Released

easYgen-1400

Operation Manual | Genset Control

easYgen-1400

Version 2.1.0.8

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Manual (original)

This is no translation but the original Technical Manual in English.

Designed in Germany and Poland; manufactured in China.

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1 General Information

1.1 About this Manual

1.1.1 Revision History

Rev.	Date	Editor	Changes
F	2023-08	MK	**NEW Software Version 2.1.0.8** • Suitable for new LCD display
E	2021-06	MK	**NEW Software Version 2.1.0.7** • needed ToolKit-SC Version 1.5.1.5 or higher **NEW features & functions** • Added output ports: 27 Preheat until safety, 28 Preheat until warming, 29 Preheat until cranking **Corrections/Repairs** • None
D	2020-11	TM	**NEW Software Version 2.1.0.6** • needed ToolKit-SC Version 1.5.1.3 or higher **NEW features & functions** • Support for HATZ ECU **Corrections/Repairs** • None
C	2020-11	TM	**NEW Software Version 2.1.0.5** **NEW features & functions** • ID 835 Enumeration "emergency shutdown" function for discrete inputs • ID 846 Action (alarm class) from analog inputs monitoring is now configurable • ID 1099 Additional logic for maintenance counters • ID 1098 Semi-Auto mode for AMF start • ID 1103 Unbalanced load alarm **Corrections/Repairs** • ID 837 Breaker logic "constant" de-energizes with breaker alarm • ID 931 Corrected Volvo ECU 50/60 Hz selection • ID 1000 Reference values for rated "active power" and "reactive power"

Rev.	Date	Editor	Changes
			• ID 443 Engine does not stop with closed generator breaker • ID 1102 AMF /Display mode configurable with HMI
B	2019-05	PW	**NEW Software Revision 2.0.0.1 and ToolKit-SC version 1.5.0.4** Corrections/Repairs • Fixed the following in HMI software: ◦ fixed the version name to 4 digits; ◦ possibility to close GCB when engine not running; ◦ kvar spelling; ◦ impossibility to mute the horn with easYlite-200; ◦ HMI user defined sensor curves displaying messy codes in other languages ◦ after gen closed, if changed breaker close delay by Toolkit-sc, 6550 countdown error occurred in HMI; ◦ when change to OEM plant theme and Terminal users theme, press close/open button in manual mode, error occurred in breaker page; ◦ Horn/Alarm Acknowledge / Alarm reset function ◦ "Traditional Chinese" implemented ◦ changed name easYgen400/easYgen1400 to easYgen-400/ easYgen-1400 in controller information page; ◦ status LED not turning on if the "Conventional Engine" was selected, easYgen and genset in STOP condition, START button pressed; ◦ maintenance counter resetting ◦ Polish translation errors ◦ modified configuration of auto test mode, including number of input ports, LED display order, and level sensor changed from flexible sensor to resistor type sensor; ◦ J1939 standard and setpoint idle ◦ Volvo EMS2 50/60Hz rated speed selection ◦ overload monitoring not using the "return" value; ◦ Volvo EMS2 rated frequency selection and rated speed modification; ◦ mains breaker warning in MAN mode; ◦ operation mode changing from MAN with closed GCB to MCB; ◦ breaker status in MAN mode; ◦ removed all ECU types with Modbus; ◦ removed “Baud rate and Modbus slave ID” parameters; ◦ parameter naming change: in order to align with ToolKit, changed “Current” to “Limit” and “Low fuel level” to “Fuel level warning” in HMI parameter config screen; • Fixed the following in ToolKit-SC :

Rev.	Date	Editor	Changes
			◦ fixed the version name of 2 digits displayed on ToolKit to 4 digits; ◦ removed WWDMODEM-3G related parameters; ◦ removed “emergency stop input”; ◦ removed “Baud rate and Modbus slave ID”parameters; ◦ removed all ECU types with Modbus.
A	2018-11	PC	**Describes device implemented software version 1.8 and ToolKit-SC version 1.4.0.2**

1.1.2 Symbols Used in this manual

Safety instructions

Safety instructions are marked with symbols. The safety instructions are always introduced by signal words that express the severity of the danger.

DANGER!

This combination of symbol and signal word indicates an immediately dangerous situation that can cause death or severe injuries if not avoided.

WARNING!

This combination of symbol and signal word indicates a possibly dangerous situation that can cause death or severe injuries if it is not avoided.

CAUTION!

This combination of symbol and signal word indicates a possibly dangerous situation that can cause slight injuries if it is not avoided.

NOTICE!

This combination of symbol and signal word indicates a possibly dangerous situation that can cause property and environmental damage if it is not avoided.

Tips and recommendations

This symbol indicates useful tips and recommendations as well as information on efficient and trouble-free operation.

Additional markings

To highlight instructions, results, lists, references, and other elements, the following markings are used in these instructions:

Marking	Explanation
▶	Step-by-step instructions
⇨	Results of action steps
▷	References to sections of these instructions and to other relevant documents
•	Listing without fixed sequence
»Buttons«	Operating elements (e.g. buttons, switches), display elements (e.g. signal lamps)
»Display«	Screen elements (e.g. buttons, programming of function keys)
[Screen xx / Screen xy / Screen xz] ...	Menu path. The following information and setting refer to a page on the HMI screen or ToolKit located as described here.
TKit HMI	Some parameters/settings/screens are available only either in ToolKit **or** on the HMI/display.

Dimensions in Figures

All dimensions with no units specified are in **mm**.

