User's guide

SDMO

Control unit

TELYS

V 6.1.0 (16/11/2006)

33502019901_0_1

1. Introduction to TELYS

1.1. Introduction

TELYS is a command / control module designed to control the generating set.
This module, with a 12V or 24V direct current supply, is incorporated into the following control consoles:

NT 2500 Circuit breaker rating ≤ 125 A	NT 3500 Circuit breaker rating ≤ 250 A	NT 4500 Circuit breaker rating ≥ 250 A (1)
		

Fig. 1.1 – View of control consoles

In special applications, TELYS can be fitted to a cabinet separate from the generating set (maximum cable length between the control cabinet and the generating set: 40 metres).
Finally, TELYS is multilingual as standard (French, English, Spanish, Portuguese and German) and offers the option of adding certain specific languages (2).

(1) above 630 A, the circuit breaker is not integrated to the console.
(2) available from 2007.

1.2. Operating conditions

The operating conditions are:

- ✓ Operating temperature: -20 to +60°C
- ✓ Storage temperature: -20 to + 70°C
- ✓ Hygrometry
  - o 95% at 45°C
  - o 70% at 50°C
  - o 50% at 60°C

As an option, the TELYS electronic boards can be protected to withstand atmospheres that cause condensation (tropicalisation).

1.3. Conformity to legal and regulatory requirements

The TELYS machine conforms to the standards below:

Conforms with European or international directives and standards:

- ✓ EMC general standards EN 61000-6-2 and EN 61000-6-4 (emission and protection)
- ✓ LOW VOLTAGE standards
- ✓ Salt spray test performance: In accordance with standard EN68011-2-11
- ✓ Protection index of a TELYS mounted to a console: IP31 with the soft USB port protective cover fitted (according to EN 60529)

Note:

European Parliament directives relating to Electrical and Electronic Equipment (WEEE):

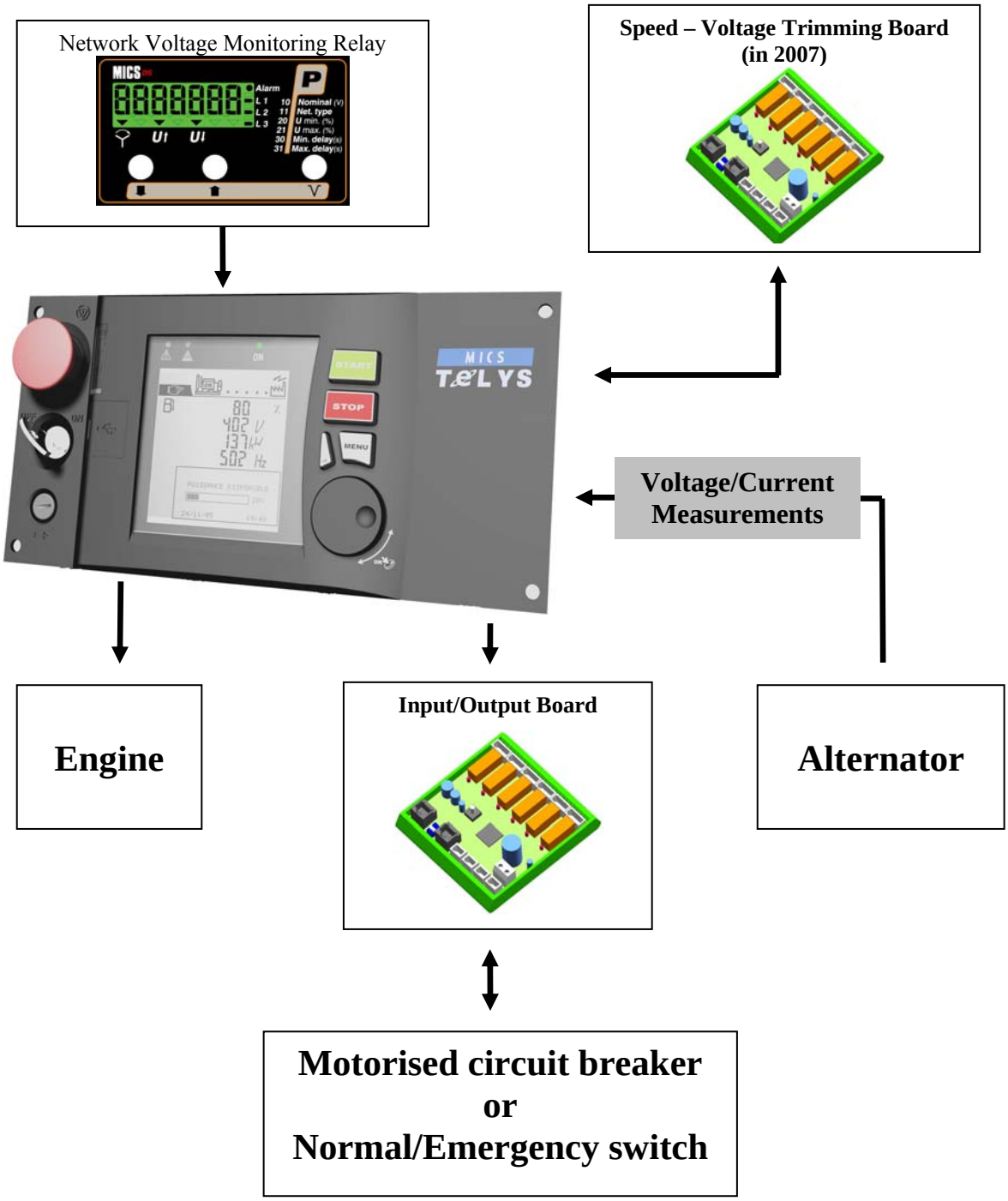
- Limitation of Harmful substances in Electrical and Electronic Equipment (LSDEEE or RoHS) *(Directive 2002/95/CE dated January 27th 2003)*
- Waste electrical and electronic equipment (WEEE). *(Directive 2002/96/CE dated January 27th 2003)*

Generating sets and their components do not come under the field of application of these two directives.

2. Description

2.1. Standard configuration

The TELYS module is composed of a polycarbonate cover plate, a screen, signalling LEDs, control components and electronic boards.
The functional connections are as follows:



2.1.1 View of the front panel

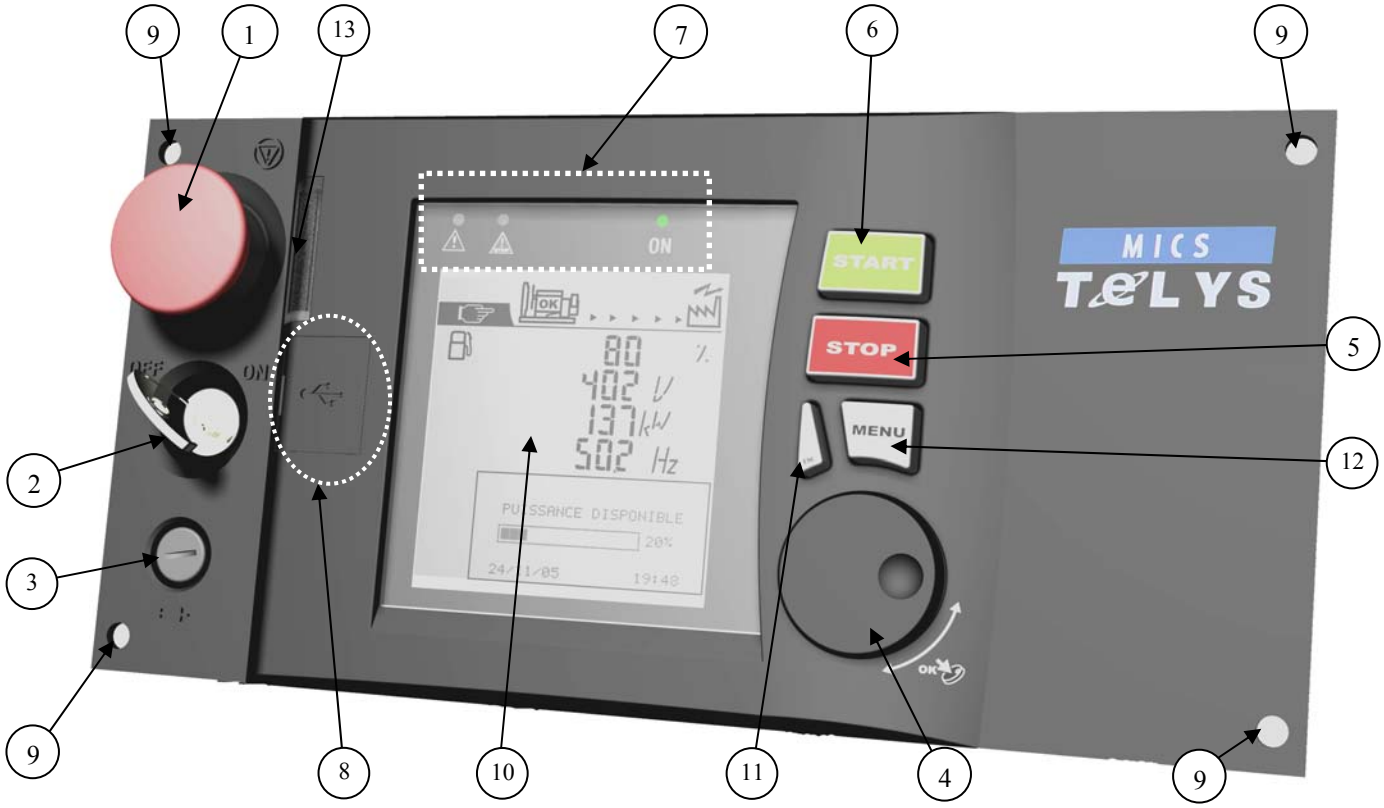


Fig. 2.1 – View of the front side

1 Emergency stop button for switching off the generating set in the event of a fault which could endanger personnel or damage equipment
2 Key switch for starting up/shutting down the module
3 Electronic board protection fuse
4 Scrolling and selection wheel for scrolling through screens and selecting items simply by pressing the wheel
5 STOP button, press to switch the generating set off
6 START button, press to switch the generating set on
7 Power ON LEDs and fault warning LEDs
8 Location of USB ports
9 Mounting bolt.
10 LCD for displaying alarms and faults, operating status, electrical and mechanical quantities.
11 ESC button: return to the previous selection and fault RESET function
12 MENU button to access the menus
13 Lighting for emergency stop button

Fig. 2.2 – Description of the LEDs

A lit LED indicates:

1 Alarm activated (flashing yellow)

2 Fault found (flashing red)

3 Module on (green, on continuously)

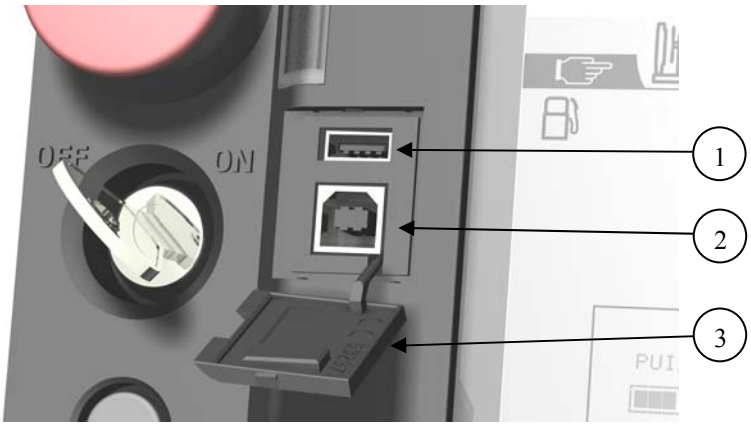


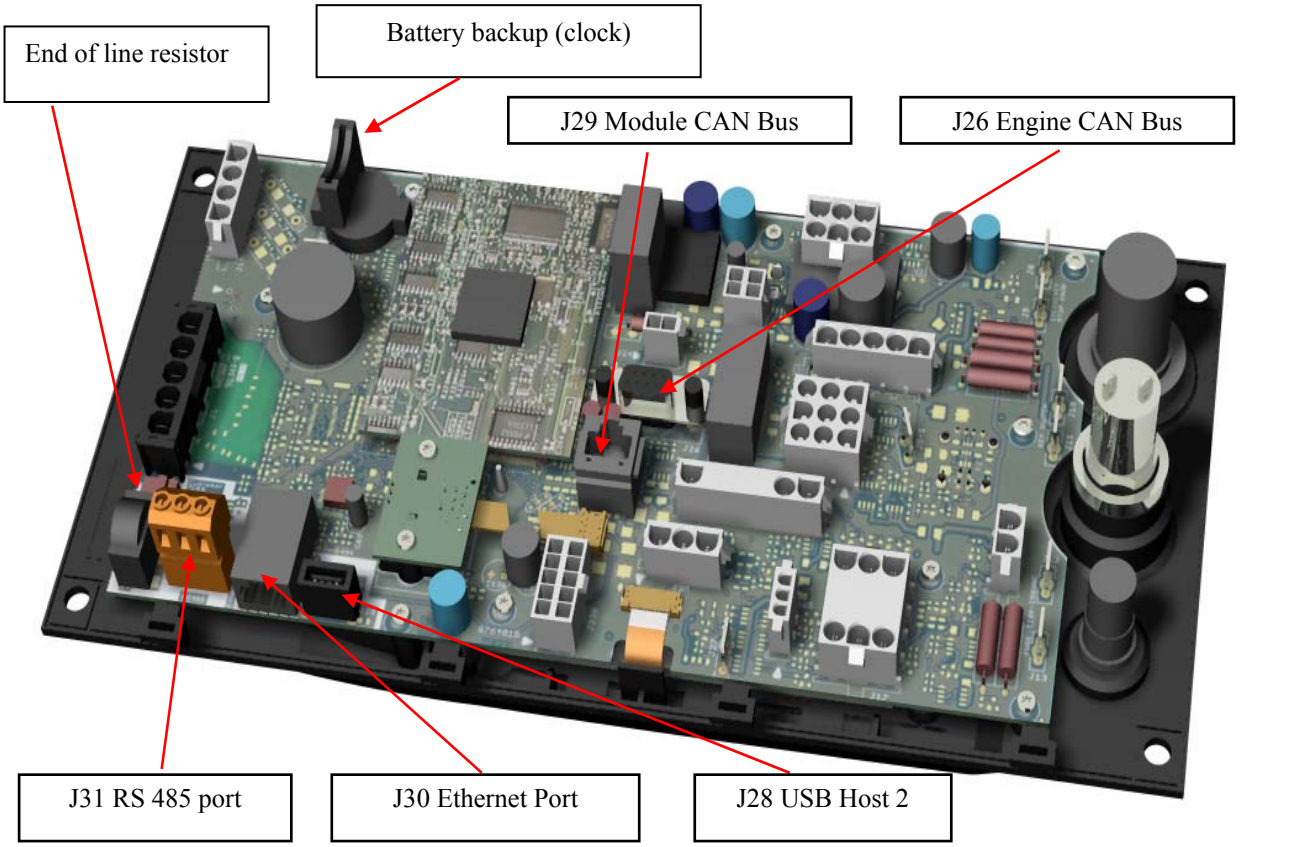
Fig. 2.3 – Close-up of USB ports

1 USB key connection (HOST): file transfer between US key and TELYS and vice-versa

2 Connection for microcomputer (DEVICE):
- file transfer between PC and TELYS and vice-versa
- main module power supply

3 Protective cover.

2.1.2 View of the rear panel



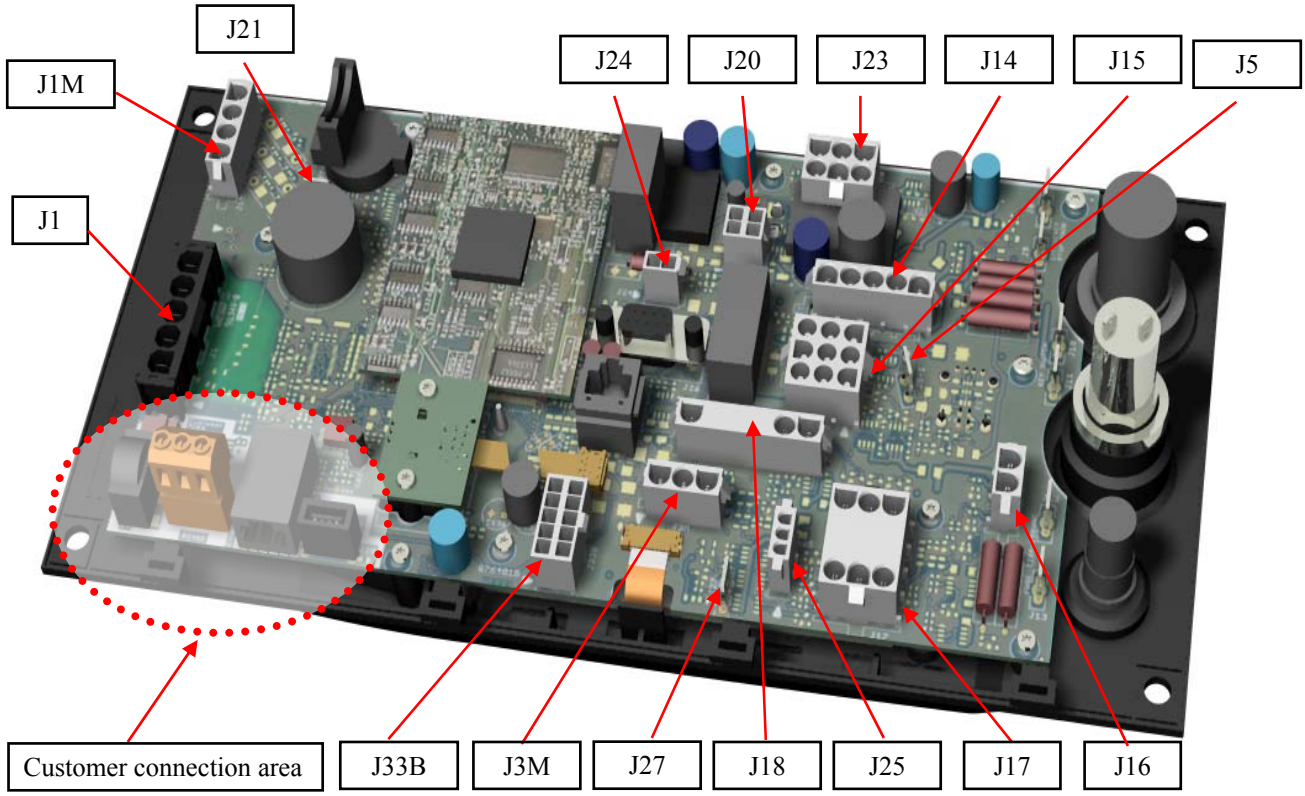


Fig. 2.4 – View of the rear side

The connections are as follows:

Factory connection

- J1: generating set voltage measurement
- J1M: generating set current measurement
- J3M: analogue indicators: oil pressure, coolant temperature and fuel level
- J5: connection to earth
- J14: default connections: battery charger, remote start order and preheating control
- J15: report pack option (genset ready to supply, general fault and general alarm), continuous current output to supply certain options, parameterizable logic input
- J16: exterior emergency stop
- J17: other engine parameters (oil pressure fault, coolant temperature, low fuel level, charging alternator excitation, coolant preheating thermostat), logic outputs and basic board supply (Full Range)
- J18: used for communicating motors: basic board supply (Restricted Range) and generating set emergency stop output
- J20: 4 all or nothing parameterizable inputs
- J21: 1 all or nothing parameterizable output
- J23: fuel level and low fuel level alarm indicators (depending on engines) and battery ammeter (all engines)
- J24: short circuit/overload input
- J25: oil temperature (indicator and fault)
- J26 Engine CAN Bus
- J27: retention container level logic input
- J29 Bus Can Module: connection to optional logic input/output module
- J33B: speed/voltage trimming board (*available in 2007)*

Customer connection

A connection area is used to make the necessary connections to operate the generating set remotely (option). This area is marked in white on the board. It is also identified on the board by the label “customer area”.

- J28 USB Host 2: connection with USB key (identical to front panel connection)
- J30 Ethernet Port: customer connection for communication *(available in 2007)*
- J31 Port RS 485: customer connection for communication

Note: all logic inputs/outputs can be set.

2.1.3 Description of the screen

The screen is backlit and requires no contrast adjustments. This screen is divided into 4 zones.

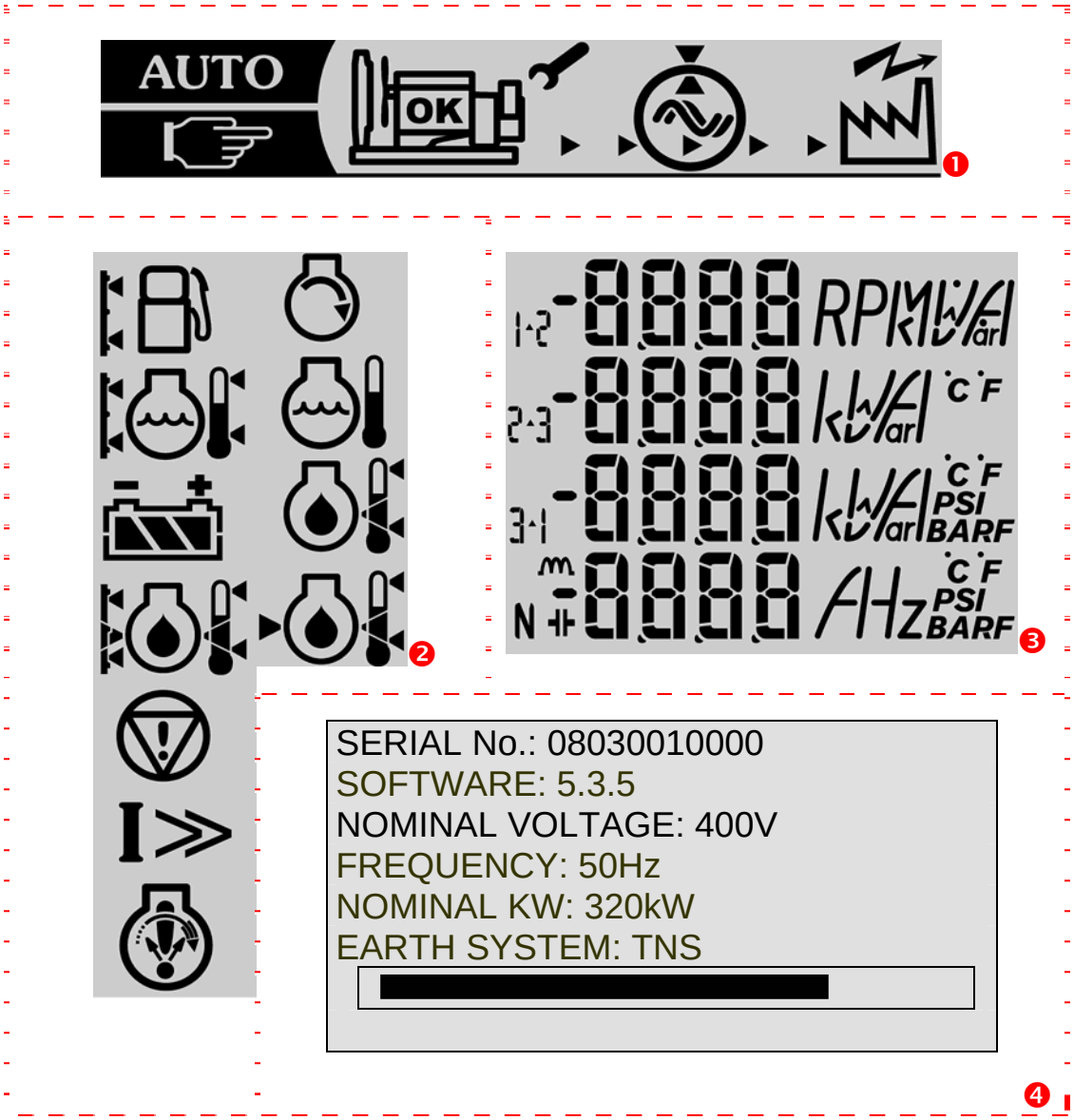


Fig. 2.5 – Description of the screen (example)

❶ Zone 1: in this zone, the status of the generating set is displayed

❷ Zone 2: in this zone, pictograms relating to dimensions measured are displayed, as well as Alarm and Fault pictograms

❸ Zone 3: in this zone, the measured values corresponding to the measured dimensions are displayed with the corresponding units of measurement

❹ Zone 4: in this zone, messages relating to the control of the generating set and the menus are displayed.

