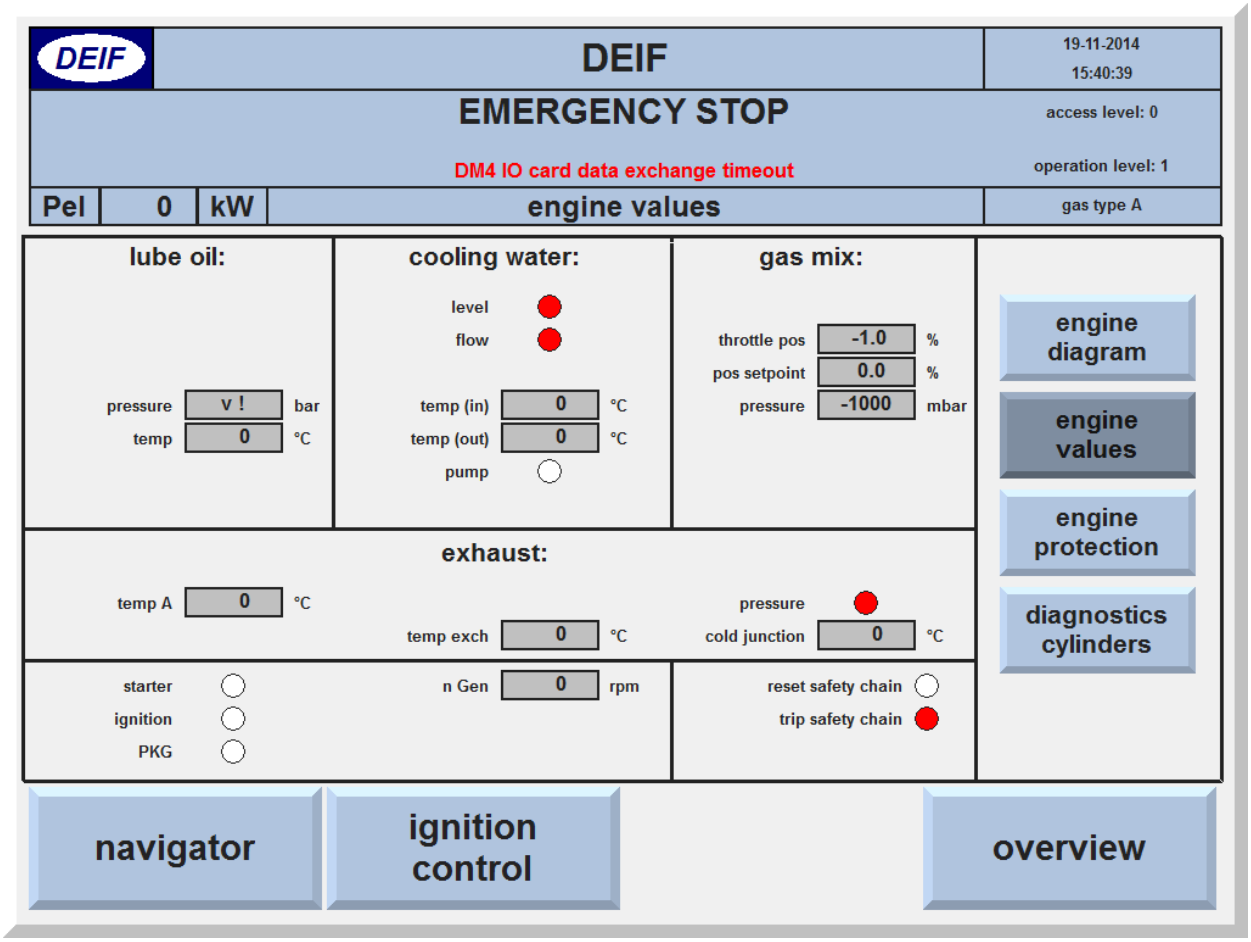
The "engine values" button opens up access to a number of other pages relating to present status and protection settings relating to the gas engine itself.

Emission control diagram



This page presents the following data:

Thr. Pos.	The relative position of the throttle valve (0 % [fully closed] -100 % [fully open])
n Gen	The present measured engine speed (rpm)
Temp A	The present measured temperature of exhaust gas (^{o}C)
pressure	The present measured engine oil pressure (bar)
temp	The present measured engine oil temperature (^{o}C)
temp (out)	The present measured temperature of engine cooling water out to the heat exchanger (^{o}C)
temp (in)	The present measured temperature of engine cooling water return from the heat exchanger (^{o}C)
Starter	An indicator representing the status of the starter where WHITE = off GREEN= status OK RED = fault, alarm or warning condition
Ignition	An indicator representing the status of the ignition unit where the colour indications are as stated above
Pressure	An indicator representing the status of the exhaust gas, either green or red only, where the colour indications are as stated above
Level	An indicator representing the status of the engine cooling water level switch, either green or red only, where the colour indications are as stated above
Flow	An indicator representing the status of the engine cooling water flow switch, either green or red only, where the colour indications are as stated above
Pump	An indicator representing the status of the engine water pump, where the colour indications are as stated above for starter



This page presents the following data:

lube oil

pressure	The present measured lube oil pressure (bar)
temp	The present measured lube oil temperature (°C)

cooling water

Level	An indicator representing the status of the engine cooling water level where GREEN= status OK RED = fault, alarm or warning condition
Flow	An indicator representing the status of the engine cooling water flow where the colour indications are as stated above
temp (in)	The present measured temperature of engine cooling water return from the heat exchanger (°C)
temp (out)	The present measured temperature of engine cooling water out to the heat exchanger (°C)
pump	An indicator representing the status of the engine water pump where WHITE = off GREEN= status OK RED = fault, alarm or warning condition

gas mix

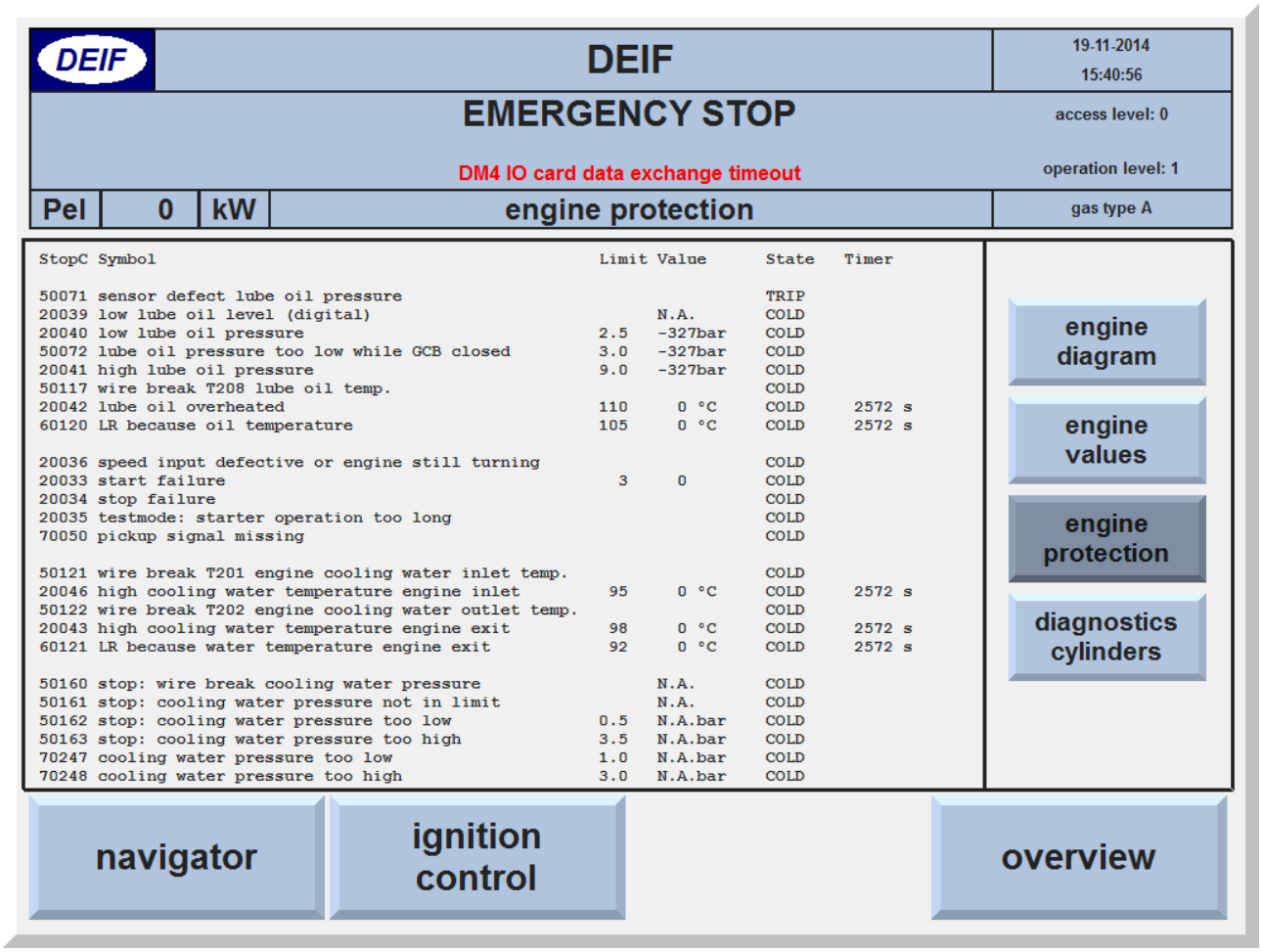
Thr. Pos.	The relative position of the throttle valve (0 % [fully closed] -100 % [fully open])
Pos set point	The set point for the throttle valve (0 % [fully closed] -100 % [fully open])
pressure	The present measured pressure of the mixture in the receiver (mbar)

exhaust

temp A	The present measured temperature of bank A exhaust temperature (^{o}C)
temp exch	The present measured temperature of exhaust heat exchanger (^{o}C)
cold junction	The present measured temperature of cold junction reference point (^{o}C)
pressure	An indicator representing the status of the exhaust gas pressure where GREEN= status OK RED = fault, alarm or warning condition
starter	An indicator representing the status of the starter where WHITE = off GREEN= status OK RED = fault, alarm or warning condition
ignition	An indicator representing the status of the ignition unit where the colour indications are as stated above
PKG	(if fitted) An indicator representing the status of the amplifier driver for the throttle valve where the colour indications are as stated above
n Gen	The present measured engine speed (rpm)

reset safety chain	An indicator representing the status of the system safety chain reset output where the colour indications are as stated above, green or red only
trip safety chain	An indicator representing the status of the system safety chain trip output where the colour indications are as stated above, green or red only

Engine protections

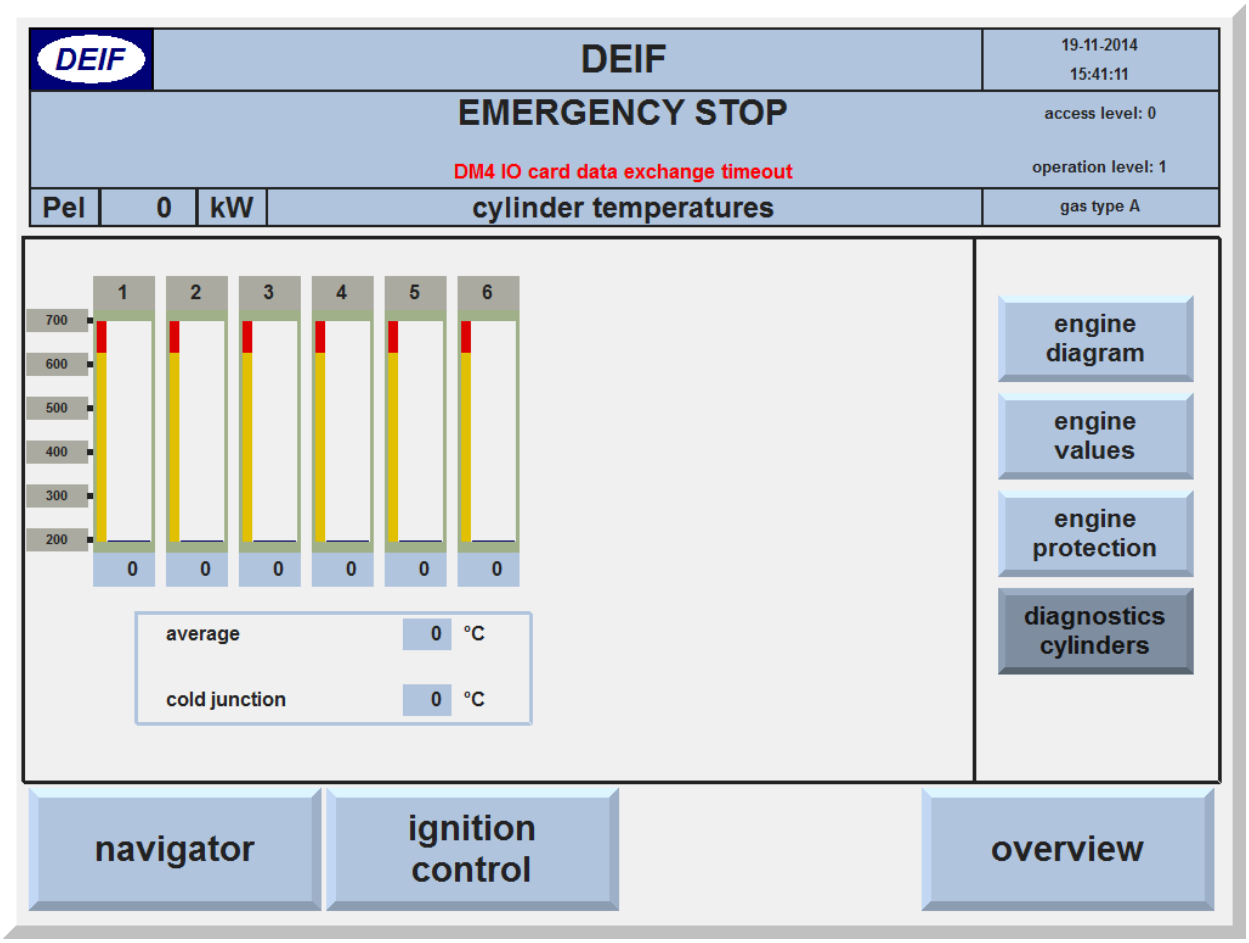


The engine protection data consists of:

StopC — Stop Condition alarm number
Symbol — Parameter text description
Limit — Parameter limit for the value column
Value — Actual value measured or calculated within the DM 400
State — Current parameter state
- COLD: not activated
- HOT: parameter limit has been exceeded and waiting for any associated time delay to expire
- REC: an auto acknowledge condition has occurred and is now in the process of recovering back to the COLD state
- TRIP: the parameter limit has been exceeded, any associated time delay has expired and therefore a warning or fault condition is present.