1.2 Copyright And Disclaimer

Disclaimer

All information and instructions in this manual have been provided under due consideration of applicable guidelines and regulations, the current and known state of the art, as well as our many years of in-house experience. Woodward assumes no liability for any damages due to:

- Failure to comply with the instructions in this manual
- Improper use / misuse
- Willful operation by non-authorized persons
- Unauthorized conversions or non-approved technical modifications
- Use of non-approved spare parts

The originator is solely liable for the full extent for damages caused by such conduct. The obligations agreed-upon in the delivery contract, the general terms and conditions, the manufacturer’s delivery conditions, and the statutory regulations valid at the time the contract was concluded, apply.

Copyright

1.3 Service And Warranty

Opening the device will nullify any warranty!

CAUTION!

Any unauthorized modifications or use of this equipment outside its specified mechanical, electrical, or other operating limits may cause personal injury and/or property damage, including damage to the equipment.

Any such unauthorized modifications

- constitute "misuse" and/or "negligence" as per the product warranty
- thereby exclude warranty coverage for any resulting damage, and
- invalidate product certifications or listings.

Our Customer Service is available for technical information. Please see page 2 for contact details.

In addition, our employees are interested in any new information and experiences that arise from usage and could be valuable for improving our products.

Warranty terms

Please enquire about the terms of warranty from your nearest Woodward representative.

To find your closest Customer Service representative, go to: ⟹ http://www.woodward.com/Directory.aspx

1.4 Safety

1.4.1 Intended Use

The easYgen unit has been designed and constructed solely for the intended use described in this Operation Manual and – with even more details – in the Technical Manual.

- Intended use requires operation of the control unit within the range outlined in the written specifications.

- Steps to be taken for commissioning are outlined in the Technical Manual.
- Intended use includes compliance with all instructions and safety notes presented in this manual.
- Any use which exceeds or differs from the intended use shall be considered improper use.
- No claims for any kind for damage will be considered if such claims result from improper use.

NOTICE!

Damage due to improper use!

Improper use of the remote panel unit may cause damage to the control unit as well as to the connected components.

Improper use includes, but is not limited to:

- Operation outside the specified operating conditions.

1.4.2 Personnel

WARNING!

Hazards due to insufficiently qualified personnel!

If unqualified personnel perform work on or with the control unit hazards may arise which can cause serious injury and substantial damage to property.

- Therefore, all work must only be carried out by appropriately qualified personnel.

This manual specifies the personnel qualifications required for the different areas of work, listed below:

- Well trained for electrical installations.
- Aware of the local safety regulations.
- Experienced in working with electronic measuring and control devices.
- Allowed to manage the controlled (engine/generator) system.

The workforce must only consist of persons who can be expected to carry out their work reliably. Persons with impaired reactions due to, for example, the consumption of drugs, alcohol, or medication are prohibited.

When selecting personnel, the age-related and occupation-related regulations governing the operating location must be observed.

1.4.3 General hazard warnings

Hazards by system controlled

DANGER!

Moving parts and dangerous electricity!

Be aware that the remote control of a system that is managing life-threatening engine-generator-electricity parts must be adapted to the local situation!

The following safety notes cover both the device itself and basics of the overall genset system. The dedicated genset-system safety instruction must be considered, too!

Prime mover safety

WARNING!

Hazards due to insufficient prime mover protection

The engine, turbine, or any other type of prime mover must be equipped with an overspeed (over-temperature, or over-pressure, where applicable) shutdown device(s) that operates independently of the prime mover control device(s) to protect from runaway or damage to the engine, turbine, or any other type of prime mover. Failure to comply with this also poses the risk of personal injury or loss of life if the mechanical-hydraulic governor(s) or electric control(s), the actuator(s), fuel control(s), the driving mechanism(s), the linkage(s), or the controlled device(s) fail.

2 System Overview

General notes

The easYgen is a stand-alone genset controller with measuring, monitoring, and breaker control functionality. It comes with an easily mountable plastic housing covering a thoroughly tested electronic-electrical system.

Display and buttons of the HMI offer access to states and values, as well as access to the application. Password protection enables the assignment of multiple operation access levels. Remote access, monitoring, visualization, and configuration are possible via integrated interfaces. Communication between easYgens using PLC control or as a network member offers an enhanced system management range; additionally supported by easy to implement accessories.

For even higher challenges in genset control, the easYgen series offers further solutions encompassing complex and ambitious applications.

For dedicated protection tasks, ask Woodward for its protection (relay) solutions.

Operation Modes

- See “3.3 Operation Modes”

2.1 HMI Status Screens

HMI displays the following status screens:

- Status (home)
- Mains
- Generator
- Load
- Engine 1
- Engine 2
- Status
- Alarm
- home screen etc.

2.2 ToolKit-SC Status Screens

General notes

ToolKit-SC lets you access status information via the following screens:

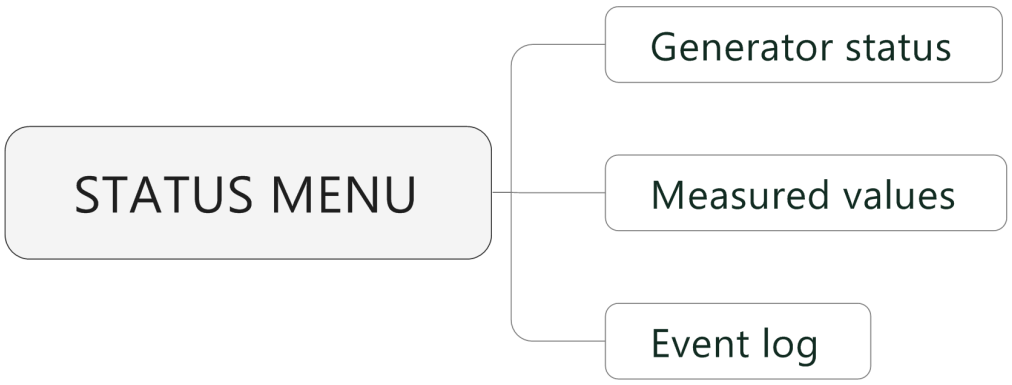

Fig. 1: easYgen-x400 status screens

Generator Status

[PARAMETER / STATUS MENU / Generator status]

