TECHNICAL DOCUMENTATION

MASTER COMPACT

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DESCRIPTION

PRESENTATION

MASTER COMPACT

ALL-IN-ONE CONTROLLERS FOR GENERATOR POWER PLANT IN MAINS PARALLELING OR CHANGE OVER

MASTER COMPACT and MASTER COMPACT 1B are 2 new controllers made to manage Generator power plants from 1 to 32 generators in parallel with Mains. The **MASTER COMPACT** is suitable for applications with 2 circuit-breakers (Bus and Mains) while the **MASTER COMPACT 1B** is suitable for applications with 1 circuit breaker (no breaker on Bus).

MASTER COMPACT range offers flexibility and time saving thanks to its simple wiring, all features included (no option), and easy engineering and programming.

Hardware and Display

Both modules are available in switchboard panel mounted version with display, or core base mounted version. They are also compatible with **i4Gen** touchscreen color display.

Software

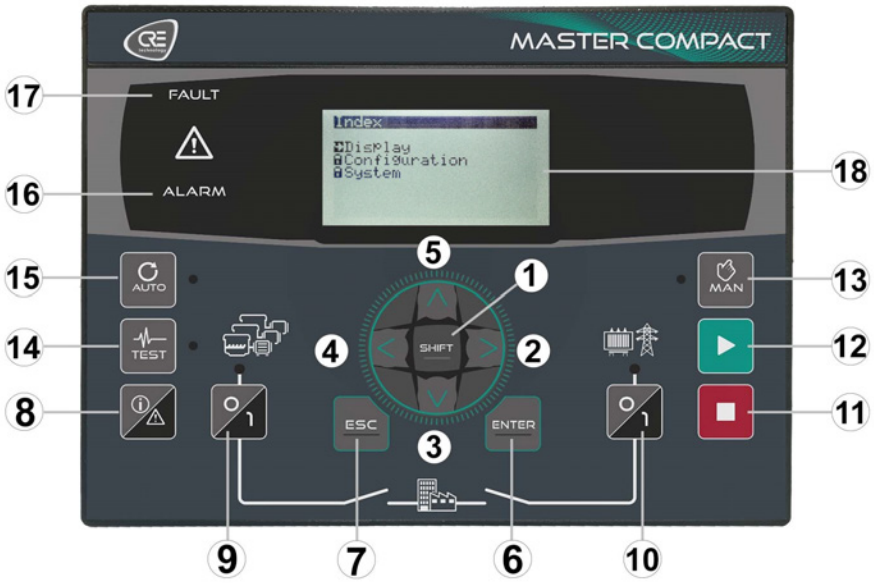
Both modules are configurable through their front panel display, from **i4Gen** touchscreen, or through the free **CRE PC** software: ***CRE Config Software***.

Control and Management

- Power plant Frequency/KW and Voltage/KVAR control through CAN bus.
- Power plant electrical parameters acquisition from wiring (PT – CTs) or from CAN bus (**CRE**)
- Remote start (digital input or Modbus TCP variable) and **TEST** mode are available in Off load or On load mode.
- Mains failure detection and No Break changeover with adjustable load transfer time and paralleling time.
- Possibility of operator Mains transfer validation.
- Mains permanent paralleling in generators fixed load or peak shaving and Power Factor control.
- Synchronization: Frequency, Phase and Voltage synchronization (Synchroscope display available on screen). Synch check (ANSI 25) + Phase sequence protection.
- New optimized frequency/KW and voltage/KVAR regulation which does not require PID adjustment in the **MASTER COMPACT** (except for the phase synchronization).
- Unload breakers management according with generators power available and load demand.
- 2 password levels.
- Automatic application management with several Mains (up to 32).
- Automatic management of CAN bus inhibitions in applications with Bus tie breaker

FRONT FACE

MASTER COMPACT



PIN	Buttons	Functions
1	SHIFT button	Additional functions.
2	RIGHT button	Navigation button (Right).
3	DOWN button	Navigation button (Down).
4	LEFT button	Navigation button (Left).
5	UP button	Navigation button (Up).
6	ENTER button	Validating entry / **MENU**.
7	ESC button	Cancel entry / escape **MENU**.
8	INFO button	Allows direct access to the current Fault or Alarm display.
9(1)	Bus circuit breaker button	Can only be used in **MAN** mode. Bus circuit breaker control. Press to Open. Press to Close (synchronization & load transfer will be done automatically if Bus is powered & configuration is setup for paralleling operation).
10(1)	Mains circuit breaker button	Can only be used in **MAN** mode. Mains circuit breaker control. Press to Open. Press to Close (synchronization & load transfer will be done automatically if Bus is powered & configuration is setup for paralleling operation).

PIN	Buttons	Functions
11(1)	STOP button	Can only be used in **MAN** mode. Stop the Power plant. Pressing once this button will set the Generator offload and initiate cooling down sequence.
12(1)	START button	Can only be used in **MAN** mode. Start the Power plant.
13(1)	MAN button	**MAN** mode. The associated LED lights up when the mode is activated.
14(1)	TEST button	**TEST** mode. The associated LED lights up if the mode is activated.
15(1)	AUTO button	**AUTO** mode. The associated LED lights up when the mode is activated.
16	ALARM indicator	The LED flashes when an alarm appears. The LED is lit when an alarm is acknowledged, but not reseted.
17	DEFAULT indicator	The LED flashes when a Fault occurs. The LED is lit when a Fault is acknowledged, but not reseted.
18	LCD display	Screen size: 40mm x 70mm; Back-light : typical 50cd/m^2, configurable. Type: STN; 64 x 128 pixels.

(1) Not available according to controller type.

NAVIGATION KEYS

Keys	Navigation mode	Edition mode
	Scrolling menus.	Modifying parameters values once selected: When up/down keys are used to modify values, holding the key will accelerate the entry scrolling.
	Navigating right/left in display.	NA
	 will increase/decrease the brightness of the LCD display.  will increase/decrease the contrast of the LCD display.	In **MAN** mode, when the Generator is offload, use  to increase/decrease: ▪ The speed when the speed control page is displayed. ▪ The voltage when the voltage control page is displayed. *Note: Not available on **MASTER COMPACT**, **MASTER COMPACT 1B** and **BTB COMPACT**.*
	Return to parent menu (press 3 times to return to main screen) or to previous menu.	Cancel setting and return to **Navigation** mode.
	Accessing a menu / Switching to **Edition** mode.	Validation of the modified parameter and return to **Navigation** mode.

BUTTON INHIBITION

To inhibit front panel buttons, use the ***CRE Config Software/System/Button inhibition*** page. This page shows the list of front panel buttons, tick the corresponding box to inhibit actions on the button.

Table below shows the 16 bits variable used for remote button inhibition by Modbus, each bit is assigned to a button:

Variable	Label	Description
[3557]	Inhibit key	Each 1-bit inhibits a front panel button.