Note: the information displayed on measurements, alarms and faults as well as messages and menus relating to control of the generating set will depend on the equipment level of each generating set. Certain screens may therefore not be present.

2.1.4 Description of the pictograms in zone 1

Pictograms in zone 1

Pictograms	Display	Activation conditions
 "MANUAL" Mode	Fixed	TELYS in manual mode (MANUAL)
	Flashing	For 5 seconds when switching from AUTO mode to MANUAL mode
 "AUTO" Mode	Fixed	TELYS in automatic mode (AUTO)
	Flashing	For 5 seconds when switching from MANUAL mode to AUTO mode
	Flashing	Generating set in start-up phase
	Fixed	Generating set started
	Fixed	Generating set stabilised (voltage and frequency)
	Flashing (appearance of constant movement from left to right)	The generating set is powering the installation
	Fixed	The installation is supplied
 Maintenance indicator (available 1st half of 2007)	Flashing	Maintenance operation due. Every time the generating set is started up
	Fixed	Maintenance operation due. Generating set started
	Not used	

2.1.5 Description of the pictograms in zone 2

Alarm and fault pictograms in zone 2

All the pictograms in this zone are activated when TELYS is initialised.

Data displayed			
Fuel level indicator			
Alarm / Fault low fuel level 		Alarm / Fault high fuel level 	
Coolant level / temperature indicator			
Alarm Low level fault 	High level fault alarm 	Alarm High temperature fault 	No preheating fault alarm 
Battery			
Min battery voltage (flashing) 	Max battery voltage (flashing) 		Battery charge indicator (flashing bars)
Oil pressure / temperature indicator			
Oil pressure Alarm / Fault 	High or low oil level Alarm / Fault 	High or low oil temperature Alarm / Fault 	
Emergency stop			
Emergency stop fault 			
Overload or short circuit			
Tripping of circuit breaker following an overload or short circuit 			
Engine speed			
Underspeed fault 	Overspeed fault 	Non-starting fault 	

2.1.6 Description of the pictograms in zone 3

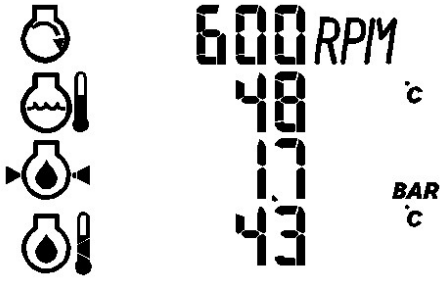
Pictograms in zone 3

All the pictograms in these zones are activated when TELYS is initialised. The pictograms below are given as examples.

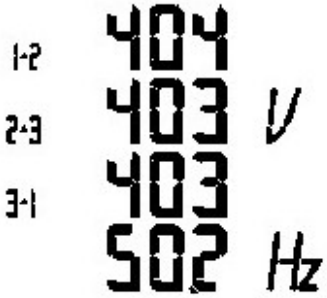
Generating set stopped

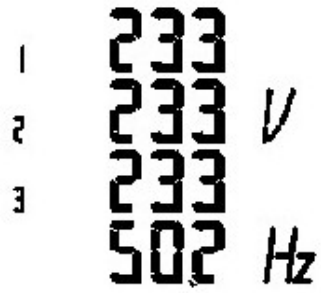
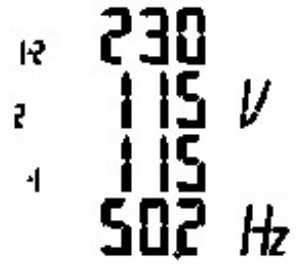
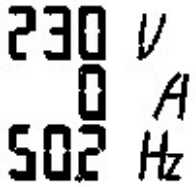
Screen no.	Pictograms	Data displayed
P1		Fuel Level Indicator Indication of Temperature of High Temperature coolant (HT) (units according to settings menu) Indication of Battery Voltage Indication of Oil Temperature (units according to settings menu)

Generating set start-up or generating set started or generating set switching off in progress

Screen no.	Pictograms	Data displayed
P2		Engine Speed Indication Indication of Temperature of High Temperature coolant (units according to settings menu) Indication of Oil Pressure (units according to settings) Indication of Oil Temperature (units according to settings menu)

Generating set started

Screen no.	Pictograms	Data displayed
P3 Default screen in operation		Fuel Level Indicator Alternator composite Voltage Indicator Total Active Power Indicator Alternator Frequency Indicator
P4		U12 Alternator composite Voltage Indicator U23 Alternator composite Voltage Indicator U31 Alternator composite Voltage Indicator Alternator Frequency Indicator

Screen no.	Pictograms	Data displayed
P5		V1 Alternator single Voltage Indicator V2 Alternator single Voltage Indicator V3 Alternator single Voltage Indicator Alternator Frequency Indicator
P6		U12 Alternator composite Voltage Indicator V2 Alternator single Voltage Indicator V1 Alternator single Voltage Indicator Alternator Frequency Indicator
P7		V1 Alternator single Voltage Indicator Single phase Alternator current indicator Alternator Frequency Indicator
P8		Single phase Alternator current indicator Two phase Alternator current indicator Three phase Alternator current indicator Neutral Alternator current indicator
P9		Total Active Power Indicator Total Reactive Power Indicator Total Effective Power Indicator Total Power Factor Indicator (lagging or leading)

Screen no.	Pictograms	Data displayed
P10		Fuel Level Indicator Indication of Battery Voltage Indication of Battery Amps

Screen order of appearance according to network type with the generating set on.

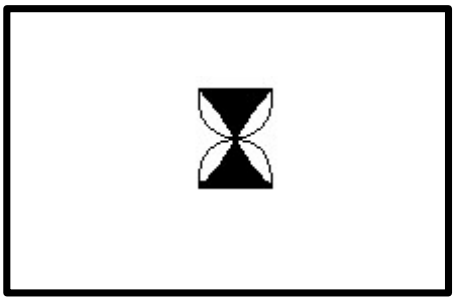
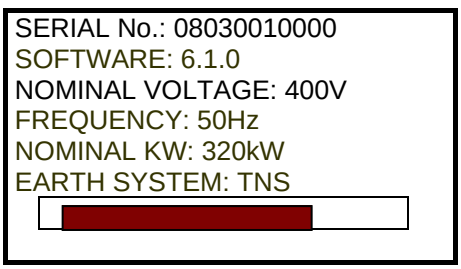
	Type of network			
Order of appearance	**3P+N**	**3P**	**2P+N**	**1P+N**
1	P3	P3	P3	P3
2	P4	P4	P6	P7
3	P5	P8	P8	P9
4	P8	P9	P9	P2
5	P9	P2	P2	P10
6	P2	P10	P10	
7	P10			

Change screens by using the scrolling and selection wheel.
When the wheel is rotated clockwise, the screens scroll upwards and vice-versa.
The screens scroll in a loop.
E.g.: On three-phase + neutral network, then screen 7, then screen 1 and vice-versa.

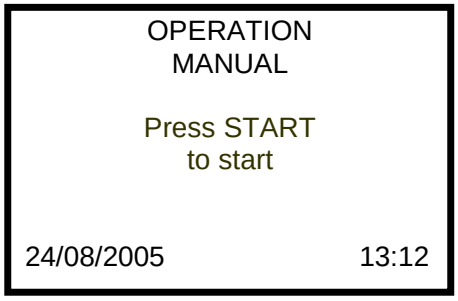
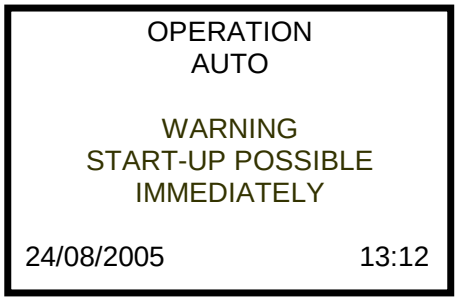
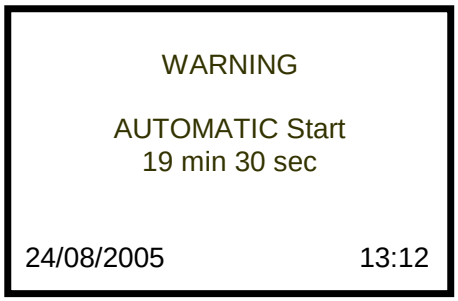
2.1.7 Display of messages in zone 4

The display (zone 4), among other things, displays messages relating to the operation of the generating set. The messages are as follows:

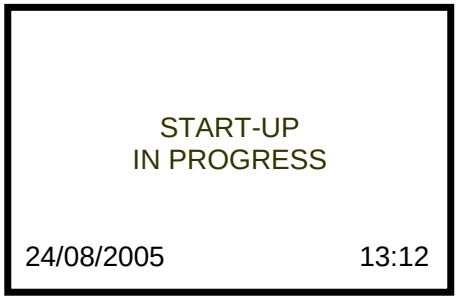
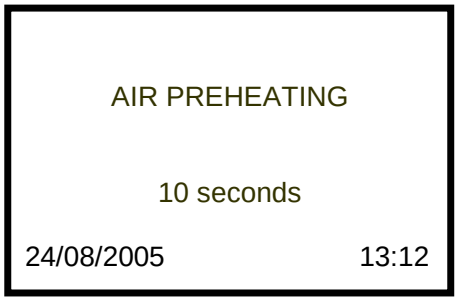
Initialisation of TELYS

Screen no.	Screen	Data displayed
G 1		Initialisation of TELYS when the power is switched on and/or when loading a configuration
G 2		Generating set serial no. Software version of TELYS Alternator Nominal Voltage Alternator Nominal Frequency Nominal Active Output Neutral Point Bar graph indicating the display delay of the screen

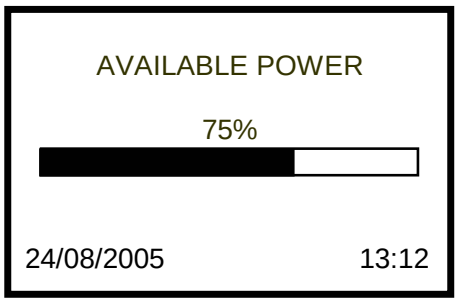
Generating set stopped

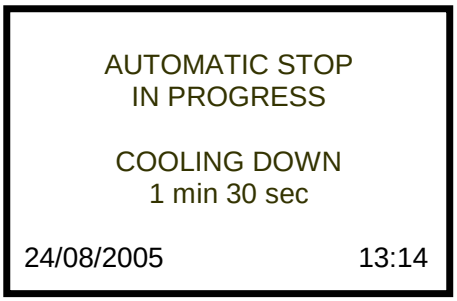
Screen no.	Screen	Data displayed
G 3		Operating mode - generating set in Manual Mode ready to start Date and time (depending on settings)
G 4		Operating mode - generating set in Auto Mode ready to start Date and time (depending on settings)
G 5		Operating mode - generating set in Auto Mode with programmed start Countdown to micro disconnection delay or EJP notice delay (for France only) Date and time (depending on settings)

Generating set start-up

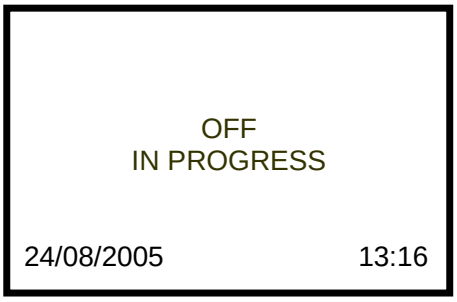
Screen no.	Screen	Data displayed
G 6		Operating phase - generating set in starting phase Date and time (depending on settings)
G 7		Operating phase - air preheating prior to starting generating set Countdown for air preheating delay Date and time (depending on settings)

Generating set started

Screen no.	Screen	Data displayed
G 8 Default screen		Operating phase – generating set in operation – stable voltage and frequency Available power Date and time (depending on settings)
G 9		Operating mode - operation in Auto Mode Opening of power supply device (motorised circuit breaker or source changeover switch controlled by TELYS) Countdown for the mains return delay OR the load test delay Date and time (depending on settings)

Screen no.	Screen	Data displayed
G 10		Operating mode - operation in Auto Mode Generation set cooling in progress Countdown for Engine Stop delay (cooling) OR Gradual Stop delay (Coolant temperature) OR Overload Gradual Stop delay OR OFF load test delay Date and time (depending on settings)

Generating setstop

Screen no.	Screen	Data displayed
G 11		Generating set stop in progress Date and time (depending on settings)

Operating mode changeover (switching from Manual Mode to Auto Mode following auto start demand)

Screen no.	Screen	Data displayed
G 12		Operating mode - operation in Manual Mode AUTOMATIC start demand

Generating set stop request due to fault or by pressing STOP in Auto Mode

Screen no.	Screen	Data displayed
G 13	Manual Mode activated Do you wish to change to AUTO mode? OK Esc	Operating mode - operation in Auto Mode (generating set in operation) Warning message for switching to Manual Mode after the STOP button has been pressed or a fault has appeared

2.2. Options

The presence of optional boards indicated on the electrical diagram depends on the options fitted to the generating set.
In order to have additional inputs and outputs, TELYS can be fitted with five logic input/output boards.
The input/output board holds additional logic inputs and outputs (all or nothing), which can be used if those of the basic module are not sufficient.
These inputs can be used to detect additional alarms or faults and outputs can be used for data transfers or to control options.

Composition:
The input/output board comprises 4 inputs and 6 outputs (M1E1 for Module1/Input1 and M1S1 for Module1/Output1).
A green LED is used to indicate the status of each output (output activated).

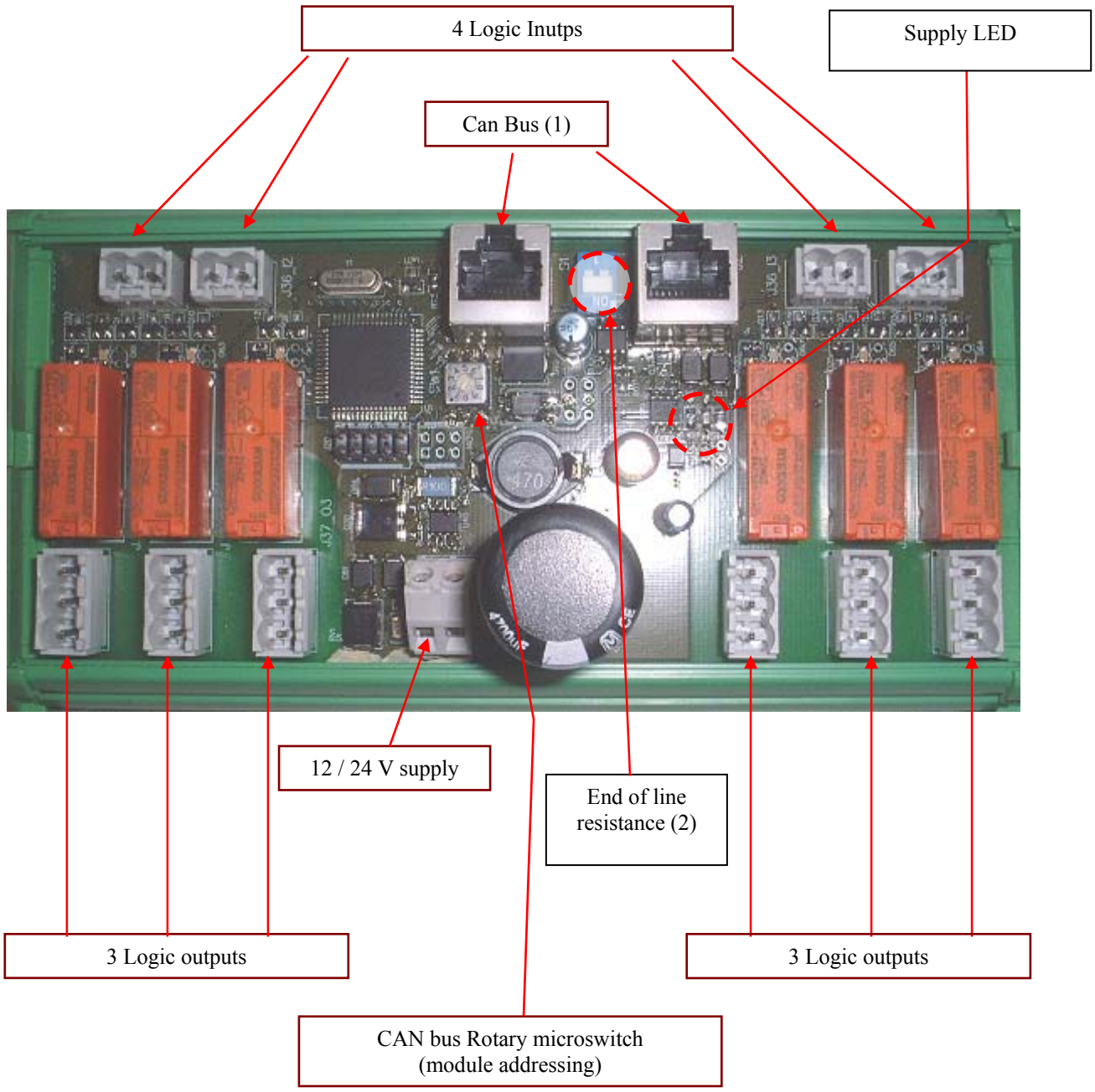


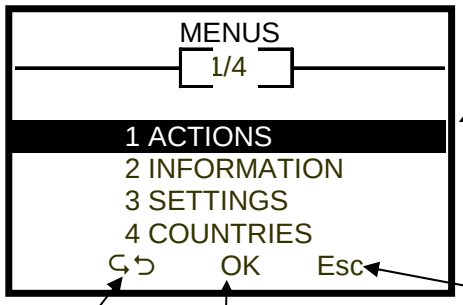
Fig. 2.6 – Input/output board

(1) CAN bus for connection between the basic board and the input/output boards. The maximum possible length of the CAN BUS is 200 metres.
(2) CAN connection loopback (factory fitted).

3. Introduction to menus

4 menus accessible by pressing the "MENU" button allow interaction with the user. The menus displayed depend on the configuration of the generating set. The menus are the following:

- ✓ "Actions" menu
- ✓ "Information" menu
- ✓ "Settings" menu
- ✓ "Country" menu



Selection activated

Return to the previous level by pressing the "ESC" button

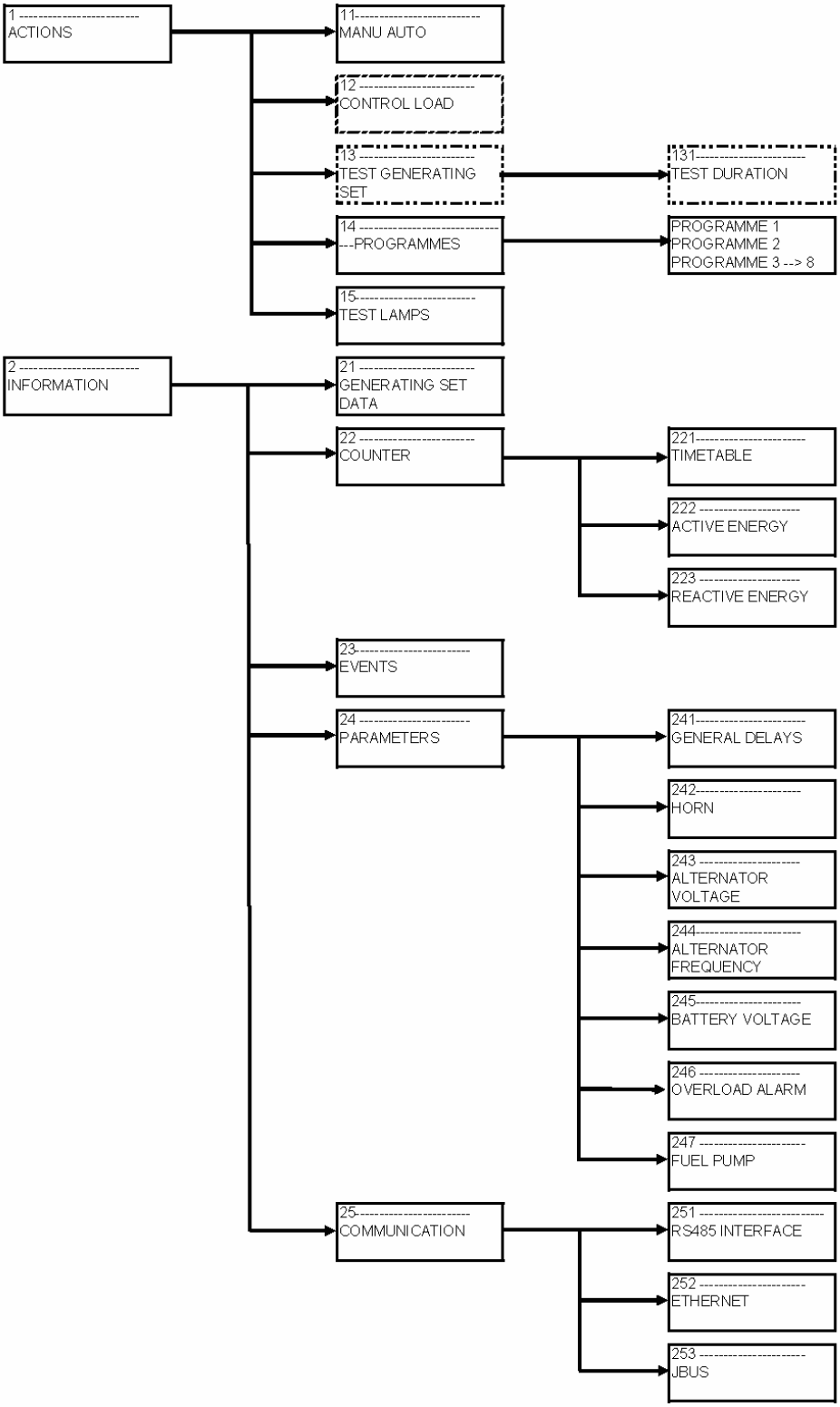
Make a selection by rotating the scrolling and selection wheel

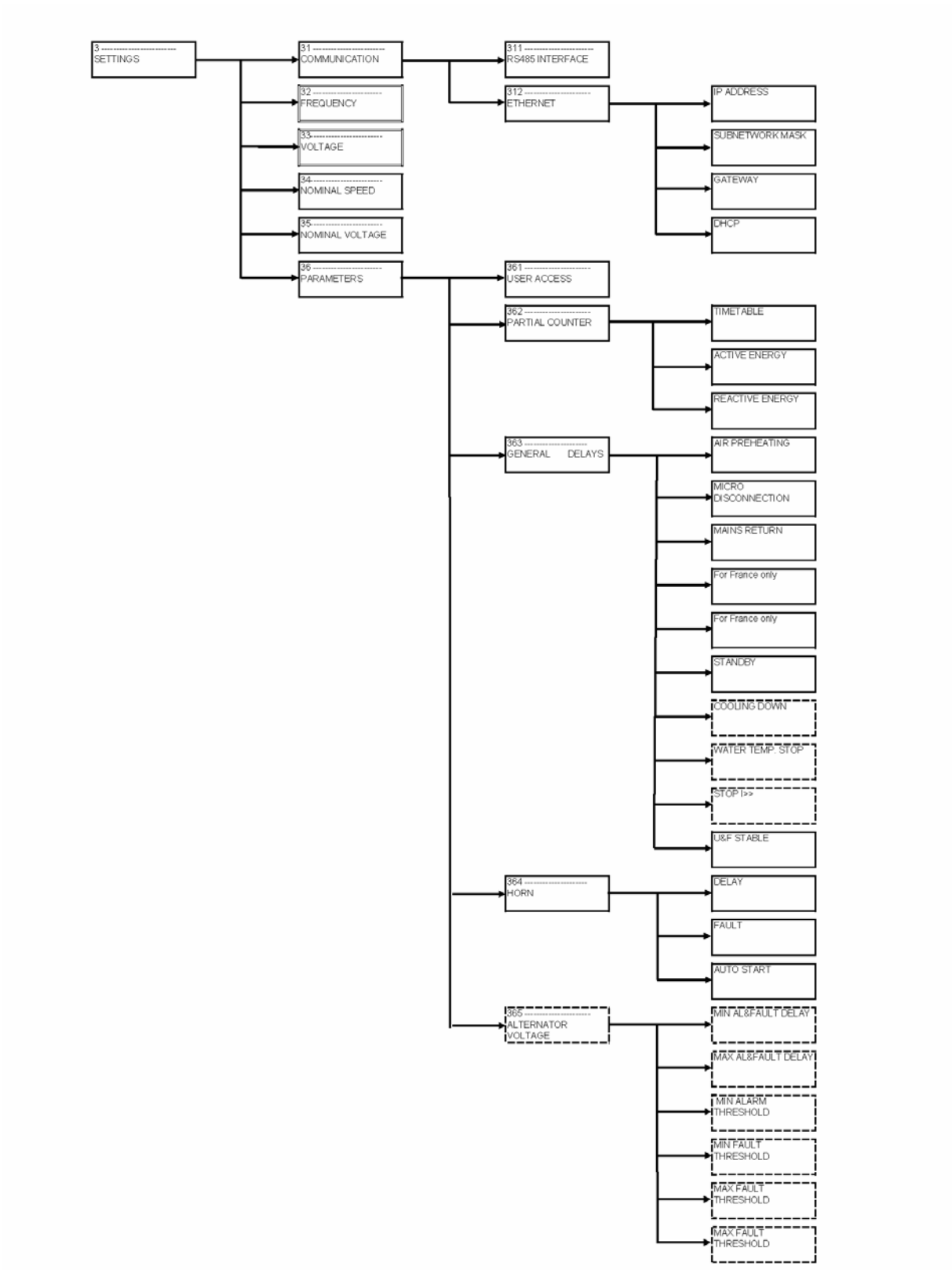
Confirm the selection by pressing the scrolling and selection wheel