Timer — The duration for which the current state has existed in seconds

Cylinder temperatures



A graphical representation of:

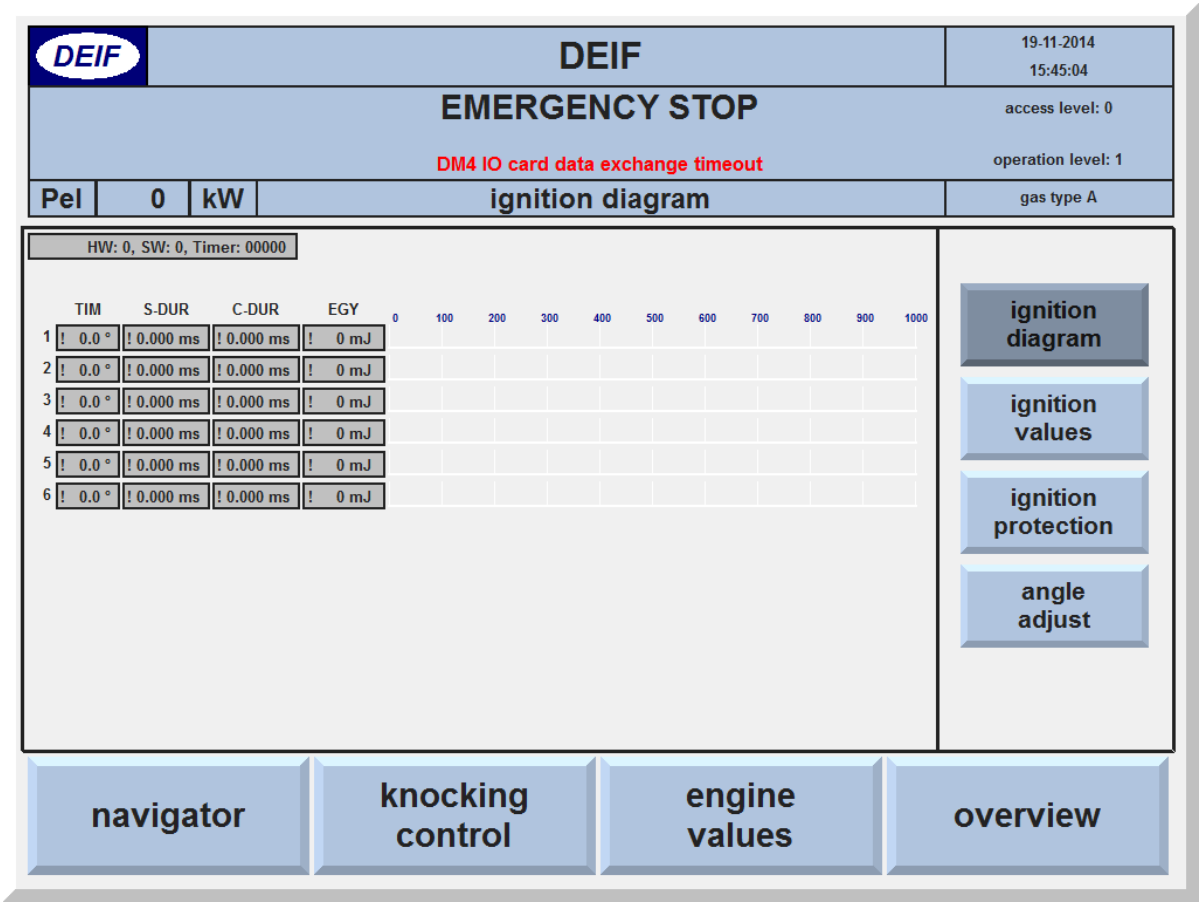
- Individual cylinder temperatures
- An average of the cylinder temperature
- An indication of the cold junction temperature

Ignition control

The ignition control pages are accessed from the engine values page and these pages present data concerning one of the possible ignition systems for the gas engine.
The ignition control pages provide data relating to the ignition control system read from that device by the DM 400 and therefore the information shown is for illustration purposes only and may differ form the actual system being operated.

Ignition control data can only be presented if the ignition control system used within the application permits communication with the DM 400 controller.

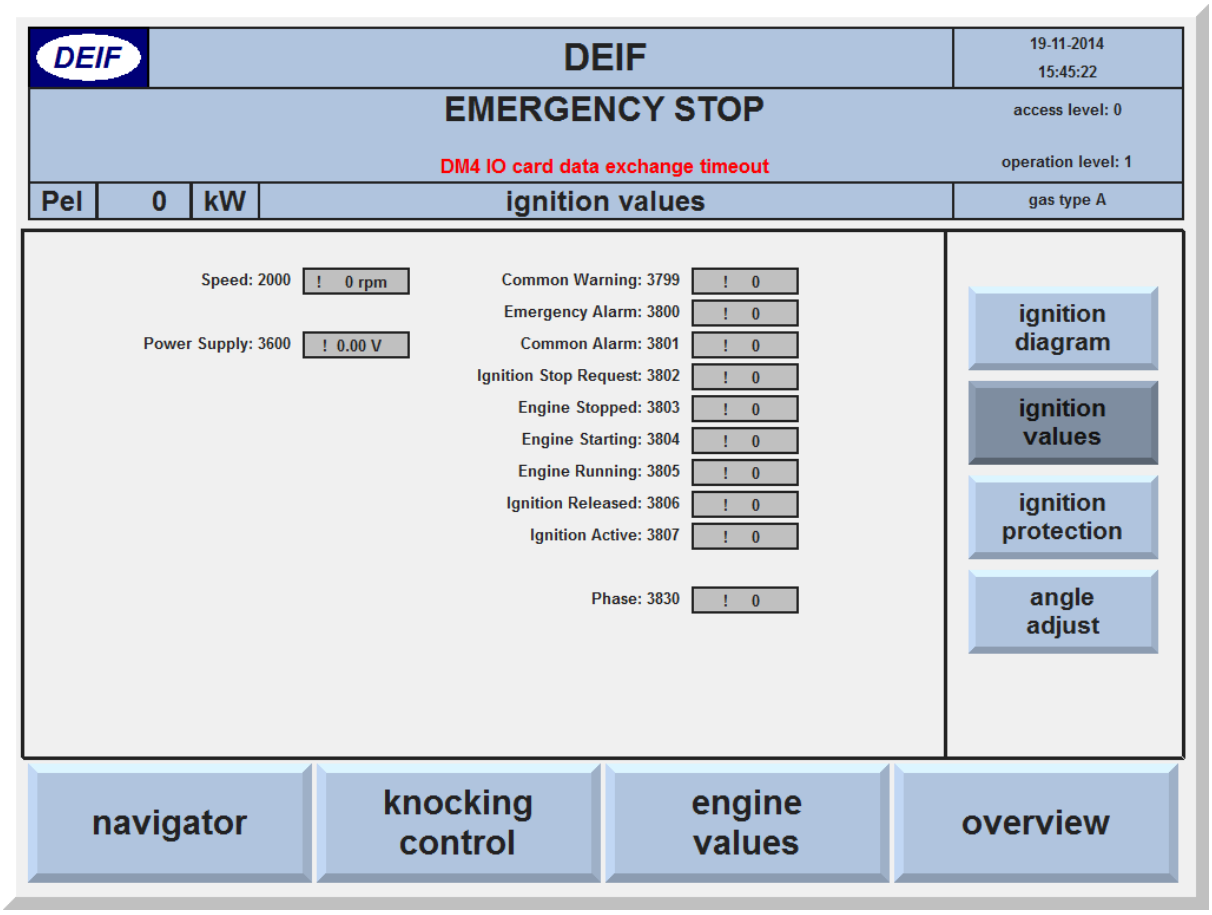
Ignition Diagram



The data displayed on this page is:
HW: , SW: , timer: This is the hardware and software version and timer reference read from the ignition controller
Then for each cylinder, the following data is displayed:
TIM timing angle (^{o})
S-DUR spark duration (ms)
C-DUR charge duration (ms)
EGY energy (mJ)
A graphical display of the energy value for each cylinder is also displayed.

Ignition values

The ignition values page displays values relating to the ignition control system that is read by the DM 400 for the ignition control system.
If it is not possible to communicate with the ignition control system in a particular application, then this data cannot be retrieved or displayed.

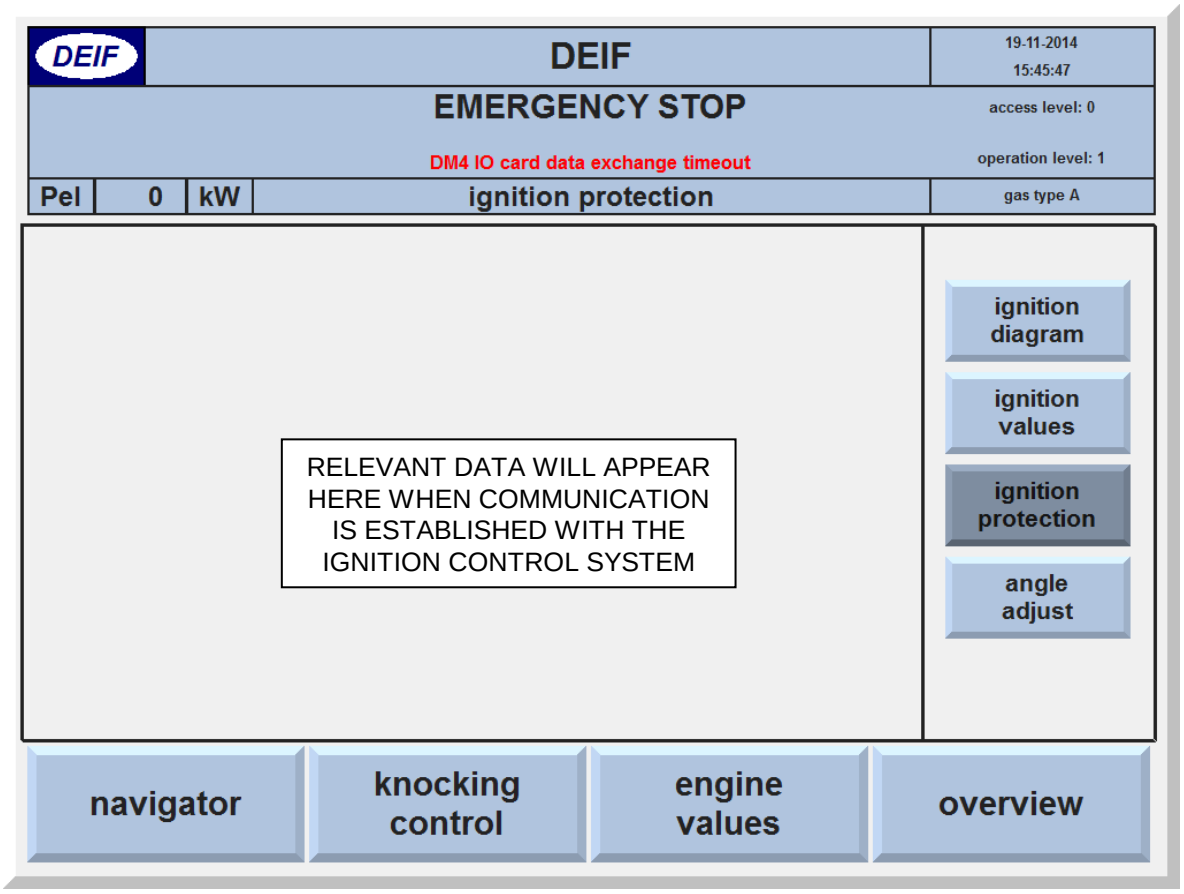


For each value, there is a description and a four digit number.
The four digit number relates to the ignition system parameter allocated to the particular ignition value.
The values shown are the values read back from the ignition control system.

The data which can be retrieved from the ignition control system and therefore displayed on these pages is depending on the capability of the ignition control system itself and so may differ from that shown above.

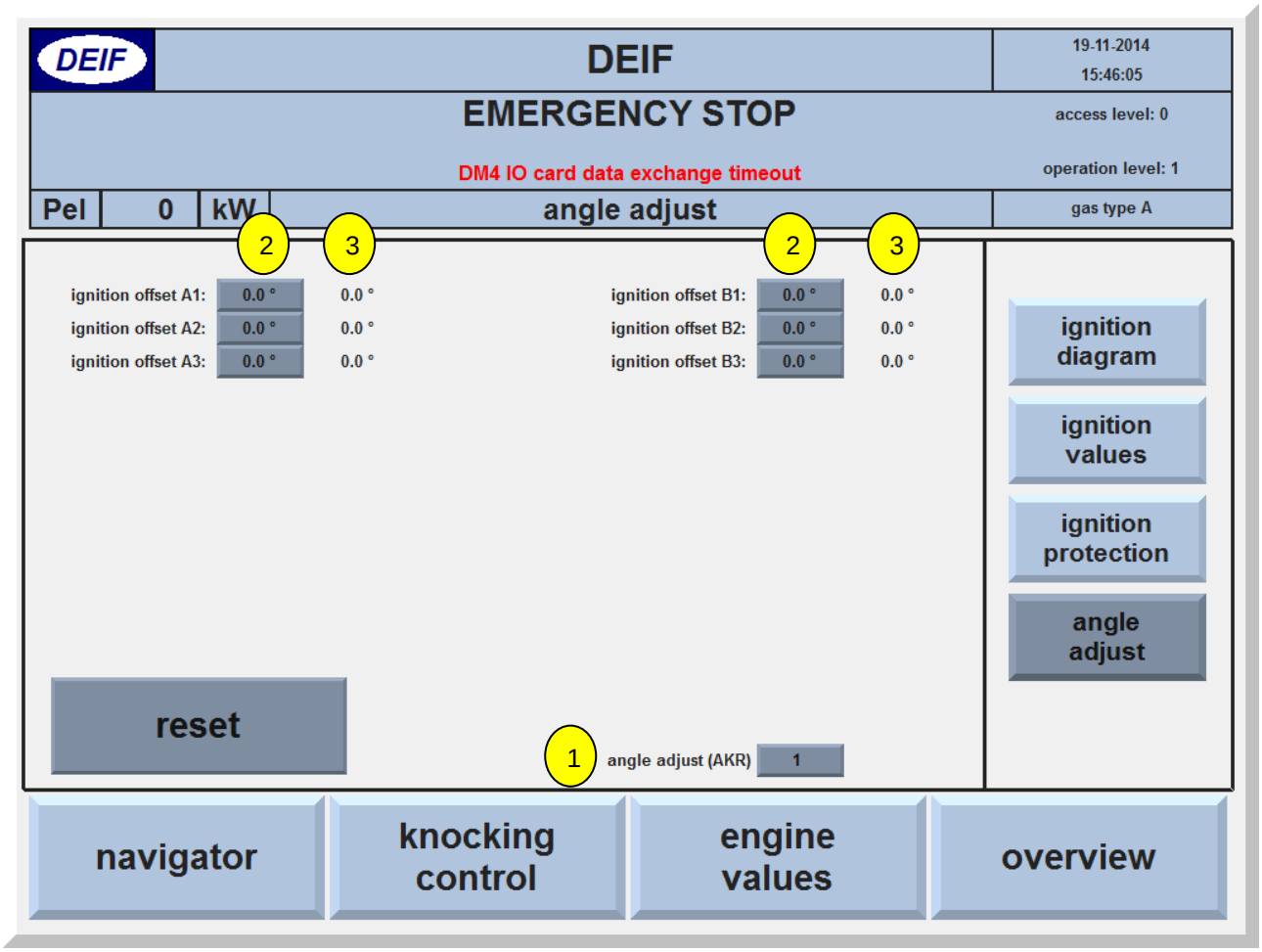
Ignition protection

The ignition protection page displays values relating to the ignition control system protections that are read by the DM 400 for the ignition control system.
If it is not possible to communicate with the ignition control system in a particular application, then this data cannot be retrieved or displayed.
The data which can be retrieved from the ignition control system and therefore displayed on these pages is depending on the capability of the ignition control system itself.



Angle adjust

The angle adjust page displays values relating to the timing angle, set for each cylinder, that are read by the DM 400 from the ignition control system.
If it is not possible to communicate with the ignition control system in a particular application, then this data cannot be retrieved or displayed.
The data which can be retrieved from the ignition control system and therefore displayed on these pages is depending on the capability of the ignition control system itself.