RELATION BUTTON/INHIBITION BIT [3557]

Inhibition bit	8	7	6	5	4	3	2	1
Key								
Inhibition bit		**15**	**14**	**13**	**12**	**11**	**10**	**9**
Key								

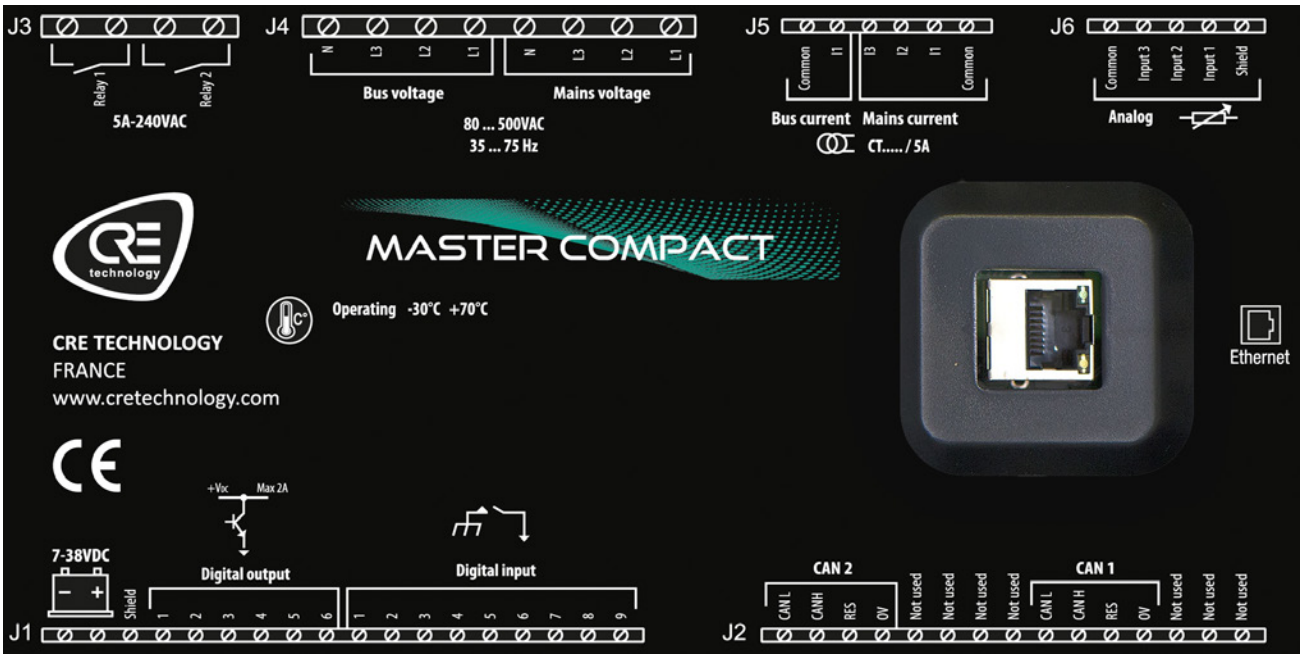
EXTERNAL BUTTON REQUESTS

It is possible to remotely activate button actions by Modbus TCP, for a remote manual control for example.
If a button action is controlled by Modbus TCP, the last request received (external or from the front panel) is treated in priority and cancel the previous request.
MAN / **AUTO**: If the 2 modes are requested, the **MAN** mode request cancels the **AUTO** mode one.

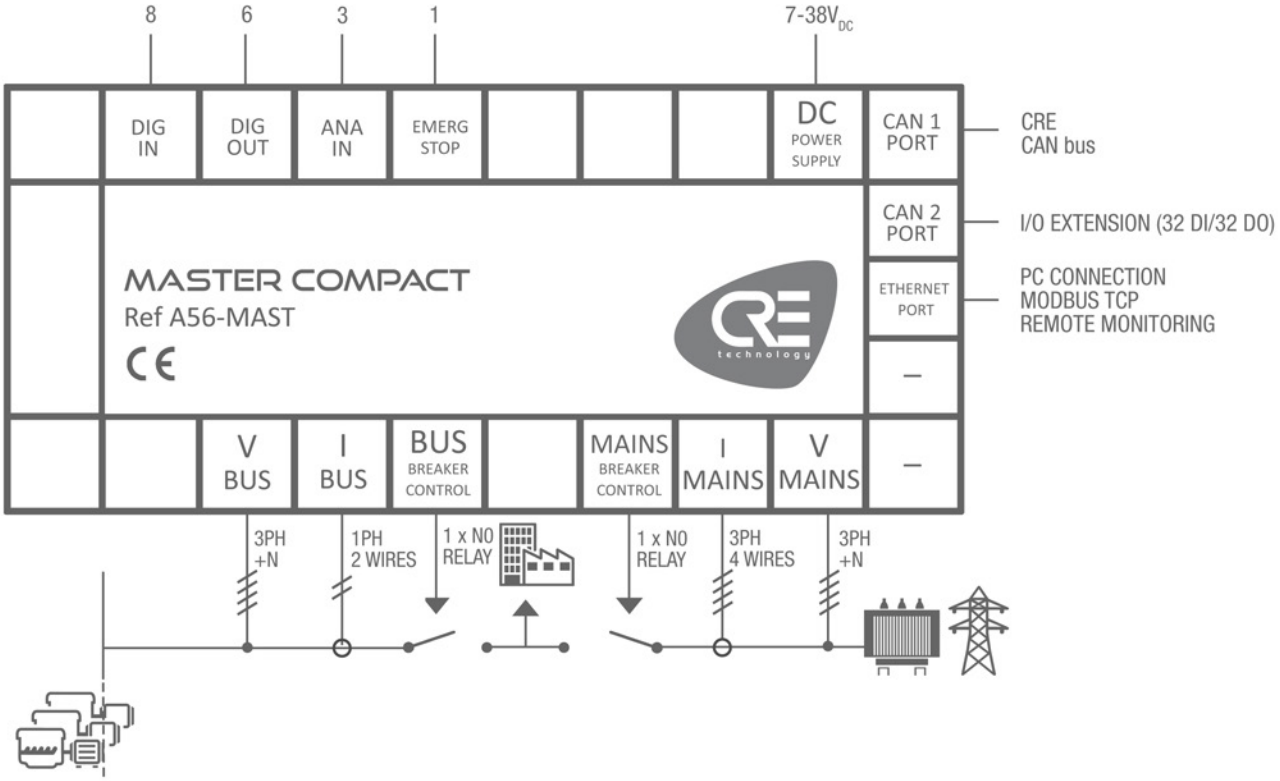
The buttons on the front panel can be replaced by external commands via digital inputs.
Modbus TCP/IP
Modbus mapping

REAR FACE

MASTER COMPACT



SIMPLIFIED WIRING DIAGRAM



PANEL MOUNTING

The unit is designed for panel mounting, which provides user with access only to the front panel.

WARNING
THE UNIT IS NOT GROUNDED
• Take all measures against Electronic Static Discharges. • Do not try to open the unit.
Failure to follow these instructions may damage the unit.

Environmental requirements:

- Operating temperature: -20…70°C (-4...158°F); LCD display slows down a bit under -5°C (23°F). Avoid direct exposure to the sun.
- Storage temperature: -40...70°C (-40...158°F).
- Altitude: ≤ 4000m (13123ft) for a max AC voltage of 480VAC; ≤ 5000m (16404ft) for a max AC voltage of 400VAC.

UNPACKING

Make sure the packaging contains:

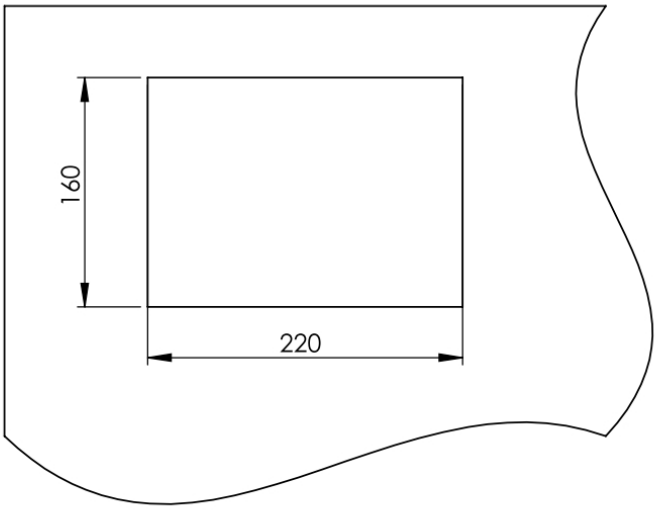
- The unit.
- Four caps and screws packaged apart.
- A delivery bill.