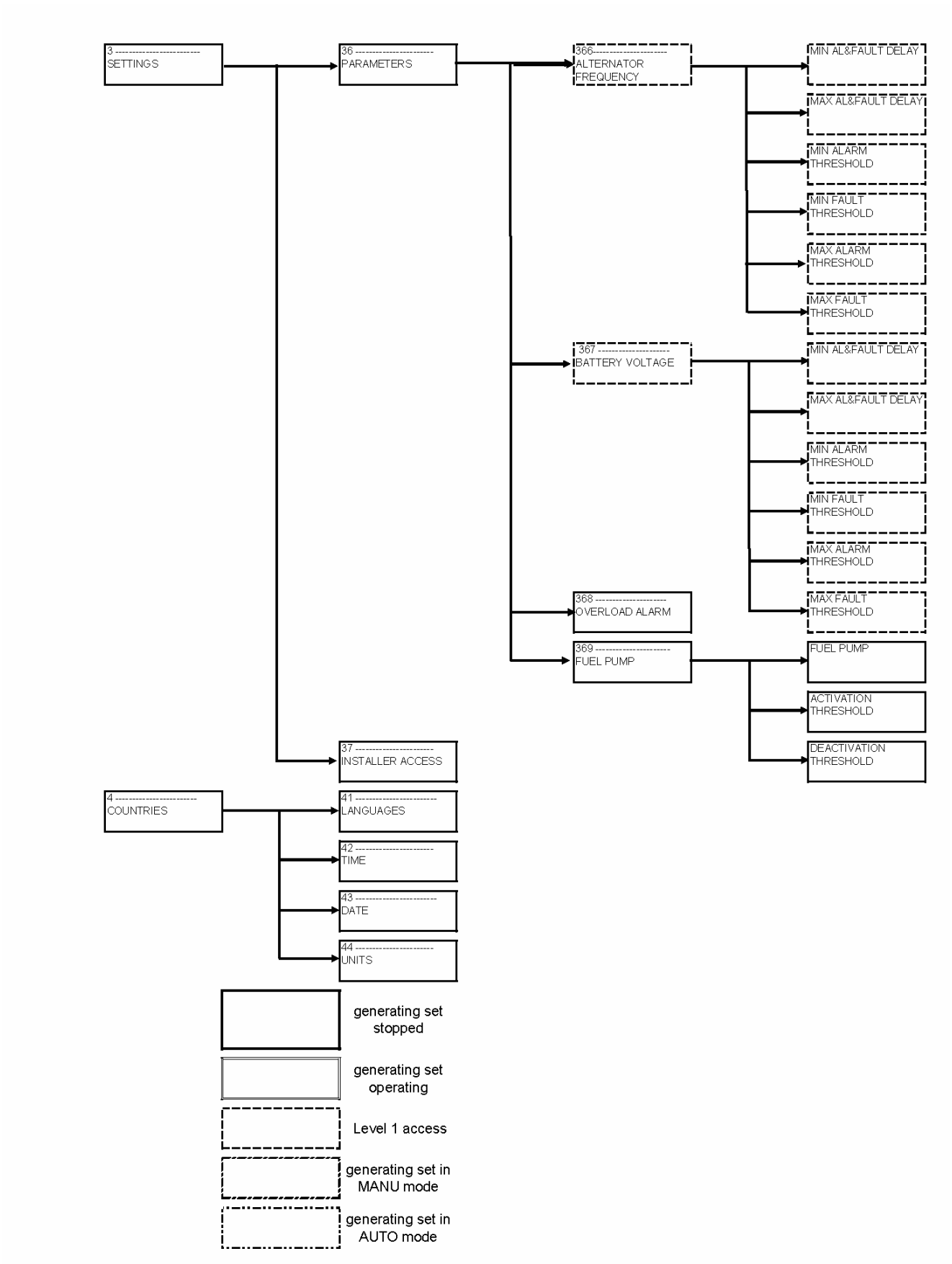
Warning	When the conditions for a menu (or sub-menu) to be displayed are not met, it will not appear. Display conditions: o Generating set status (in operation or stopped, MANUAL or AUTO mode) o Access level (user or installer) o Generating set equipment (options)

For reasons of operating security, access to the menu contents (settings) is restricted and depends on authorised access levels. The contents of each access level and the configuration mode of these levels are described in the section entitled "Access levels".

The tree structure of the menus is describes on the following pages:


1 ----------
ACTIONS
11----------
MANU AUTO
12 ----------
CONTROL LOAD
13 ----------
TEST GENERATING SET
131----------
TEST DURATION
14 ----------
---PROGRAMMES
PROGRAMME 1
PROGRAMME 2
PROGRAMME 3 --> 8
15----------
TEST LAMPS
2 ----------
INFORMATION
21 ----------
GENERATING SET DATA
22 ----------
COUNTER
221----------
TIMETABLE
222 ----------
ACTIVE ENERGY
223 ----------
REACTIVE ENERGY
23----------
EVENTS
24 ----------
PARAMETERS
241----------
GENERAL DELAYS
242----------
HORN
243 ----------
ALTERNATOR VOLTAGE
244----------
ALTERNATOR FREQUENCY
245----------
BATTERY VOLTAGE
246 ----------
OVERLOAD ALARM
247 ----------
FUEL PUMP
25----------
COMMUNICATION
251 ----------
RS485 INTERFACE
252 ----------
ETHERNET
253 ----------
JBUS

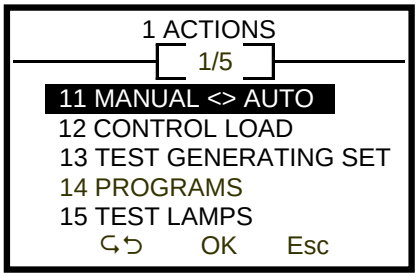

3 SETTINGS
31 COMMUNICATION
32 FREQUENCY
33 VOLTAGE
34 NOMINAL SPEED
35 NOMINAL VOLTAGE
36 PARAMETERS
311 RS485 INTERFACE
312 ETHERNET
IP ADDRESS
SUBNETWORK MASK
GATEWAY
DHCP
361 USER ACCESS
362 PARTIAL COUNTER
TIMETABLE
ACTIVE ENERGY
REACTIVE ENERGY
363 GENERAL DELAYS
AIR PREHEATING
MICRO DISCONNECTION
MAINS RETURN
For France only
For France only
STANDBY
COOLING DOWN
WATER TEMP. STOP
STOP I>>
U&F STABLE
364 HORN
DELAY
FAULT
AUTO START
365 ALTERNATOR VOLTAGE
MIN AL&FAULT DELAY
MAX AL&FAULT DELAY
MIN ALARM THRESHOLD
MIN FAULT THRESHOLD
MAX FAULT THRESHOLD
MAX FAULT THRESHOLD


3 SETTINGS
36 PARAMETERS
366 ALTERNATOR FREQUENCY
MIN AL&FAULT DELAY
MAX AL&FAULT DELAY
MIN ALARM THRESHOLD
MIN FAULT THRESHOLD
MAX ALARM THRESHOLD
MAX FAULT THRESHOLD
367 BATTERY VOLTAGE
MIN AL&FAULT DELAY
MAX AL&FAULT DELAY
MIN ALARM THRESHOLD
MIN FAULT THRESHOLD
MAX ALARM THRESHOLD
MAX FAULT THRESHOLD
368 OVERLOAD ALARM
369 FUEL PUMP
FUEL PUMP
ACTIVATION THRESHOLD
DEACTIVATION THRESHOLD
37 INSTALLER ACCESS
4 COUNTRIES
41 LANGUAGES
42 TIME
43 DATE
44 UNITS
generating set stopped
generating set operating
Level 1 access
generating set in MANU mode
generating set in AUTO mode

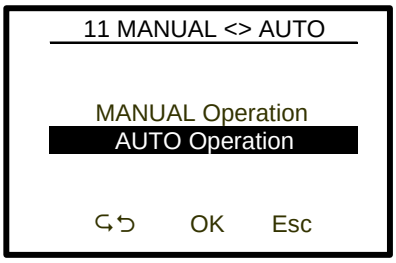
3.1. "Actions" menu

This menu makes it possible to:

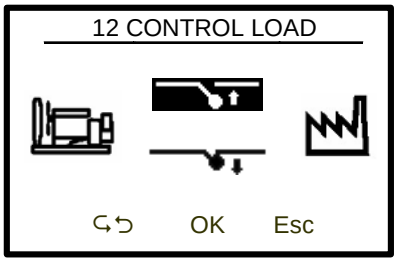
- ✓ 11 Select the operation mode (AUTO or MANUAL)
- ✓ 12 Control the load
- ✓ 13 Test the generating set
- ✓ 14 Configure the starting programmes
- ✓ 15 Test the lamps



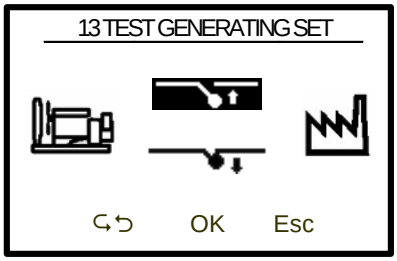
The tree structure of the menu is as follows:

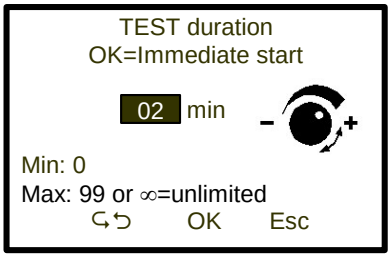


Used to select the operating mode of the generating set.
The configuration highlighted with white text on a black background is the TELYS's current mode



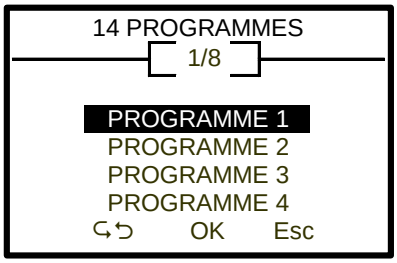
Load control in MANUAL mode, generating set on.
Used to control the closing or opening of the generating set's motorised circuit breaker or an inverter controlled by TELYS.
The highlighted configuration indicates the possible action (closing or opening control).
The selection wheel makes it possible to change the selected item.



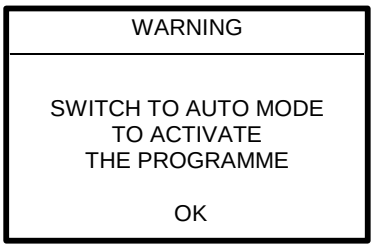


OFF load or ON load test in AUTO mode
The Test Delay can be changed using the selection wheel
Press OK > select the Test Delay value and initiate the test sequence
Press Esc > return to the previous screen
The screen will disappear as soon as ESC or OK is pressed

The selection wheel makes it possible to change the selected item (OFF load or ON load)



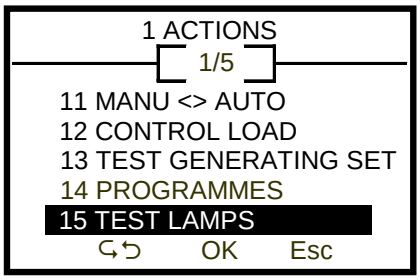
8 possible programmes
Selection:
- Frequency (Not activated, None, Day, Week, Month or Year)
- Load (OFF Load or ON Load)
- Programme start and end dates and times (1)



Makes it possible to configure test programmes (with or without load).

⚠ Warning	The programmes are only active in AUTO mode.

(1) Programming a schedule that is:
- Daily: select the start and stop times for the generating set
- Weekly: select the start and stop times and days for the generating set (the generating set will start on the first day selected and at the selected time, and will turn off on the first day selected at the selected time every week)
- Monthly: select the start and stop times and dates for the generating set (the generating set will start on the first day selected and at the selected time, and will turn off on the first day selected at the selected time every month)
- Yearly: select the start and stop times and dates for the generating set (the generating set will start on the first day selected and at the selected time, and will turn off on the first day selected at the selected time every year)

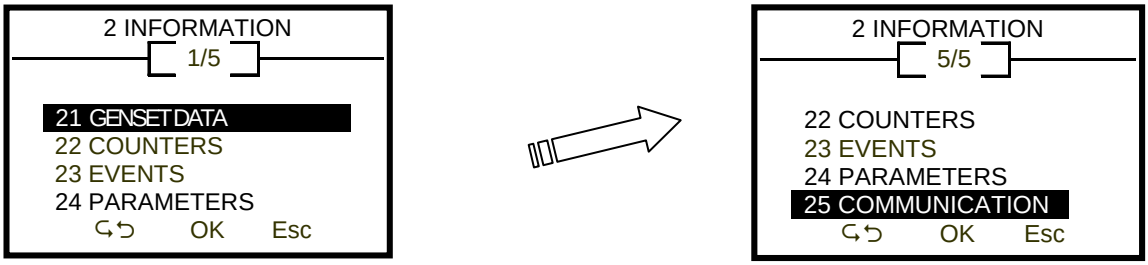


Allows the Alarm and Fault LEDs to be tested.

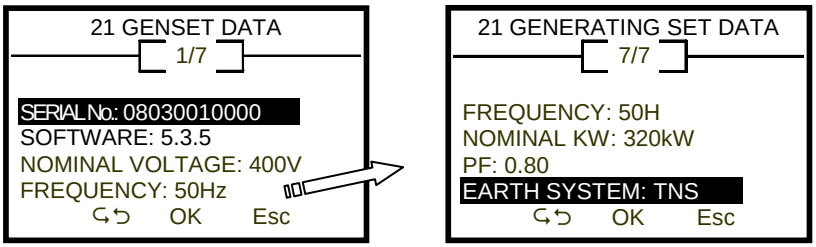
3.2. "Information" menu

This menu makes it possible to **view**:

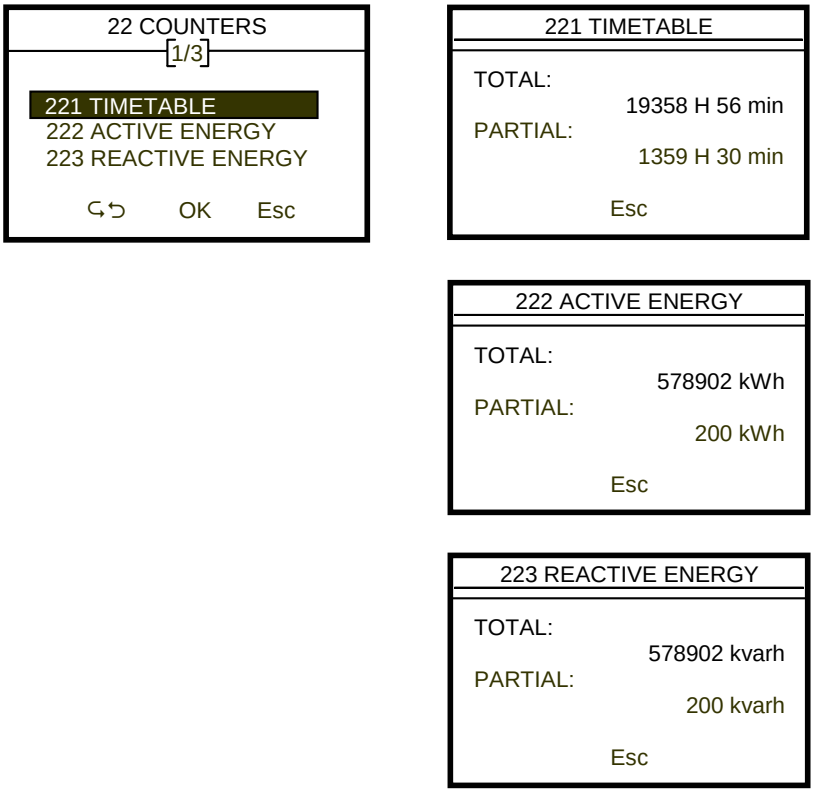
- ✓ 21 the generating set data
- ✓ 22 the counters
- ✓ 23 the events stored in the event history
- ✓ 24 the generating set parameters (displays all the settings values of all the parameters, including those that are write protected)
- ✓ 25 communication parameters



The tree structure of the menu is as follows:



Generating set serial no.
Software version of TELYS
Alternator Nominal Voltage
Alternator Nominal Frequency
Nominal Active Output
Corresponding power factor
Neutral Point



Total operating hours of the generating set

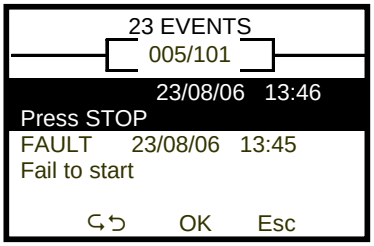
Partial operating hours of the generating set (between 2 successive start-ups)

Total active energy supplied by the generating set

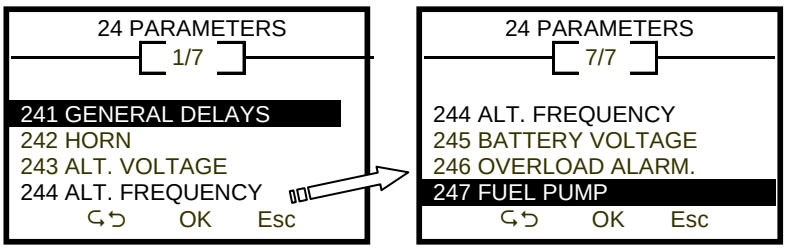
Partial active energy supplied by the generating set (between 2 successive power supplies)

Total reactive energy supplied by the generating set

Partial reactive energy supplied by the generating set (between 2 successive power supplies)



List of events stored in the event history.
Appearance in descending chronological order (from the most recent to the oldest).
The maximum number of events which can be consulted is 101.



List of all the modifiable parameters of the generating set.

- 241 GENERAL DELAYS
- 242 HORN
- 243 ALT*ERNATOR* VOLTAGE
- 244 ALT*ERNATOR* FREQUENCY
- 245 BATTERY VOLTAGE
- 246 OVERLOAD ALARM
- 247 FUEL PUMP

241 GENERAL DELAYS
- ✓Air preheating
- ✓Micro disconnection
- ✓Mains return
- ✓EJP warning (France only)
- ✓EJP top loss (France only)
- ✓Standby
- ✓Cooling
- ✓Coolant temperature stop
- ✓Stop I>>
- ✓U&F stable

242 HORN
- ✓Delay (of the time period)
- ✓Fault (activation or not and selection of the cause "Alarms, Faults, Alarms and Faults")
- ✓ Auto Start (activation or not on auto start demand.)

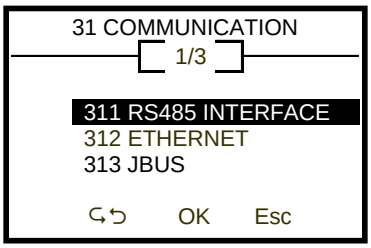
243 ALT. VOLTAGE
- ✓Min AL&Fault Delay
- ✓Max AL&Fault Delay
- ✓Min. Alarm Threshold
- ✓Min. Fault threshold
- ✓Max. Alarm Threshold
- ✓Max. Fault Threshold

244 ALT. FREQUENCY
- ✓Min AL&Fault Delay
- ✓Max AL&Fault Delay
- ✓Min. Alarm Threshold
- ✓Min. Fault threshold
- ✓Max. Alarm Threshold
- ✓Max. Fault Threshold

245 BATTERY VOLTAGE
- ✓Min AL&Fault Delay
- ✓Max AL&Fault Delay
- ✓Min. Alarm Threshold
- ✓Min. Fault threshold
- ✓Max. Alarm Threshold
- ✓Max. Fault Threshold

246 OVERLOAD ALARM
- ✓Parametered value
- ✓Min. possible value
- ✓Max. possible value

247 FUEL PUMP
- ✓Activation Threshold
- ✓Deactivation threshold



Displays the communication parameters according to the selection

<u>RS485 INTERFACE</u>
Speed: in Bauds
Data: in bits
Parity: with or without
STOP: x Bit

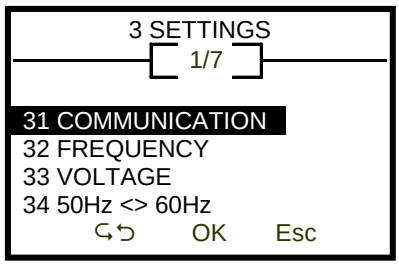
<u>ETHERNET</u>
Generating set IP Address
Subnetwork mask
Gateway IP address
DHCP

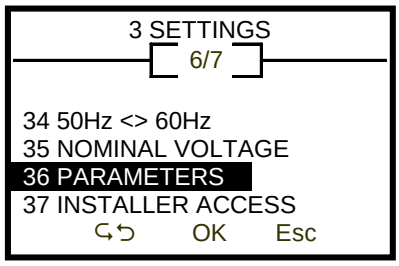
<u>JBUS</u>
Address

3.3. "Settings" menu

This menu is used to enter, adjust or modify:

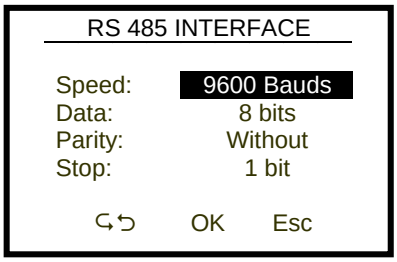
- ✓ 31 communication parameters
- ✓ 32 generating set frequency by adjusting generating set speed (by 2007)
- ✓ 33 generating set voltage by adjusting voltage (by 2007)
- ✓ 34 frequency change
- ✓ 35 voltage change
- ✓ 36 parameters
  - o 361 USER ACCESS
  - o 362 PARTIAL COUNTER
  - o 363 GENERAL DELAYS
  - o 364 HORN
  - o 365 ALT*ERNATOR* VOLTAGE
  - o 366 ALT*ERNATOR* FREQUENCY.
  - o 367 BATTERY VOLTAGE
  - o 368 OVERLOAD ALARM
  - o 369 FUEL PUMP
- ✓ 37 installer access

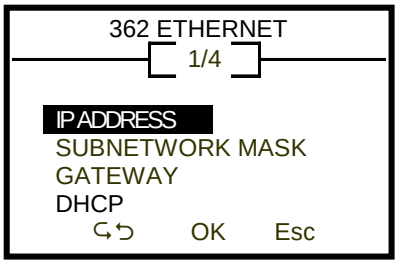


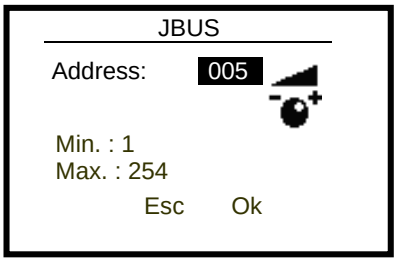


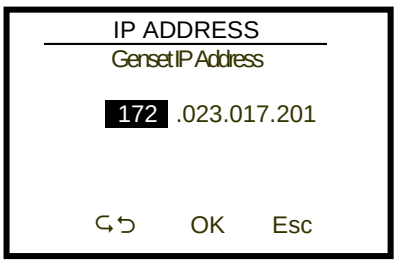
3.3.1 Communication

This menu is used to configure the communication parameters.