The data displayed on this page is:

1. Angle adjust (AKR): this parameter is used to indicate if a suitable Anti-Knocking Regulator (AKR) is fitted to the system that will enable the adjustment of ignition timing angles based on input from the AKR device
   0 = this is not permitted
   1 = this is permitted
2. Ignition offset: if the value of the angle adjust (AKR) parameter is 1, then by clicking any of the boxes opens up the keypad input window (as shown previously) through which it is possible to enter a set point for the ignition offset value.
3. The values shown in position 3 are the actual values for the ignition timing read from the ignition control system.

The reset button resets any manually entered offset values immediately to zero.

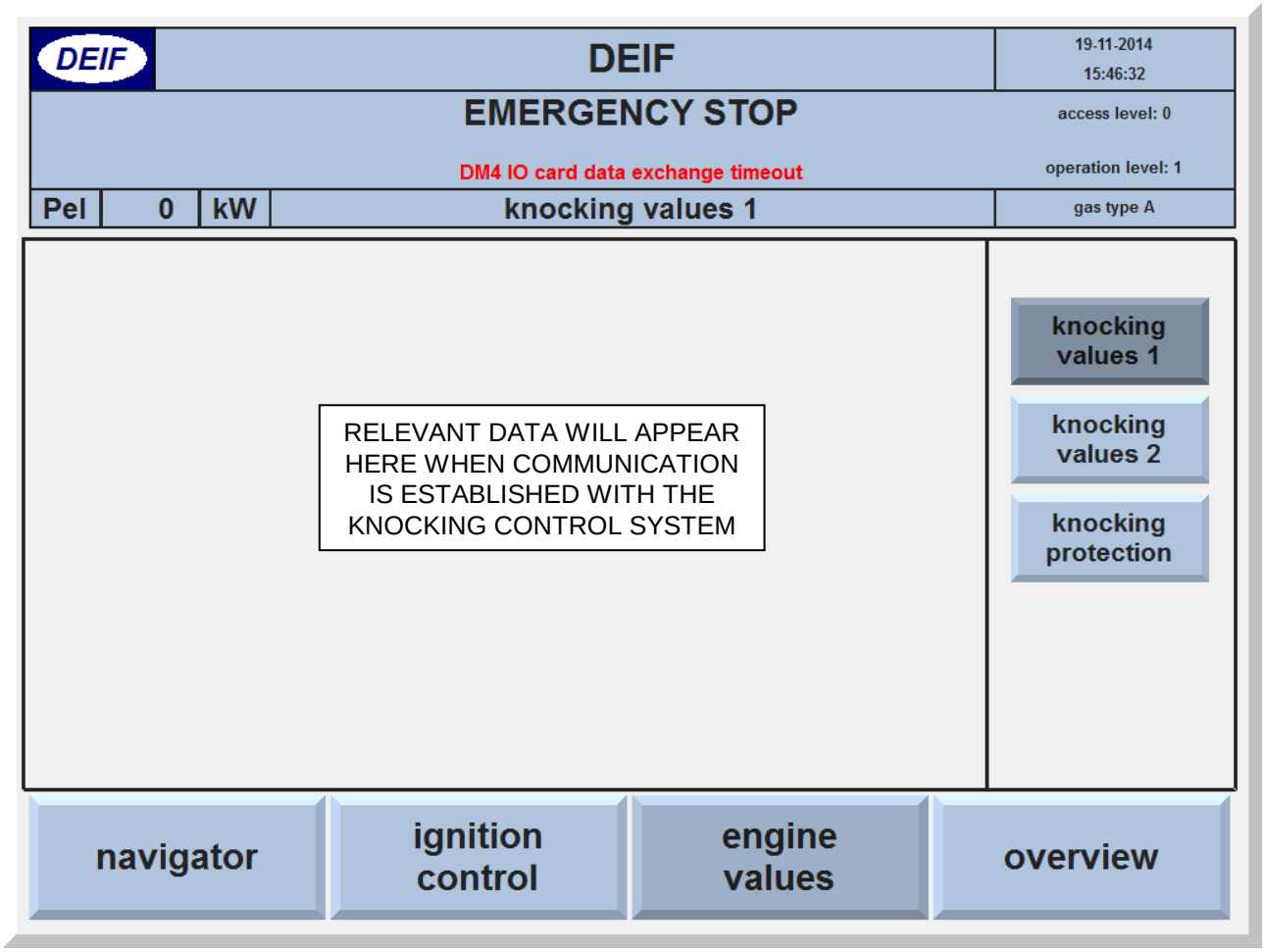
Knocking control

The knocking control pages are accessed from the engine values page or the ignition control page, and these pages present data concerning the knocking control system for the gas engine.

Knocking control data can only be presented if the knocking control system used within the application permits communication with the DM 400 controller.

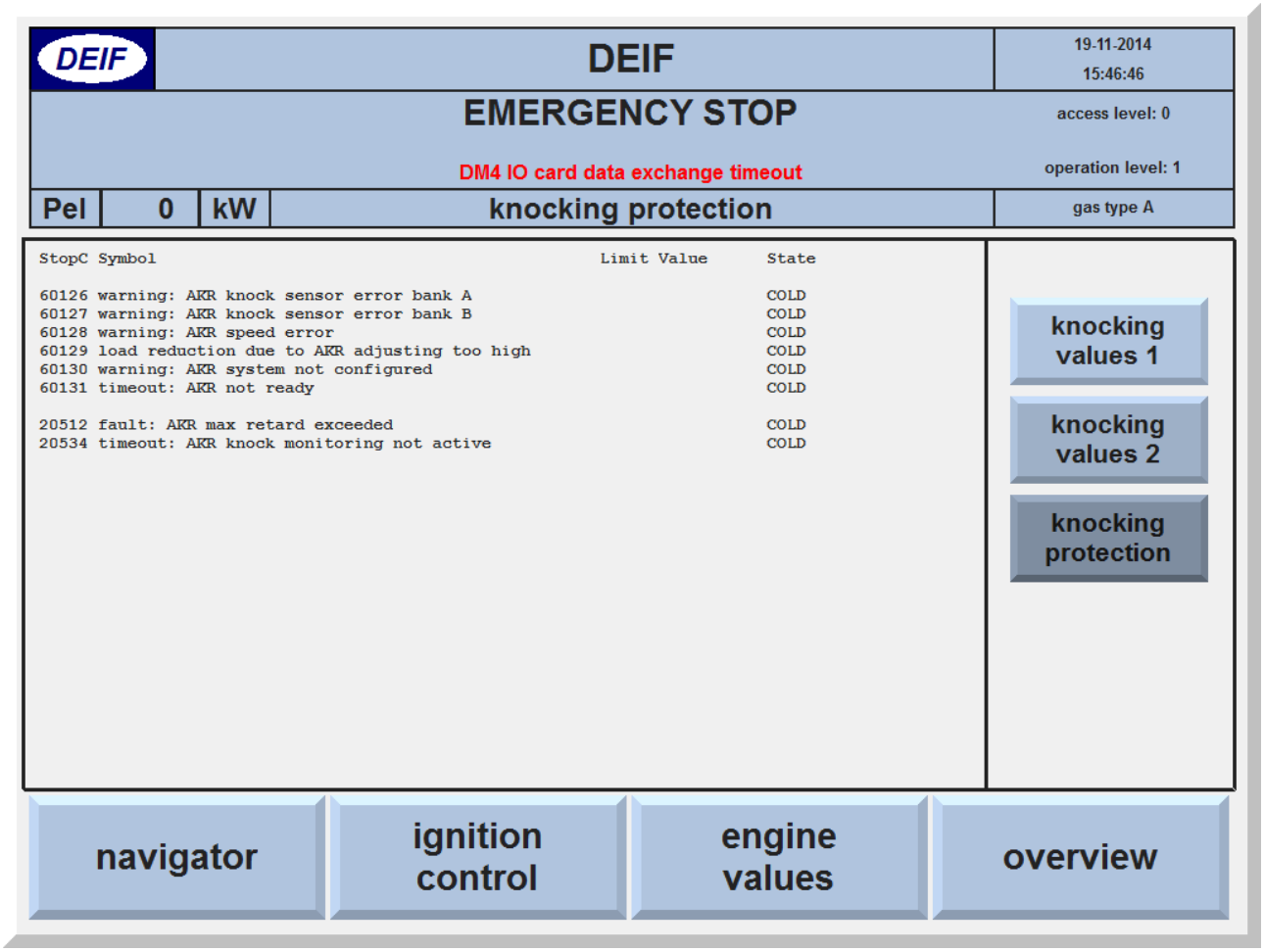
Knocking values pages 1 and 2

The knocking values pages display values relating to the anti-knocking control system that are read by the DM 400.
If it is not possible to communicate with the knocking control system in a particular application, then this data cannot be retrieved or displayed.
The data which can be retrieved from the knocking control system and therefore displayed on these pages is depending on the capability of the knocking control system itself.



Knocking protection

The knocking protection page displays DM 400 parameters relating to the anti-knocking control system.



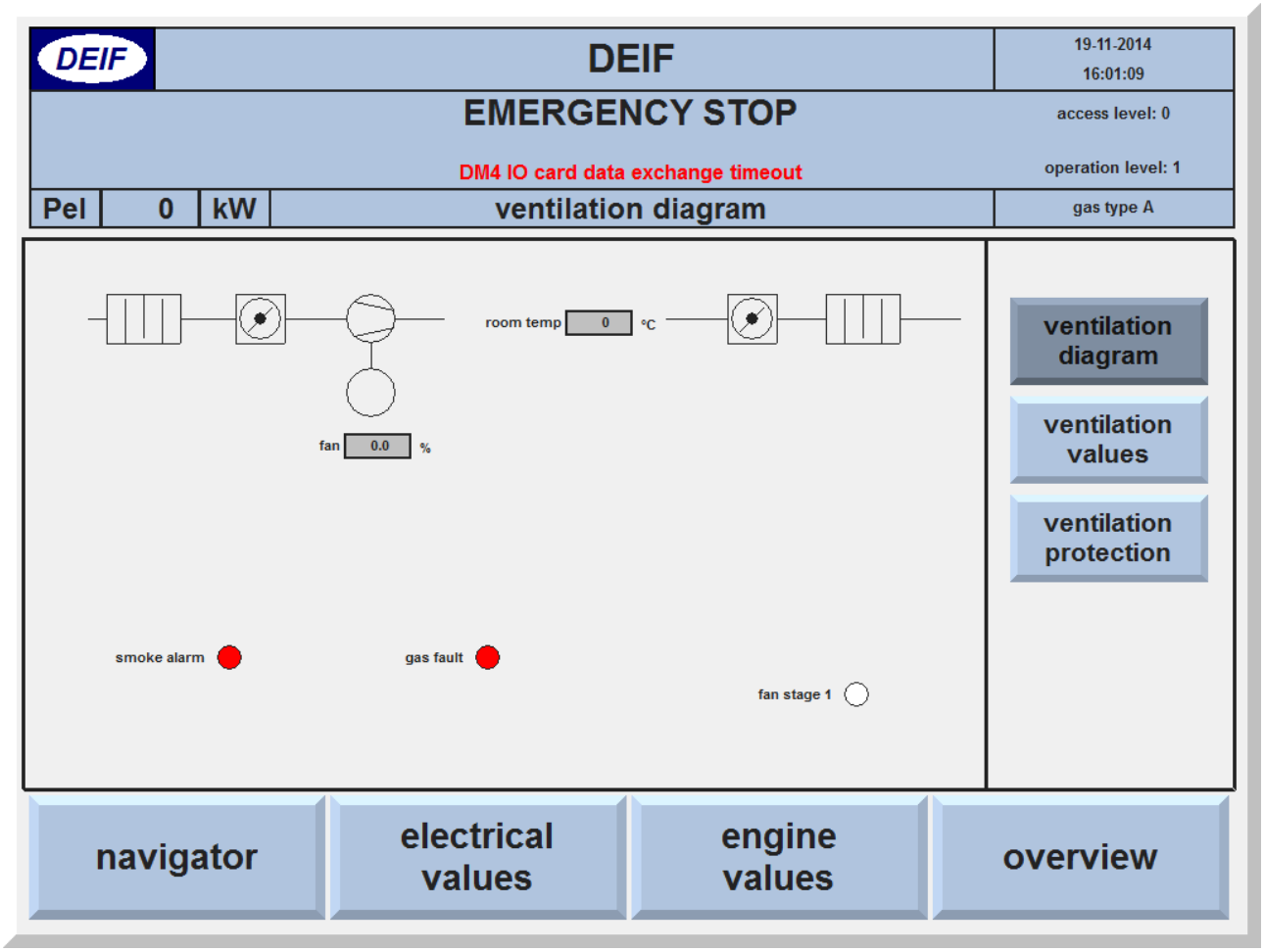
The knocking protection data consists of:

StopC — Stop Condition alarm number
Symbol — Parameter text description
Limit — Parameter limit for the value column
Value — Actual value measured or calculated within the DM 400
State — Current parameter state

- COLD: not activated
- HOT: parameter limit has been exceeded and waiting for any associated time delay to expire
- REC: an auto acknowledge condition has occurred and is now in the process of recovering back to the COLD state
- TRIP: the parameter limit has been exceeded, any associated time delay has expired and therefore a warning or fault condition is present.