Unpack and keep the packaging in case of return.
Make sure the unit does not show scratches or visible defaults. Otherwise describe them on the RMA sheet (available on CRE Technology website) and return it with the product to **CRE Technology**.

INSTALLATION

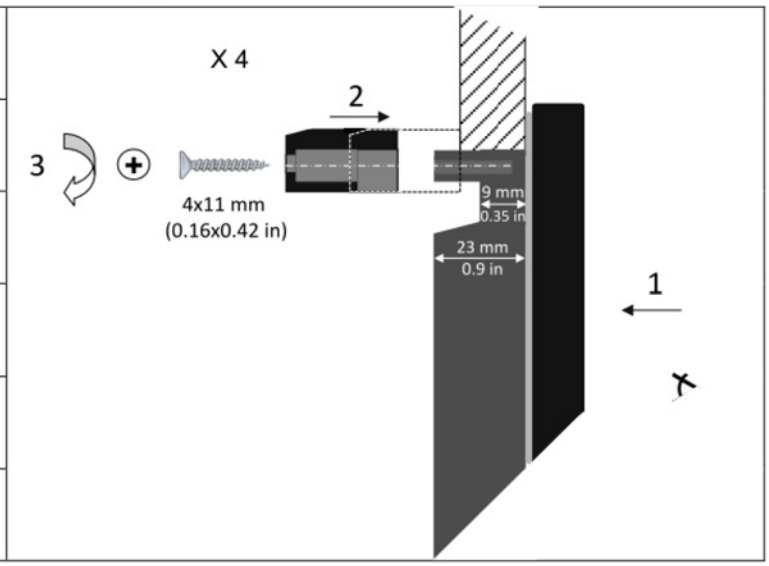
Preparation

- Open type devices to be installed inside a suitable type rated enclosure.
- Torque of mounting brackets: 0.4Nm.
- Cut out the panel to 220x160mm (8.7x6.3in) minimum.
- Make sure the cut-out is smooth and clean.



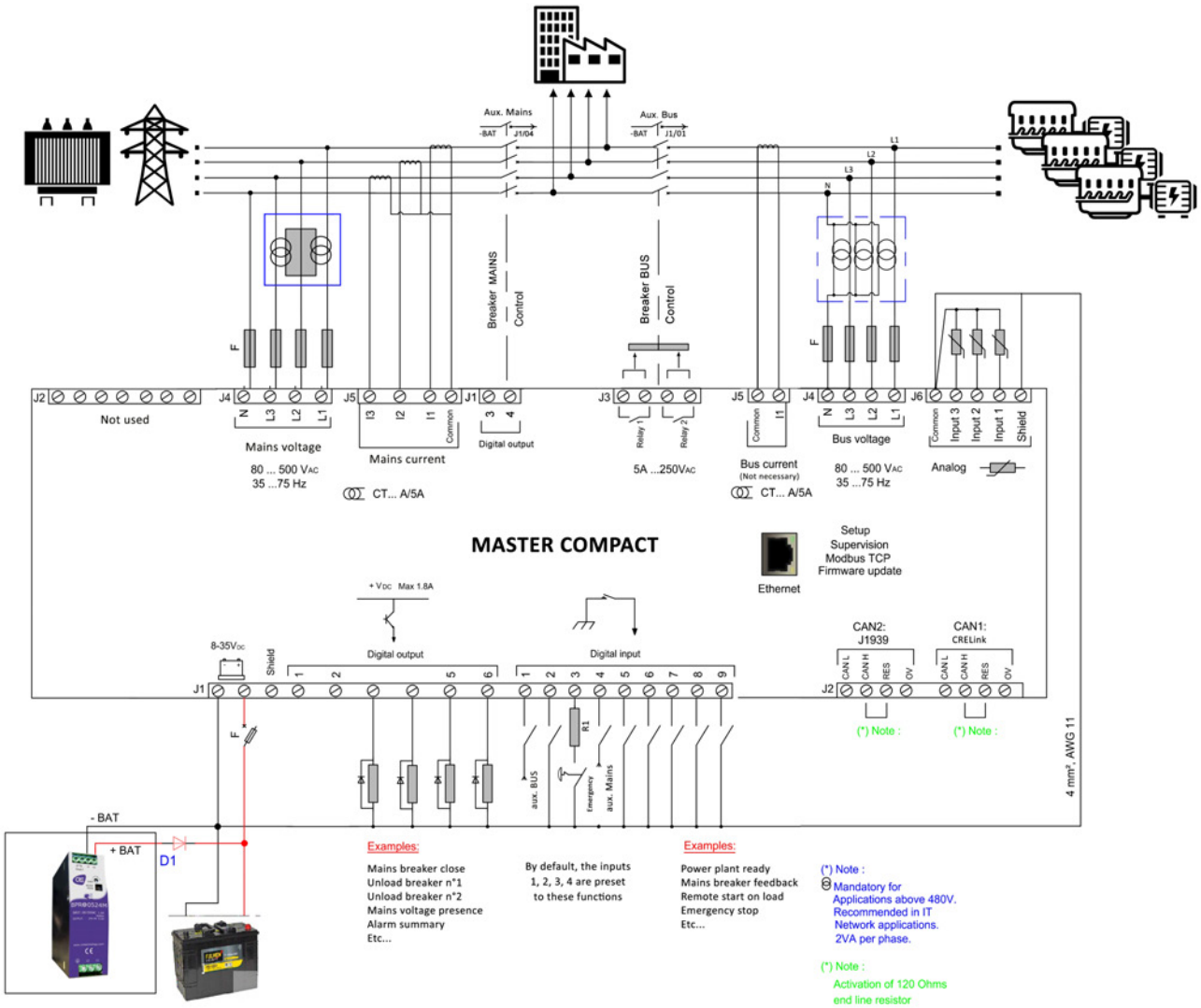
Mounting

0	Tool: cross-heas screwdriver size 1
1	Pass the unit through the mounting surface
2	In the rear, cover each of the four spacers with a cap
3	Screw a cap against the mounting surface
4	Repeat on the diagonally opposite spacer
5	Repeat on the other diagonal and tighten equally (do not overtighten)



UL REQUIREMENTS

ADVANCED WIRING DIAGRAM



CIRCUIT SEPARATION

The communication, sensor, and/or battery derived circuit conductors shall be separated and secured to maintain at least 1/4" (6mm) separation from the Mains and the Bus connected circuit conductors unless all conductors are rated 600V or greater.

MAINS RATINGS

Over-voltage Category
III, 300VAC system voltage.

Sensing Mains / Bus Voltage Measurement (J4)
300VAC max P-N, 2 phases; 500VAC P-P 3 phases, 35...75Hz.

Current Inputs (J5)
Must be connected through listed or recognized isolating current transformers with secondary rating of 5A max 50/60Hz. (XODW2.8) Instrument transformers (according to IEEE C57.13 series or the equivalent).

Communication Circuits
Must be connected to communication circuits of UL Listed equipment.

Output Pilot Duty (J3)
250VAC, 5A max general purpose, 240VAC, 1/4HP for NO contact, 1/6HP for NC contact Pilot duty: C150, C300.

Digital outputs (J1)
FET: Fuel shutoff: 63VA, 1.8A max current.