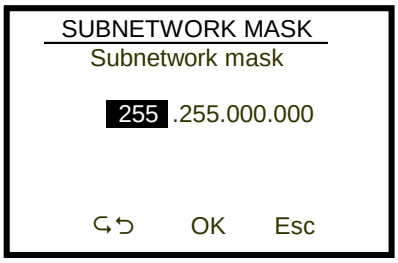


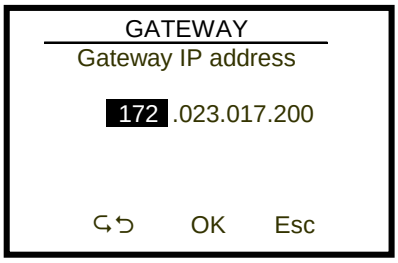


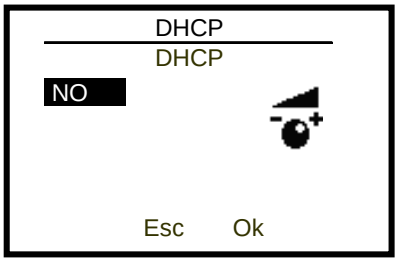




The value (highlighted on a black background) can be modified using the scrolling and selection wheel. Each time an item is confirmed, the entry field (on a black background) moves to the following value.

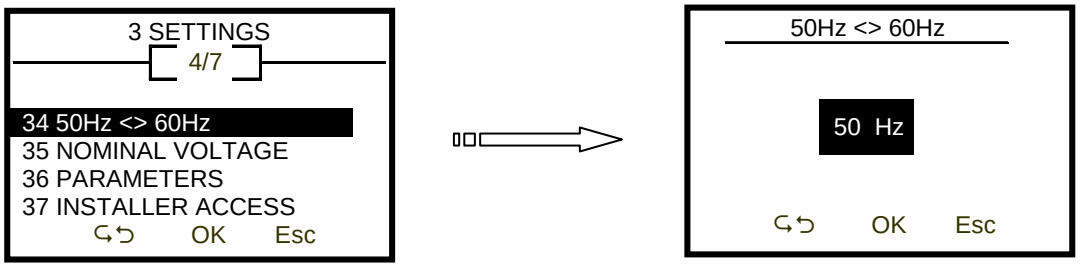






3.3.2 Changing the frequency

This menu permits a new current frequency for the power supply from the generating set to be entered in the generating set configuration (applies to dual frequency generating sets)
The tree structure of the menu is as follows:



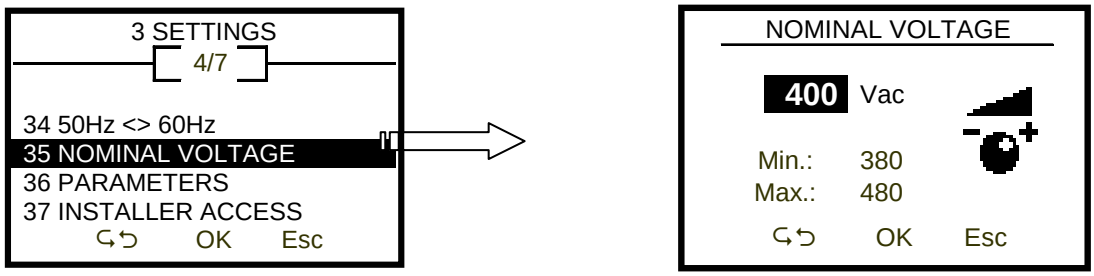
Select and confirm "50Hz <> 60Hz" using the scrolling and selection wheel

Select and confirm the required frequency using the scrolling and selection wheel

Warning	The frequency can only be changed when the generating set is stopped.

3.3.3 Changing the voltage

This menu permits a new voltage for the power supply from the generating set to be entered in the generating set configuration (applies to dual voltage generating sets)
The tree structure of the menu is as follows:



Select and confirm "NOMINAL VOLTAGE" using the scrolling and selection wheel

Define the required voltage and confirm the required frequency using the scrolling and selection wheel

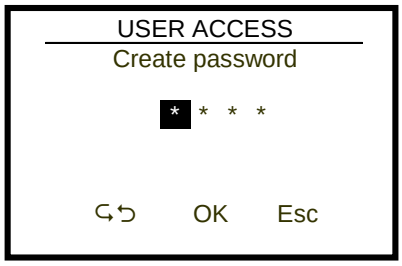
Warning	The voltage must also be changed when the generating set is stopped.

3.3.4 Parameter settings

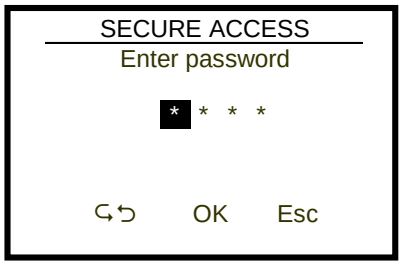
With the generating set off, this menu can be used to adjust or modify:

✓ 36 the following parameters: (list of parameters and example screens)

- 361 USER ACCESS

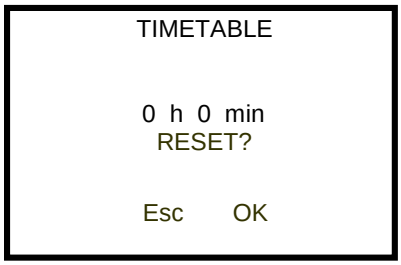


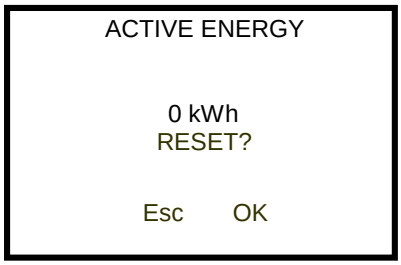
Makes it possible to create a user password

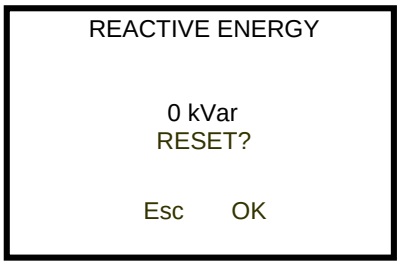


Screen displayed if the customer has entered an access code in menu
3 SETTINGS > 361 Create password
Reset by entering the code 1966

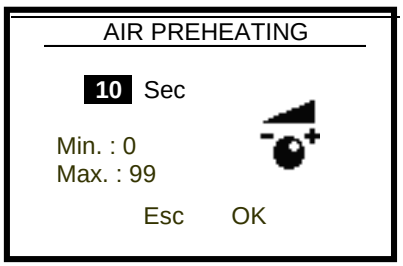
- 362 PARTIAL COUNTER
  - ❖ Timetable
  - ❖ Active energy
  - ❖ Reactive energy

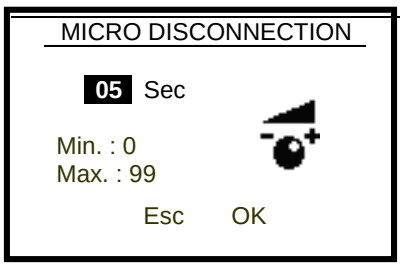


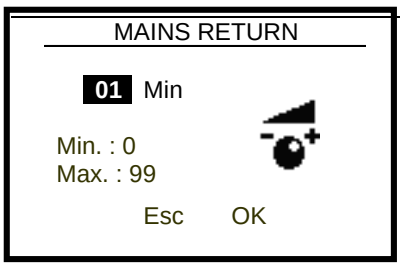




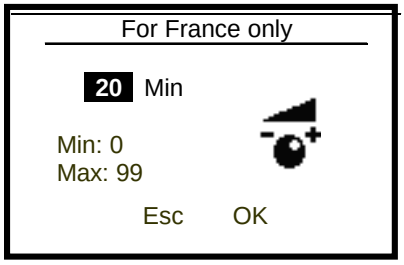
- 363 GENERAL DELAYS
  - ❖ Air preheating
  - ❖ Micro disconnection
  - ❖ Mains return
  - ❖ EJP warning (France only)
  - ❖ EJP top loss (France only)
  - ❖ STANDBY
  - ❖ Cooling (access protected => "installer access" level)
  - ❖ Coolant temperature stop (access protected => "installer access" level)
  - ❖ Stop I>> (access protected => "installer access" level)
  - ❖ Stabilisation U & F



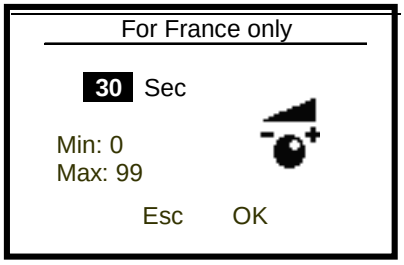




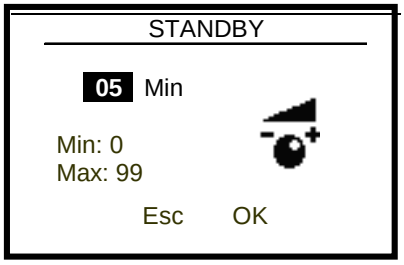
- 363 GENERAL DELAYS (continued)

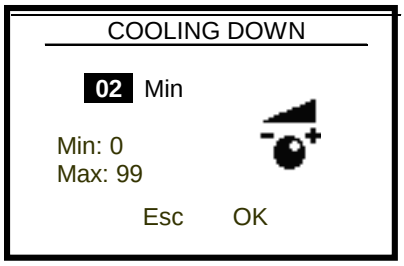


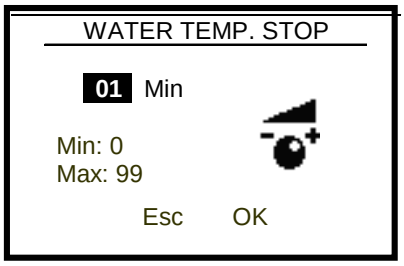
France only

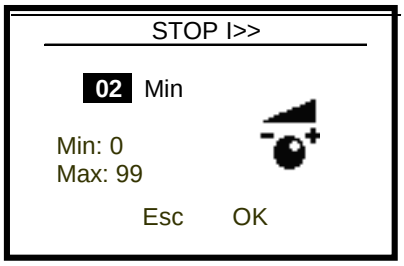


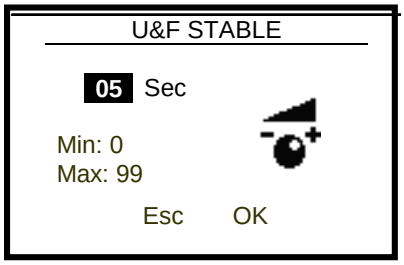
France only



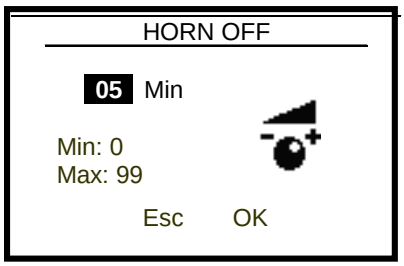


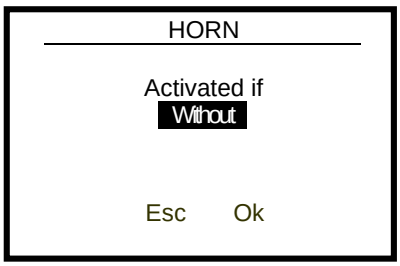




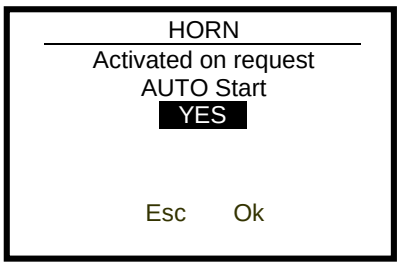


- 364 HORN
  - Delay
  - Fault
  - Auto start



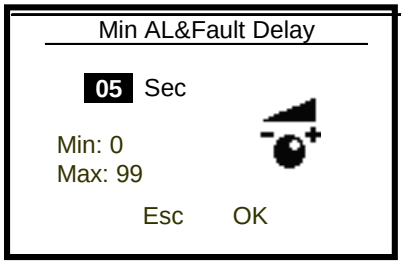


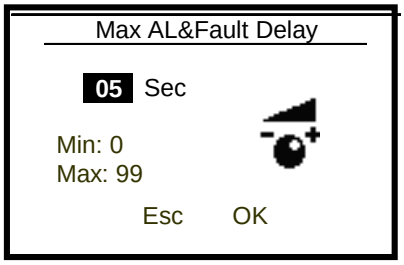
4 possible choices:
- Without (deactivated)
- Activated for Alarms
- Activated for Faults
- Activated for Alarms & Faults

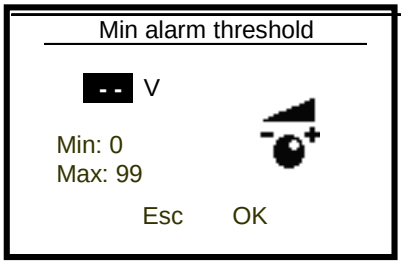


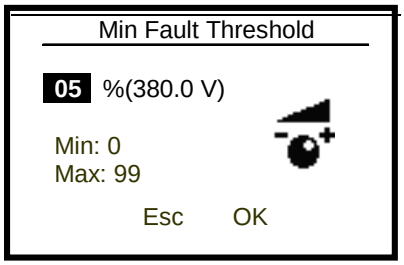
Possible choices:
- YES
- NO

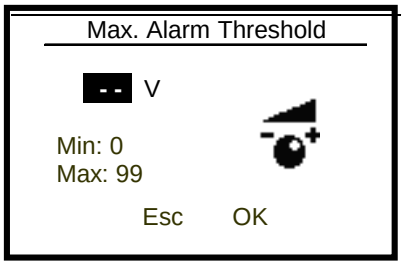
- 365 ALT*ERNATOR* VOLTAGE
  - MIN AL&FAULT DELAY (Min Alternator Voltage Delay)
  - MAX AL&FAULT DELAY (Max Alternator Voltage Delay)
  - MIN. ALARM THRESHOLD (Min Alternator Voltage Alarm Threshold)
  - MIN. FAULT THRESHOLD (Min Alternator Voltage Fault Threshold)
  - MAX. ALARM THRESHOLD (Max Alternator Voltage Alarm Threshold)
  - MAX. FAULT THRESHOLD (Max Alternator Voltage Fault Threshold)

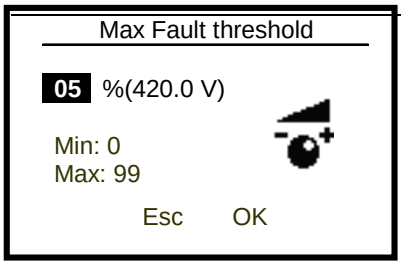




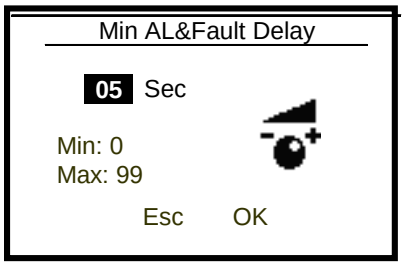


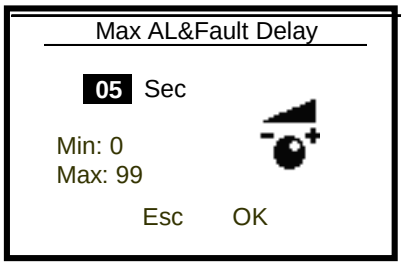


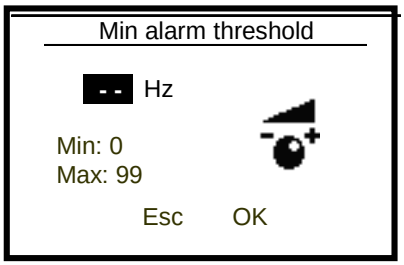


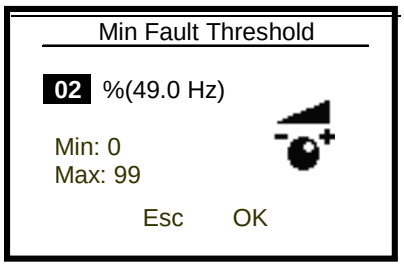


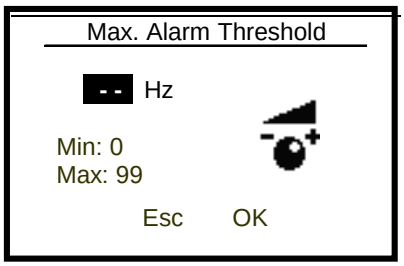
- 366 ALT*ERNATOR* FREQUENCY.
  - MIN AL&FAULT DELAY (Min Alternator Frequency Delay)
  - MAX AL&FAULT DELAY (Max Alternator Frequency Delay)
  - MIN. ALARM THRESHOLD (Min Alternator Frequency Alarm Threshold)
  - MIN. FAULT THRESHOLD (Min Alternator Frequency Fault Threshold)
  - MAX. ALARM THRESHOLD (Max Alternator Frequency Alarm Threshold)
  - MAX. FAULT THRESHOLD (Max Alternator Frequency Fault Threshold)

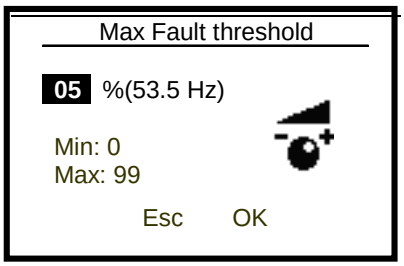




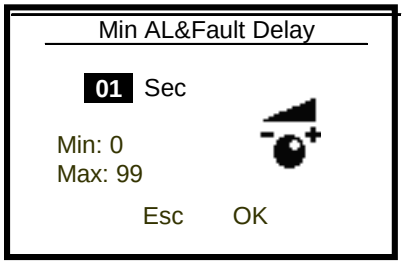


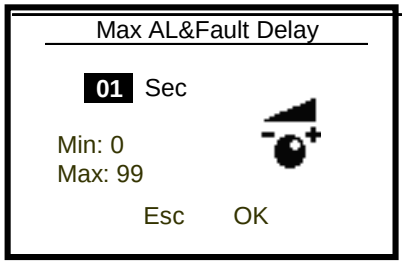


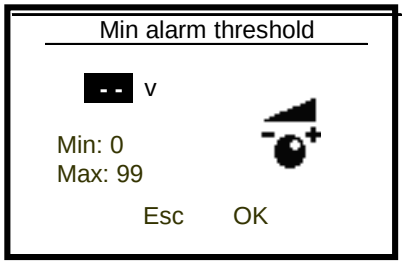


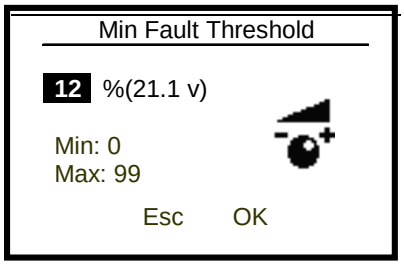


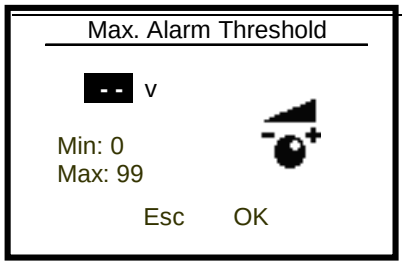
- 367 BATTERY VOLTAGE
  - MIN AL&FAULT DELAY (Min Battery Voltage Delay)
  - MAX AL&FAULT DELAY (Max Battery Voltage Delay)
  - MIN. ALARM THRESHOLD (Min Battery Voltage Alarm Threshold)
  - MIN. FAULT THRESHOLD (Min Battery Voltage Fault Threshold)
  - MAX. ALARM THRESHOLD (Max Battery Voltage Alarm Threshold)
  - MAX. FAULT THRESHOLD (Max Battery Voltage Fault Threshold)

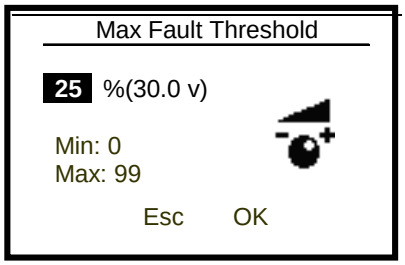






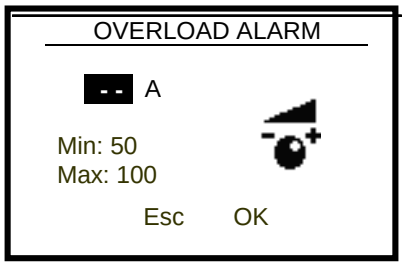






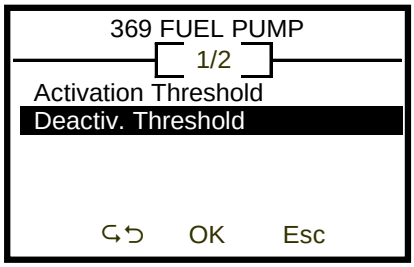
If no value is displayed, this means the corresponding alarm has been deactivated

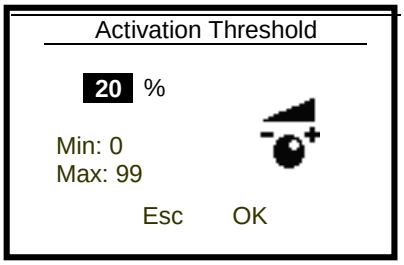
- 368 OVERLOAD ALARM

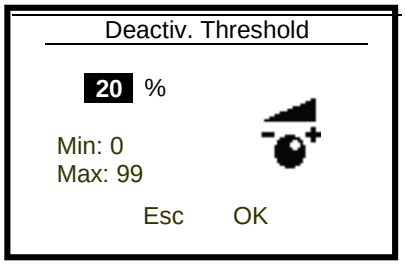


If no value is displayed, this means the corresponding alarm has been deactivated

- 369 FUEL PUMP

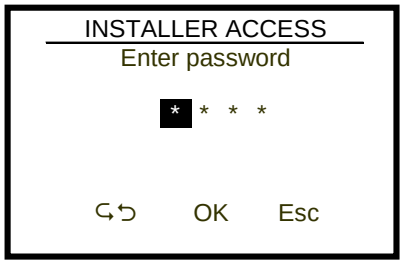






3.3.5 Installer access

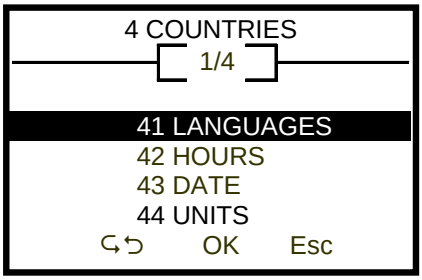
This menu permits the installer access to be configured - the non-modifiable code is 1966



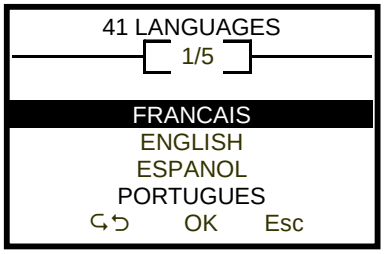
3.4. "Country" menu

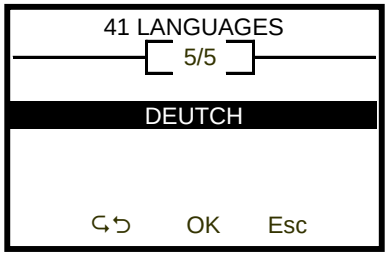
This menu is used to consult or modify:

- ✓ 41 the languages used
- ✓ 42 the time
- ✓ 43 the date
- ✓ 44 the units of measurement



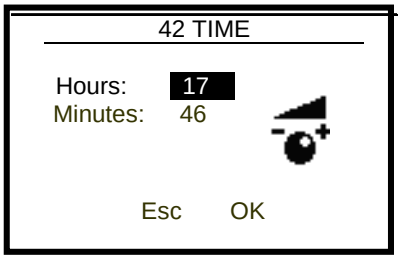
The tree structure of the menus is as follows:

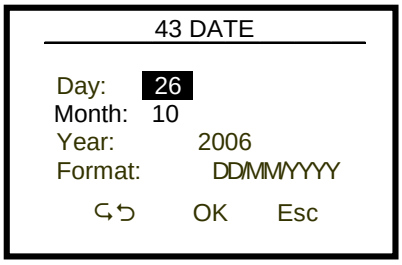




List of languages

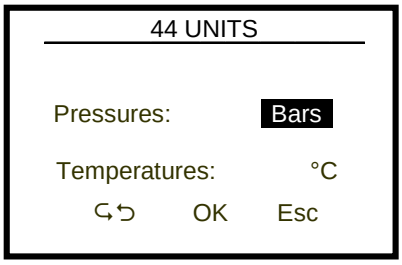
- ✓ FRANÇAIS (French)
- ✓ ENGLISH
- ✓ ESPANOL (Spanish)
- ✓ PORTUGUES (Portuguese)
- ✓ DEUTCH (German)





Possible formats:

- DD/MM/YYYY
- YYYY/MM/DD



Possible formats:

- Pressure: Bar or PSI
- Temperature: °C or °F

4. Alarms and faults

4.1. Viewing alarms and faults

Alarms and faults are displayed as follows:

① Alarms

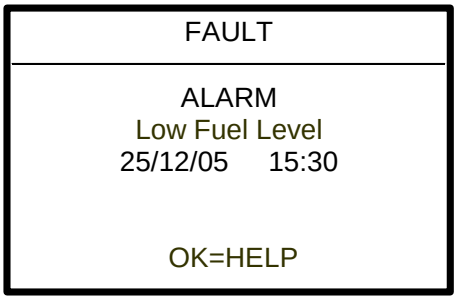
All alarms will cause:

- the yellow LED to flash "General alarm".