Room air ventilation

Ventilation diagram



This page presents the following data:

Fan — The set point of the flap position or the fan speed (0 %-100 %)

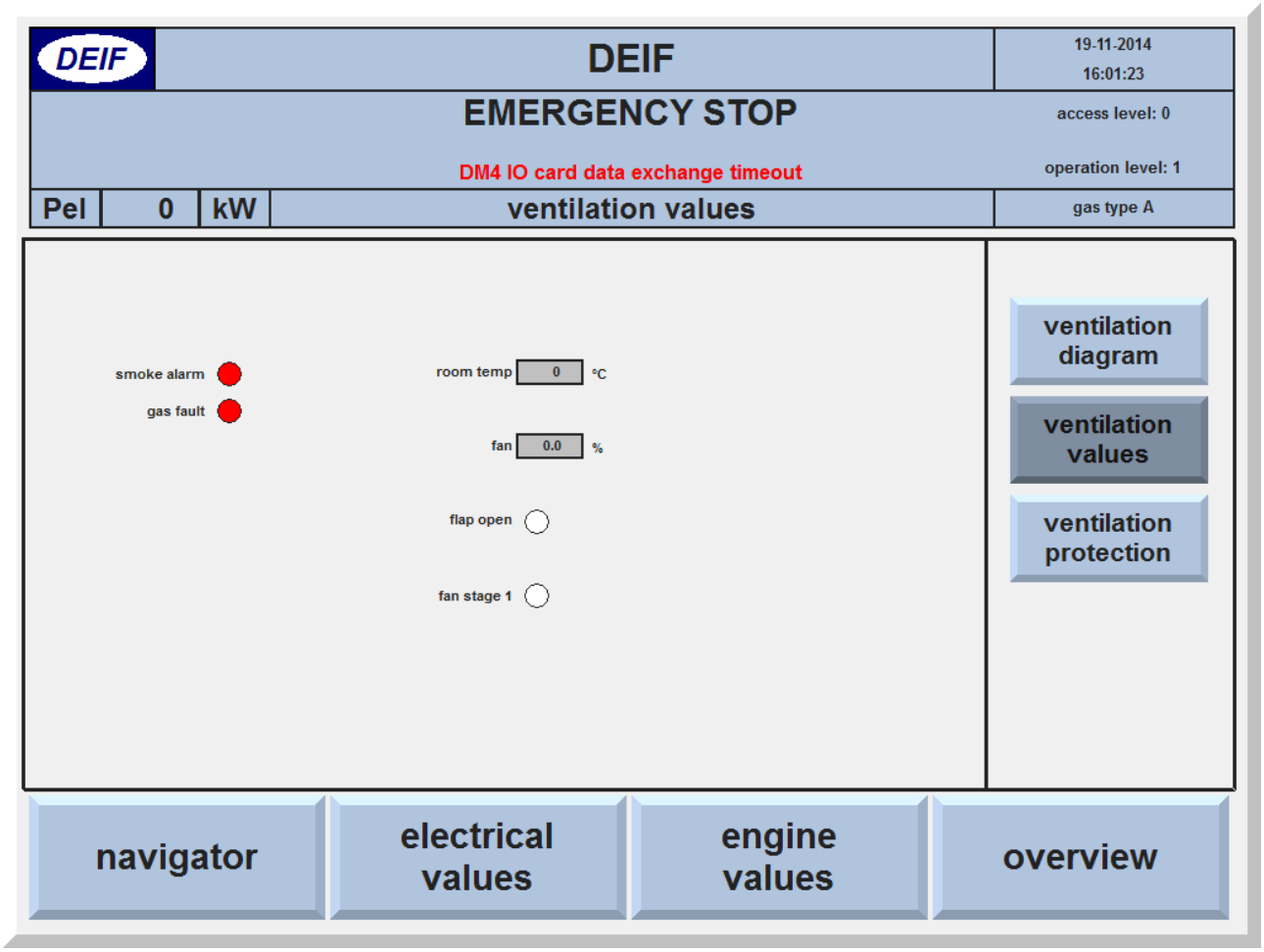
Room temp — The present measured container/enclosure temperature (°C)

Smoke alarm — An indicator representing the status of the smoke alarm where
WHITE = off
GREEN= status OK
RED = fault, alarm or warning condition

Gas fault — An indicator representing the status of gas fault indicator where the colour indications are as stated above

Fan stage 1 — An indicator representing the status of cooling fan(s) where the colour indications are as stated above

Ventilation values



This page presents the following data:

Smoke alarm — An indicator representing the status of the smoke alarm where
WHITE = off
GREEN= status OK
RED = fault, alarm or warning condition

Gas fault — An indicator representing the status of gas fault indicator where the colour indications are as stated above

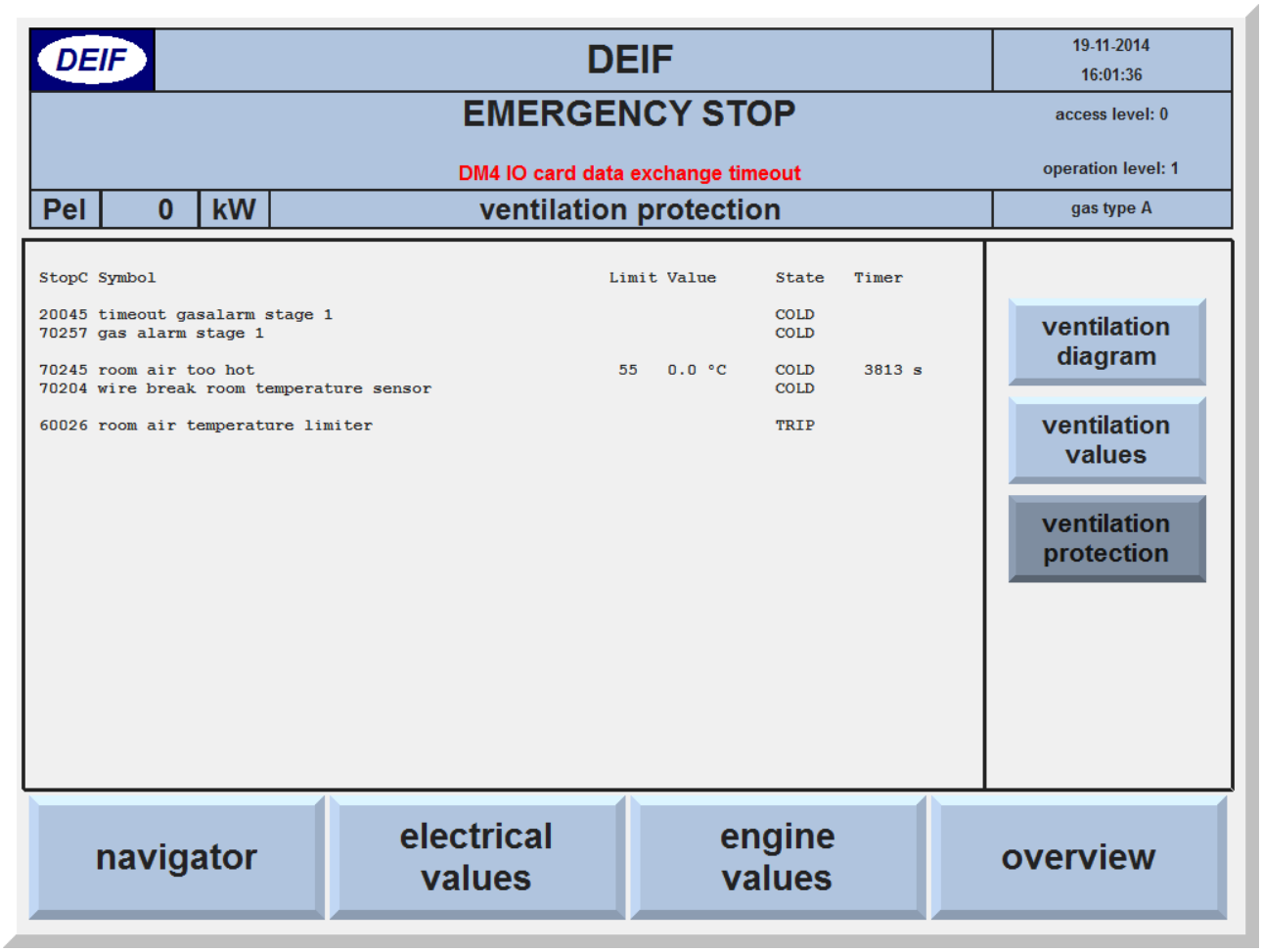
Room temp — The present measured conainer/enclosure temperature (^{o}C)

Fan — The set point of the flap position or thefan speed (0 %-100 %)

Flap open — An indicator representing the status ventilation flap where the colour indications are as stated above

Fan stage 1 — An indicator representing the status of cooling fan(s) where the colour indications are as stated above

Ventilation protections



The ventialtion protection data consists of:

StopC — Stop Condition alarm number
Symbol — Parameter text description
Limit — Parameter limit for the value column
Value — Actual value measured or calculated within the DM 400
State — Current parameter state
- COLD: not activated
- HOT: parameter limit has been exceeded and waiting for any associated time delay to expire
- REC: an auto acknowledge condition has occurred and is now in the process of recovering back to the COLD state
- TRIP: the parameter limit has been exceeded, any associated time delay has expired and therefore a warning or fault condition is present.

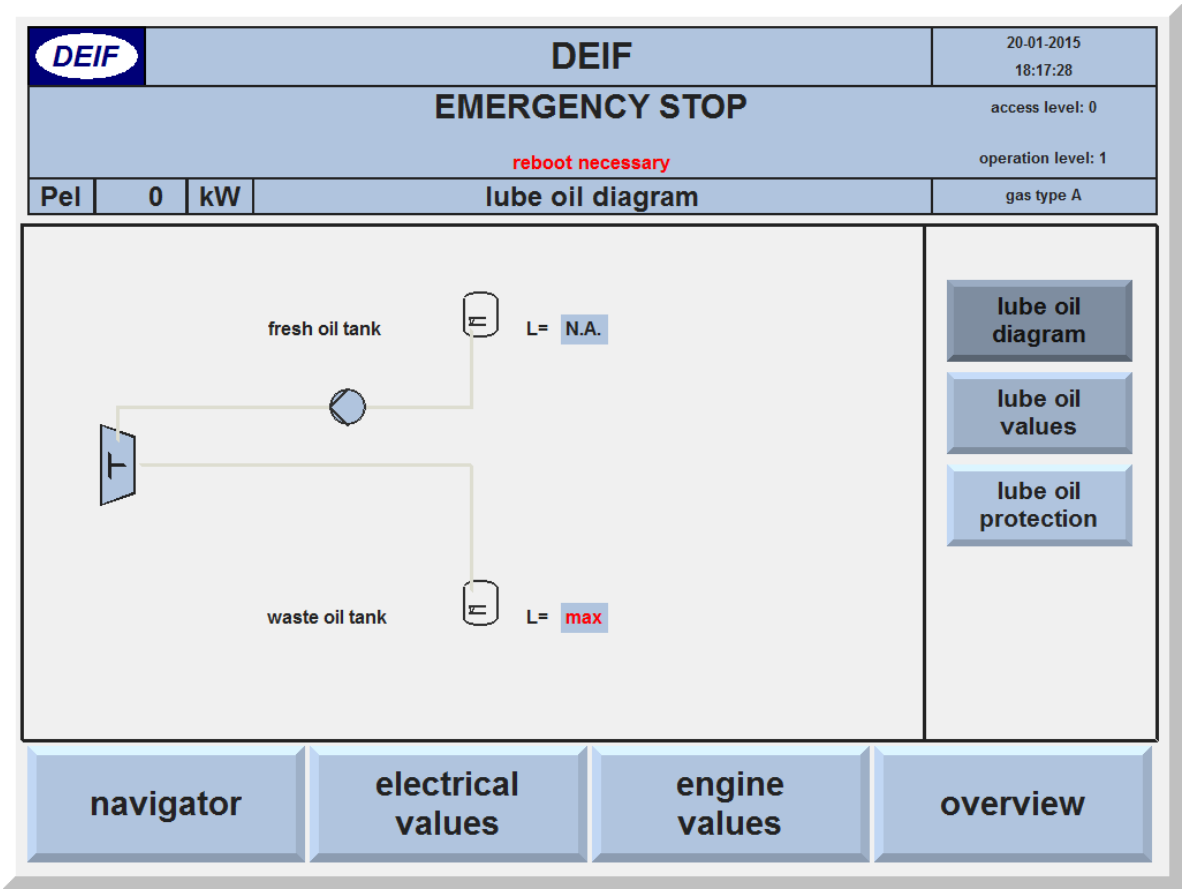
Timer — The duration for which the current state has existed in seconds

Test of auxiliaries

The auxiliaries test functionality is designed only for use during commissioning and for diagnostics purposes. The pages and functions within this section are not intended for use by an untrained operator and are therefore intentionally omitted from this manual. Consequently, no descriptions are provided.