Items	Parameters	Description
Engine info	Engine speed, Battery volt, Charger volt D+	
Sensor info	Engine temp, Oil pressure, Fuel level	Selection of ECU data via J1939.
More info	Coolant pressure, Coolant level,Fuel pressure, Fuel temp, Turbo pressure, Oil temp, Inlet temp, Fuel consume, Exhaust temp, Total consume	
Alarms	Current Alarms and Warning	Lists of current alarms and warnings
(Digital)Inputs	01 High temperature shutdown, 02 Low oil pressure shutdown, 10 Start request in AUTO, 11 Fuel level warning, 12 Coolant level warning	
(Digital) Outputs	02 Stop solenoid, 03 Idle control, 05 Close GCB, 06 Close MCB Fuel relay, Start relay	
Accumulation (run)	Time, Starts	
Next maintenance time	Time	
Engine hours	Time	
Generator status	Gen status	
Mains status	Overvoltage, Undervoltage, Loss of phase	

Items	Parameters	Description
Module info	will be moved to Event log page	

Measured Values

[PARAMETER / STATUS MENU / Measured values]

Items	Parameters	Description
Electricity quantity		
Mains	L1, L2, L3, L1-2, L2-3, L3-1, L1Phase, L2Phase, L3Phase, Frequency	
Generator	L1, L2, L3, L1-2, L2-3, L3-1, L1Phase, L2Phase, L3Phase, Frequency	
Current (A)	L1, L2, L3	
Active power (kW)	L1, L2, L3, Total	
Reactive power (kvar)	L1, L2, L3, Total	
Apparent power (kVA)	L1, L2, L3, Total	
Power factor	L1, L2, L3, Avg	

Ext. Analog Inputs

[PARAMETER / STATUS MENU / Ext. analog inputs]

Items	Parameters	Description
Expansion AIN24 {X}		{X}: 1 or 2
Cylinder Temp {Y}	(in °C and °F)	{Y}: 1 or 22
Exhaust Temp {Z}	(in °C and °F)	{Z}: 1 or 2
Sensor {N}		{N}: 15 or 24

Event Log and Version

[PARAMETER / STATUS MENU / Event log and version]

Items	Parameters	Description
Module Info	Model, Hardware Version, Software Version, Issue Date	
Event log	**Fixed view of:** No., Event type **Columns "move behind" visible part of the screen:** Event Item, Date, Time, Mains Uab (V) / Ubc (V) / Uca (V), Mains Ua (V), Mains Ub (V), Mains Uc (V), Mains f (Hz), Gens Uab (V) ..., Gens Ua (V) ..., Gens f(Hz), Current Ia (A) ..., Power (kW), Speed (r/min), Temp. (°C), Press. (kPa),	Event log report table. Showss the 99 latest events.

Items	Parameters	Description
	Volt. (V)	
	Read log Clear Export to Txt	Push buttons to manage logged data