In conjunction with this LED:

- a flashing pictogram appears on the LCD screen representing the circuit affected by the alarm and the associated indicator, if present (example)

- message on graphic display (example)



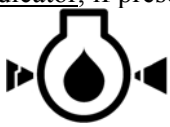
② Faults

All faults will cause:

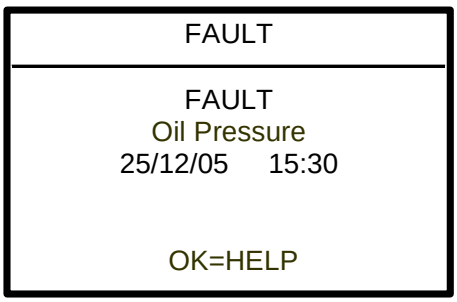
- **the generating set to stop: immediate or gradual stop (coolant temperature and overload or short circuit)**
- the red LED to flash "General fault".

In conjunction with this LED:

- a flashing pictogram appears on the LCD screen representing the circuit affected by the fault and the associated indicator, if present (example)



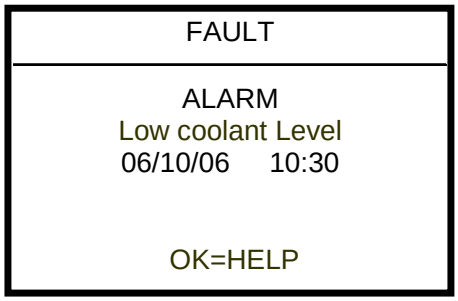
- message on graphic display (example)

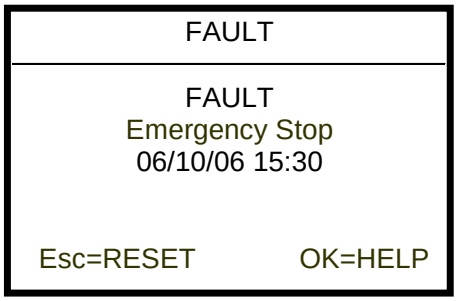


Faults have priority over alarms. Faults are displayed in the descending order of their appearance (from the most recent to the oldest).

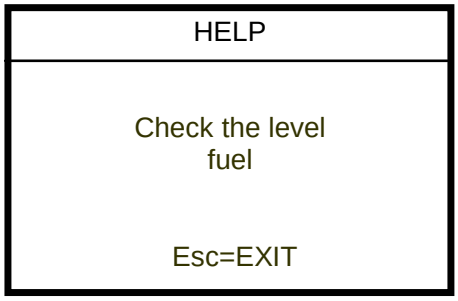
4.2. Activation of an alarm or fault

The appearance of an alarm **or** a fault causes the corresponding screen to be displayed (examples below)





Press OK (on the scrolling and selection wheel) to access the help message if it is available (example below)



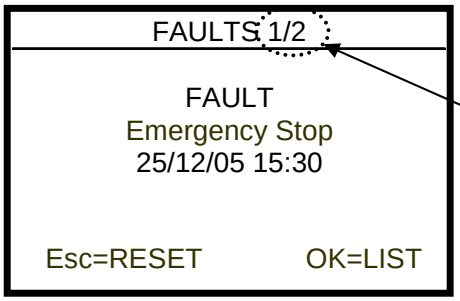
If the alarm is no longer active, it is reset automatically (cause disappears).
Press Esc to reset a fault:

- reset acknowledged if the cause of the fault has been removed
- reset not performed if the cause of the fault is still present.

4.3. Activation of an alarm and a fault

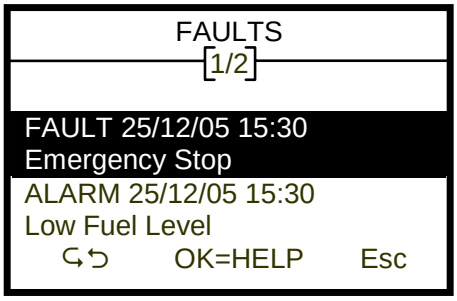
The appearance of an alarm **and** a fault causes:

- The yellow and red LEDs to flash
- the related screen to be displayed (example below)

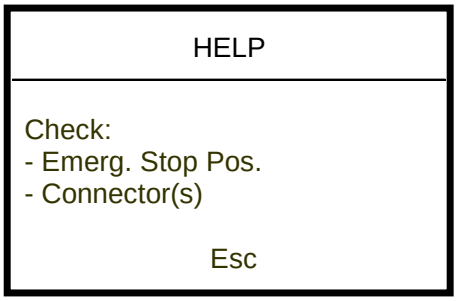


If several faults are present, the number of faults is displayed at the top of the screen.

The faults list can be accessed by pressing OK (of the scrolling and selection wheel) (examples below)



Press Esc to return to the previous screen.
Press OK to go to the HELP screen (help on the highlighted fault)
Use the scrolling and selection wheel to scroll through the list of faults.



If the alarm is no longer active, it is reset automatically (cause disappears).
Press Esc to reset a fault:

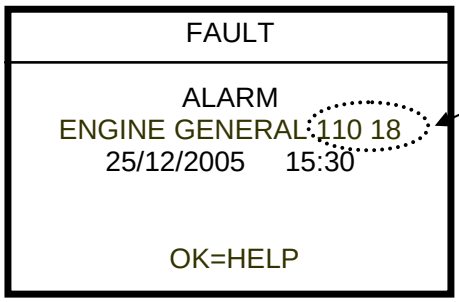
- reset acknowledged if the cause of the fault has been removed
- reset not performed if the cause of the fault is still present.

4.4. Engine fault codes display

Certain alarms and engine faults generate specific fault codes. These codes are standardised according to the J1939 and/or J1587 standards, except for MTU engines that have a specific transmission protocol (see appendix A and B).

Terminology used by the SAE CAN J1939 standard	
SPN: Suspect Parameter Number	This represents the system or component at fault, for example: SPN 100, indicates an oil pressure problem or a problem with the oil pressure sensor.
FMI: Failure Mode identifier	This represents the type of fault that has occurred. This may be an electrical, mechanical or equipment fault.
Terminology used by VOLVO	
SID: System Identifier	This term, used in the J1587 standard, has an equivalent in the J1939 standard (SPN). However, this term corresponds, more particularly, to an assembly of components, for example, the injection system.
PID: Parameter Identifier	This term, used in the J1587 standard, has an equivalent in the J1939 standard (SPN). However, this term corresponds, more particularly, to a specific component, for example, a sensor.
PPID: Parameter Identifier	This term, used in the J1587 standard, has an equivalent in the J1939 standard (SPN). PPID corresponds to PID, but is only used by VOLVO.
FMI: Failure Mode identifier	This represents the type of fault that has occurred. This may be an electrical, mechanical or equipment fault. VOLVO uses a SID-FMI or PID-FMI or PPID-FMI combination.
Terminology used by PERKINS	
CID: Component parameter	This term used by PERKINS has an equivalent in the J1939 standard (SPN).
FMI: Failure Mode identifier	This represents the type of fault that has occurred. This may be an electrical, mechanical or equipment fault.
Terminology used by JOHN DEERE	
SPN: Suspect Parameter Number	This represents the system or component at fault, for example: SPN 100, indicates an oil pressure problem or a problem with the oil pressure sensor.
FMI: Failure Mode identifier	This represents the type of fault that has occurred. This may be an electrical, mechanical or equipment fault.
Terminology used by MTU	
Displaying faults	The MDEC general system faults are indicated on the equipment in the following way: fault code numbers (generated by the ECU - Engine control unit).

In the event of a fault, the screen will display the following message:



Engine fault code.
Pressing OK will display fault finding information.
In addition, appendix A and B indicate the meaning of the code. The checking and maintenance operations to carry out in order to solve the fault are included in the user and maintenance manuals of the engines supplied with the generating set documentation.

For JOHN DEERE (JD), PERKINS (PE) and VOLVO (VO) engines, the codes displayed are SPN and FMI codes.

4.5. Horn reset

Depending on the settings made (menu 364 - HORN), the activation of an alarm and/or a fault leads to the horn sounding and the following screen appearing:

This screen will display first any messages relating to the alarms and faults that appear as soon as OK is pressed.

5. Access levels

Different generating set parameters access levels are available with the TELYS unit (levels 0 and 1).

5.1. List of access levels

The list of access levels is as follows:

Level		Who?	How?	What?
Level 0	A	User access	TELYS - unrestricted access	Modification of generating set control parameters (delay for mains return, horn usage, etc.)
	B	User access	TELYS with customer access code	User parameters protected
Level 1		Installer access	TELYS with access code supplied by the agent	Modification of parameters relating to certain automatic and safety functions of the generating set that can be adjusted during installation.

5.2. Contents of access level 0

The detailed contents of level 0 is as follows:

- Level 0A

This level allows the user to adjust certain parameters associated with the control of the generating set. Each change to a parameter is stored in the event history which can be consulted in the "INFORMATION" menu.

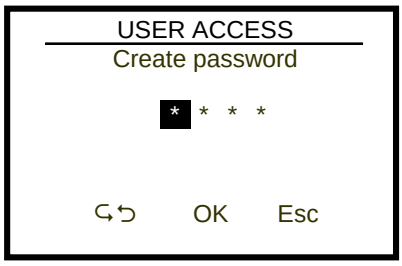
List of accessible parameters:

- ✓ 361- User access
- ✓ 362 - Reset Generating Set Partial Working Hours Counter
- ✓ 362 - Reset Generating Set Partial Active Energy Counter
- ✓ 362 - Reset Generating Set Partial Reactive Energy Counter
- ✓ 363 - Air Preheating Delay
- ✓ 363 - Micro Disconnection Delay
- ✓ 363 - Mains Return Delay
- ✓ 363 - EJP Warning Delay (France only)
- ✓ 363 - EJP Start Loss Delay (France only)
- ✓ 363 - Standby Delay
- ✓ 363 - U and F Stabilisation Delay
- ✓ 364 - Horn Stop Delay
- ✓ 364 - Horn activation / deactivation with fault
- ✓ 364 - Horn activation / deactivation with automatic start
- ✓ 368 - Overload Alarm Threshold

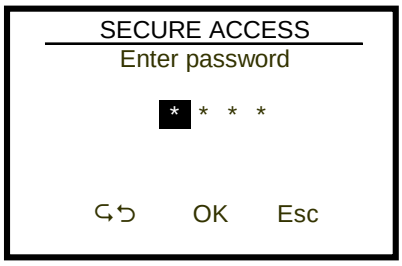
- Level 0B

This level allows the user to protect access to the settings of level 0A.
The access code is programmed by the user and can be modified by the user. Access level 1 makes it possible to modify the code. The code is entered in menu 361.

- 361 USER ACCESS



Makes it possible to create a user password



Screen displayed if the customer has entered an access code in menu
3 SETTINGS > 361 Create password
Reset by entering the code 1966

5.3. Contents of access level 1

The detailed contents of level 1 is as follows:

- Level 1

This level allows the customer, on the instructions of the service agent, to modify certain parameters when installing the generating set. Each change is saved in the event history with the access code used.
After the code is entered, exiting the settings menu requires the code to be entered again.
The code is identical for all TELYS units: "1966".

List of parameters:
As well as the parameters accessible at level 0, the following parameters are accessible:

- ✓ 363 - Engine Stop Delay Cooling
- ✓ 363 - Gradual Stop Delay Coolant Temperature
- ✓ 363 - Gradual Stop Delay Overload
- ✓ 365 - Alternator Min Voltage Delay
- ✓ 365 - Alternator Max Voltage Delay
- ✓ 365 - Alternator Min Voltage Alarm Threshold
- ✓ 365 - Alternator Min Voltage Fault Threshold
- ✓ 365 - Alternator Max Voltage Alarm Threshold
- ✓ 365 - Alternator Max Voltage Fault Threshold
- ✓ 366 - Alternator Min Frequency Delay
- ✓ 366 - Alternator Max Frequency Delay
- ✓ 366 - Alternator Min Frequency Alarm Threshold
- ✓ 366 - Alternator Min Frequency Fault Threshold
- ✓ 366 - Alternator Max Frequency Alarm Threshold
- ✓ 366 - Alternator Max Frequency Fault Threshold
- ✓ 367 - Battery Min Voltage Delay
- ✓ 367 - Battery Max Voltage Delay
- ✓ 367 - Battery Min Voltage Alarm Threshold
- ✓ 367 - Battery Min Voltage Fault Threshold
- ✓ 367 - Battery Max Voltage Alarm Threshold
- ✓ 367 - Battery Max Voltage Fault Threshold
- ✓ 368 - Fuel Pump Control Activation Threshold
- ✓ 368 - Fuel Pump Control Deactivation Threshold

6. Exterior communication

Control of the generating set and viewing of the operating parameters can be carried out remotely, without having to install specific software, via a computer network, a landline telephone network or a mobile telephone network.
The external communication of TELYS, is the devices integrated to the main board that make external communication possible. Each communication mode conforms to the international standards in force.
All the communication ports can be used simultaneously.

6.1. Series communication with the RS485 port

This communication port is used for a permanent or non-permanent connection between TELYS and the following equipment:

- ✓ a PC type computer
- ✓ a programmable logic controller (PLC)
- ✓ a modem
- ✓ all equipment fitted with an RS485 interface

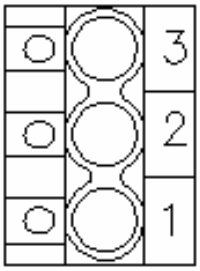
The parameters of this port are as follows:

- o speed: communication speed 2400, 4800, 9600, 19200, 38400 Bauds
- o data: data format: 7 or 8 bits
- o parity: parity check: without, even, odd,
- o stop: stop bit: yes or no.
- o address no.: from 1 to 255
- o signal type: Rx, Tx, transmission and reception of data
- o signal transmission: twisted pair armoured cable.

All these parameters can be accessed from the menu no. 31 "COMMUNICATION".

The connector is the following:

- Detachable screw block type.
- Non-isolated input
- The base must be closed at the extremities.
- Filtered and protected from EMC overvoltage.
- End of line resistance configuration switch (120 ohms) positioned to one side on the main board marked R31
- Maximum communication speed of the port: 38400 bauds
- Port conforms to RS485 standards



Connector no.	Designation	Electrical specifications	Marking on male connector
1	L0	0 Vdc	0 Vdc
2	L1	5 Vdc	A +
3	L2	5 Vdc	B -

6.2. Communication using USB ports

File transfers with TELYS is possible with the HOST USB ports.
The HOST USB ports are used to transfer files when TELYS is powered on.
The DEVICE USB port is used when TELYS is not powered; in this case the power supply comes from the PC.
The USB ports support versions:

- ✓ 1.0, 1.1 of the USB Bus, for a maximum throughput of 12Mbits/s or 1Mb/second
- ✓ 2.0 of the USB Bus, for a throughput of 480Mbits/s or 60Mb/second.

Data exchangeable by the USB ports with a PC or USB key

- ✓ additional language
- ✓ configuration parameters
- ✓ events
- ✓ updates (flashing) software versions (soft)
- ✓ data contained on the board for the replacement of a board

Usage of data exchangeable with USB key (functions)

Additional language	
Contents	Additional language file: contains all the messages that may appear on the display, translated into a language not integrated with the TELYS base
Usage	TELYS has 5 languages: French, English, Spanish, Portuguese, German. Space is provided for an additional language depending on customer requirements

Configuration parameters	
Contents	File containing all the configuration parameters (operation) relating to each generating set
Usage	Transfer and/or recover parameters configured in the factory or with the user during installation

Events	
Contents	File containing all the data necessary to facilitate the diagnosis of faults. Contains the list of all the events that have occurred with TELYS (operator actions, fault displays, etc.). Maximum number of events: 300.
Usage	In the event of a fault, the user of the generating set will be able to give the repair agent a file containing all the date required to facilitate repair. The file can be sent by email once it has been recovered from the USB key

Software (soft)	
Contents	TELYS operation software
Usage	This function is used to transfer, to save and to update software saved on the main board and all the boards containing associated software.

Data contained on the boards	
Contents	Data contained on the boards: software (soft), languages, configuration, fault finding help
Usage	This function is used to recover all the data stored on the TELYS boards to integrate them to another TELYS console when replacing a board or an entire console.

6.2.1 USB communication - operation

Operation is of the "Plug & Play" type: when a USB key is connected to the port, TELYS executes the following tasks:

- compatibility check of the key (driver) with the Windows CE version used
- files on key read
- compatibility check of the files on the key with those on TELYS.

	The following transfer screens are displayed following connection of the USB key and software recognition. **They only appear if the screen is on the homepage (not within a menu)**. **The transfer screens are displayed only a few seconds after the USB key is inserted**. Data transfer with a **USB key** (USB Host port) requires that **TELYS be powered on**. Data transfer with **PC** (USB Device port) does not require **TELYS to be powered on**

✓ USB key data transfer to TELYS (if compatible files stored on the key)

- Option to load configuration parameters
- Option to flash (update) a software version (soft)
- Option to load an additional language
- Option to load all data

	The transfer of "configuration parameters" and "all data" files from the key to TELYS can only be made with the **generating set stopped**. The files to be transferred to TELYS must be located at the "root" of the key and not in a sub-folder.

✓ Data transfer from TELYS to a USB key ("Copy" function)

- Option to copy the fault finding help file (events)
- Option to copy the configuration parameters (configuration)
- Option to copy the languages used (Languages)
- Option to copy the software installed (Soft)
- Option to copy all data from TELYS (all).

6.2.2 HOST USB port

This port makes it possible:

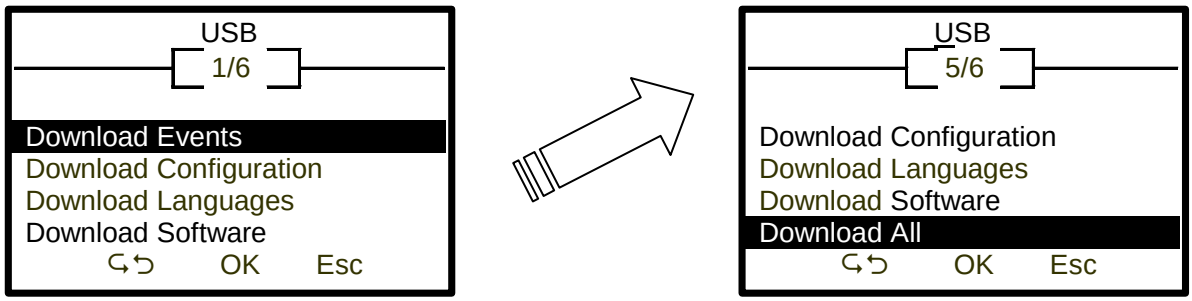
✓ to transfer the following information from TELYS to a USB key (operation known as "copying"):

- copy of the "diagnostic help" events that create a "PileEvent.dat" type file in a folder such as: "NS08030010000" for example (*)
- copy of the TELYS configuration that creates: "UpdateConf.dat, Com.dat, EqLog.dat, Application.dat, Constructeur.dat and Configuration.dat" type files in a folder such as "NS08030010000" for example
- copy of the languages used that creates "Label.txt and Langues.txt" type files in a folder such as "NS08030010000" for example
- copy of the software installed (operating software) that creates "Noyau.exe, IHM.exe, CE_JBUS.exe, Label.txt, Langues.txt, Soft_M16C_Telys2.mot and some *.bmp" type files in a folder such as "NS08030010000" for example
- copy of the 4 previous items (events, configuration, languages and software).

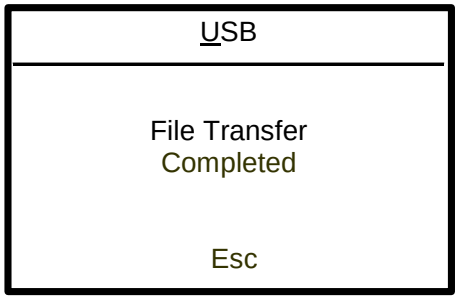
✓ to transfer a new configuration from a USB key to TELYS.

(*) E.g.: "NS08030010000" corresponds to the generating set serial number.

TELYS to USB transfer screens



When the transfer is completed, the following screen appears:

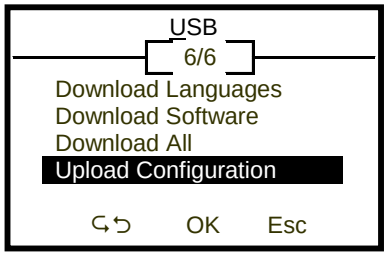


✓ to transfer the following information from a USB key to TELYS (operation known as "copying"):
- configuration parameters
- software version
- additional language
- all data.

USB to TELYS transfer screens

⚠	The transfer screens are displayed following connection of the USB key and software recognition. **They only appear if the screen is on the homepage (not within a menu)**. **The transfer screens are displayed only a few seconds after the USB key is inserted**. Data transfer with a **USB key** (USB Host port) requires that **TELYS be powered on**.

⚠	The transfer of "configuration parameters" and "all data" files from the key to TELYS can only be made with the **generating set stopped**. The files to be transferred to TELYS must be located at the "root" of the key and not in a sub-folder.



Example of screen

Note: once loading is complete, TELYS will reinitialise itself.

6.2.3 DEVICE USB port

This port makes it possible:

- ✓ to transfer from TELYS to a PC the same information as that transferred via USB key (events, configuration, languages, software and these 4 items can be transferred simultaneously)
- ✓ to transfer a new configuration from a PC to TELYS.

These transfers require specific communication software (service agents).

7. Use

The TELYS command / control module supports two possible modes:

- ➢ manual mode
- ➢ automatic mode.

7.1. Manual mode

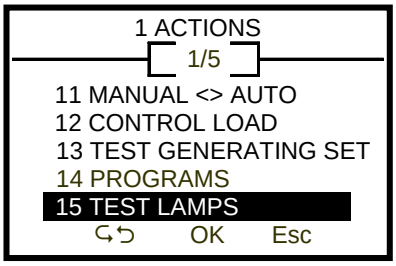
7.1.1 Generating set start-up

⚠ Danger	Check that the generating set circuit breaker has triggered.