Lube oil system

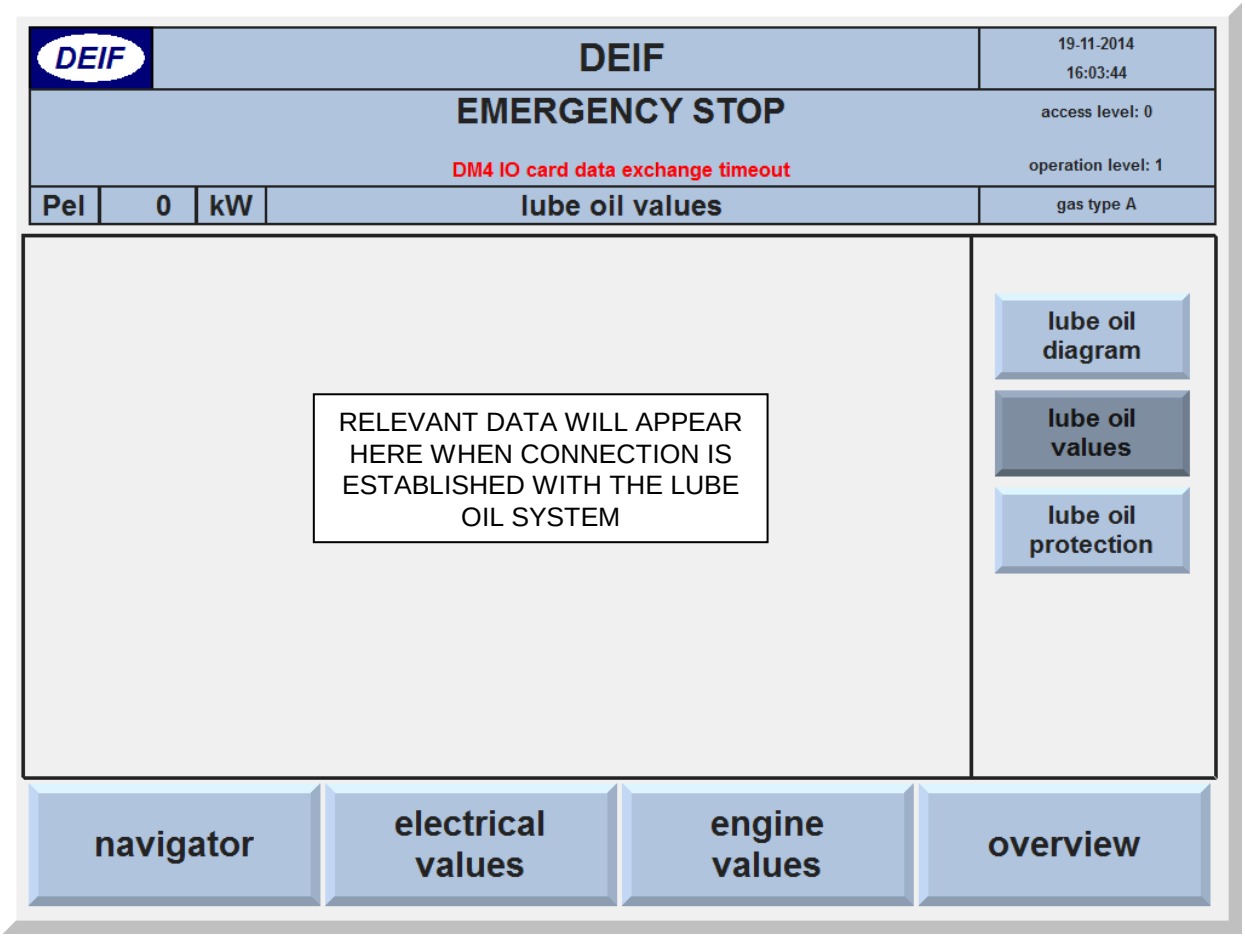
Lube oil diagram



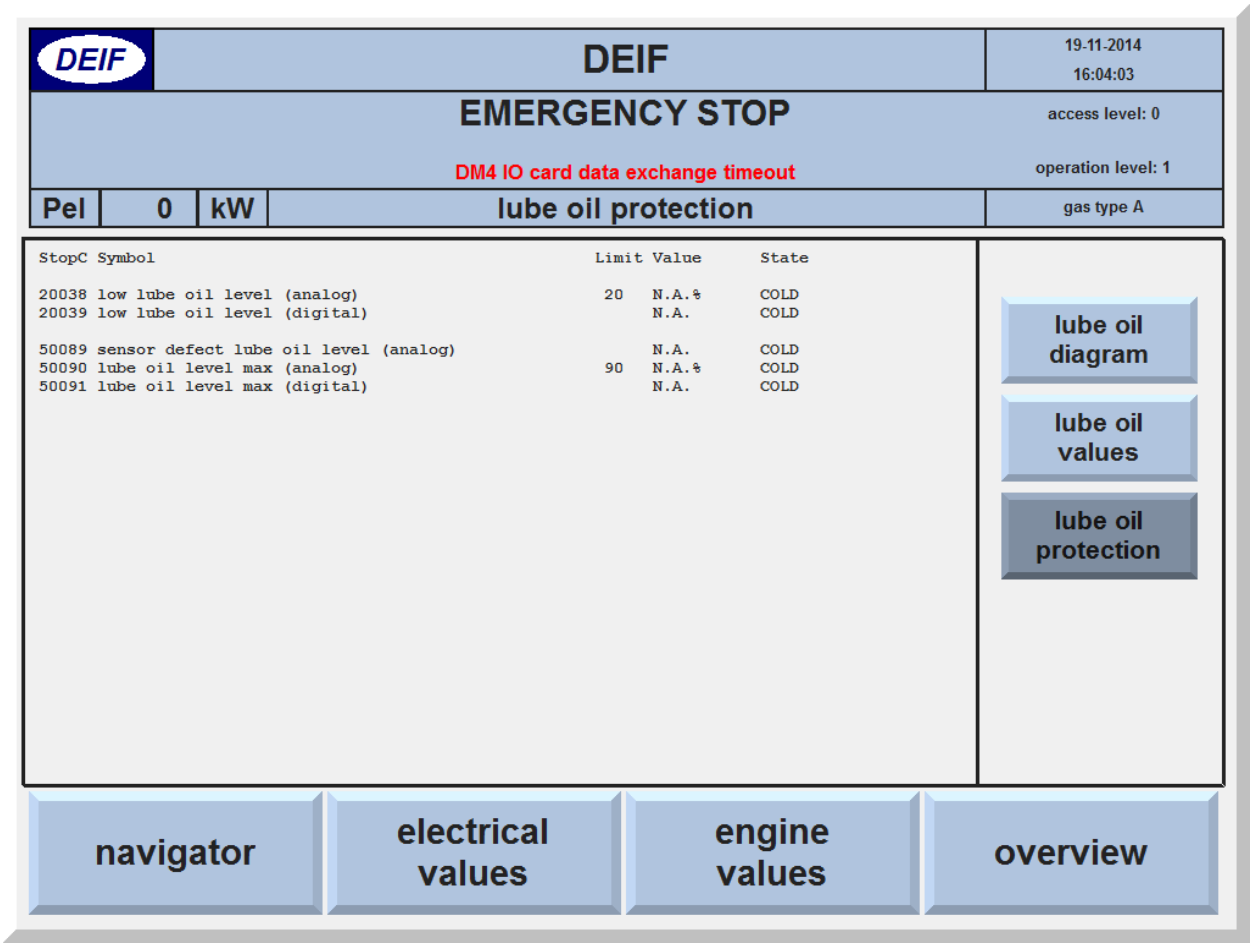
This page presents the following data:

fresh oil tank: the value read from the fresh oil tank sender
oil tank pump: the status of the pump for adding fresh oil to the engine
waste oil tank: the value read from the waste oil tank sender

Lube oil values



Lube oil protection



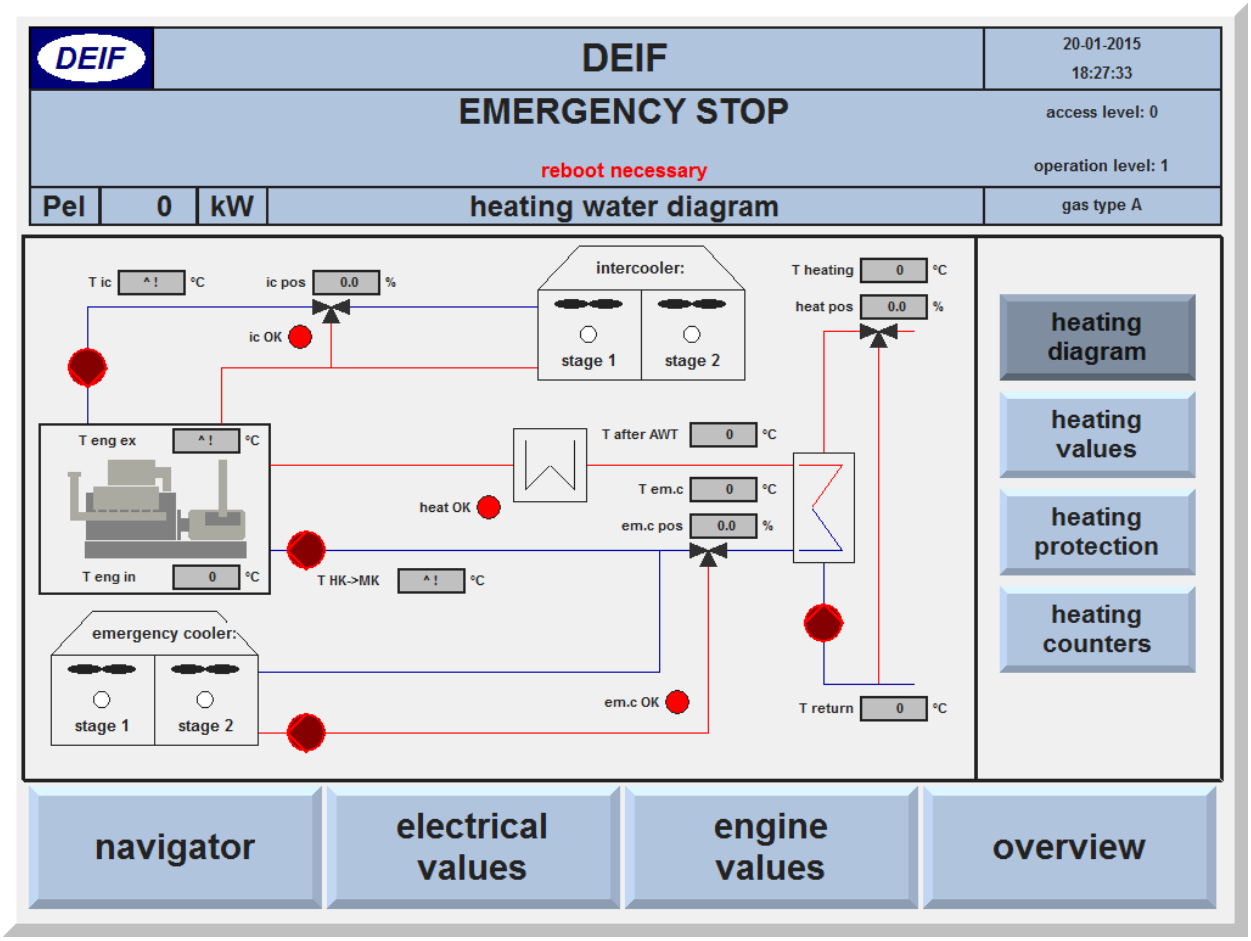
The lube oil protection data consists of:

StopC — Stop Condition alarm number
Symbol — Parameter text description
Limit — Parameter limit for the value column
Value — Actual value measured or calculated within the DM 400
State — Current parameter state

COLD: not activated
HOT: parameter limit has been exceeded and waiting for any associated time delay to expire
REC: an auto acknowledge condition has occurred and is now in the process of recovering back to the COLD state
TRIP: the parameter limit has been exceeded, any associated time delay has expired and therefore a warning or fault condition is present.

Heating system

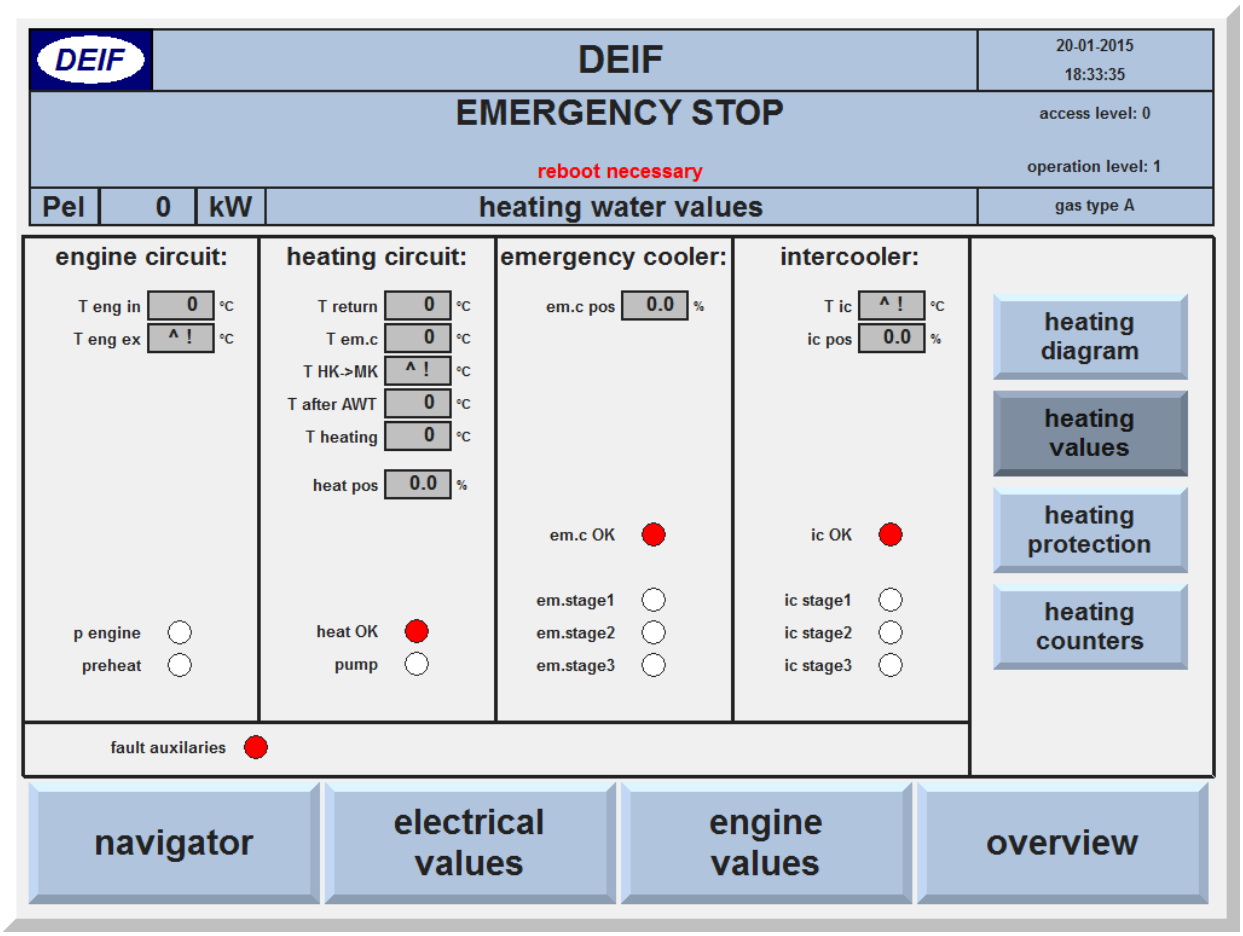
Heating system diagram



The heating system shows relevant values measured at various points of the heating/cooling circuit and also shows the status of pumps and visual status indicators of temperature values where a GREEN indicator confirms that the temperature values at the specified points are acceptable and a RED indicator advises that the temperature is out of the specified limits.

Note that the heating system diagram automatically updates, based on the parameter options selected.
Consequently, the diagram above is shown for illustration purposes, and the actual diagram displayed will be system-specific.

Heating water values



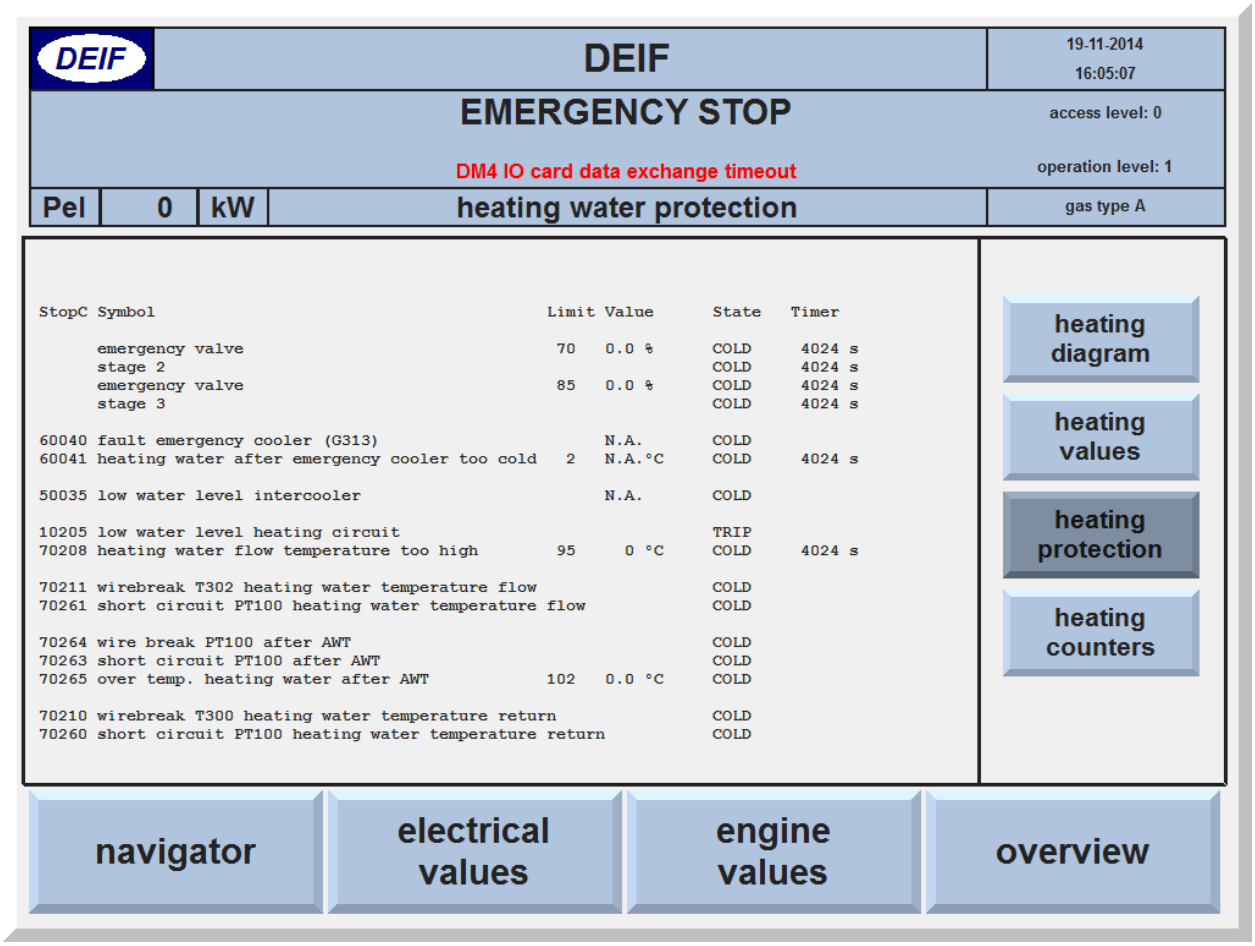
This page presents the heating and cooling circuit data and is shown for illustration purposes. The actual data displayed is system-specific based on the parameter options selected. Consequently, the actual data shown may differ from that shown above.

All measured values are displayed with text identifier and unit of measure.