OTHER CIRCUITS RATINGS

Block and mark	Description	Note
Breaker commands		Normally open. Breaking capacity: 5A, 240VAC.
Relay 1	Relay 1 +	
	Relay 1 –	
Relay 2	Relay 2 +	
	Relay 2 –	
AC voltage (1)		100...480VAC, 35…75Hz, 100mA max; accuracy: 1% fsd.
N	Mains N	Optional.
L3	Mains L3	These lines must be protected externally with 100mA/600VAC fuses.
L2	Mains L2	
L1	Mains L1	
N	Bus N	Optional.
L3	Bus Phase 3	These lines must be protected externally with 100mA/600VAC fuses.
L2	Bus Phase 2	
L1	Bus Phase 1	
Current inputs(1)		Short-circuit protection available.
Bus common	GND	GND.
Bus current I1	Bus I1	0…5A. Maximum rating: 15A during 10s. Burden: 1VA. Keep the lead length short to preserve accuracy (up to 0.5% full scale deviation). External CT max ratio is 3250 (i.e. 3250:1 or, preferably, 16250:5). On **GENSYS COMPACT PRIME**, this input must be used only for the earth fault protection. On **GENSYS COMPACT MAINS** and **AMF COMPACT**, if Mains power measurement is configured as 20mA, this input can be used as an earth current measurement.
Mains current I3	Mains I3	0…5A. Maximum rating: 15A during 10s. Burden: 1VA. Keep the lead length short to preserve accuracy (up to 0.5% full scale deviation). External CT max ratio is 3250 (i.e. 3250:1 or, preferably, 16250:5).
Mains current I2	Mains I2	
Mains current I1	Mains I1	
Mains common	GND	Optionally connected to CT –.
Analog inputs		0...500Ω.
Common		Connect it to battery -.
Input 3	Available input	
Input 2	Available input	

Block and mark	Description	Note
Input 1	Available input	
Shield	GND	Ground plane.

(1) Not available according to controller type.

Block and mark	Description	Notes
7...38VDC		**Not protected against polarity reversal**.
-	Power supply -	2.5mm² (AWG13).
+	Power supply +	7…38VDC, consumed current: 130mA at 24V (standby and operation).
Shield	GND	Ground of the Generator.
Digital outputs		Free solid state output. State 1 at the supply voltage (max: 1.8A). Protected against short circuits. A reactive load is supported. Not isolated from power.
1	Available outputs	
2		
3		
4		
5		
6		
Digital inputs		Free digital input with 10kΩ pull-up. Accepts NO or NC contact to 0V. Not isolated from power.
1	Available inputs	
2		
3		
4		
5		
6		
7		
8		
9		
CAN2: J1939-Extensions		Isolated CAN bus J1939 / CANopen. Twisted pair.
	CAN L	Blue wire.
	CAN H	White wire.
	Resistor -	Strap to CAN H when inner resistor must be inserted (bus ends).
Shield	0V	Connect the cable shield herein.
Speed (1)		Compatible with all analog speed controllers. Isolated from power supply.
Out	Speed output	Analog output ±10V to speed controller.
common	Speed reference	Twisted pair; length. < 5m (16ft) if unshielded, < 50m max if shielded.
AVR (1)		Compatible with most voltage regulators. Isolated from power supply.

Block and mark	Description	Notes
Out	AVR output +	Analog output ±10V to voltage regulator.
Common	AVR output –	Twisted pair; length. < 5m (16ft) if unshielded, < 50m max if shielded.
CAN1: CRE-Link® (1)		Isolated CAN bus, use twisted pair.
	CAN L	White wire with blue strip (when using a **CRE Technology** cable).
	CAN H	Blue wire with white strip (when using a **CRE Technology** cable).
	Resistor -	Strap to CAN H when inner resistor must be inserted (bus ends).
Shield	0V	Connect the cable shield herein.
Pickup (1)		100Hz....10kHz. Voltage limits between + and –: 2...40VAC. Speed measurement for speed regulation, crank drop out and over-speed. Better option than alternator voltage. An over-speed shutdown device independent of the module is required; the alarm can be generated by ECU or by the module.
	Pickup +	
	Pickup –	

(1) Not available according to controller type.

OVERCURRENT PROTECTION (DC SUPPLY AND L1, L2, L3, N)

Installer shall protect DC supply and L1, L2, L3, N by fuse Type: R/C (JDYX2/7), or R/C (JDYX2) and CSA Certified Class 1422-30.
Rating of fuses:

- DC supply to be protected by 5A, 40VDC max.
- L1, L2, L3, N, fuse protection 100mA/600VAC max.

TERMINALS WIRING

Terminal (screw type):

- Tightening Torque: 3.5lb.in (0.4Nm).

Wires :

- 28-14 AWG, Cu, 75°C min.

Conductor protection must be provided in accordance with NFPA 70, Article 240.
Low voltage circuits (35VDC or less) must be supplied from the engine starting battery or an isolated secondary circuit.

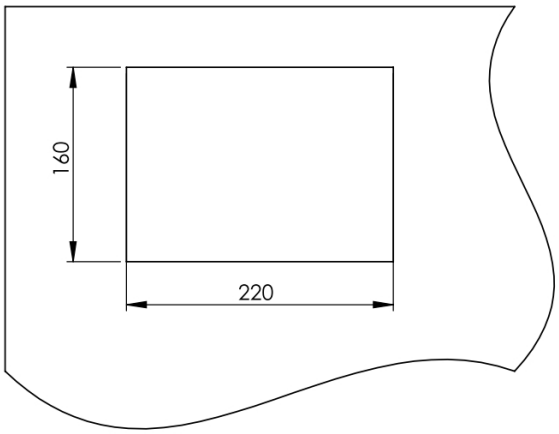
ENVIRONMENT

Device must be installed in an unventilated or filtered ventilation enclosure to maintain a pollution degree 2 environment.
Maximum surrounding air temperature rating: 45°C.

INSTALLATION

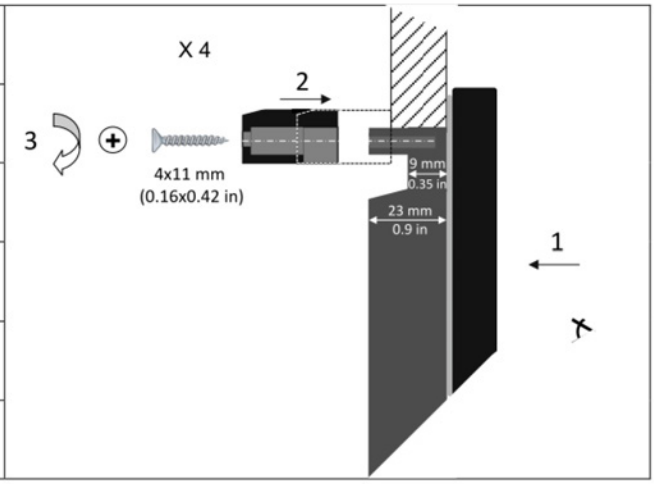
Preparation

- Open type devices to be installed inside a suitable type rated enclosure.
- Torque of mounting brackets: 0.4Nm.
- Cut out the panel to 220x160mm minimum (8.7x6.3in).
- Make sure the cut-out is smooth and clean.



Mounting

0	Tool: cross-heas screwdriver size 1
1	Pass the unit through the mounting surface
2	In the rear, cover each of the four spacers with a cap
3	Screw a cap against the mounting surface
4	Repeat on the diagonally opposite spacer
5	Repeat on the other diagonal and tighten equally (do not overtighten)



USAGE

PASSWORD

ADVICE
USEFUL INFORMATION ▪ Adjustment tip ▪ Using the module **Failure to comply with these recommendations may cause the module to malfunction.**

The menus will be automatically locked if no operation is performed during the time set in the System menu (Factory setting: 5 minutes).
The standby screen will be displayed.

The module provides secured password access to protect configuration changes and limit data accessibility:

Level	Default password	Authorization	Accessible pages and items
0	No password. Press ENTER	By default, this level is not password protected, but you can implement one.	**Display** menu pages only.
1	1	User level, settings and commissioning.	**Display**, **Configuration** and **System** menus pages.
2	1234	Used to change advanced settings.	Advanced settings (***CRE Config Software*** only).