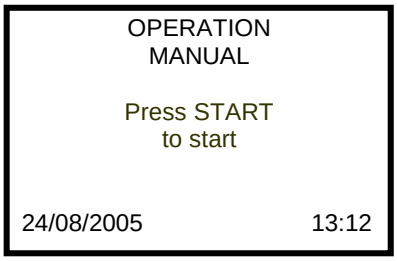
❶ Connect the generating set battery

❷ Turn the key switch to the ON position (without forcing it to the ON position), the ON lamp will light up (if the lamp does not light up, check and replace the fuse if necessary)

❸ Test the Alarm and Fault LEDs (menu 15 – TEST LAMPS)

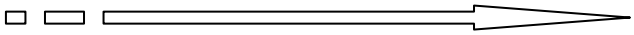


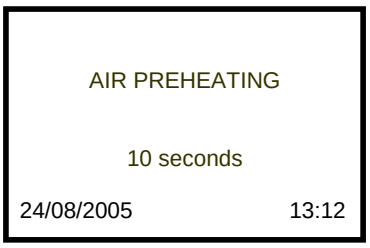
❹ Press "Esc" several times to return to the following home menu

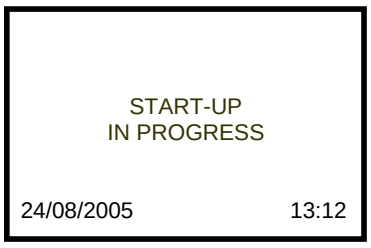


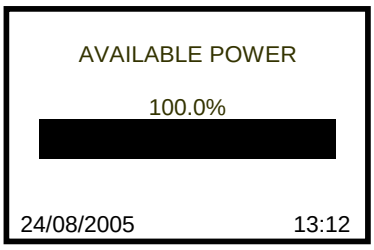
❺ Check the battery voltage 

❻ Press START:







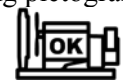


- If the engine is equipped with an air preheating system, there is a delay (adjustable) before the engine starts (preheating activation period).
- If the motor is not fitted with an air preheating system or once the preheating delay has elapsed, the engine starts up (start of a cycle comprising 3 attempts to start up the engine).

Warning: the number of successive and automatic starting attempts is limited to 3.

The following pictogram will flash

The following pictogram is displayed



The following information is displayed

Speed of rotation

Coolant temperature

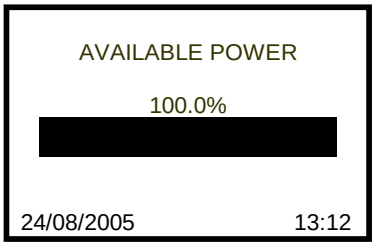
Oil pressure

Oil Temperature

7.1.2 Under load tests

ON load test – manual circuit breaker

❶ After the voltage and frequency have stabilised, the following information is displayed



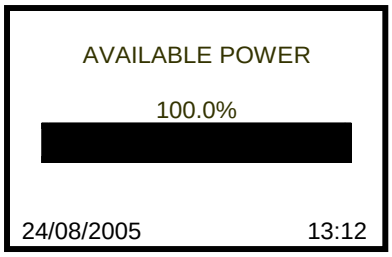
Stabilised voltage and frequency

Close the circuit breaker

After the circuit breaker is closed, the following display appears (the generating set is supplying the application):

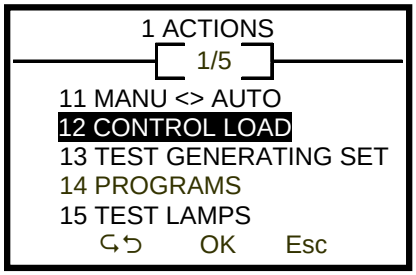
ON load test – motorised circuit breaker

After the voltage and frequency have stabilised, the following information is displayed

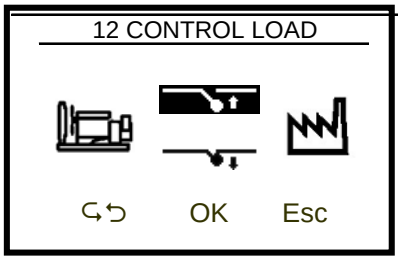


Stabilised voltage and frequency

❶ Selecting menu 12 "CONTROL LOAD"



❷ Request the motorised circuit breaker to close



After the circuit breaker is closed, the following display appears (the generating set is supplying the application):

7.1.3 Stopping the generating set

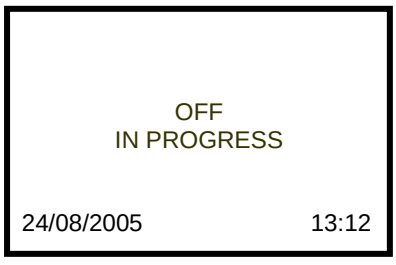
❶ Open the circuit breaker

➢ manually OR ➢ by selecting menu 12 "CONTROL LOAD"

The following display will disappear (supply stopped)

❷ Press the STOP button

❸ The following screen is displayed and the generating set will stop



❹ Switch TELYS off by turning the key to "OFF" (without forcing it to the "OFF" position).

7.2. Automatic mode

7.2.1 Generating set start-up

Start-up in auto mode can be initiated in two ways:

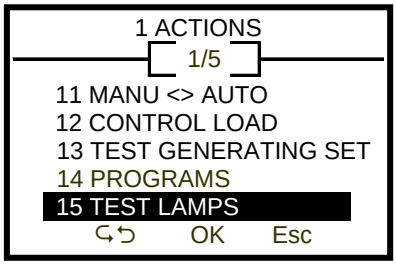
- from a remote start order
- from a programme

Danger	In auto mode, with the control / command module in operation (key switch ON), the generating set may start with no delay, when a remote start order is sent.

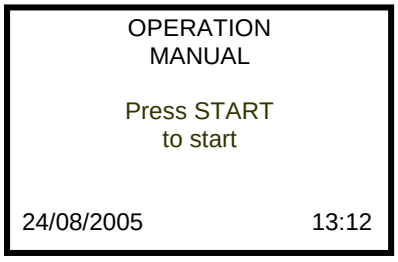
❶ Connect the generating set battery

❷ Turn the key switch to the ON position (without forcing it to the ON position), the ON lamp will light up (if the lamp does not light up, check and replace the fuse if necessary)

❸ Test the Alarm and Fault LEDs (menu 15 – TEST LAMPS)

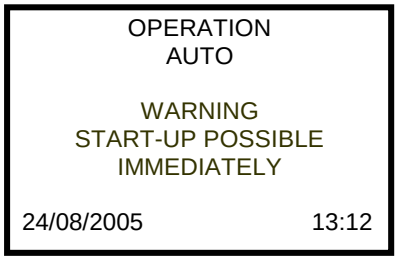


❹ Press "Esc" several times to return to the following home menu

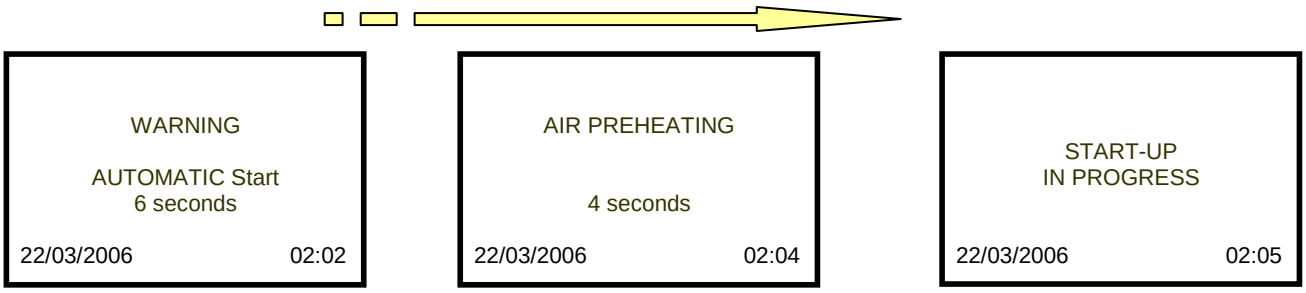


❺ Check the battery voltage 

❻ Select the automatic mode, menu 11 "MANUAL <> AUTO", the following pictogram and screen are displayed



❼ Following activation of the remote order (or following a programme), the following sequence occurs

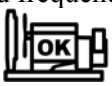


- If the engine is equipped with an air preheating system, there is a delay (adjustable) before the engine starts (preheating activation period).
- If the engine is not fitted with an air preheating system or once the preheating delay has elapsed, the engine starts up (start of a cycle comprising 3 attempts to start up the engine).

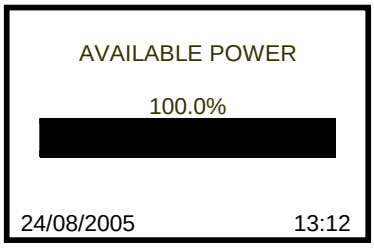
Warning: the number of successive and automatic starting attempts is limited to 3.

The following pictogram will flash

The following pictogram is displayed (voltage and frequency stabilisation)



The following screen appears:

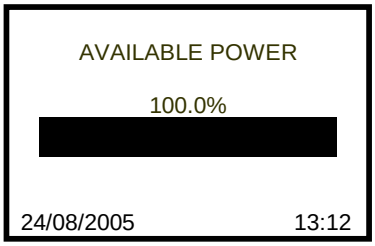


The following information is displayed

- Speed of rotation
- Coolant temperature
- Oil pressure
- Oil Temperature

7.2.2 Applying the load

❶ After the voltage and frequency have stabilised, the following information is displayed:



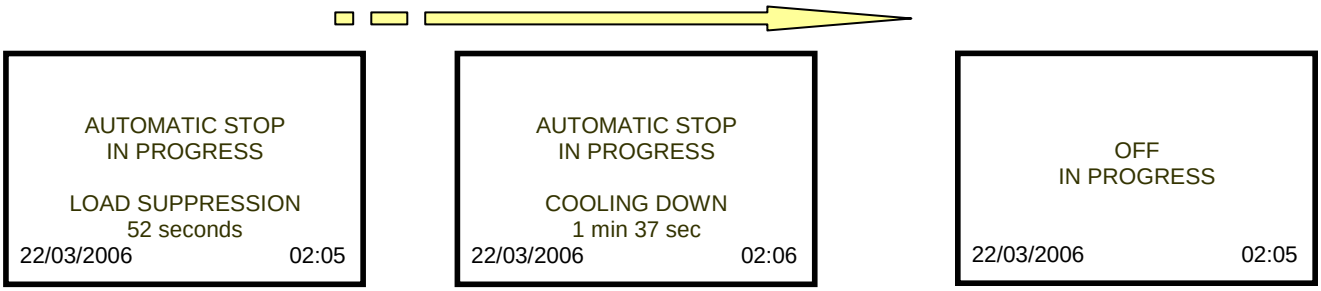
Stabilised voltage and frequency

❷ Closure of motorised circuit breaker

❸ After the circuit breaker is closed, the following display appears (the generating set is supplying the application):

7.2.3 Stopping the generating set

Following deactivation of the remote order (or following a programme), the following sequence occurs:



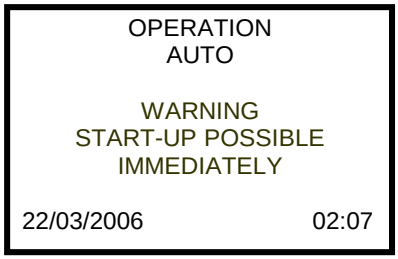
Load suppression delay

Engine cooling delay

The following display will disappear (supply stopped)

Engine stop phase

When completed, the display returns to the initial screen



8. Fault finding

Problem	Probable causes	Remedial action
No LED displays and no screen display	Faulty module supply fuse	Check and replace the fuse
	Faulty battery	Check and replace the battery if necessary

9. Maintenance

9.1. Replacing the fuse

❶ Use a suitable screwdriver or your hand to turn the cap anti-clockwise until it can be removed.
❷ Remove and replace the fuse (use a fuse of the same size and rating).
❸ Refit the cap in the reverse order to removal.

10. Appendix

10.1. Enclosure A - List of John Deere - Volvo and Perkins fault codes

SPN	CID	SID	PID	PPID	FMI	John Deere	Volvo	Perkins	DESCRIPTION	COMMENTARY
28									**Throttle #3 Position**	
					3	■			Throttle Voltage high, short to V+	Short to V+
					4	■			Throttle Voltage low, short to V-	Short to V-
29									**Throttle #2 Position**	
					3	■			Throttle Voltage high, short to V+	Short to V+
					4	■			Throttle Voltage low, short to V-	Short to V-
					14	■			Throttle Voltage out of range	
84									**Vehicle speed**	
					2	■			Vehicle invalid or missing	Not possible with genset application
					31	■			Vehicle speed mismatch	
91	**91**		**91**				■		**Accelerator pedal position**	**FMI not informed by VOLVO**
					3	■			Throttle Voltage high, short to V+	Not possible with genset application, codes declared by the CAN J1587 for VOLVO.
					4	■			Throttle Voltage low, short to V-	
					7	■			Throttle calibration invalid	
					8	■		■	PWM throttle abnormal pulse width	
					9	■			Throttle invalid (CAN value)	
					10	■			Throttle voltage out of range low	
					13	■			Throttle calibration aborted	
					14	■			Throttle voltage out of range	

SPN	CID	SID	PID	PPID	FMI	John Deere	Volvo	Perkins	DESCRIPTION	COMMENTARY
94			**94**				■		**Fuel rail pressure sensor**	
					1	■	■		Fuel supply pressure extremely low	
					3	■	■		Fuel rail pressure input voltage high	Short to V+
					4	■			Fuel rail pressure input voltage low	Short to V-
					5		■		Fuel rail pressure sensor open circuit	
					10	■			Fuel rail pressure lost detected	
					13	■			Fuel rail pressure higher than expected	
					16	■			Fuel supply pressure moderately high	
					17	■			Fuel rail pressure not developped	
					18	■			Fuel supply pressure moderately low	
97			**97**				■		**Water in fuel sensor**	
					0	■	■		Water in fuel continuously detected	
					3	■	■		Water in fuel input voltage high	Short to V+
					4	■			Water in fuel input voltage low	Short to V-
					16	■			Water in fuel detected	
					31	■			Water in fuel detected	
98			**98**				■		**Oil level sensor**	
					1		■		Oil level value below normal	
					3		■		Oil level sensor input voltage high	Short to V+
					4		■		Oil level sensor input voltage low	Short to V-
					5		■		Oil level sensor open circuit	
100	**100**		**100**				■		**Oil pressure sensor**	
					1	■	■		Engine oil pressure extremely low	
					3	■	■	■	Oil pressure sensor input voltage high	Short to V+
					4	■		■	Oil pressure sensor input voltage low	Short to V-
					5		■		Oil pressure sensor open circuit	
					17			■	Engine oil pressure low	
					18	■		■	Engine oil pressure moderately low	

SPN	CID	SID	PID	PPID	FMI	John Deere	Volvo	Perkins	DESCRIPTION	COMMENTARY
102	**273**		**102**						**Manifold air pressure sensor**	
					0				Manifold air pressure above normal	
					1				Manifold air pressure below normal	
					3				Manifold air pressure sensor input voltage high	Short to V+
					4				Manifold air pressure sensor input voltage low	Short to V-
					15				Manifold air pressure moderately low	
					16				Manifold air pressure low	
105			**105**						**Manifold air temperature sensor**	
					0				Manifold air temperature extremely high	
					3				Manifold air temperature sensor input voltage high	
					4				Manifold air temperature sensor input voltage low	
					5				Manifold air temperature sensor open circuit	
					16				Manifold air temperature moderately high	
106			**106**						**Air inlet pressure sensor**	
					0				Air inlet pressure above normal	
					3				Air inlet pressure sensor input voltage high	
					5				Air inlet pressure sensor open circuit	
107			**107**						**Ait filter differential pressure sensor**	
					0				Air filter restriction high	
					3				Air filter differential pressure sensor input voltage high	
					4				Air filter differential pressure sensor input voltage low	
					5				Air filter differential pressure sensor open circuit	
					31				Air filter restriction high	
108	**274**		**108**						**Barometric pressure sensor**	**Not use with EDC III and EMS2**
					3				high barometric pressure sensor short to high	
					4				high barometric pressure sensor short to low	
					17				high barometric pressure	ECM option, sensor not connected

SPN	CID	SID	PID	PPID	FMI	John Deere	Volvo	Perkins	DESCRIPTION	COMMENTARY
110	**110**		**110**				■		**Coolant temperature sensor**	
					0	■	■	■	Coolant temperature extremely high	
					3	■	■	■	Coolant temperature sensor input voltage high	
					4	■	■	■	Coolant temperature sensor input voltage low	
					5		■		Coolant temperature sensor open circuit	
					15	■		■	Coolant temperature high least severe	
					16	■		■	Coolant temperature moderately high	
					31	■			Coolant temperature high	
111			**111**						**Coolant level sensor**	
					0		■		Engine coolant level low	
					1	■			Engine coolant level low	
					3	■	■		Coolant level sensor input voltage high	
					4	■			Coolant level sensor input voltage low	
153			**153**						**Cranckcase pressure sensor**	
					0		■		Value above normal	
					3		■		Crankcase pressure sensor input voltage high	
					5		■		Crankcase pressure sensor open circuit	
158			**158**						**Battery voltage sensor**	
					1		■		Voltage above normal	
					17	■			ECU power down error	
160									**Wheel speed sensor**	
					2	■			Wheel speed input noise	
168	**168**								**Electrical system voltage**	
					2			■	Electrical system voltage low	
172	**172**		**172**						**Ambiant air temperature sensor**	**Inlet air temperature sensor for PERKINS**
					3			■	Ambiant air temperature sensor input voltage high	Inlet air temperature sensor input voltage high
					4		■	■	Ambiant air temperature sensor input voltage low	Inlet air temperature sensor input voltage low
					5		■		Ambiant air temperature sensor open circuit	
					15			■		High Inlet air temperature alarme-warning
					16			■		High Inlet air temperature alarme-action alert

SPN	CID	SID	PID	PPID	FMI	John Deere	Volvo	Perkins	DESCRIPTION	COMMENTARY
174	**174**								**Fuel temperature sensor**	
					0	■			Fuel temperature high most severe	
					3	■		■	Fuel temperature sensor input voltage high	
					4	■		■	Fuel temperature sensor input voltage low	
					15	■		■	Fuel temperature high	
					16	■		■	Fuel temperature high moderately high	
					31	■			Fuel temperature sensor faulty	
175			**175**						**Oil temperature sensor**	
					0		■		Oil temperature extremely high	
					3		■		Oil temperature sensor input voltage high	
					4		■		Oil temperature sensor input voltage low	
					5		■		Oil temperature sensor open circuit	
177									**Transmission oil temperature sensor**	
					9	■			Transmission oil temperature invalid	not possible with Genset application
189									**Rated engine speed**	
					0	■			Engine speed derated	
					31	■			Engine speed derated	
190	**190**		**190**				■		**Engine speed sensor**	
					0	■		■	Overspeed extreme	
					2			■	Engine speed sensor data intermittent	
					9			■	Engine speed sensor abnormal update	
					11			■	Engine speed sensor signal lost	
					12			■	Engine speed sensor signal lost	
					15			■	Overspeed	
					16	■		■	Overspeed moderate	
228	**261**								**Speed sensor calibration**	
					13			■	Engine timing abnormal calibration	
252	**252**								**Software**	
					11			■	Incorrect engine software	

SPN	CID	SID	PID	PPID	FMI	John Deere	Volvo	Perkins	DESCRIPTION	COMMENTARY
234	**253**								**Check system parameters**	
					2			■	Incorrect parameters	
281	**281**								**Action alert output status**	
					3			■	Action alert output open/short to B+	
					4			■	Action alert output short to ground	
					5			■	Action alert output open circuit	
282	**282**								**Overspeed output status**	
					3			■	Overspeed output open/short to B+	
					4			■	Overspeed output short to ground	
285	**285**								**Coolant temperature output status**	
					3			■	Coolant temperature lamp open/short to B+	
					4			■	Coolant temperature lamp short to ground	
286	**286**								**Oil pressure output status**	
					3			■	Oil pressure output open/short to B+	
					4			■	Oil pressure output short to ground	
					5			■	Oil pressure output open circuit	
323	**323**								**Shutdown output status**	
					3			■	Shutdown output open/short to B+	
					4			■	Shutdown output short to ground	
					5			■	Shutdown output open circuit	
324	**324**								**Warning output status**	
					3			■	Warning output open/short to B+	
					4			■	Warning output short to ground	
					5			■	Warning output open circuit	
443	**443**								**ENGINE RUN output status**	
					3			■	Engine run output open/short to B+	
					4			■	Engine run output short to B-	
523									**Gear selection**	
					9	■			Gear selection invalid	not possible with Genset application

SPN	CID	SID	PID	PPID	FMI	John Deere	Volvo	Perkins	DESCRIPTION	COMMENTARY
608		**250**							**Data link faulty J1587**	
611									**Injector wiring status**	
					3				injector wiring shorted to power source	
					4				injector wiring shorted to ground	
620	**262**	**232**							**5 Volt sensor power supply**	**FMI not informed by VOLVO**
					3				Sensor power supply open/short to B+	
					4				Sensor power supply short to ground	
626			**44**						**Start enable device (intake heater and ether)**	
					3				Start enable device output short to B+	Not use, the control panel is in charge to manage the start enable device
					4				Start enable device output short to ground	
					5				Start enable device output open circuit	
627									**Power supply**	
					1				Injector supply voltage problem	for 6125HF070 only
					4				ECU unswitched power missing	for 6068HF275 VP44 only
628		**240**							**Memory fault in EMS2**	
629		**254**							**ECU status**	**CIU module status**
					2				RAM cell test failure	
					8				CPU watchdog reset test failure	
					11				Main and fuelling ASIC test fail	
					12				RAM adress test failure	
					13				Watchdog trip failure	
					19				ECU to injection pump communication error	Possible only with 6068HF475 VP44
630		**253**							**Data set memory EEPROM**	
632									**Injection status**	
					2				Fuel shutoff error	
					5				Fuel shutoff non-functional	

SPN	CID	SID	PID	PPID	FMI	John Deere	Volvo	Perkins	DESCRIPTION	COMMENTARY
636		**21**							**Pump position sensor/Cam position sensor**	Pump position or CAM position in function of the type of injection
					2	■	■		Pump position sensor/cam position sensor input noise	
					3		■		Permanent loss of signal	
					8	■	■		Pump position sensor/cam position sensor input missing	
					9		■		Not informed by VOLVO	
					10	■			Pump position sensor/cam position sensor input pattern error	
637		**22**							**Crank position sensor**	
					2	■	■		Crank position input noice	
					3		■		Permanent loss of signal	
					7	■			Crank position/Cam position out of synchronisation	
					8	■	■		Crank position input missing	
					9		■		Not informed by VOLVO	
					10	■			Crank position sensor input pattern error	
639	**247**	**231**							**Communication status**	
					2		■		Bus Off error	
					9		■		Passive bus error	
					11		■		Data registers read back failure	
					12		■		Loss of message error	
					13	■			Bus CAN error	
640									**Engine shutdown vehicle status**	
					11	■			Engine shutdown vehicle request invalid	
					31	■			Engine shutdown vehicle request	

SPN	CID	SID	PID	PPID	FMI	John Deere	Volvo	Perkins	DESCRIPTION	COMMENTARY
651	**1**	**1**	**651**						**Cylinder #1 status**	
					2				Short circuit high side to B+	
					3				Short circuit high side to low side or low side to B+	
					4				Short circuit high or low side to ground	
					5				Cylinder #1 circuit open	
					6				Cylinder #1 circuit shorted	
					7				Cylinder #1 balancing error/mechanical failure	
					11				Cylinder #1 unknown error/mechanical failure	
652	**2**	**2**	**652**						**Cylinder #2 status**	
					2				Short circuit high side to B+	
					3				Short circuit high side to low side or low side to B+	
					4				Short circuit high or low side to ground	
					5				Cylinder #1 circuit open	
					6				Cylinder #1 circuit shorted	
					7				Cylinder #1 balancing error/mechanical failure	
					11				Cylinder #1 unknown error/mechanical failure	
653	**3**	**3**	**653**						**Cylinder #3 status**	
					2				Short circuit high side to B+	
					3				Short circuit high side to low side or low side to B+	
					4				Short circuit high or low side to ground	
					5				Cylinder #1 circuit open	
					6				Cylinder #1 circuit shorted	
					7				Cylinder #1 balancing error/mechanical failure	
					11				Cylinder #1 unknown error/mechanical failure	