An indicator representing the status of the equipment is also displayed where

WHITE = off
GREEN= status OK
RED = fault, alarm or warning condition

Heating water protection

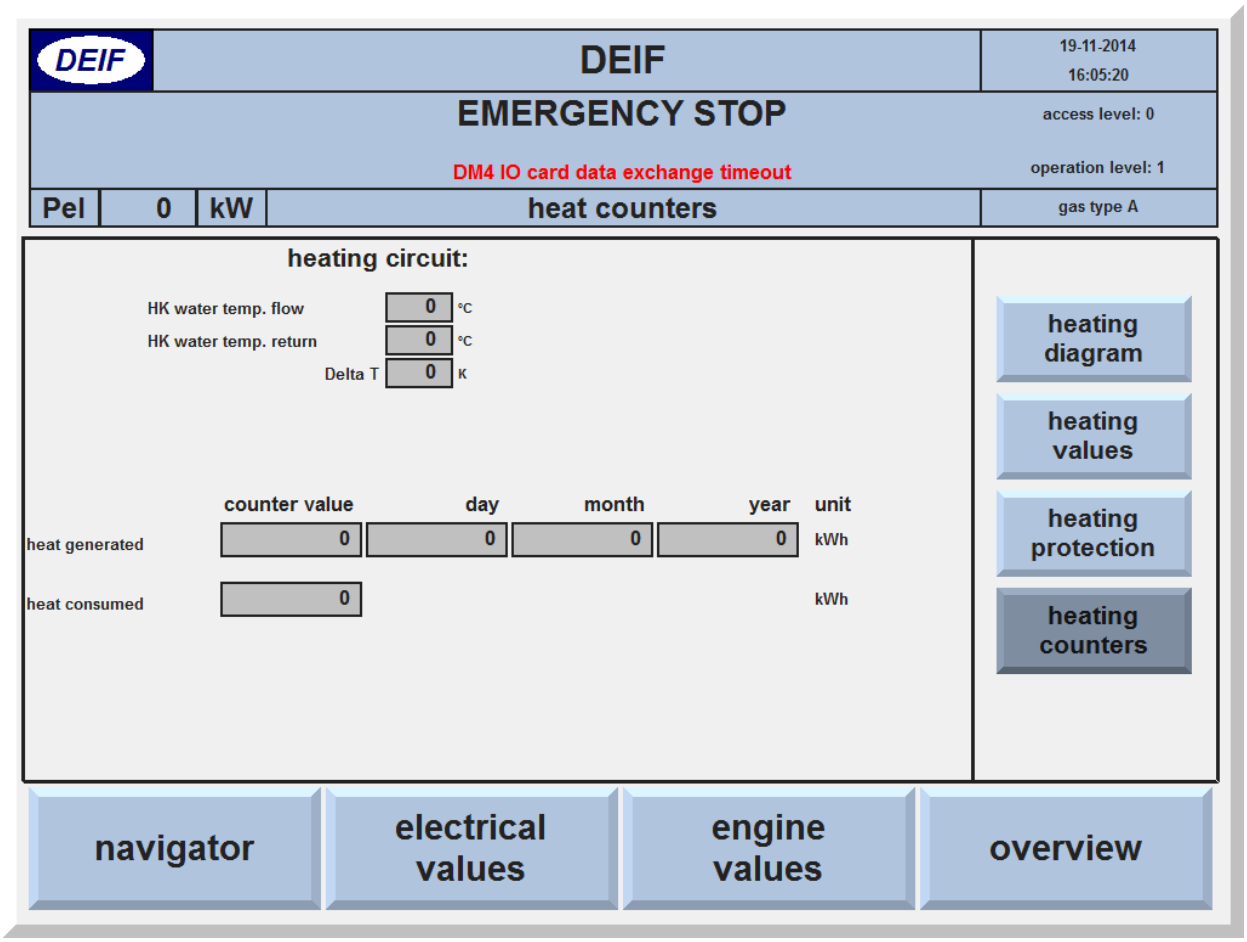


The heating water protection data consists of:

StopC — Stop Condition alarm number
Symbol — Parameter text description
Limit — Parameter limit for the value column
Value — Actual value measured or calculated within the DM 400
State — Current parameter state
- COLD: not activated
- HOT: parameter limit has been exceeded and waiting for any associated time delay to expire
- REC: an auto acknowledge condition has occurred and is now in the process of recovering back to the COLD state
- TRIP: the parameter limit has been exceeded, any associated time delay has expired and therefore a warning or fault condition is present.

Timer — The duration for which the current state has existed in seconds

Heat counters



This page displays the following data:

HK Water Temp Flow: heating circuit water temperature flow (out of CHP system) (^{o}C)
HK Water Temp Return: heating circuit water temperature return (back to CHP system) (^{o}C)

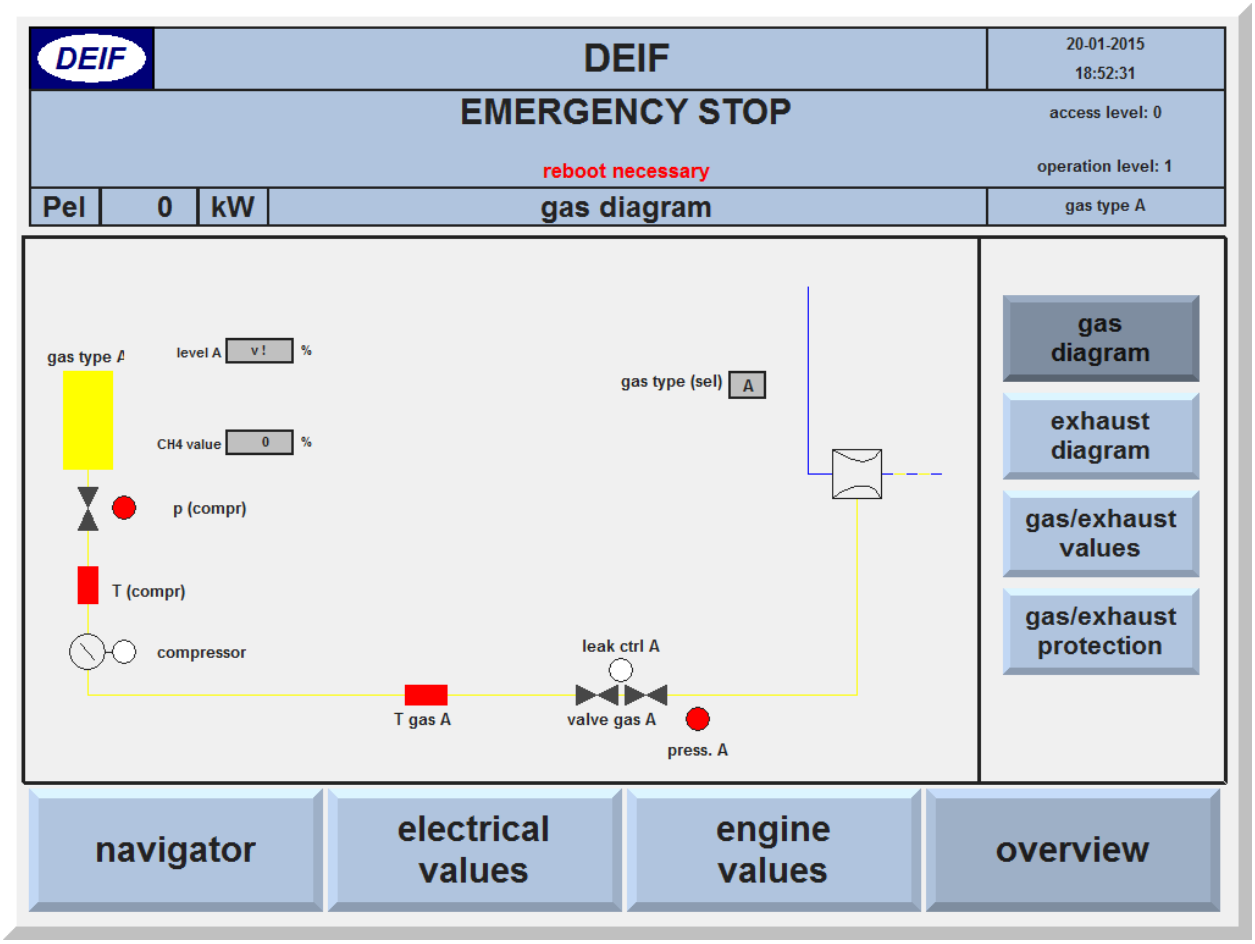
Also displayed on this page are the counters for the generated heat energy and a value for the heat energy consumed.

The heat-generated counter displays
- a total heat value generated by the system
- for the current day
- for the current month and
- for the current year

The heat consumed counter displays
- a total heat value consumed by the system

Gas/exhaust system

Gas diagram



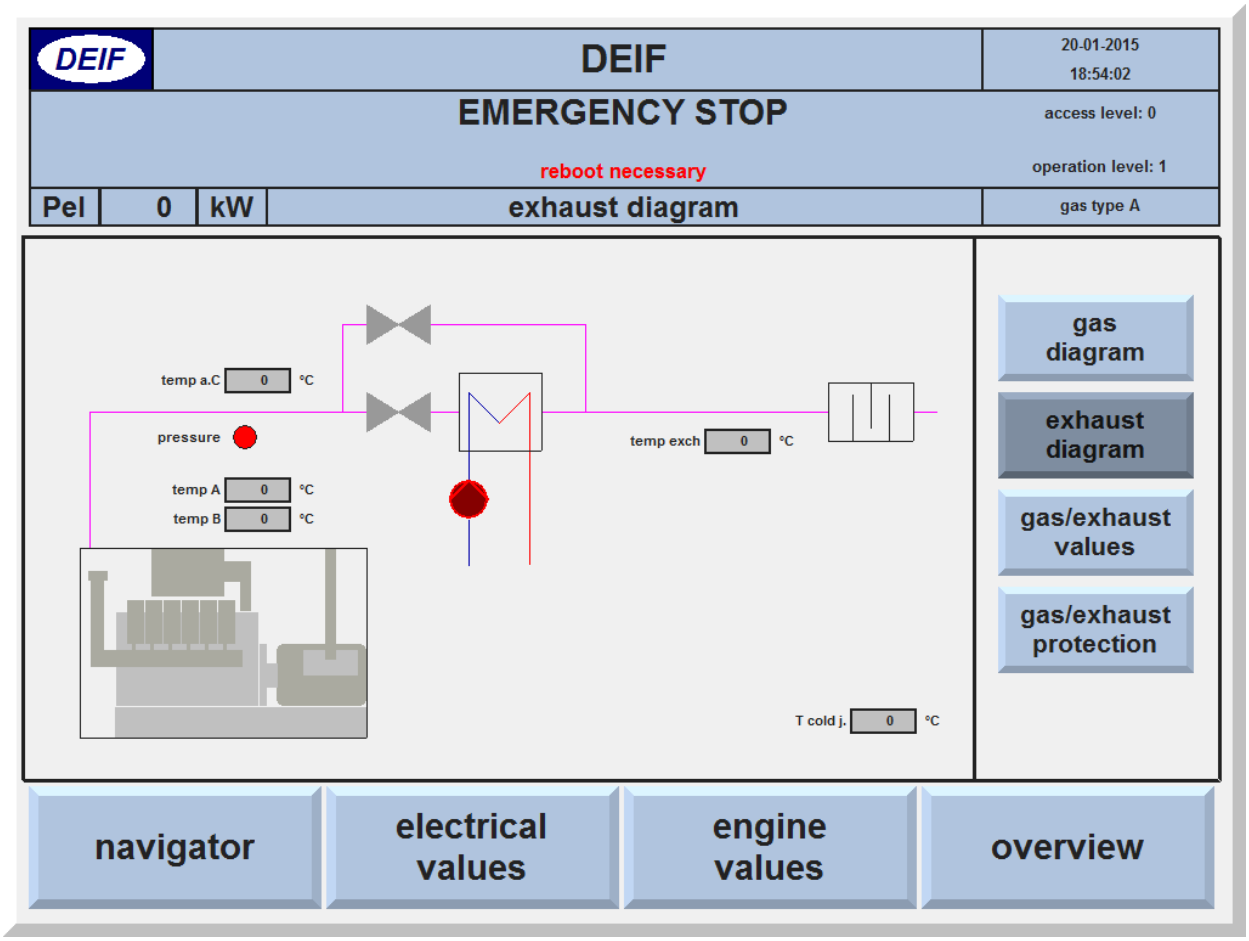
This page presents the gas supply system data and is shown for illustration purposes. The actual data displayed is system-specific based on the parameter options selected. Consequently, the actual data shown may differ from that shown above.

All measured values are displayed with text identifier and unit of measure.

An indicator representing the status of the equipment is also displayed where

WHITE = off
GREEN= status OK
RED = fault, alarm or warning condition

Exhaust diagram



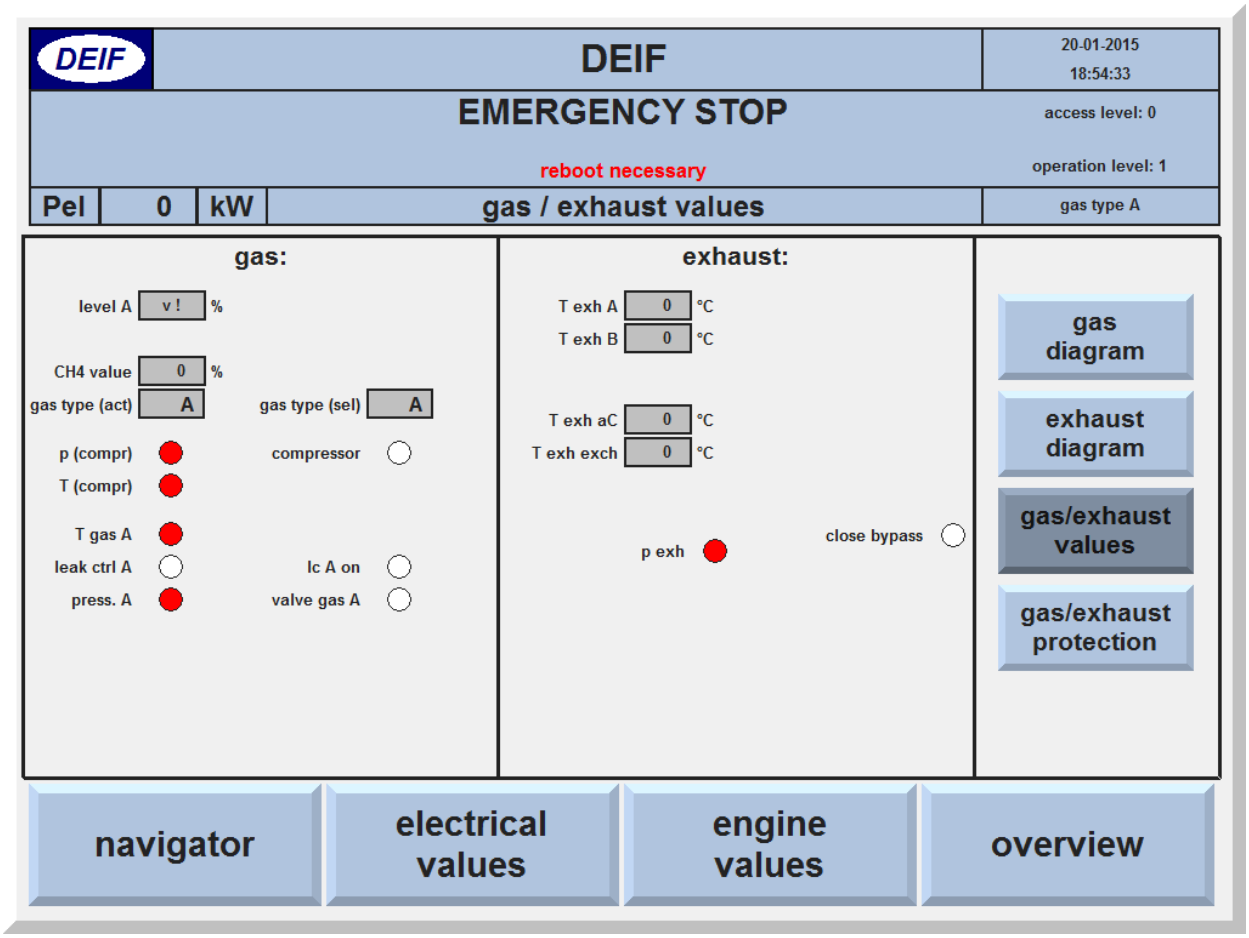
This page presents the exhaust system data and is shown for illustration purposes.
The actual data displayed is system-specific based on the parameter options selected.
Consequently, the actual data shown may differ from that shown above.