Passwords can be changed via **CRE PC** software: ***CRE Config Software***

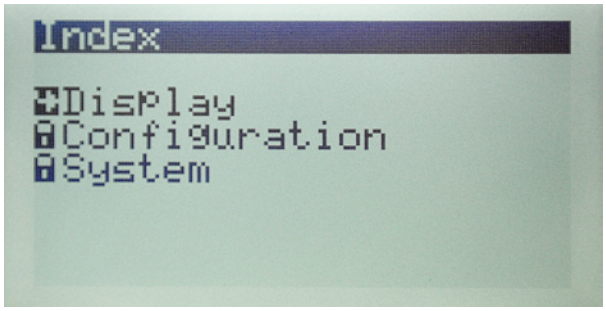
To access the **Display** menu, press ENTER.
To access the **Configuration** and **System** menus, the padlock must be released:

1. Press ∨ to select **Configuration** or **System**.
2. Press ENTER to switch to password input mode (as for other settings); the first character is represented by a cursor.
3. Change the character by pressing ∧
4. Move to the next character by pressing >
5. Repeat the operation for each character.
6. Confirm the password by pressing ENTER

LCD

NAVIGATION

Press ESC then ENTER and type in the level 1 password as described above to access the top level menu:



A black pointer spots the currently selected item/setting.
Three main menus are available on the LCD screen and in ***CRE Config Software***:

- **Display** gives information on Mains/Bus and displays real-time information/status.
- **Configuration** is used to adjust the settings done previously with***CRE Config Software /Configuration***.
- **System** is used to adjust the settings done previously with***CRE Config Software /System*** (Date/Hour, screen features, ...).

To cycle through the menus and menu items, press ∨ or ∧

To cycle through the pages of lists of settings/readings, press > or <

EDITION

To change a setting:

1. Navigate to the setting.
2. Press ENTER to switch to **Edition** mode; the current value blinks.
3. Press ∨ or ∧ to get the new value.
4. Press ENTER to validate the new value, ESC to reject it. Module returns to **Navigation** mode.

It is also possible to change settings using Modbus TCP.

DEDICATED PAGES

Dedicated pages include:

- Active fault and archive pages.
- Active alarm and archive pages.
- The information pages.

At any time, faults/alarms/information can be displayed on the LCD screen by pressing the button ⓘ⚠.

If a fault is active and has not been acknowledged yet, the active fault page will be displayed.
Otherwise, if an alarm is active and has not yet been acknowledged, the active alarms page will be displayed.
Otherwise the information page will appear.

It is then possible to navigate through these dedicated pages using the arrow buttons.

To return to the previous page, press ESC or  .

EVENTS

Up to 15 active events and 30 archived events can be displayed on the screen.

Each event is time-stamped as follows:
jj/mm/yy hh:mn:ss protec. label On (or Off).

To reset events, press SHIFT + 

Note: Correct the condition that triggered the protection before performing a reset; if necessary, the protection will trip again.

INFORMATION

These pages allow to display the power and engine current state with the associate elapsed time in this state.
Power [4000] displays the unit current state regarding power management.
Custom variables: to display any variable, enter the code of the variable to be displayed.

WIRING

Tool: insulated screwdriver Ø2.5 mm (0.1 in), tightening torque: 0.8 Nm (7 lb-in) max.

Accessories: 4, 5, 6, 8, 15 & 18-terminal cable connectors, protective gloves, carpet if the floor is wet.

⚠ WARNING

THE UNIT IS NOT PROTECTED

- Use external fuses:
  - Mains and Bus phases: 100mA/600VAC
  - Battery positive: 5A/40VDC
- Install the fuses as near as possible to the unit, in a place easily accessible to the user.
- The disconnection device must NOT be fitted in a flexible cord.

Failure to follow these instructions may damage the unit.

DANGER

RISK OF ELECTRIC SHOCK, EXPLOSION OR ARCING

- The module may only be installed and maintained by qualified electricians.
- Use personal protective equipment (PPE)
- Follow good safety practices for electrical work.
- Turn off the power before installing or replacing a fuse, and before installing the module.
- Use equipment adapted to the potential voltages to check the absence of voltage.
- Do not use a resettable fuse.

Failure to follow these recommendations may result in death or serious injury.

GENERAL PROCEDURE

1. Make sure the cable connectors are not plugged.
2. Take on protective gloves.
3. Connect the wires on each cable connector in accordance with the National Wiring Regulations.
4. Plug each cable connector onto the related connector.
5. Plug a direct Ethernet cord (RJ45, male-male, 100m max., 100Ω; a crossover cable such as 3-m long A53W1 is OK as long as your switch uses auto MDI/MDIX technology or if the link to PC is direct) and lock the rear door.

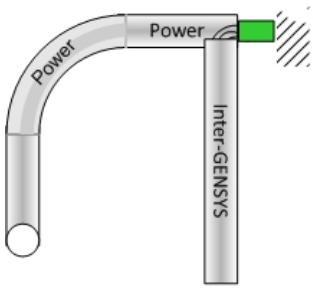
RECOMMENDATIONS

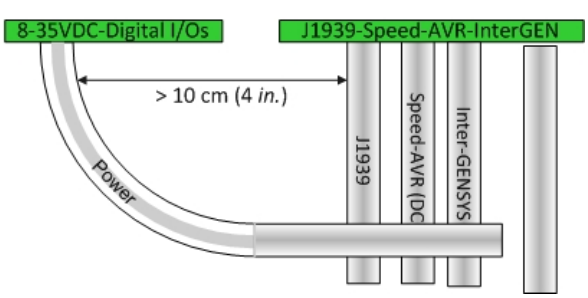
Wires section: 2.5mm² (AWG13).

To avoid ElectroMagnetic Interferences, shield cables appropriately; for CAN bus, see CAN bus good practices.

Isolation: keep the power cable separate from the CAN bus cables. The latter can be installed in the same duct as the low level DC I/O wires (under 10V).

If power and communication cables have to cross each other, do it at right angles to avoid crosstalk:





CONNECTION DIAGRAMS

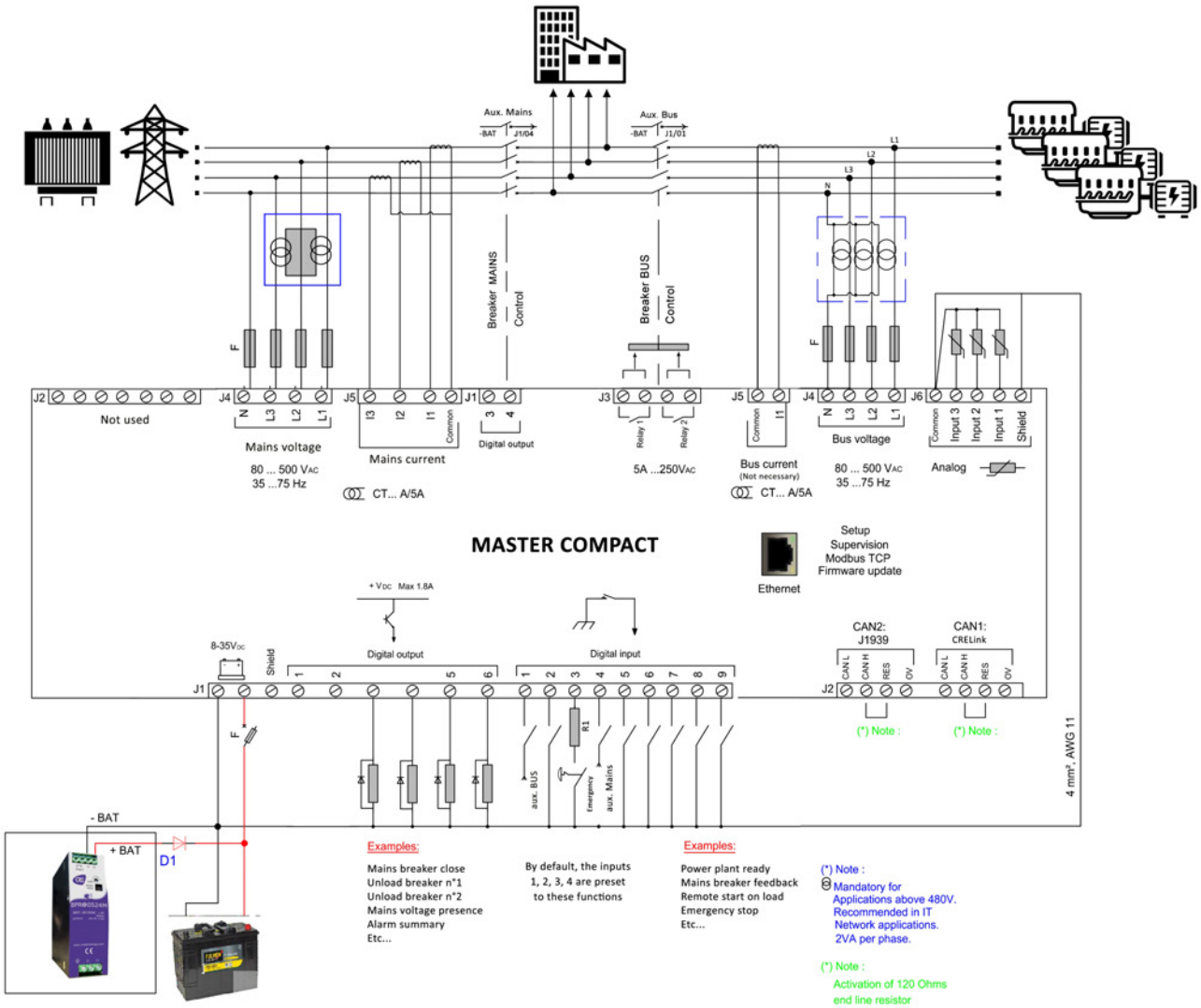
These diagrams show that the PT (Potential Transformers) can be connected in various ways.

- Star (wye) on Bus side (1 insulated high-voltage terminal per PT); the ratio is for example:

$$\frac{Unom/\sqrt{3}}{100}$$

- See on Mains side (2 insulated high-voltage terminals per PT); the ratio is for example:

$$\frac{Unom}{100}$$



UPPER BLOCKS

DANGER

EXPOSED TERMINALS

Do not touch L1, L2, L3 terminals nor use non-insulated tools near them. These terminals are unprotected and will expose the user to dangerous voltages.

Failure to follow this instruction may result in death, serious injury or equipment damage.

Block and mark	Description	Note
Breaker commands		Normally open. Breaking capacity: 5A, 240VAC.
Relay 1	Relay 1 +	
	Relay 1 –	
Relay 2	Relay 2 +	
	Relay 2 –	
AC voltage (1)		100...480VAC, 35…75Hz, 100mAmax; accuracy: 1% fsd.
N	Mains N	Optional.
L3	Mains L3	These lines must be protected externally with 100mA/600VAC fuses.
L2	Mains L2	
L1	Mains L1	
N	Bus N	Optional.
L3	Bus 3	These lines must be protected externally with 100mA/600VAC fuses.
L2	Bus 2	
L1	Bus 1	
Current inputs(1)		Short-circuit protection available.
Bus common	GND	Connect to the ground.
Bus current I1	Bus I1	0…5A. Maximum rating: 15Aduring 10s. • Burden: 1VA. Keep the lead length short to preserve accuracy (up to 0.5% full scale deviation). • External CT max ratio is 3250 (i.e. 3250:1 or, preferably, 16250:5). • On **GENSYS COMPACT PRIME**, this input must be used only for the earth fault protection. • On **GENSYS COMPACT MAINS** and **AMF COMPACT**, if Mains power measurement is configured as 20mA, this input can be used as an earth current measurement.
Mains current I3	Mains I3	0…5A. Maximum rating: 15Aduring 10s. • Burden: 1VA. Keep the lead length short to preserve accuracy (up to 0.5% full scale deviation). • External CT max ratio is 3250 (i.e. 3250:1 or, preferably, 16250:5).
Mains current I2	Mains I2	
Mains current I1	Mains I1	

Block and mark	Description	Note
Mains common	GND	Optionally connected to CT –. For a 2-CT setup, see further.
Analog inputs		0...500Ω.
Common		Connect it to battery -.
Input 3	Available input	
Input 2	Available input	
Input 1	Available input	
Shield	GND	Ground plane.

(1) Not available according to controller type.

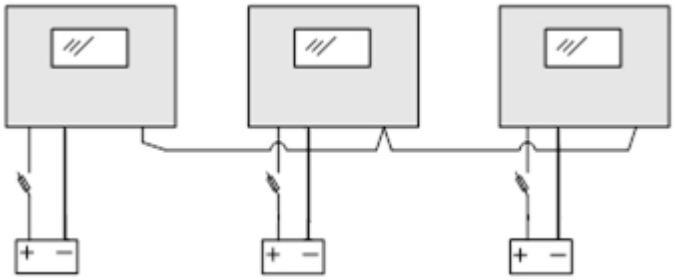
LOWER BLOCKS

⚠ WARNING

RISK OF EQUIPMENT DAMAGE

- As a protection against polarity reversal, install a 6A fuse between battery positive plug and terminal 8...35VDC +.
- Connect battery negative to the module terminal 8...35VDC– with 2.5mm² (AWG13) cable.

Failure to follow this instruction can damage the controller.



Block and mark	Description	Notes
7...38V_{DC}		**Not protected against polarity reversal** .
-	Power supply -	2.5mm² (AWG13).
+	Power supply +	7…38VDC, consumed current: 130mA at 24V (standby and operation).
Shield	GND	Connect to the ground.
Digital outputs		Free solid state output. State 1 at the supply voltage (max: 1.8A). Protected against short circuits. A reactive load is supported. Not isolated from power.
1	Available outputs	
2		
3		
4		
5		
6		
Digital inputs		Free digital input with 10kΩ pull-up. Accepts NO or NC contact to 0V. Not isolated from power.
1	Available inputs	
2		
3		
4		
5		
6		
7		
8		
9		
CAN2: J1939-Extensions		Isolated CAN bus J1939/CANopen. Twisted pair.

Block and mark	Description	Notes
	CAN L	Blue wire.
	CAN H	White wire.
	Resistor -	Strap to CAN H when inner resistor must be inserted (bus ends).
Shield	0V	Connect the cable shield herein.
Speed (1)		Compatible with all analog speed controllers. Isolated from power supply.
Out	Speed output	Analog output ±10V to speed controller.
common	Speed reference	Twisted pair; length. < 5m (16ft) if unshielded, < 50m max if shielded.
AVR (1)		Compatible with most voltage regulators. Isolated from power supply.
Out	AVR output +	Analog output ±10V to voltage regulator.
Common	AVR output –	Twisted pair; length. < 5m (16ft) if unshielded, < 50m max if shielded.
CAN1 : CRE-Link® (1)		Isolated CAN© bus, use twisted pair.
	CAN L	White wire with blue strip (when using a **CRE Technology** cable).
	CAN H	Blue wire with white strip (when using a **CRE Technology** cable).
	Resistor -	Strap to CAN H when inner resistor must be inserted (bus ends).
Shield	0V	Connect the cable shield herein.
Pickup (1)		100Hz...10kHz. Voltage limits between + /–2...40VAC. Speed measurement for speed regulation, crank drop out and over-speed. Better option than alternator voltage. An over-speed shutdown device independent of the module is required; the alarm can be generated by ECU or by the module.
	Pickup +	
	Pickup –	

(1) *Not available according to controller type.*

⚠ WARNING

RISK OF EQUIPMENT DAMAGE

Switch off the unit before plugging or unplugging the CAN bus connector or disconnecting wires.