3 Operation

3.1 Front Panel: Operating and Display Elements

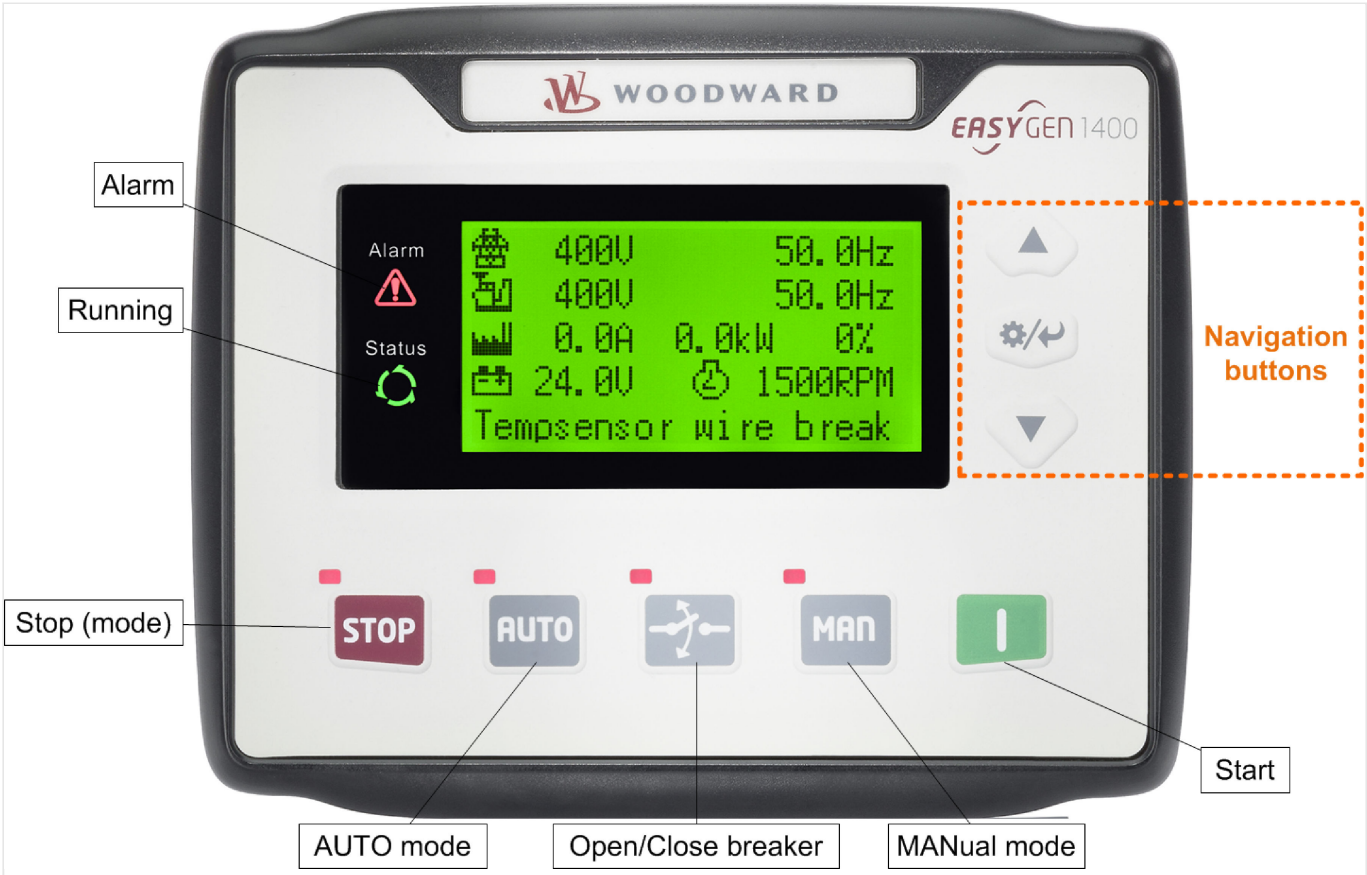

Fig. 2: easYgen-1400

Icons	Keys	Description
STOP	STOP	Auto/Manual mode: Stops running generator Stop mode: Resets alarm Lamp test (press at least 3 seconds)
		Notes During stopping process, press this button again to stop generator immediately.
I	**I** (START)	MANual mode: Start genset
MAN	MAN (Manual Mode)	Press this key and the controller enters into MAN mode
AUTO	AUTO (Automatic Mode)	Press this key and the controller enters into AUTO mode
	Open/Close breaker	Release breaker control in MAN mode. The navigation button "Up/Increase" is used to close the GCB.

Icons	Keys	Description
		The navigation button "Down/Decrease" is used to open the GCB
	Up/Increase	1) Screen scroll 2) Settings menu: Up cursor and increase value in 3) Open/close MCB in MAN mode
	Down/Decrease	1) Screen scroll 2) Settings menu: Down cursor and decrease value 3) Open/close GCB in MAN mode 4) Lamp test (hold button for 5 sec)
	Right Set/Confirm	1) Mute horn 2) Settings menu hold button for 5 sec 3) Settings menu: select digit position 4) Return to home page
	Alarm	
	Status	

In MANual mode:

Pressing  and  (START) simultaneously will force the generator to crank. Successful start will not be judged according to crank disconnect conditions, the operator needs to crank the starter motor manually; Once the engine has fired, the operator must relase the button. Only then the start output will be deactivated, safety on delay will start.

WARNING!

Users can change passwords. Please make note of the new password after changing it. If you forget the password, please contact Woodward services and send all device information on the “ABOUT” page of the controller for legitimation.

3.2 Warning/Alarm Signaling

The Alarm type is visualized with av »Alarm« LED located beside the display.

Alarm Indicator LED	Alarm Type
Slow flashing	Warning
Fast flashing	Shutdown or Trip Alarm
ON (permanently illuminated)	Common Alarm, acknowledged

3.2.1 Alarm Acknowledgment

General notes

The alarm acknowledge handling is valid for following alarm classes

- Shutdown
- Trip/Stop
- Trip

Mute Horn

Any new active alarm activates the horn and is made visible by the flashing Alarm LED.

After pressing the "Down/Decrease" button, the horn is deactivated and the Alarm LED changes from flashing to constantly active and stays active as long as any alarm is present. An additional active alarm reactivates the horn and the Alarm LED starts flashing again.

Stop by alarm

The operation mode automatically changes to STOP if a stopping alarm is active (»Shutdown« or »Trip/Stop«).

Acknowledge alarm

In case of alarm condition, pressing the STOP button will reset the alarm.

3.3 Operation Modes

General notes

The easYgen offers three operation modes:

- AUTO
- MANUAL (MAN)
- STOP
- ... and an internal (non) operating phase during the start of the device itself

The operation mode can be initiated – provided the current settings allow for this function:

- directly by pressing the respective button on the front panel
- directly by click on the respective button on the ToolKit-SC remote screen
- via discrete inputs
- via interface

3.3.1 Operation Mode AUTO

General notes

In operation mode AUTO, both genset and breakers are under easYgen control. The start and stopping of the engine are managed automatically, along with open, close, and breaker transition.

- supply load by mains
- supply load by generator
- transition load supply from mains to generator or from generator to mains
- start the engine
- stop the engine

Load supply transition from mains to genset

Situation

- Mains becomes abnormal when one or more parameter are outside their working range and one of the following occurs:
  - »Overvoltage«
  - »Undervoltage«
  - »Overfrequency«
  - »Underfrequency«
  - »Mains voltage asymmetry«
  - »Mains phase rotation fail«

The start procedure includes breaker handling, engine start, and signaling/warning.

Load supply transition from genset (back) to mains

All of the above listed parameters are (back) in normal range.

The stop procedure includes breaker handling, engine stand-by, and signaling/warning.