All measured values are displayed with text identifier and unit of measure.

An indicator representing the status of the equipment is also displayed where

WHITE = off
GREEN= status OK
RED = fault, alarm or warning condition

Gas and exhaust values



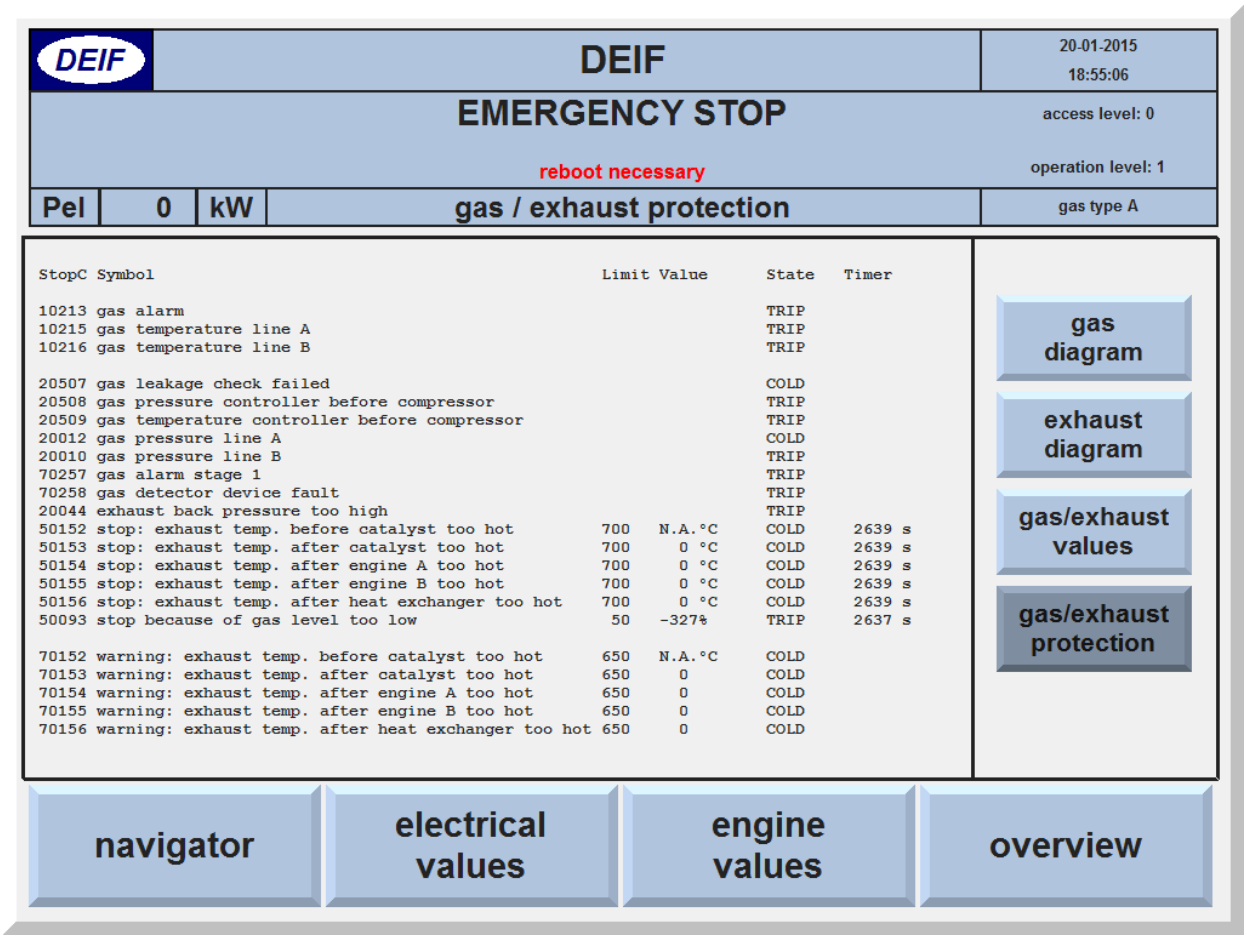
This page presents the combined data from the gas supply and exhaust systems and is shown for illustration purposes.
The actual data displayed is system-specific based on the parameter options selected. Consequently, the actual data shown may differ from that shown above.

All measured values are displayed with text identifier and unit of measure.

An indicator representing the status of the equipment is also displayed where

WHITE = off
GREEN= status OK
RED = fault, alarm or warning condition

Gas and exhaust protections



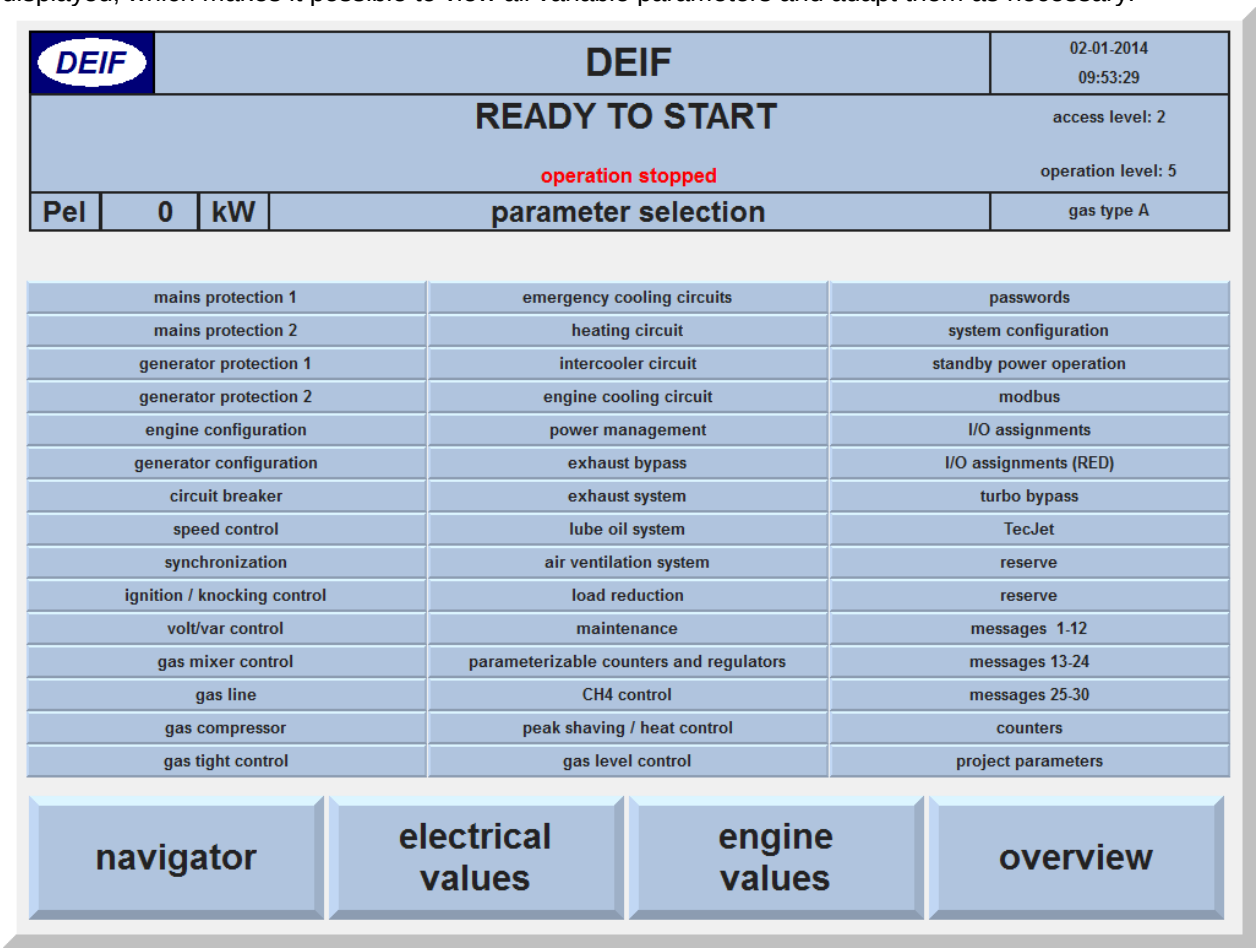
The gas and exhaust protection data consists of:

StopC	Stop Condition alarm number
Symbol	Parameter text description
Limit	Parameter limit for the value column
Value	Actual value measured or calculated within the DM 400
State	Current parameter state COLD: not activated HOT: parameter limit has been exceeded and waiting for any associated time delay to expire REC: an auto acknowledge condition has occurred and is now in the process of recovering back to the COLD state TRIP: the parameter limit has been exceeded, any associated time delay has expired and therefore a warning or fault condition is present.
Timer	The duration for which the current state has existed in seconds

Parameters

Parameters are variable settings that define the limits and the functionality of the overall DM 400 system. Parameters are set relative to the specific requirements of each system and thus the values shown in the following pages are for illustration purposes only.

Access to the system parameters is made via the navigator page.
With the "parameters" button (on the navigator page), the "parameter selection**"** page is displayed, which makes it possible to view all variable parameters and adapt them as necessary.



Parameter numbers

Each parameter has a unique number which is used to identify the parameter and is displayed in the parameters editor page and also entered into the parameter log book when changed.

Permission level

Each parameter is assigned with a minimum permission level required to change that value. Only users who have logged on with the required permission level (or higher) can change that parameter.

Parameter list

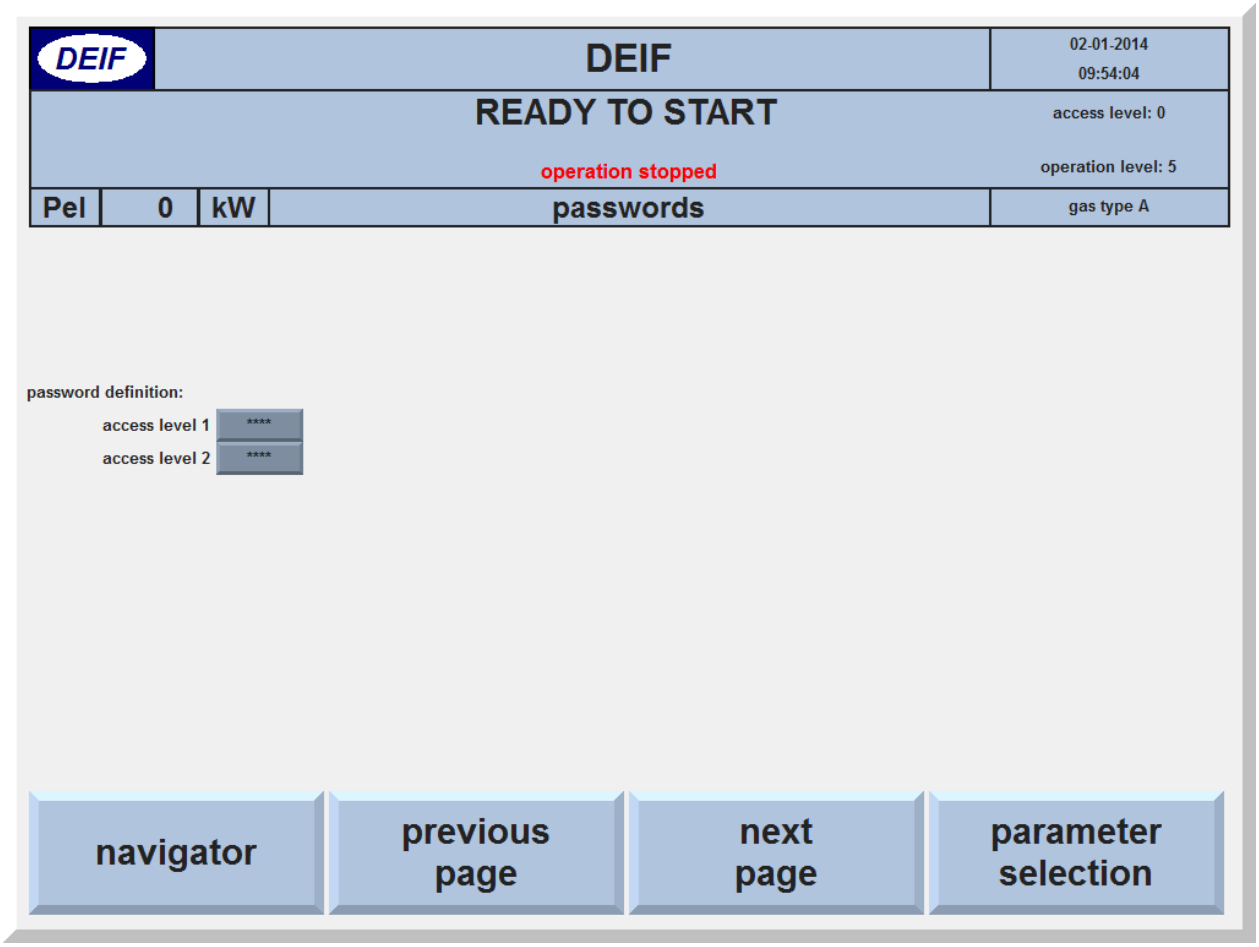
All parameters available within the standard DM 400 software can be found in the DM 400 software parameter list document. This document is adapted to the project in question and is delivered with the Delomatic 400.
This document provides information relating to each individual parameter then, after logging on, select the parameter and the parameter editor will display the parameter number and this can be located in the parameter list documentation.

Define password/parameters editor

With a new system, it is possible to log in as an operator (access level 1) or service technician (access level 2) without a password, until the respective password has been defined.
As long as a password has not been defined and saved as a parameter, logging in is possible by simply clicking the access level 1 or access level 2 buttons; in other words, the system is not protected from unauthorised parameter changes.

It is normal that the passwords are set during the commissioning procedure to ensure that the system is properly protected.