SPN	CID	SID	PID	PPID	FMI	John Deere	Volvo	Perkins	DESCRIPTION	COMMENTARY
654	**4**	**4**	**654**						**Cylinder #4 status**	
					2				Short circuit high side to B+	
					3				Short circuit high side to low side or low side to B+	
					4				Short circuit high or low side to ground	
					5				Cylinder #1 circuit open	
					6				Cylinder #1 circuit shorted	
					7				Cylinder #1 balancing error/mechanical failure	
					11				Cylinder #1 unknown error/mechanical failure	
655	**5**	**5**	**655**						**Cylinder #5 status**	
					2				Short circuit high side to B+	
					3				Short circuit high side to low side or low side to B+	
					4				Short circuit high or low side to ground	
					5				Cylinder #1 circuit open	
					6				Cylinder #1 circuit shorted	
					7				Cylinder #1 balancing error/mechanical failure	
					11				Cylinder #1 unknown error/mechanical failure	
656	**6**	**6**	**656**						**Cylinder #6 status**	
					2				Short circuit high side to B+	
					3				Short circuit high side to low side or low side to B+	
					4				Short circuit high or low side to ground	
					5				Cylinder #1 circuit open	
					6				Cylinder #1 circuit shorted	
					7				Cylinder #1 balancing error/mechanical failure	
					11					

SPN	CID	SID	PID	PPID	FMI	John Deere	Volvo	Perkins	DESCRIPTION	COMMENTARY
676									**Glow plug relay status**	
					3	■			Glow plug relay voltage high	
					5	■			Glow plug relay voltage low	
677				**3**					**Start relay status**	
					3		■		Start relay control short circuit to high	
					4		■		Start relay control short cicuit low	
					5		■		Start relay control open circuit	
678	**41**								**8 Volt power supply**	
					3			■	ACM 8 Volt DC supply open/short to B+	
					4			■	ACM 8 Volt DC supply open/short to ground	
723	**342**								**Secondary speed sensor**	
					2			■	Sencondary engine speed sensor data intermittent	
					11			■	Sencondary engine speed sensor loss of signal	
					12			■	Loss of signal/sesnor failure	
729									**Inlet air heater signal**	
					3	■			Inlet air heater signal high	
					5	■			Inlet air heater signal low	
810									**Vehicle speed**	
					2	■			Calculated vehicle speed input noise	not possible with Genset application
861	**861**								**Diagnostic output status**	
					3			■	Diagnostic output open/short to B+	
					4			■	Diagnostic output short to ground	
898									**CAN throttle status**	
					9	■			Speed value invalid or missing	
970									**Auxiliary engine shutdown switch status**	
					2	■			Auxiliary engine shutdown switch signal invalid	not used
					31	■			Auxiliary engine shutdown switch active	
971									**External engine derate switch status**	
					31	■			External engine derate switch active	not used

SPN	CID	SID	PID	PPID	FMI	John Deere	Volvo	Perkins	DESCRIPTION	COMMENTARY
1069									**Tire size status**	
					2				Tire size error	not possible with Genset application
					9				Tire size invalid	
					31				Tire size error	
1076									**Fuel Injection pump status**	**Only with John DEERE**
					0				Pump control valve closure too long	Injection DE10
					1				Pump control valve closure too short	Injection DE10
					2				Pump detected defect	Injection VP44
					3				Pump solenoid current high	Injection DE10
					5				Pump solenoid circuit open	Injection DE10
					6				Pump solenoid circuit severely shorted	Injection DE10
					7				Pump control valve closure not detected	Injection DE10
					10				Pump solenoid circuit moderately shorted	Injection DE10
					13				Pump current decay time invalid	Injection DE10
1077									**Fuel injection pump controller status**	
					7				Attempting to fuel without command	
					11				Pump supply voltage out of range	
					12				Pump self test error	
					19				Pump detected communication error	
					31				Pump initiated engine protection	
1078									**ECU/Pump timing status**	
					7				ECU/Pump timing moderately out of synchronisation	
					11				ECU/Pump timing speed out of synchronisation	
					31				ECU/Pump timing extremely out of synchronisation	
1079									**Sensor supply voltage (+5 Volt)**	**Analog throttle reference**
					3				Sensor supply voltage high	> 5,5 Volt
					4				Sensor supply voltage low	< 4,44 Volt

SPN	CID	SID	PID	PPID	FMI	John Deere	Volvo	Perkins	DESCRIPTION	COMMENTARY
1080									**Sensor supply voltage (Oil pressure, Coolant temp, fuel pressure)**	
					3	■			Sensor supply voltage high	> 5,5 Volt
					4	■			Sensor supply voltage low	< 4,40 Volt
1109									**Engine/ECU status**	
					31	■			Engine shutdown warning	
1110									**Engine status**	
					31	■			Engine shutdown	
1111	**268**								**Check parameters**	
					2			■	Programmed parameter fault	
1266	**1266**								**General fault output status**	
					3			■	General fault output open/short to B+	
					4			■	General fault output short to ground	
1347									**Pump control valve status**	**Pump control valve #1 status for 6081HF070**
					3	■			Pump control valve current high	
					5	■			Pump control valve error/mismatch	
					7	■			Fuel rail pressure control error	
					10	■			Pump control valve fuel flow not detected	
1348									**Pump control valve #2 status**	**only for 6081HF070**
					5	■			Pump control valve #2 error/mismatch	
					10	■			Pump control valve #2 fuel flow not detected	
1485			**1485**						**Pump power relay status**	**ECU main relay of VOLVO EMS/EDC**
					2	■			Pump power relay fault	
					3		■			ECU main relay short circuit high
1568									**Torque curve selection**	
					2	■			Torque curve selection invalid	
					4	■			Torque curve input voltage high	
					9	■			Torque curve selection missing	
1569									**Fuel sypply status**	
					31	■			Fuel derate	

SPN	CID	SID	PID	PPID	FMI	John Deere	Volvo	Perkins	DESCRIPTION	COMMENTARY
1639									**Fan speed sensor**	
					1				Fan speed signal missing	
					2				Fan speed signal erratic	
					16				Fan speed higher than expected	
					18				Fan speed lower than expected	
1690	**1690**								**Analogue throttle status**	
									Abnormal pulse signal	
2000									**ECU status**	
					6				Vehicle ID missing	
					13				Security violation	

10.2. Enclosure B - List of MTU engine fault codes

Fault displays

Faults in the overall MDEC system are indicated at the devices as follows:

- ✓ Fault code numbers (generated inside Engine Control Unit ECU)

Table

- ✓ The number of the fault code on the display is listed in the first column “No.”in the table.
- ✓ The message is explained in the second column “Meaning/cause” and the reason for the message is explained
- ✓ The third column “Counteraction” in the table lists measures which can be taken on-site by the operator or other information about how to proceed.
- ✓ The last two columns indicate which fault can appear for which engine series.

No.	Meaning/Cause	Measures	2000	4000
003	Fuel temperature too high (first limit value overshot)	Engine documentation	☑	☑
005	Charge air temperature too high (first limit value overshot)	Engine documentation	☑	☑
006	Charge air temperature toohigh (second limit value overshot)	Engine documentation	☑	☑
009	Charge air coolant temperature too high (Limit 1 overshot)	Engine documentation	☑	☑
015	Lube oil pressure too low (first limit value undershot)	Engine documentation	☑	☑
016	Lub eoil pressure too low (second limit value undershot) → enginestop	Engine documentation	☑	☑
023	Coolant level too low	Check coolant level in expansion tank Engine documentation	☑	☑
024	Coolant level too low	Check coolant level in expansion tank Engine documentation	☑	☑
030	Engine overspeed → emergency stop	Restart the engine, eliminate cause of overspeeding	☑	☑
033	Fuel differential pressure too high	Check filter Engine documentation	☑	
044	Charge air coolant level too low	Check coolant level Engine documentation		☑
045	Charge air coolant level too low	Check coolant level Engine documentation		☑
051	Lube oil temperature too high (first limit value overshot)	Engine documentation	☑	☑
052	Lube oil temperature too high (second limit value overshot)	Engine documentation	☑	☑
065	Fuel infeed pressure too low (first limit value undershot)	Check low pressure fuel side Engine documentation		☑
066	Fuel infeed pressure too low (second limit value undershot)	Check low pressure fuel side Engine documentation		☑
067	Coolant temperature too high (first limit value overshot); warning	Engine documentation	☑	☑
068	Coolant temperature too high (second limit value overshot); shutdown	Engine documentation	☑	☑
069	Alarm ‘First limit value violated’ for ext. temperature channel 1	The measured value is read in via the CAN. The alarm is handled in MDEC.	☑	☑

No.	Meaning/Cause	Measures	2000	4000
070	Alarm ‘Second limit value violated’ for ext. temperature channel1	The measured value is read in via the CAN. The alarm is handled in MDEC.	☑	☑
071	Alarm ‘First limit value violated’ for ext. temperature channel 2	The measured value is read in via the CAN. The alarm is handled in MDEC.	☑	☑
072	Alarm ‘Second limit value violated’ for ext. temperature channel 2	The measured value is read in via the CAN. The alarm is handled in MDEC.	☑	☑
073	Alarm ‘First limit value violated’ for ext. pressure channel 1	The measured value is read in via the CAN. The alarm is handled in MDEC.	☑	☑
074	Alarm ‘Second limit value violated’ for ext. pressure channel 1	The measured value is read in via the CAN. The alarm is handled in MDEC.	☑	☑
075	Alarm ’First limit value violated’ for ext. pressure channel 2	The measured value is read in via the CAN. The alarm is handled in MDEC.	☑	☑
076	Alarm ’Second limit value violated’ for ext. pressure channel 2	The measured value is read in via the CAN. The alarm is handled in MDEC.	☑	☑
077	Alarm from external coolant level monitor	The measured value is read in via the CAN. The alarm is handled in MDEC.	☑	☑
078	Alarm from external charge air coolan tlevel monitor	The measured value is read in via the CAN. The alarm is handled in MDEC.	☑	☑
079	Alarm from external binary channel 3 (plant)	The measured value is read in via the CAN. The alarm is handled in MDEC.	☑	☑
080	Alarm from external binary channel 4 (plant)	The measured value is read in via the CAN. The alarm is handled in MDEC.	☑	☑
081	Low pressure gradient on starting or high pressure gradient on stopping	High pressure system leaking, air in the system Engine documentation		☑
082	Rail pressure above set value → DBR reduction, injection start later	Interface transformer malfunction or interface transformer wiring B48 Engine documentation		☑
083	Rail pressure below set value → DBR reduction	Interface transformer faulty or leakage in the high pressure system Engine Documentation Message also appears when very large generators are in use and the rundown time exceeds 20 s Fault irrelevant		☑
089	Engine speed has fallen below 200 rpm → engine stop		☑	☑

No.	Meaning/Cause	Measures	2000	4000
090	Fault message during starting, idling speed not reached within the time defined	Check for further messages	☑	☑
091	Fault message during starting, runup speed not reached within the time defined	Check for further messages	☑	☑
092	Start error message, starter speed not reached within the time defined (counting starts when the starter is activated) → starttermination	Check for further messages	☑	☑
093	Coolant preheating temperature too low (second limit value undershot)	Preheating temperature not reached	☑	☑
094	Coolant preheating temperature too low (firs tlimit value undershot)	Preheating temperature not reached	☑	☑
095	Interval priming pressure not reached	Oil pressure sensor and priming pump Engine documentation	☑	☑
099	Dummy			☑
100	Measuring point data checksum error in EDM	Electronics service	☑	☑
101	Measuring point data checksum error in IDM	Electronics service	☑	☑
102	Accumulated fuel consumption checksum error in EDM (redundant datar ecord 1)	Electronics service	☑	☑
103	Accumulated fuel consumption checksum error in EDM (redundant data record 2)	Electronics service	☑	☑
104	Operating hours counter checksum error inEDM	Electronics service	☑	☑
105	Operating hours counter checksum error in IDM	Electronics service	☑	☑
106	Fault memory checksum error in EDM (redundant data record 1)	Electronics service	☑	☑
107	Fault memory checksum error in EDM (redundant data record 2)	Electronics service	☑	☑
118	If the supply voltage is below set lower limit value 1 the value calculated from the DBR curve is multiplied by 0.8 and injection start is delayed by 5°	Check battery / generator	☑	☑
119	If the supply voltage is below set lower limit value 2 the value calculated from the DBR curve is multiplied by 0.8 and injection start is delayed by 5°	Check battery / generator	☑	☑
120	If the supply voltage is above set upper limit value 1 the value calculated from the DBR curve is multiplied by 0.8 and injection start is delayed by 5°	Check battery / generator	☑	☑
121	If the supply voltage is above set upper limit value 2 the engine is stopped, if configurated	Check battery / generator	☑	☑

No.	Meaning/Cause	Measures	2000	4000
122	ECU temperature too high (first limit value exceeded)	Check electronics environment (heat accumulation)	☑	☑
134	Internal electronics failure → engine stop due to electronics failure	Replace Engine Control Unit ECU	☑	☑
136	Internal electronics failure → engine stop due to electronics failure	Replace Engine Control Unit ECU	☑	☑
137	This fault can have various causes: 1. Pressure sensor fault 2. Sensor wiring 3. Internal electronics failure	Fault analysis for internal electronic fault:Disconnect connectors X2 and X3, ECU is faulty if fault message remains. Fault analysis of pressure sensors: Disconnect pressure sensors one after the other and pinpoint which sensor causes the fault. If both measures prove unsuccessful the fault lies in the cable harness.	☑	☑
138	This fault can have various causes: 1. Pressure sensor fault 2. Sensor wiring 3. Internal electronics failure	Fault analysis for internal electronic fault:Disconnect connectors X2 and X3, ECU is faulty if fault message remains. Fault analysis of pressure sensors: Disconnect pressure sensors one after the other and pinpoint which sensor causes the fault. If both measures prove unsuccessful the fault lies in the cable harness.	☑	☑
139	Internal electronics failure → Sensor defect –alarm for dependent sensors, temperature values are set to default values	1. Sensor defect Electronics service 2. Electronics faulty Replace Engine Control Unit ECU	☑	☑
140	Internal electronics failure → Sensor defect –alarm for dependent sensors, temperature values are set to default values	1. Sensor defect Electronics service 2. Electronics faulty Replace Engine Control Unit ECU	☑	☑
142	Internal electronics failure → engine does not start, electronics faulty, test with engine at standstill only	Replace Engine Control Unit ECU	☑	☑
144	Internal electronics failure → engine does not start, electronics faulty, test with engine at standstill only	Replace Engine Control Unit ECU	☑	☑
145	Internal electronics fault → engine stop due to electronics failure	Replace Engine Control Unit ECU	☑	☑
147	Internal electronics failure → engine stop due to electronics failure	Replace Engine Control Unit ECU	☑	☑
149	Internal electronics failure → engine stop due to electronics failure	Replace Engine Control Unit ECU	☑	☑
151	Internal electronics failure → engine stop due to electronics failure	Replace Engine Control Unit ECU	☑	☑
170	Module in maintenance indicator faulty or missing	Check whether the MI is properly installed Electronics service	☑	☑

No.	Meaning/Cause	Measures	2000	4000
171	Maintenance indicator no longer active	Check whether the MI is properly installed Electronics service	☑	☑
173	EEPROM write limit reached	Electronics service	☑	☑
180	At least one Alive PDU on CAN 1 monitored by the ECU is missing → connected device out of order	Check CAN devices and CAN bus wiring as necessary	☑	☑
181	At least one Alive PDU on CAN 2 monitored by the ECU is missing → connected device out of order	Check CAN devices and CAN bus wiring as necessary	☑	☑
182	Parameter 200.00 and/or 200.05 have no valid values	Parameterize given values correctly	☑	☑
183	A CAN mode is selected in which communication is initialized with the help of the PU datamodule. However, the required PU data module is missing or invalid.	Test the devices connected to the CAN Download again via BDM Electronicsservice	☑	☑
184	A programming error occurred in one or both modules on attempting to copy a received PU data module in both EEPROM modules.	Electronics service	☑	☑
185	Insufficient receiving mailboxes ready on one or both CAN controllers on initializing the receiving identifiers.	Electronics service	☑	☑
186	CAN controller 1 in bus off state → automatic switching to CAN2	Causes are e.g. short-circuit, major disruptions or baud rate in compatibility	☑	☑
187	CAN controller 1 has signalled a warning	Causes are e.g. missing nodes, minor disruptions or temporary bus overloading	☑	☑
188	CAN controller 2 in bus off state → automatic switching to CAN 1	Causes are e.g. short-circuit, major disruptions or baud rate incompatibility	☑	☑
189	CAN controller 2 has signalled a warning	Causes are e.g. missing nodes, minor disruptions or temporary bus overloading	☑	☑
201	Sensor defect (coolant temperature)	Short-circuit or wire breakage, check sensor and wiring to B6 Electronics service	☑	☑
202	Sensor defect (fuel temperature)	Short-circuit or wire breakage, check sensor and wiring to B33 Electronics service	☑	☑
203	Sensor defect (charge air temperature)	Short-circuit or wire breakage, check sensor and wiring to B9 Electronicsservice	☑	☑
205	Sensor defect (charge air coolant temperature)	Short-circuit or wire breakage, check sensor and wiring to B26 Electronics service	☑	☑
208	Sensor defect (charge pressure)	Short-circuit or wire breakage, check sensor and wiring to B10 Electronicsservice	☑	☑

No.	Meaning/Cause	Measures	2000	4000
211	Sensor defect (lube oil pressure)	Short-circuit or wire breakage, check sensor and wiring to B5 Electronicsservice	☑	☑
215	Sensor defect (Rail pressure) → high pressure governor emergency operation	Short-circuit or wire breakage, check sensor and wiring to B48 Electronics service		☑
216	Sensor defect (lube oil temperatur)	Short-circuit or wire breakage, check sensor and wiring to B7 Electronicsservice	☑	☑
220	Sensor defect (coolant level)	Short-circuit or wire breakage, check sensor and wiring to F33 Electronics service Note : If a sensor cable connector has been temporarily disconnected and then reconnected (e.g. next to the ECU), this fault message is signalled for a further approx. 60min. The fault can be immediately cleared by switching the system off and back on.	☑	☑
223	Sensor defect (charge air coolant level)	Short-circuit or wire breakage, check sensor and wiring to F57 Electronics service Note : If a sensor cable connector has been temporarily disconnected and then reconnected (e.g. next to the ECU), this fault message is signalled for a further approx. 60min. The fault can be immediately cleared by switching the system off and back on.		☑
229	Sensor defect crank case speed and sensor defect camshaft speed	Compare alarms 230 and 231	☑	☑
230	Sensor defect (crankshaft speed)	Short-circuit or wire breakage, check sensor and wiring to B13 Electronicsservice	☑	☑
231	Sensor defect (camshaft speed)	Short-circuit or wire breakage, check sensor and wiring to B1 Electronicsservice	☑	☑
240	Sensor defect (fuel pressure)	Short-circuit or wire breakage, check sensor and wiring to B43 Electronicsservice		☑
245	Internal ECU failure	Electronics faulty Replace Engine Control Unit ECU	☑	☑
246	Internal ECU failure	Electronics faulty Replace Engine Control Unit ECU	☑	☑
250	Sensor defect CAN (Speed Demand) → no set speed signal, the speed is either set to a fault value (MP180.05) or remains set to the actual speed depending on the setting at MP180.14		☑	☑

No.	Meaning/Cause	Measures	2000	4000
266	Sensor defect (analog speed setting) → speed is set to a fault value or remains set to the actual speed (adjustable, MP180.14)	Short-circuit or wire breakage, check set speed transmitter and wiring Electronics service	☑	☑
267	**Used in test stand mode only:** Sensor defect (analog speed setting) → speed is set to a fault value or remains set to the actual speed (adjustable, MP180.14)	Short-circuit or wire breakage, check set speed transmitter and wiring Electronics service	☑	☑
270	Sensor defect frequency setting	Short-circuit or wire breakage, check set speed transmitter and wiring Electronicsservice	☑	☑
271	Missing Data CAN (T-EXTERN 1)	Electronics service (external device faulty)	☑	☑
272	Missing Data CAN (T-EXTERN 2)	Electronics service (external device faulty)	☑	☑
273	Missing Data CAN (P-EXTERN 1)	Electronics service (external device faulty)	☑	☑
274	Missing Data CAN (P-EXTERN 2)	Electronics service (external device faulty)	☑	☑
275	Missing Data CAN (EXT. COOLANT LEVEL)	Electronics service (external device faulty)	☑	☑
276	Missing Data CAN (charge air coolant level)	Electronics service (external device faulty)	☑	☑
277	Missing Data CAN (BIN-EXTERN 3)	Electronics service (external device faulty)	☑	☑
278	Missing Data CAN (BIN-EXTERN 4)	Electronics service (external device faulty)	☑	☑
301	Cylinder A1 : - FPGA fault status = 2 - Time-of-flight t < 600 µs - Time-of-flight t > 1400 µs	Replace solenoid valve if this occurs frequently Engine documentation	☑	☑
302	Cylinder A2 : - FPGA fault status = 2 - Time-of-flight t < 600 µs - Time-of-flight t > 1400 µs	Replace solenoid valve if this occurs frequently Engine documentation	☑	☑
303	Cylinder A3 : - FPGA fault status = 2 - Time-of-flight t < 600 µs Or - Time-of-flight t > 1400 µs	Replace solenoid valve if this occurs frequently Engine documentation	☑	☑
304	Cylinder A4 : - FPGA fault status = 2 - Time-of-flight t < 600 µs - Time-of-flight t > 1400 µs	Replace solenoid valve if this occurs frequently Engine documentation	☑	☑
305	Cylinder A5 : - FPGA fault status = 2 - Time-of-flight t < 600 µs - Time-of-flight t > 1400 µs	Replace solenoid valve if this occurs frequently Engine documentation	☑	☑
306	Cylinder A6 : - FPGA fault status = 2 - Time-of-flight t < 600 µs - Time-of-flight t > 1400 µs	Replace solenoid valve if this occurs frequently Engine documentation	☑	☑

No.	Meaning/Cause	Measures	2000	4000
307	Cylinder A7 : - FPGA fault status = 2 - Time-of-flight t < 600 µs - Time-of-flight t > 1400 µs	Replace solenoid valve if this occurs frequently Engine documentation	☑	☑
308	Cylinder A8 : - FPGA fault status = 2 - Time-of-flight t < 600 µs - Time-of-flight t > 1400 µs	Replace solenoid valve if this occurs frequently Engine documentation	☑	☑
309	Cylinder A9 : - FPGA fault status = 2 - Time-of-flight t < 600 µs - Time-of-flight t > 1400 µs	Replace solenoid valve if this occurs frequently Engine documentation	☑	☑
310	Cylinder A10 : - FPGA fault status = 2 - Time-of-flight t < 600 µs - Time-of-flight t > 1400 µs	Replace solenoid valve if this occurs frequently Engine documentation	☑	☑
311	Cylinder B1 : - FPGA fault status = 2 - Time-of-flight t < 600 µs - Time-of-flight t > 1400 µs	Replace solenoid valve if this occurs frequently Engine documentation	☑	☑
312	Cylinder B2 : - FPGA fault status = 2 - Time-of-flight t < 600 µs - Time-of-flight t > 1400 µs	Replace solenoid valve if this occurs frequently Engine documentation	☑	☑
313	Cylinder B3 : - FPGA fault status = 2 - Time-of-flight t < 600 µs - Time-of-flight t > 1400 µs	Replace solenoid valve if this occurs frequently Engine documentation	☑	☑
314	Cylinder B4 : - FPGA fault status = 2 - Time-of-flight t < 600 µs - Time-of-flight t > 1400 µs	Replace solenoid valve if this occurs frequently Engine documentation	☑	☑
315	Cylinder B5 : - FPGA fault status = 2 - Time-of-flight t < 600 µs - Time-of-flight t > 1400 µs	Replace solenoid valve if this occurs frequently Engine documentation	☑	☑
316	Cylinder B6 : - FPGA fault status = 2 - Time-of-flight t < 600 µs - Time-of-flight t > 1400 µs	Replace solenoid valve if this occurs frequently Engine documentation	☑	☑
317	Cylinder B7 : - FPGA fault status = 2 - Time-of-flight t < 600 µs - Time-of-flight t > 1400 µs	Replace solenoid valve if this occurs frequently Engine documentation	☑	☑
318	Cylinder B8 : - FPGA fault status = 2 - Time-of-flight t < 600 µs - Time-of-flight t > 1400 µs	Replace solenoid valve if this occurs frequently Engine documentation	☑	☑
319	Cylinder B9 : - FPGA fault status = 2 - Time-of-flight t < 600 µs - Time-of-flight t > 1400 µs	Replace solenoid valve if this occurs frequently Engine documentation	☑	☑