3.3.2 Operation Mode MANual

General notes

In operation mode MANual, both genset and breakers are independent of each other under easYgen control.

The starting and stopping of the engine are managed using the same procedure as in AUTO mode but without breaker control. Breakers can be opened and closed without taking care of load, genset, or mains state!

CAUTION!

Take care for genset and supply.

3.3.3 Operation Mode STOP

General notes

In operation mode STOP, the breakers are open and the engine is not running.

This is a configurable operation mode, only. This is NO emergency STOP!

3.4 START/STOP Operation

3.4.1 Start engine to supply load

General notes

Pre-Condition

Mode	Energy	Breakers	Genset
AUTO	Mains is "normal"	GCB is open	Not running
		MCB is closed	Ready for operation

Situation

- Mains becomes abnormal when one or more parameter are outside their working range and one of the following occurs:
  - »Overvoltage«
  - »Undervoltage«
  - »Overfrequency«
  - »Underfrequency«
  - »Mains voltage asymmetry«
  - »Mains phase rotation fail«

The AUTO Start procedure runs sub procedures with own timers.

If the mains is back during the process, re-connecting the mains has priority.

The remaining time of each of the timers initiated displays.

When started via “Remote Start (off Load)” input, the starting procedure is the same as shown below but the generator close relay is deactivated.

Because there is no mains control, only the "Start engine" section (green background) is relevant.

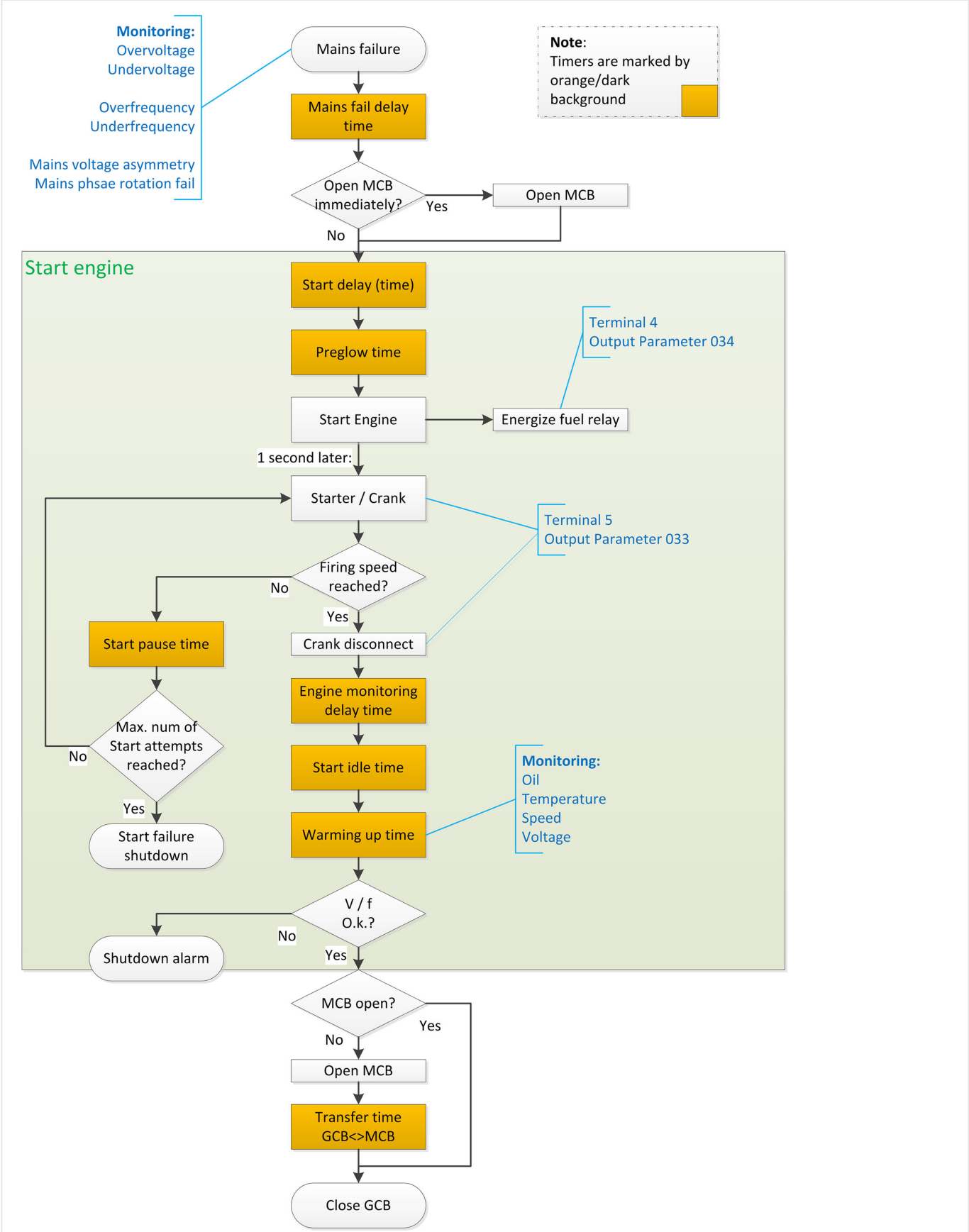

Fig. 3: Transition Mains to Genset including engine start procedure

3.4.2 Stop engine after mains supplying load (again)

General notes

☼ **Pre-Condition**

Mode	Energy	Breakers	Genset
AUTO	Mains is "abnormal"	GCB is closed	Running Delivering power
		MCB is open	

Situation

- Mains becomes normal when all of the parameters below are inside their working ranges:
  - »Overvoltage«
  - »Undervoltage«
  - »Overfrequency«
  - »Underfrequency«
  - »Mains voltage asymmetry«
  - »Mains phase rotation fail«

The AUTO Stop procedure is going through sub procedures with own timers.