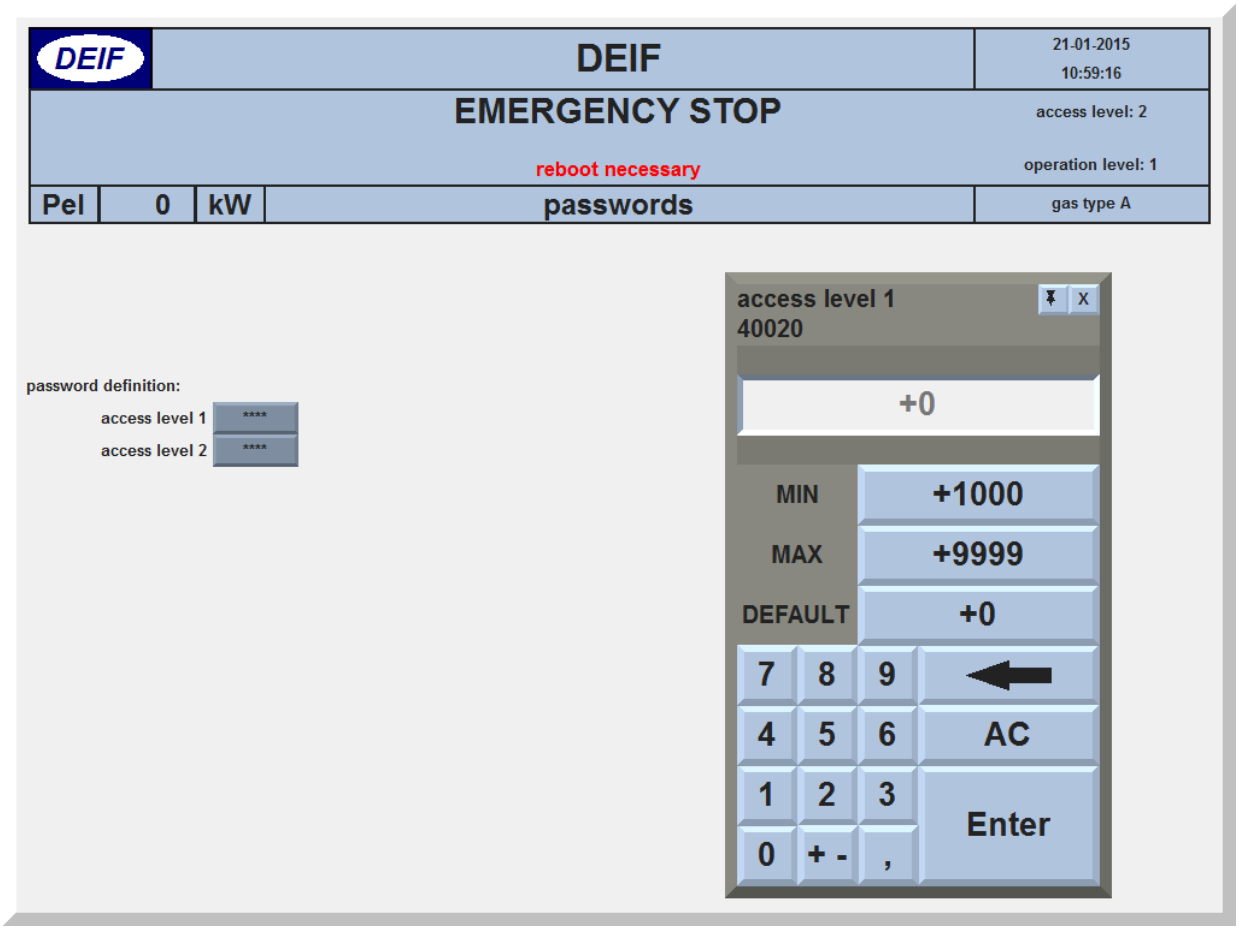
The passwords can only be defined or redefined if the operator is logged in with at least the appropriate permission level.



If, for example, the operator is logged in with access level 1, then only the access level 1 password can be changed, not the access level 2 password.
Access level 3 is reserved for DEIF and cannot be reset.

By clicking the button for define password (access level 1 or access level 2), the parameters editor is activated. This enables the definition of a password in the permissible range between 1000 and 9999.
It is **very important** that the **password** entered is **recorded and kept in a secure yet retrievable location.**

Password parameter editor

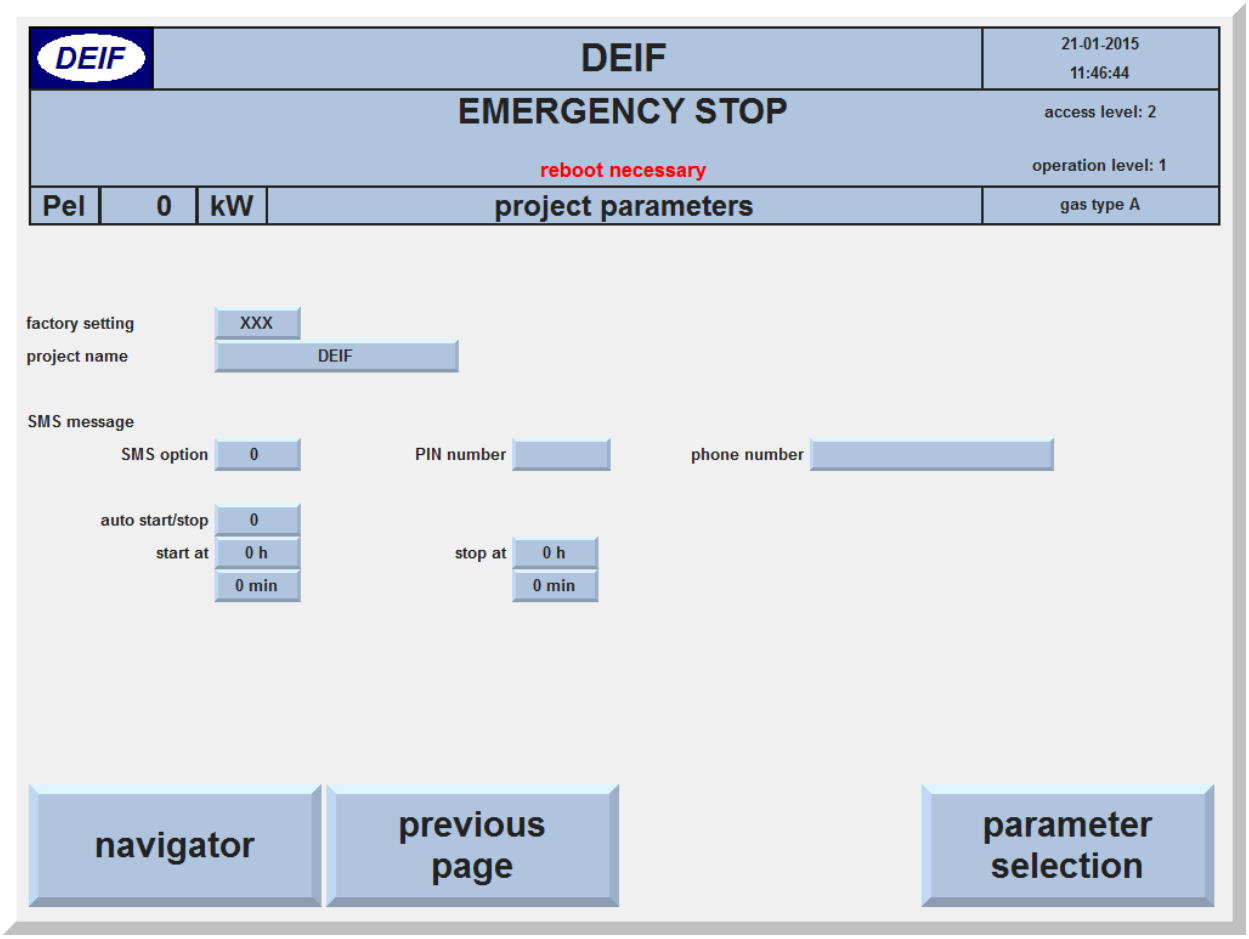


Factory setting for the passwords:
Level 1: 1111
Level 2: 2222

Use the parameter editor in the standard way as previously defined.

Project parameters

The project parameters page is accessed via the parameter selection page.



The page displays the following data:

Factory setting	A password-protected function which will restore all PARAMETER values back to their factory default settings.
Project name	The name under which the data will be saved on the hard drive of the touchpanel PC HMI and the wording that will appear at the top of every display page
SMS option	0 = disabled; 1 = enabled
Pin number	For the SIM card used
Phone number	For the SIM card used
Auto start/stop	Option to allow the unit to auto start/stop within defined time periods. 0 = disabled; 1 = enabled
Start at	Hours value for start time setting (range 0-23 h) Minute value for start time setting (range 0-59 minutes)
Stop at	Hours value for stop time setting (range 0-23 h) Minute value for start time setting (range 0-59 minutes)

7. Statuses and messages

The current primary status of the plant is displayed on the user interface at all times.
The sub-condition information and error messages are also shown at all times directly below the primary status.
If the text of the sub-condition is red, this indicates either a stop condition or pending error message relating to a fault condition.
The highest priority fault condition error message is always shown here.
When this fault condition shown is cleared, the next highest priority fault condition (if there is one) is displayed.

Error messages

Every error message defined in the system by an alarm number along with descriptive text.

"Current alarms" can be viewed at any time with the navigator button, and these alarms can also be acknowledged on this page.
The first digit of the alarm number indicates the operating level of the error message.
The highest priority fault condition is shown in the sub-condition field of the HMI display.

Higher level fault conditions must be acknowledged by the user before the system will allow the operation to commence.

It is possible to classify lower level fault conditions as "auto acknowledge". This means that the error message will be automatically acknowledged, and the message will be cleared whenever the fault condition is no longer present.

It is not possible to acknowledge and clear an error message if the fault condition still exists.
The fault condition must be removed and then the error message acknowledged before the system operation will continue.

Primary statuses

The following primary statuses are possible:

Primary status - text	Comments
SYSTEM BOOT	**DM 400 main boot**
SYSTEM START	**DM 400 system start**
EMERGENCY STOP	**Emergency stop condition exists, and engine is stopped**
EMERGENCY BRAKING	**An emergency stop condition exists, and the engine is stopping**
REARM SAFETY CHAIN	**Rearm the safety chain**
START BLOCKED	**System is blocked from restarting due to a fault condition**
READY TO START	**System is ready to start**
STOPPING	**Engine is stopping under a normal stop condition**
START PREPARATION	**Starting sequence has been initiated**
CRANKING	**Engine has been given the signal to crank**
IGNITION	**Ignition system has been enabled**
OPEN GAS VALVES	**Gas valves have been given signal to open**
ACCELERATION	**Engine is running and is accelerating to nominal speed**
IDLE RUNNING	**Engine is running at nominal speed. Generator breaker is open**
SYNCHRONISING	**Voltage and frequency are being adjusted to match mains/busbar voltage. Generator breaker is open**
LIMITED LOAD	**Generator breaker is closed and the generator is operating at reduced load for warming up**
GRID PARALLEL OPERATION	**Generator breaker is closed, and generator is operating in parallel to the grid at nominal power output.**
OPEN BREAKER	**Signal sent to open breaker**
COOLDOWN	**Generator breaker is open, and the engine is in a cool down period before stopping**
TEST OPERATION	**Running in test mode**
CLOSE BREAKER (ISLAND)	**Signal sent to close generator breaker in island mode**
ISLAND OPERATION	**Generator breaker is closed, and generator is operating in island mode at nominal power output**
BACK SYNCHRONISING	**Voltage and frequency are being adjusted to match mains voltage. Mains breaker is open.**
OPEN MAINS BREAKER	**Signal sent to open mains breaker**
LOADSHARING RAMP UP	**Power output is being increased in order to join load sharing**

Primary status - text	Comments
LOADSHARING	**Load sharing mode at nominal value**
LOADSHARING RAMP DOWN	**Power output is being decreased in order to leave load sharing**
UNDEFINED BREAKER POSITION	**Breaker feedback has been lost, and the system cannot be certain of the position of the breaker that is being operated**
BLACK OPERATION	**System operating under a loss of mains condition**
MAINS OPERATION	**System operating with mains present**
WAIT FOR BLACKOUT CLOSING	**System is waiting for release information from other power producing units within the island group**

Sub-conditions

The following sub-conditions can arise:

Sub-condition – text	Comments
Opening air flaps	**Ventilation flaps have been given signal to open**
Closing air flaps	**Ventilation flaps have been given signal to close**
Opening exhaust flap	**Exhaust flaps have been given signal to open**
Closing exhaust flaps	**Exhaust flaps have been given signal to close**
Flushing	**Engine is being flushed of gas remaining from previous run**
Stop time	**Waiting for the stop timers to expire**
Starter on	**Starter has been enabled**
Starter pause	**Start sequence has been temporarily paused**
Engine running	**Engine running feedback has been received**
Adjusting voltage	**Voltage output is being adjusted**
Adjusting frequency	**Frequency output is being adjusted**
Island operation	**Generator is running in island mode**
Adjusting real power	**Real power output is being adjusted**
Load reduction operation	**System is completing a load reduction instruction**
Deloading for cut out	**System is reducing power output prior to opening the generator breaker**
Interval prelubrication	**System is completing a scheduled engine lubrication process, and starting is blocked until process is completed**
Start prelubrication	**System is completing a pre-start engine lubrication process, and starting is blocked until process is completed**
Post lubrication	**System is completing a post-run engine lubrication process, and starting is blocked until process is completed**
Gas mixer in configuration	**The operator has disabled automatic regulation of the gas mixer (normally for testing purposes), and this will remain disabled until the operator exits the testing mode.**

Operating levels

There are alarms which make it necessary to stop and/or block the continued operation of the plant until the fault condition is removed or an alarm can simply show a warning message.
If the alarm type is more serious than a warning and requires the engine to be stopped, then there is an additional level of attribute which will indicate if an immediate stop or a controlled stop of the engine is required.
If the fault condition has caused the engine to stop (whether immediately or via a controlled stop), the engine will be blocked from restarting until the fault condition has been cleared and the alarm has been acknowledged.

Operating Level	Level description	Comments
0	System boot, system start	System tries to start. No further action is possible until this has been achieved. All outputs are 0.
1	Emergency stop	An emergency stop condition has occurred and has not been cleared. All outputs are 0.
2	Standstill	Auxiliary units can operate, engine is stopped, starter off, start sequence is possible
3	Idle run	Auxiliary units, generator and engine are operating. Voltage and frequency are at nominal values. Generator breaker close operation is blocked
4	Voltage and frequency adjustment	Auxiliary units, generator and engine are operating. Voltage and frequency are being adjusted to nominal values (island mode) or for synchronisation (grid parallel operation mode) prior to generator breaker close operation. Generator breaker is open.
5	Power output increase	Auxiliary units, generator and engine are operating. Voltage and frequency have been adjusted to nominal values (island mode) or are synchronised (grid parallel operation mode). Generator breaker is closed. Power output is being increased to nominal power operating conditions (power ramp up).
6	Power output reduction	Auxiliary units, generator and engine are operating. Parallel or island mode operation (as applicable). Generator breaker is closed. Reduced power operating conditions exist.
7	Normal operation	Auxiliary units, generator and engine are operating. Normal (or island – if applicable) mode operation. Generator breaker is closed. Nominal power operating conditions. Warning messages may occur without the unit stopping.
8	Full operation	Auxiliary units, generator and engine are operating. Normal (or island – if applicable) mode operation. Generator breaker is closed. Nominal power operating conditions. No warning messages active.

List of error messages

A summary of the possible alarm numbers and error messages can be downloaded from the system using the DEIF DM 400 configuration software tool.

Inputs and outputs

The inputs and outputs available from the DM 400 Gas system fall into one of three categories, which are:

- a number of permanently configured inputs and outputs
- a number of pre-programmed project-specific inputs and outputs
- a number of freely configurable inputs and outputs

Even though many units are delivered with the standard software to which this manual relates, it is still possible to have project-specific inputs and outputs assigned prior to delivery. As a consequence of this, the operator should refer to the I/O assignment created specifically for their project.