Failure to follow this instruction can damage the CAN transmitter/receiver.

Note: On loss of power supply, the unit survives for 70ms at 24V, and 20ms at 12V.

OTHER SYSTEMS OF VOLTAGE

If bi-phase 180° is selected in ***CRE Config Software***, connect voltages and currents to L1-L3 terminals (and N). The same logic applies for I1-I3 (and common).
If mono phase is selected, connect voltages and currents to the terminals L1-N. The same logic applies for I1 and common.

DIGITAL INPUTS

ADVICE
USEFUL INFORMATION ▪ Adjustment tip ▪ Using the module **Failure to comply with these recommendations may cause the module to malfunction.**

Note: If a digital input changes a piece of data also to be written by Modbus, the latest request takes over the other. If two digital inputs are assigned to one function, the latest change is taken into account.

Several parameters can be configured from the ***CRE Config Software***:

- **Label**
- **Validity**
- **Direction**
- **Delay**
- **Function**

LABEL

This is the name you give to the input. The name will be shown in the info, alarm, and fault screens if programmed accordingly.

VALIDITY

Validity indicates when the input is taken into account. It can take four values:

Value	Validity	Description
2330	Never	Never active: must be selected if you do not use the input.
2329	Always	Always active: input is monitored as long as the module is powered.
2192	Post-start	Input is monitored by the end of the "Safety on delay" [2004]. (1)
2331	Stabilized	Input is monitored when the Power plant is ready for use.

(1) *Configure the protection inhibition time in* ***CRE Config Software/Configuration/Time-outs and Delays***.

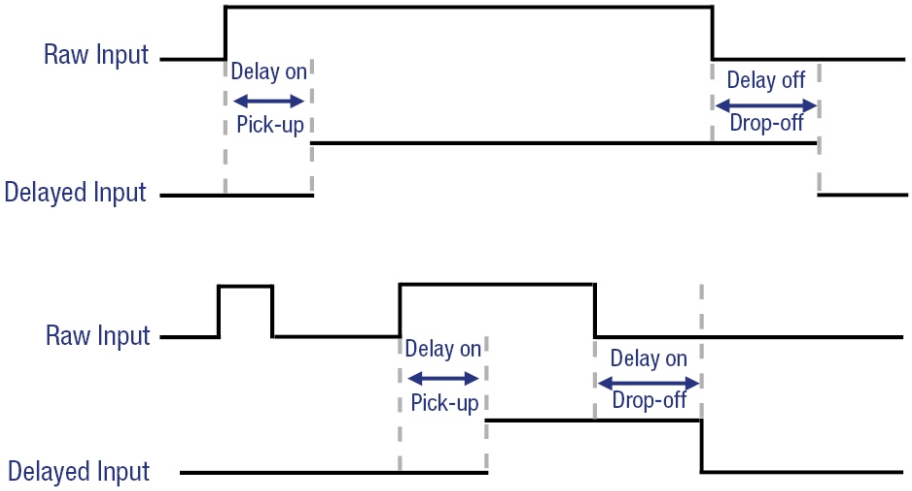
DIRECTION

For each input, two options are available:

Value	Label	Function
0	Normally open	Contact pair is open when input is in a de-energized state.
1	Normally closed	Contact pair is closed when input is in a de-energized state.

DELAYS

For each input, two delays can be defined in 100ms steps between 0 and 6553s:



FUNCTIONS

Each input can be configured using ***CRE Config Software***.
Function list is available in Software variables.

DIGITAL OUTPUTS

Each output is tagged with a label defined in ***CRE Config Software/Configuration***, and features several attributes set in the **Configuration** menu:

- **Direction**
- **Pulse length: 0 means no pulse**
- **Function**

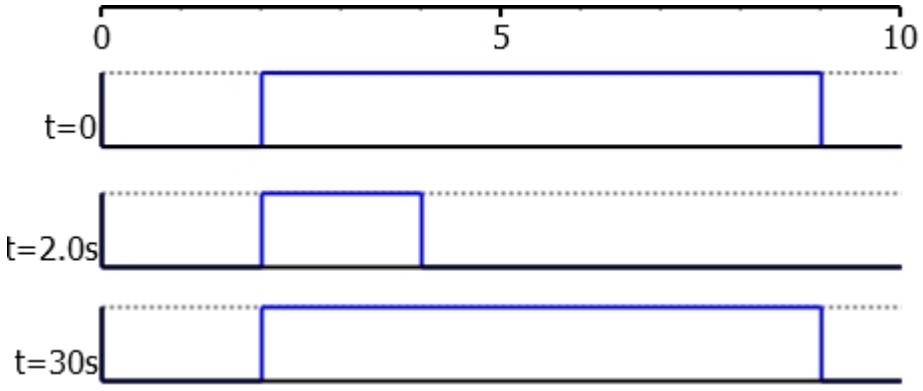
DIRECTION

Each output can be:

- **NE**: normally energized; the output is de-energized when its function is activated.
- **ND**: normally de-energized; the output is energized when its function is activated.

PULSE LENGTH

Each digital output can be configured to act as a pulse. The pulses lengths are defined with the parameters [2761] to [2766].
Set to 0 in order to have a continuous output (no pulse).



FUNCTIONS

Each output can be configured using ***CRE Config Software***.
Function list is available in Software variables.

ANALOG INPUTS

In addition to the speed and electrical currents and voltages, three analog inputs are available. They measure a resistance 0…500Ω . However, they can serve as digital inputs or 20 mA transducer input.

INPUT

Each input is tagged with a name and preset to a function. It features several attributes preset in ***CRE Config Software/Configuration/Inputs/Analog inputs***:

- **Accuracy** (number of digits after decimal point)**:** set to 0.1.
- **Unit:** among No unit, V, KV, mA, A, KA, Hz, KW, KWh, KVAR, KVARh, rpm, %, Bar, mbar, KPa, psi, °, °C, °F, L, Gal, s, h, days, Hz/s, m3/h, L/h, Gal/h.
- **Calibration:** measure value according to resistor value in Ω.

CALIBRATION

Calibration is used to estimate a reading from a resistance value by interpolation between 2 wrapping resistance values. Negative values are supported for readings. Enter a table in ***CRE Config Software / Configuration / Inputs / Analog inputs***.
Enter the limits of reading according to the sensor calibration; generally the lower limit is 0 and the slope is Range/Rating. Calculate and enter the intermediary readings to get a linear distribution.

PROTECTIONS

The input threshold features several attributes preset in ***CRE Config Software/Configuration/Protections/Engine/battery protections/Analog inputs protection:***

- Level (LV): limit value in units; it can be a low or high threshold.
- Delay (TM): time after which the protection is triggered.
- Validation (CT): protection type to which the signal contributes (8 potential values).
- Direction (SS): threshold polarity (0 = low, 1 = high).

Note: Do not confuse Validation with Validity (engine state that validates a digital input).

SUMMARY

The attributes are shown in ***CRE Config Software***:

	Protections				
	Threshold	**Timer**	**Control**	**Direction**	**Function**
AI 1 level 1	2600	2601	2602	2606	2607
AI 1 level 2	2603	2604	2605		
AI 2 level 1	2608	2609	2610	2614	2615
AI 2 level 2	2611	2612	2613		
AI 3 level 1	2616	2617	2618	2622	2623
AI 3 level 2	2619	2620	2621		

USE OF AN ANALOG INPUT AS A DIGITAL INPUT

To act as a digital input, connect the input to power through a switch, and select the function to implement in the list ***CRE Config Software/Configuration/Inputs/Analog inputs/Function***.
Then set the delay, validity and polarity.