If the mains becomes abnormal during the process, remaining with generator load has priority.

The remaining time of each of the timers initiated displays.

When started via “Remote Stop (off Load)” input, the starting procedure is the same as shown below but the generator close relay is deactivated.

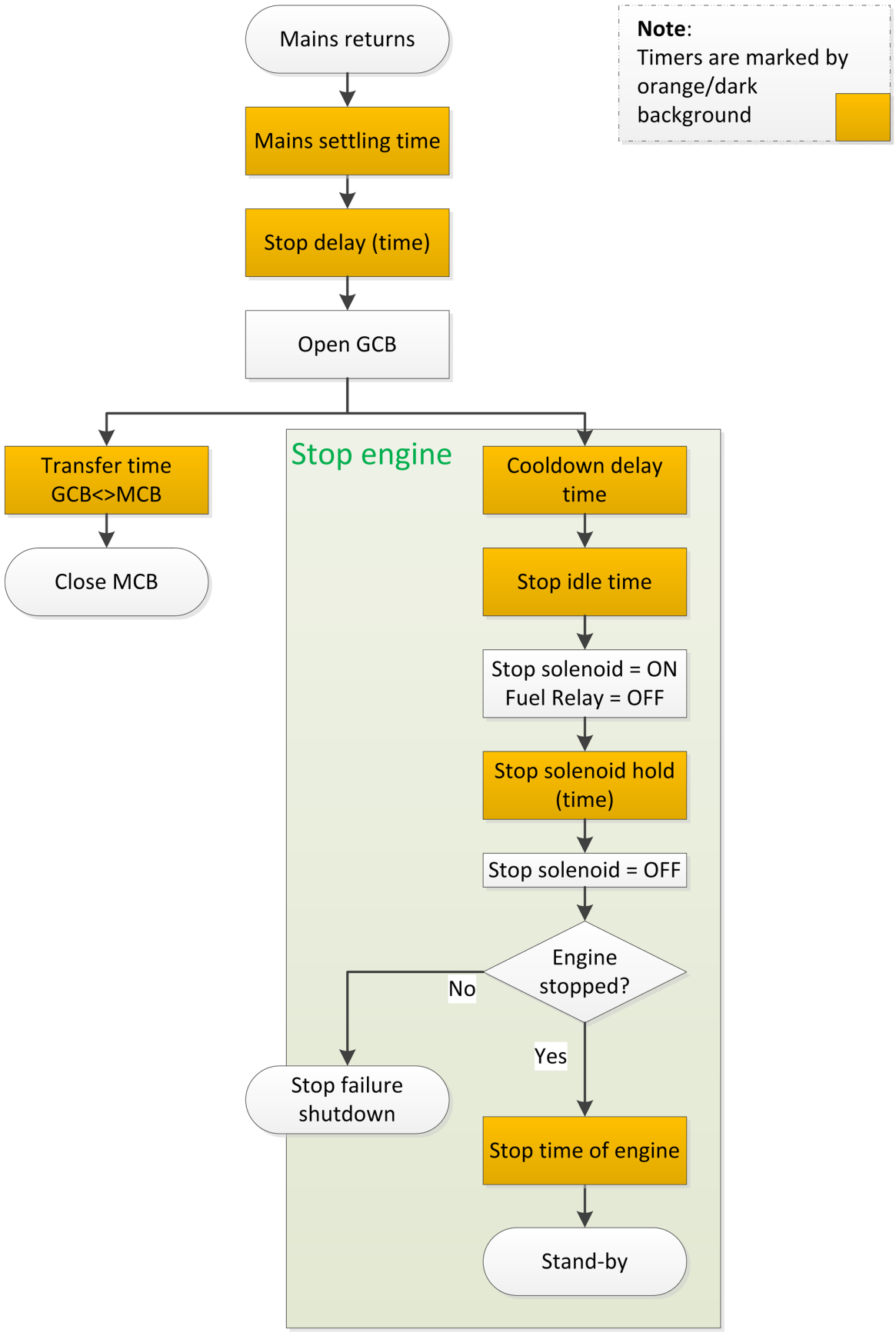

Fig. 4: Transition genset to mains including engine stop/stand-by procedure

3.4.3 MANual START/STOP

Engine control is separated from breaker management. Breaker(s) must be manually opened/closed (supply should be in normal range).

⚙	**MANual Start**
1. ▷	Press the MAN button 
▶	The LED next to the button will illuminate to confirm the operation
2. ▷	Press the START button  to start the genset as described above. I case of abnormal conditions, such as overheating, low oil pressure, over speed and abnormal voltage during generator running occur, the controller can protect genset by stopping quickly.

⚙	**MANual Stop**
1. ▷	Pressing  can stop the running generator as described above.

3.5 Transition Procedures

3.5.1 Disconnect during cranking

There are three conditions under control to abort the starting of the engine:

- speed sensor
- generator frequency
- engine oil pressure

They can be used separately or in combinations.

We recommend selecting all three at the same time: engine oil pressure together with speed sensor, and generator frequency. This allows for an immediate separation of the starter motor from the engine. Additionally, crank disconnect can be checked exactly.

When set to speed sensor, ensure that the number of flywheel teeth is the same as setting.

Sensor not used? Make sure not to select a sensor that is not in use. Otherwise, an error message might occur.