No.	Meaning/Cause	Measures	2000	4000
320	Cylinder B10 : - FPGA fault status = 2 - Time-of-flight t < 600 µs - Time-of-flight t > 1400 µs	Replace solenoid valve if this occurs frequently Engine documentation	☑	☑
321	Cabling fault cylinder A1 → misfiring	SV short-circuit or +SV line shorted to electronic ground (Requirement : Engine block grounded) Replace solenoid valve or cable harness Engine documentation	☑	☑
322	Cabling fault cylinder A2 → misfiring	SV short-circuit or +SV line shorted to electronic ground (Requirement : Engine block grounded) Replace solenoid valve or cable harness Engine documentation	☑	☑
323	Cabling fault cylinder A3 → misfiring	SV short-circuit or +SV line shorted to electronic ground (Requirement : Engine block grounded) Replace solenoid valve or cable harness Engine documentation	☑	☑
324	Cabling fault cylinder A4 → misfiring	SV short-circuit or +SV line shorted to electronic ground (Requirement : Engine block grounded) Replace solenoid valve or cable harness Engine documentation	☑	☑
325	Cabling fault cylinder A5 → misfiring	SV short-circuit or +SV line shorted to electronic ground (Requirement : Engine block grounded) Replace solenoid valve or cable harness Engine documentation	☑	☑
326	Cabling fault cylinder A6 → misfiring	SV short-circuit or +SV line shorted to electronic ground (Requirement : Engine block grounded) Replace solenoid valve or cable harness Engine documentation	☑	☑
327	Cabling fault cylinder A7 → misfiring	SV short-circuit or +SV line shorted to electronic ground (Requirement : Engine block grounded) Replace solenoid valve or cable harness Engine documentation	☑	☑

No.	Meaning/Cause	Measures	2000	4000
328	Cabling fault cylinder A8 → misfiring	SV short-circuit or +SV line shorted to electronic ground (Requirement : Engine block grounded) Replace solenoid valve or cable harness Engine documentation	☑	☑
329	Cabling fault cylinder A9 → misfiring	SV short-circuit or +SV line shorted to electronic ground (Requirement : Engine block grounded) Replace solenoid valve or cable harness Engine documentation	☑	☑
330	VCabling fault cylinder A10 → misfiring	SV short-circuit or +SV line shorted to electronic ground (Requirement : Engine block grounded) Replace solenoid valve or cable harness Engine documentation	☑	☑
331	Cabling fault cylinder B1 → misfiring	SV short-circuit or +SV line shorted to electronic ground (Requirement : Engine block grounded) Replace solenoid valve or cable harness Engine documentation	☑	☑
332	Cabling fault cylinder B2 → misfiring	SV short-circuit or +SV line shorted to electronic ground (Requirement : Engine block grounded) Replace solenoid valve or cable harness Engine documentation	☑	☑
333	Cabling fault cylinder B3 → misfiring	SV short-circuit or +SV line shorted to electronic ground (Requirement : Engine block grounded) Replace solenoid valve or cable harness Engine documentation	☑	☑
334	Cabling fault cylinder B4 → misfiring	SV short-circuit or +SV line shorted to electronic ground (Requirement : Engine block grounded) Replace solenoid valve or cable harness Engine documentation	☑	☑

No.	Meaning/Cause	Measures	2000	4000
335	Cabling fault cylinder B5 → misfiring	SV short-circuit or +SV line shorted to electronic ground (Requirement : Engine block grounded) Replace solenoid valve or cable harness Engine documentation	☑	☑
336	Cabling fault cylinder B6 → misfiring	SV short-circuit or +SV line shorted to electronic ground (Requirement : Engine block grounded) Replace solenoid valve or cable harness Engine documentation	☑	☑
337	Cabling fault cylinder B7 → misfiring	SV short-circuit or +SV line shorted to electronic ground (Requirement : Engine block grounded) Replace solenoid valve or cable harness Engine documentation	☑	☑
338	Cabling fault cylinder B8 → misfiring	SV short-circuit or +SV line shorted to electronic ground (Requirement : Engine block grounded) Replace solenoid valve or cable harness Engine documentation	☑	☑
339	Cabling fault cylinder B9 → misfiring	SV short-circuit or +SV line shorted to electronic ground (Requirement : Engine block grounded) Replace solenoid valve or cable harness Engine documentation	☑	☑
340	Cabling fault cylinder B10 → misfiring	SV short-circuit or +SV line shorted to electronic ground (Requirement : Engine block grounded) Replace solenoid valve or cable harness Engine documentation	☑	☑
341	Fault (interruption) in cabling of cylinder A1 → misfiring	SV short-circuit or +SV line shorted to electronic ground (Requirement : Engine block grounded) Replace solenoid valve or cable harness Engine documentation	☑	☑

No.	Meaning/Cause	Measures	2000	4000
342	Fault (interruption) in cabling of cylinder A2 → misfiring	SV short-circuit or +SV line shorted to electronic ground (Requirement : Engine block grounded) Replace solenoid valve or cable harness Engine documentation	☑	☑
343	Fault (interruption) in cabling of cylinder A3 → misfiring	SV short-circuit or +SV line shorted to electronic ground (Requirement : Engine block grounded) Replace solenoid valve or cable harness Engine documentation	☑	☑
344	Fault (interruption) in cabling of cylinder A4 → misfiring	SV short-circuit or +SV line shorted to electronic ground (Requirement : Engine block grounded) Replace solenoid valve or cable harness Engine documentation	☑	☑
345	Fault (interruption) in cabling of cylinder A5 → misfiring	SV short-circuit or +SV line shorted to electronic ground (Requirement : Engine block grounded) Replace solenoid valve or cable harness Engine documentation	☑	☑
346	Fault (interruption) in cabling of cylinder A6 → misfiring	Check cabling and solenoid valve for interruption Replace solenoid valve or cable harness Engine documentation	☑	☑
347	Fault (interruption) in cabling of cylinder A7 → misfiring	Check cabling and solenoid valve for interruption Replace solenoid valve or cable harness Engine documentation	☑	☑
348	Fault (interruption) in cabling of cylinder A8 → misfiring	Check cabling and solenoid valve for interruption Replace solenoid valve or cable harness Engine documentation	☑	☑
349	Fault (interruption) in cabling of cylinder A9 → misfiring	Check cabling and solenoid valve for interruption Replace solenoid valve or cable harness Engine documentation	☑	☑
350	Fault (interruption) in cabling of cylinder A10 → misfiring	Check cabling and solenoid valve for interruption Replace solenoid valve or cable harness Engine documentation	☑	☑

No.	Meaning/Cause	Measures	2000	4000
351	Fault (interruption) in cabling of cylinder B1 → misfiring	Check cabling and solenoid valve for interruption Replace solenoid valve or cable harness Engine documentation	☑	☑
352	Fault (interruption) in cabling of cylinder B2 → misfiring	Check cabling and solenoid valve for interruption Replace solenoid valve or cable harness Engine documentation	☑	☑
353	Fault (interruption) in cabling of cylinder B3 → misfiring	Check cabling and solenoid valve for interruption Replace solenoid valve or cable harness Engine documentation	☑	☑
354	Fault (interruption) in cabling of cylinder B4 → misfiring	Check cabling and solenoid valve for interruption Replace solenoid valve or cable harness Engine documentation	☑	☑
355	Fault (interruption) in cabling of cylinder B5 → misfiring	Check cabling and solenoid valve for interruption Replace solenoid valve or cable harness Engine documentation	☑	☑
356	Fault (interruption) in cabling of cylinder B6 → misfiring	Check cabling and solenoid valve for interruption Replace solenoid valve or cable harness Engine documentation	☑	☑
357	Fault (interruption) in cabling of cylinder B7 → misfiring	Check cabling and solenoid valve for interruption Replace solenoid valve or cable harness Engine documentation	☑	☑
358	Fault (interruption) in cabling of cylinder B8 → misfiring	Check cabling and solenoid valve for interruption Replace solenoid valve or cable harness Engine documentation	☑	☑
359	Fault (interruption) in cabling of cylinder B9 → misfiring	Check cabling and solenoid valve for interruption Replace solenoid valve or cable harness Engine documentation	☑	☑
360	Fault (interruption) in cabling of cylinder B10 → misfiring	Check cabling and solenoid valve for interruption Replace solenoid valve or cable harness Engine documentation	☑	☑
361	Internal electronics failure (if fault permanently applied) → possible quantity limitation	PA circuit faulty or free-wheeling transistor short-circuit Replace Engine Control Unit ECU	☑	☑

No.	Meaning/Cause	Measures	2000	4000
362	Internal electronics failure (if fault permanently applied) → possible quantity limitation	PA circuit faulty or free-wheeling transistor short-circuit Replace Engine Control Unit ECU	☑	☑
363	Internal electronics failure →engine stop	1. SV line shorted to electronic ground by resistance less than 1 Ohm (engine block applied to electronic ground) Replace cable harness Engine documentation 2. Electronics faulty Replace Engine Control Unit ECU	☑	☑
364	Internal electronics failure →enginestop	1. SV line shorted to electronic ground by resistance less than 1 Ohm (engine block applied to electronic ground) Replace cable harness Engine documentation 2. Electronics faulty Replace Engine Control Unit ECU	☑	☑
365	Solenoid valve wiring fault → engine stop	SV line shorted to electronic ground (engine block applied to electronic ground) Replace cable harness Engine documentation	☑	☑
381	TAA1 faulty	1. Wire breakage or short-circuit Replace cable harness Engine documentation 2. Electronics faulty Replace Engine Control Unit ECU	☑	☑
382	TAA2 faulty	1. Wire breakage or short-circuit Replace cable harness Engine documentation 2. Electronics faulty Replace Engine Control Unit ECU	☑	☑
383	TAA3 faulty	1. Wire breakage or short-circuit Replace cable harness Engine documentation 2. Electronics faulty Replace Engine Control Unit ECU	☑	☑
384	TAA4 faulty	1. Wire breakage or short-circuit Replace cable harness Engine documentation 2. Electronics faulty Replace Engine Control Unit ECU	☑	☑

No.	Meaning/Cause	Measures	2000	4000
385	TAA5 faulty	1. Wire breakage or short-circuit Replace cable harness Engine documentation 2. Electronics faulty Replace Engine Control Unit ECU	☑	☑
386	TAA6 faulty	1. Wire breakage or short-circuit Replace cable harness Engine documentation 2. Electronics faulty Replace Engine Control Unit ECU	☑	☑
E02	ECU communication via CAN2 bus faulty	Check CAN2 bus wiring at ECU	☑	☑
399	ECU communication via CAN2 bus faulty	Check CAN2 bus wiring at ECU	☑	☑
E11	▪ Electronics temperature of PIM A 521 too high (>95°C) ▪ Temperature sensor in PIM A 521 faulty	Check ambient temperature Replace printed circuit board MPU 23	☑	☑
E12	▪ Power supply (+5VDC) of PIM A521 out of range (>5.25V) ▪ Power measurement of PIM A 521 faulty	Check voltage at PIM A521 Replace printed circuit board MPU 23	☑	☑
E13	PIM A 521 communication via CAN1 bus (default) faulty	Check CAN1 bus wiring at PIM A 521	☑	☑
E14	PIM A 521 communication via CAN2 bus (redundant) faulty	Check CAN2 bus wiring at PIM A 521	☑	☑
E22	▪ Electronics temperature of PIM A 522 too high (>95°C) ▪ Temperature sensor in PIM A 522 faulty	Check ambient temperature Replace printed circuit board MPU 23	☑	☑
E23	▪ Power supply (+5VDC) of PIM A 522 out of range (>5.25 V) ▪ Current measurement of PIM A 522 faulty	Check voltage at PIM A 522 Replace printed circuit board MPU 23	☑	☑
E24	PIM A 522 communication via CAN1 bus (default) faulty	Check CAN1 bus wiring at PIM A 522	☑	☑
E25	PIM A 522 communication via CAN2 bus (redundant) faulty	Check CAN2 bus wiring at PIM A 522	☑	☑
E28	During self-test, BOB 1 was not detected in slot 3 of PIM A 522 (e.g. no or wrong printed circuit board inserted or BOB 1 faulty)	Replace printed circuit board BOB 1	☑	☑
E29	During self-test, BOB 1 was not detected in slot 4 of PIM A 522 (e.g. no or wrong printed circuit board inserted or BOB 1 faulty)	Replace printed circuit board BOB 1	☑	☑

No.	Meaning/Cause	Measures	2000	4000
E33	▪ Electronics temperature of PIM A 523 too high (>95°C) ▪ Temperature sensor in PIM A 523 faulty	Check ambient temperature at PIM A 523 Replace printed circuit board MPU 23	☑	☑
E34	▪ Power supply (+5VDC) of PIM A 523 out of range (>5.25 V) ▪ Current measurement of PIM A 523 faulty	Check voltage at PIM A 523 Replace printed circuit board MPU 23	☑	☑
E35	PIM A 523 communication via CAN1 bus (default) faulty	Check CAN1 bus wiring at PIM A 523	☑	☑
E36	PIM A 523 communication via CAN2 bus (redundant) faulty	Check CAN2 bus wiring at PIM A 523	☑	☑
E38	During self-test, BOB 2 was not detected in slot 2 of PIM A 523 (e.g. no or wrong printed circuit board inserted or BOB 2 faulty)	Replace printed circuit board BOB 2	☑	☑
E55	▪ Electronics temperature of PIM A 525 too high (>95°C) ▪ Temperature sensor in PIM A 525 faulty	Check ambient temperature Replace printed circuit board MPU23	☑	☑
E56	▪ Power supply (+5VDC) of PIM A 525 out of range (>5.25 V) ▪ Current measurement of PIM A 525 faulty	Check voltage at PIM A 525 Replace printed circuit board MPU23	☑	☑
E57	PIM A 525 communication via CAN1 bus (default) faulty	Check CAN1 bus wiring at PIM A 525	☑	☑
E58	PIM A 525 communication via CAN2 bus (redundant) faulty	Check CAN2 bus wiring at PIM A 525	☑	☑
E60	During self-test, SCB 3 was not detected in slot 2 of PIM A 525 (e.g. no or wrong printed circuit board inserted or SCB 3 faulty)	Replace printed circuit board SCB 3	☑	☑
E63	SCB 3 has no serial connection -	Check serial connection at SCB 3 and wiring, replace SCB 3 as necessary	☑	☑
E66	▪ Electronics temperature of PIM A 526 too high (>95°C) ▪ Temperature sensor in PIM A 526 faulty	Check ambient temperature at PIM A 526 Replace printed circuit board MPU 23	☑	☑
E67	▪ Power supply (+5VDC) of PIM A 526 out of range (>5.25 V) ▪ Current measurement of PIM A 526 faulty	Check voltage at PIM A 526 Replace printed circuit board MPU 23	☑	☑
E68	PIM A 526 communication via CAN1 bus (default) faulty	Check CAN1 bus wiring at PIM A 526	☑	☑
E69	PIM A 526 communication via CAN2 bus (redundant) faulty	Check CAN2 bus wiring at PIM A 526	☑	☑
E71	During self-test, BOB 3 was not detected in slot 2 of PIM A 526 (e.g. no or wrong printed circuit board inserted or BOB 3 faulty)	Replace printed circuit board BOB 3	☑	☑

No.	Meaning/Cause	Measures	2000	4000
E77	▪ Electronics temperature of PIM A 527 too high (>95°C) ▪ Temperature sensor in PIM A 527 faulty	Check ambient temperature at PIM A 527 Replace printed circuit board MPU 23	☑	☑
E78	▪ Power supply (+5VDC) of PIM A 527 out of range (>5.25 V) ▪ Current measurement of PIM A 527 faulty	Check voltage at PIM A 527 Replace printed circuit board MPU 23	☑	☑
E79	PIM A 527 communication via CAN1 bus (default) faulty	Check CAN1 bus wiring at PIM A 527	☑	☑
E80	PIM A 527 communication via CAN2 bus (redundant) faulty	Check CAN2 bus wiring at PIM A 527	☑	☑
E82	During self-test, BOB 1 was not detected in slot 2 of PIM A 527 (e.g. no or wrong printed circuit board inserted or BOB 1 faulty)	Replace printed circuit board BOB 1	☑	☑
E83	During self-test, BOB 1 was not detected in slot 3 of PIM A 527 (e.g. no or wrong printed circuit board inserted or BOB 1 faulty)	Replace printed circuit board BOB 1	☑	☑
E84	During self-test, BOB 1 was not detected in slot 4 of PIM A 527 (e.g. no or wrong printed circuit board inserted or BOB 1 faulty)	Replace printed circuit board BOB 1	☑	☑
E88	▪ Electronics temperature of PIM A 528 too high (>95°C) Temperature sensor in PIM A 528 faulty	Check ambient temperature at PIM A 528 Replace printed circuit board MPU 23	☑	☑
E89	▪ Power supply (+5VDC) of PIM A 528 out of range (>5.25 V) ▪ Current measurement of PIM A 528 faulty	Check voltage at PIM A 528 Replace printed circuit board MPU 23	☑	☑
E90	PIM A 528 communication via CAN1 bus (default) faulty	Check CAN1 bus wiring at PIM A 528	☑	☑
E91	PIM A 528 communication via CAN2 bus (redundant) faulty	Check CAN2 bus wiring at PIM A 528	☑	☑
E93	During self-test, BIB 1 was not detected in slot 2 of PIM A 528 (e.g. no or wrong printed circuit board inserted or BIB 1 faulty)	Replace printed circuit board BIB 1	☑	☑
E99	▪ Electronics temperature of PIM A 529 too high (>95°C) ▪ Temperature sensor in PIM A 529 faulty	Check ambient temperature at PIM A 529 Replace printed circuit board MPU 23	☑	☑
F00	▪ Power supply (+5VDC) of PIM A 529 out of range (>5.25V) ▪ Current measurement of PIM A 529 faulty	Check voltage at PIM A 529 Replace printed circuit board MPU 23	☑	☑
F01	PIM A 529 communication via CAN1 bus (default) faulty	Check CAN2 bus wiring at PIM A 529	☑	☑

No.	Meaning/Cause	Measures	2000	4000
F02	PIM A 529 communication via CAN2 bus (redundant) faulty	Check CAN2 bus wiring at PIM A 529	☑	☑
F04	During self-test, IIB1 was not detected in slot 2 of PIM A 529 (e.g. no or wrong printed circuit board inserted or IIB1 faulty)	Replace printed circuit board IIB 1	☑	☑
F05	During self-test, AIB1 was not detected in slot 3 of PIM A 529 (e.g. no or wrong printed circuit board inserted or AIB1 faulty)	Replace printed circuit board AIB 1	☑	☑
F06	During self-test, BOB2 was not detected in slot 4 of PIM A 529 (e.g. no or wrong printed circuit board inserted or BOB1 faulty)	Replace printed circuit board BOB 2	☑	☑
J30	Fault code display does not detect another CAN bus participant	Check CAN bus wiring	☑	☑
J31	Fault code display does not detect the ECU on the CAN bus	Check CAN bus wiring and replace ECU as necessary	☑	☑

10.3. Enclosure C - List and explanation of parameters

Parameter type	Parameter	Meaning
General time delays	Air preheating delay	Duration of air preheating before starting for a Diesel engine
	Micro disconnection delay	Delay between remote order and start-up of the generating set
	Mains return delay	Delay between cooling of the generating set and the remote order
	EJP warning delay (France only)	Delay between appearance of EJP warning and start-up of the generating set Note: if the generating set is fitted with a motorised circuit breaker, it will close when the delay has expired
	EJP top loss time (France only)	The EJP top signal sometimes undergoes transitional status fluctuations. To dampen this phenomena, this delay prevents repeated switching of the normal/safety inverter. EJP top loss acknowledgement delay
	Standby delay	Delay before TELYS switches to standby
	Cooling delay	Time period for which the generating set cooling continues to operate after the set has been operating in automatic mode (after output is started)
	Coolant temperature stop delay	Time for which the generating set is cooled following detection of a coolant temperature fault
	Stop delay I>> (overload or short circuit)	Time for which the generating set is cooled following detection of an overload or short circuit fault. If the setting is equal to 0, the generating set will stop immediately.
	U&F stabilisation delay	Delay before min/max voltage and min/max frequency faults are recognised. This delay begins from the starter cut-off threshold. Once the delay has expired, the normal/safety inverter will operate if the frequency and voltage are outside of the permitted values.
Horn	Horn delay	Activation time of the horn for Faults and Alarms and interval between two horn activations
	Fault	Activation or not of the horn for a fault
	Auto Start	Horn activated following Automatic start
Alternator voltage	Min & fault alarm delay	Time before alternator min voltage fault is declared
	Max & fault alarm delay	Time before alternator max voltage fault is declared
	Min. alarm threshold	Threshold for nominal voltage set in the Factory when the min alternator voltage alarm is activated
	Min. fault threshold	Threshold for nominal voltage set in the Factory when the min alternator voltage fault is activated
	Max. alarm threshold	Threshold for nominal voltage set in the Factory when the max alternator voltage alarm is activated
	Max. fault threshold	Threshold for nominal voltage set in the Factory when the max alternator voltage fault is activated

Parameter type	Parameter	Meaning
Alternator Frequency	Min & fault alarm delay	Time before alternator min frequency fault is declared
	Max & fault alarm delay	Time before alternator max frequency fault is declared
	Min. alarm threshold	Threshold for nominal frequency set in the Factory when the min alternator frequency alarm is activated
	Min. fault threshold	Threshold for nominal frequency set in the Factory when the min alternator frequency fault is activated
	Max. alarm threshold	Threshold for nominal frequency set in the Factory when the max alternator frequency alarm is activated
	Max. fault threshold	Threshold for nominal frequency set in the Factory when the max alternator frequency fault is activated
Battery voltage	Min & fault alarm delay	Time before battery min voltage fault is declared
	Max & fault alarm delay	Time before battery max voltage fault is declared
	Min. alarm threshold	Threshold for Vcc supply voltage when the min battery voltage alarm is activated
	Min. fault threshold	Threshold for Vcc supply voltage for the min battery voltage fault
	Max. alarm threshold	Threshold for Vcc supply voltage when the max battery voltage alarm is activated
	Max. fault threshold	Threshold for Vcc supply voltage for the max battery voltage fault
Overload	Overload alarm	Threshold for the factory setting for nominal current
Fuel pump	Activation threshold	Fuel level indicator threshold to activate the Fuel pump control
	Deactivation threshold	Fuel level indicator threshold to deactivate the Fuel pump control

10.4. Enclosure D - Glossary

Title	Meaning
Plug and Play	Equipment that requires only to be connected for it to be immediately recognised and made operational
RS 485 - speed	Data transfer speed
Bit	Data unit with the value of 0 or 1
RS 485 - parity	Supplementary bit added to the positioned character used to detect transmission errors
RS 485 - stop	Bit indicating the end of a character
Character	Any number, letter, punctuation mark etc., that is part of a message
ETHERNET Network	Business sized local network
FTP	File Transfer Protocol: transfer protocol for files. The transfer is made between two separate addresses on the Internet.
USB	Universal Serial BUS: universal communication BUS
LAN	Local Area Network: groups together networks adapted to the size of an industrial site and which the furthest points are separated by a distance not exceeding a few kilometres. These are sometimes known as local business networks.
SMTP	Simple Mail Transfer Protocol: electronic messaging application
TCP/IP	TCP (Transmission Control Protocol): data transmission protocol
	IP (Internet Protocol): Internet interconnection protocol
IP Address	Computer identifier (of the generating set)
Subnetwork mask	Name given to each network connected to the Internet
Gateway	Equipment that enables switching from one computer network to another
DHCP	Dynamic Host Configuration Protocol: automatic configuration application enabling a computer unit (TELYS) to be attributed with an IP address if DHCP is configured to "YES"
BUS	Assembly of electrical conductors fitted in parallel and allowing data transfer
JBUS	This communication mode uses the ModBus RTU standard protocol. The main functions of this protocol are commonly referred to as JBUS
Repeater	Device that automatically repeats signals it receives and passes them on from one unit to another
Point to point	Connection mode only involving 2 parties