If the speed sensor (»Firing speed RPM«) is not selected, the rotating speed displayed on the controller is calculated from generator frequency and the number of poles.

If the generator frequency (»Firing speed Hz«) is not selected, the relative power quantity will neither be registrated nor displayed (e.g. water pump application).

HMI only! In ToolKit-SC frequency, speed, and oil pressure can be enabled/ disabled separately; HMI is using a table »Firing speed« instead:	
No.	**Setting description**
0	Gen frequency
1	Speed sensor
2	Speed sensor + Gen frequency
3	Oil pressure
4	Oil pressure + Gen frequency
5	Oil pressure + Speed sensor
6	Oil pressure + Speed sensor + Gen frequency

3.5.2 Manual Breaker Transition

When the controller is in MANual mode, the procedures to switch supply between mains and genset will be started by a manual process when the breaker switch is pressed.

CAUTION!

Neither mains nor generator state is taken into account. Breaker open/close works independent from the load.

If the generator or the mains are "out of range", the load can be damaged!

⚙

> Both breakers GCB and MCB open:

1. ▷ **Taking load**

Press the breaker switch 

▶ The respective breaker is closed.
The closing signal will last for the »Closing time«

During this time, all other breaker signals are suppressed.

⚙ **Unload**

> One of the breakers is closed - open this breaker.

1. ▷ Press the breaker switch  of the closed breaker

▶ The respective breaker will be opened.
The opening signal will last for the »Opening time«

During this time, all other breaker signals are suppressed.

⚙ **Transfer load**

> One of the breakers is closed - close the other breaker.

1. ▷ Press the breaker switch  of the open breaker

▶ The other (closed) breaker is opened.
The opening signal will last for the »Opening time«

During this time, all other breaker signals are suppressed.

2. ▷ After this, the other breaker (selected by pressed button) will be closed

▶ Closing signal will last for the »Closing time«

During this time, all other breaker signals are suppressed.

3.6 Trouble Shooting

Symptoms	Possible Solutions
Controller has no power.	Check starting batteries; Check controller connection wiring; Check DC fuse.
Genset shutdown	Check if the water/cylinder temperature exceeds the limits; Check the genset AC voltage; Check DC fuse.
Controller emergency stop	Check if emergency stop button works properly; Check whether the starting battery's positive pole is connected to the emergency stop input; Check whether the circuit is open.
Low oil pressure alarm after crank disconnect	Check the oil pressure sensor and its connections.

Symptoms	Possible Solutions
High water temp. alarm after crank disconnect	Check the temperature sensor and its connections.
Shutdown Alarm in running	Check the switch and its connections according to the information on LCD; Check auxiliary input ports.
Fail to start	Check the fuel oil circuit and its connections; Check the starting batteries; Check the speed sensor and its connections; Refer to the engine manual.
Starter no response	Check the starter connections; Check the starting batteries.
Genset running while ATS not transfer	Check the ATS; Check the connections between ATS and controllers.
ECU communication failed	Check the CAN connections for high and low polarity; Check if the 120 Ω resistor is connected properly; Check if the type of engine is correct; Check if the connections from the controller to the engine and the output ports settings are correct.
ECU warning or shutdown	Get information from the LCD of the alarm page; If there is a detailed alarm, check the respective engine. If there is no detailed alarm, please refer to the relevant section of the engine manual as specified in the SPN alarm code.

4 Appendix

4.1 Alarms and Warnings

4.1.1 Alarm Classes

Alarm class	Visible in the display	LED and horn	Open GCB	Shut-down engine	Engine blocked until acknowledge
Warn	**X**				
	This alarm does not interrupt the operation of the unit. An output of the centralized alarm occurs and the “Horn” command is issued. Alarm text + flashing LED + Relay centralized alarm (horn)				
Shutdown	**X**	**X**	Immediately	Immediately	**X**
	The GCB is opened and the engine is stopped. Alarm text + flashing LED + Relay centralized alarm (horn) + GCB open + Engine stop.				
Trip/shut	x	x	Immediately	Cool down time	**X**
	The GCB is opened immediately and the engine is stopped after cool down. Alarm text + flashing LED + Relay centralized alarm (horn) + GCB open + Cool down + Engine stop.				
Trip	**X**	**X**	**X**		
	The GCB is opened but does not interrupt the operation of the unit. Alarm text + flashing LED + Relay centralized alarm (horn) + GCB open.				
Indication	**X**				
	This alarm does not interrupt the operation of the unit. A message output without a centralized alarm occurs. Alarm text				

4.1.2 Warnings

No.	Items	Description
1	Loss Of Speed Signal	When the speed of genset is 0 and speed loss delay is 0, controller will send a warning alarm signal that will be displayed in LCD.
2	Genset Over Current	When the current of genset is higher than threshold and setting over current delay is 0, controller will send warning alarm signal and it will be displayed in LCD.
3	Fail To Stop	When genset cannot stop after the “stop delay” is over, controller will send warning alarm signal and it will be displayed in LCD.
4	Low Fuel Level	When the fuel level of genset is lower than threshold or low fuel level warning is active, controller will send warning alarm signal and it will be displayed in LCD.
5	Failed To Charge	When the voltage of genset charger is lower than threshold, controller will send warning alarm signal and it will be displayed in LCD.
6	Battery Under Voltage	When the battery voltage of genset is lower than threshold, controller will send warning alarm signal and it will be displayed in LCD.
7	Battery Over Voltage	When the battery voltage of genset is higher than threshold, controller will send warning alarm signal and it will be displayed in LCD.
8	Low Coolant Level	When low coolant level input is active, controller will send warning alarm signal and it will be displayed in LCD.
9	Temp. Sensor Open	When sensor hasn’t connected to corresponding port, controller will send warning alarm signal and it will be displayed in LCD.

No.	Items	Description
10	Oil Pressure Sensor Open	When sensor hasn’t connected to corresponding port, controller will send warning alarm signal and it will be displayed in LCD.
11	Maintenance Warn	When genset running time is longer than maintenance time of user setting, and the maintenance action is set as warning, controller send warning alarm signal and it will be displayed in LCD. When maintenance action type is set as “Not used”, maintenance alarm reset.
12	High Temp.	When the water/cylinder temperature of genset is higher than threshold and Enabled High Temp. Stop Inhibited or Input High Temp. Stop Inhibited is active, controller will send warning alarm signal and it will be displayed in LCD.
13	Low Oil Pressure	When the oil pressure of genset is less than threshold and Enabled Low Oil Pressure Stop Inhibited or Input Low Oil Pressure Stop Inhibited is active, controller will send warning alarm signal and it will be displayed in LCD.
14	Input Warn	When external input is active, controller will send warning alarm signal and it will be displayed in LCD.
15	Failed To Charge	When Failed To Charge input is active, controller will send warning alarm signal and it will be displayed in LCD.
16	Over Power	If over power detection is enabled, when the controller detects that the over power value (power is positive) has exceeded the pre-set value and the action select “Warn”, it will initiate a warning alarm.
17	ECU Warn	If an error message is received from ECU via J1939, it will initiate a warning alarm.

4.1.3 Shutdown Alarms

When controller detects shutdown alarm, it will send signal to open breaker and shuts down generator.

No.	Items	Description
2	High Temp. Shutdown	When the temperature of water/cylinder is higher than set threshold, controller will send a stop alarm signal and it will be displayed on the LCD.
3	Low Oil Pressure Shutdown	When oil pressure is lower than threshold, controller will send a stop alarm signal and it will be displayed on the LCD.
4	Over Speed Shutdown	When genset speed is higher than set threshold, controller will send a stop alarm signal and it will be displayed on the LCD.
5	Under Speed Shutdown	When genset speed is lower than set threshold, controller will send a stop alarm signal and it will be displayed on the LCD.
6	Loss Of Speed Signal Shutdown	When rotate speed is 0 and delay is not 0, controller will send a stop alarm signal and it will be displayed on the LCD.
7	Genset Over Voltage Shutdown	When genset voltage is higher than threshold, controller will send a stop alarm signal and it will be displayed on the LCD.
8	Genset Under Voltage Shutdown	When genset voltage is under set threshold, controller will send a stop alarm signal and it will be displayed on the LCD.
9	Genset Over Current Shutdown	When genset current is higher than set threshold and delay is not 0, it will send a stop alarm signal and it will be displayed on the LCD.
10	Failed To Start	Within set start times, if failed to start, controller will send a stop alarm signal and it will be displayed on the LCD.
11	Over Freq. Shutdown	When genset frequency is higher than set threshold, controller will send a stop alarm signal and it will be displayed on the LCD.
12	Under Freq. Shutdown	When genset frequency is lower than set threshold, controller will send a stop alarm signal and it will be displayed on the LCD.

No.	Items	Description
13	Genset Failed	When genset frequency is 0, controller will send a stop alarm signal and it will be displayed on the LCD.
14	Low Fuel Level	When fuel level low input is active, controller will send a stop alarm signal and it will be displayed on the LCD.
15	Low Coolant Level	When genset coolant level low input is active, controller will send a stop alarm signal and it will be displayed on the LCD.
16	Temp. Sensor Open	When sensor hasn’t connected to corresponding port, controller will send shutdown alarm signal and it will be displayed on the LCD.
17	Oil Sensor Open	When sensor hasn’t connected to corresponding port, controller will send shutdown alarm signal and it will be displayed on the LCD.
18	Maintenance shutdown	When the genset running time is longer than the maintenance time of the user setting and maintenance action is set to shutdown, the controller send a shutdown alarm signal and it will be displayed on the LCD. When the maintenance action type is set to “Not used”, maintenance alarm resets.
19	Input Shutdown	When the external input is active, the controller will send a shutdown alarm signal and it will be displayed on the LCD.
20	Over Power	If the over power detection is enabled, the controller will initiate a shutdown alarm, when it detects that the over power value (power is positive) has exceeded the pre-set value and the selected action is “Shutdown”.
21	ECU Shutdown	If an error message is received from ECU via J1939, it will initiate a shutdown alarm.
22	ECU Fail	If the module does not detect the ECU data, it will initiate a shutdown alarm.

5 Glossary and List of Abbreviations

CB	Circuit Breaker
CT	Current Transformer
DI	Discrete Input
DO	Discrete (Relay) Output
ECU	Engine Control Unit
FMI	Failure Mode Indicator
GCB	Generator Circuit Breaker
GOV	(speed) Governor; rpm regulator
HMI	Human Machine Interface e.g., a front panel with display and buttons for interaction
I	Current
MCB	Mains Circuit Breaker
MPU	Magnetic Pickup Unit
N.C.	Normally Closed (break) contact
N.O.	Normally Open (make) contact
NC	Neutral Contactor
OC	Occurrence Count
Operation	In (general) operation. State when the genset is running according to the selected mode, all parameters are in allowed values and ranges, and without OPEN requests or alarms. Somehow "waiting for next occurrence".
P	Real power
P/N	Part Number
PF	Power Factor
PT	Potential (Voltage) Transformer
Q	Reactive power
S	Apparent power
S/N	Serial Number
SPN	Suspect Parameter Number
V	Voltage

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