USE OF AN ANALOG INPUT AS A TRANSCEIVER INPUT

To act as a 20mA input, connect the input with a 39Ω resistor between the analog input and the analog common, and select the function 20mA transceiver in the list ***CRE Config Software / Configuration/Inputs / Analog inputs / Function***. The non-linearity of the sensor can be corrected through a curve. Select the tweaking grade – the resolution in actual value – in accordance with the sensor accuracy.

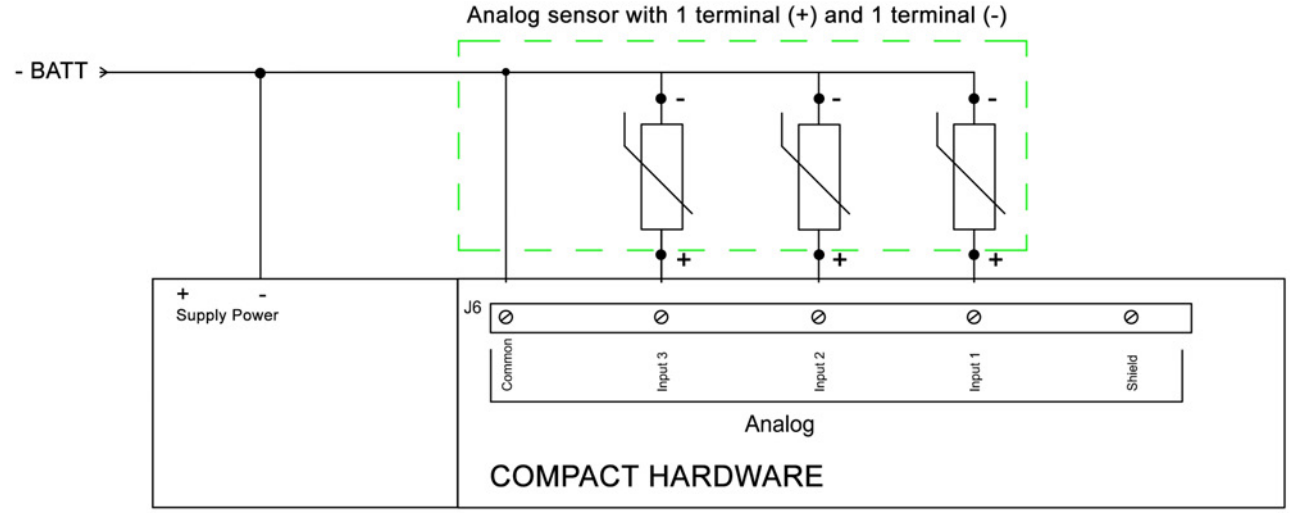
HOW TO CONNECT ANALOG OR DIGITAL SENSORS

You can use 1 or 2-wire analog sensors, or 1-wire or 2-wire logical sensors.

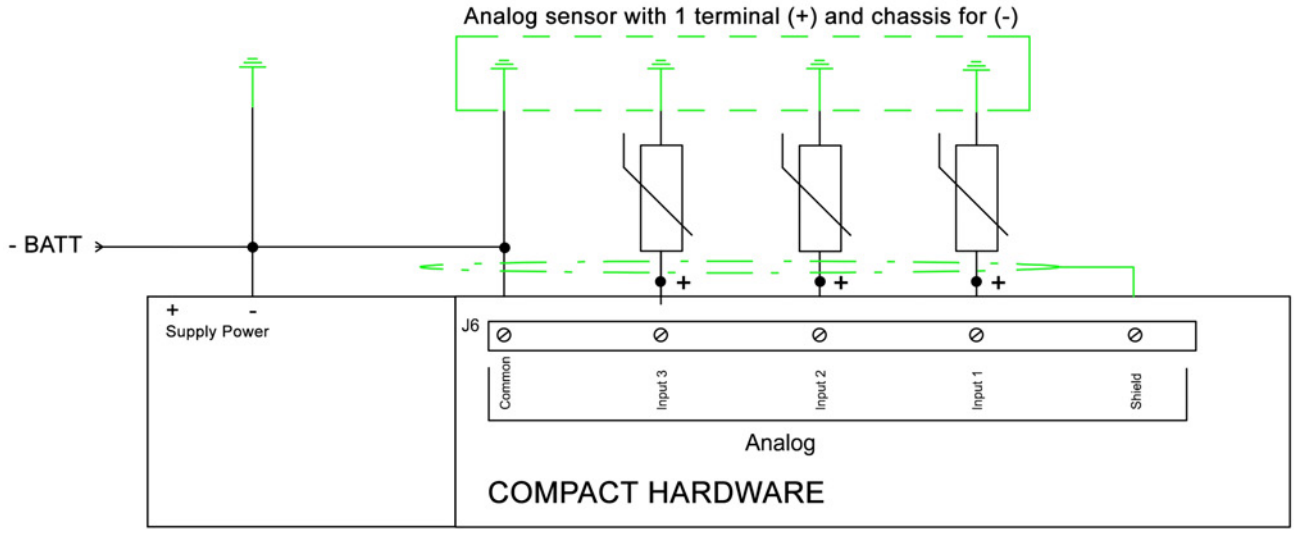
CRE RECOMMANDATION: In each case you must always connect the "common" J6 to the "- Power Supply" J1 and also connect it to the engine block in the case of 1-wire sensor.

You must use the following wiring (Incorrect wiring of the analog inputs can cause damage to the module, or cause a wrong measurement):

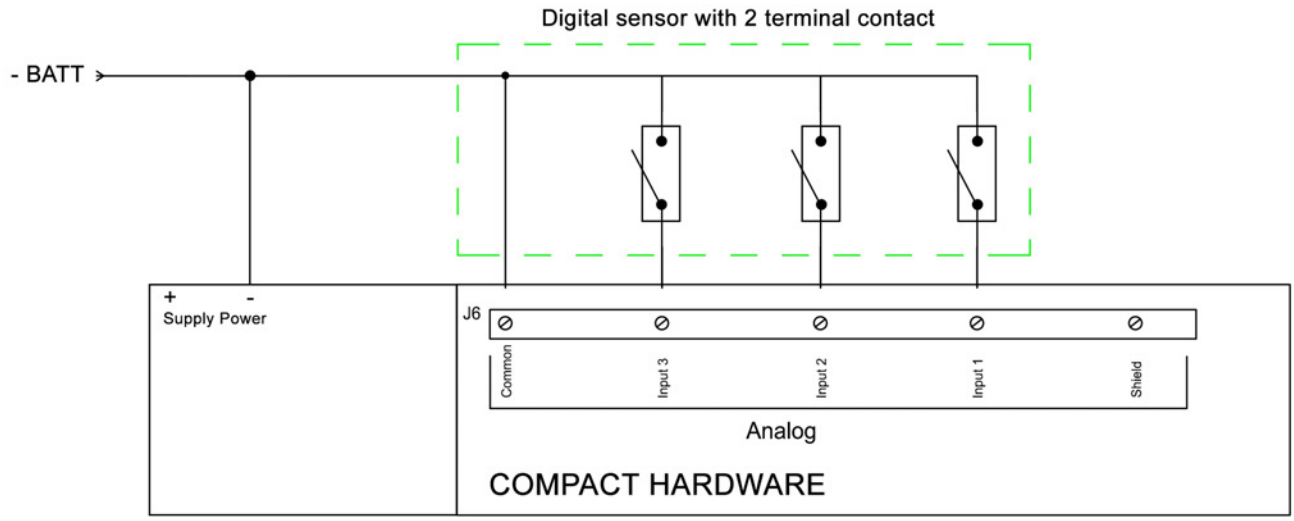
A-1 : Analog Sensor 2 Wires



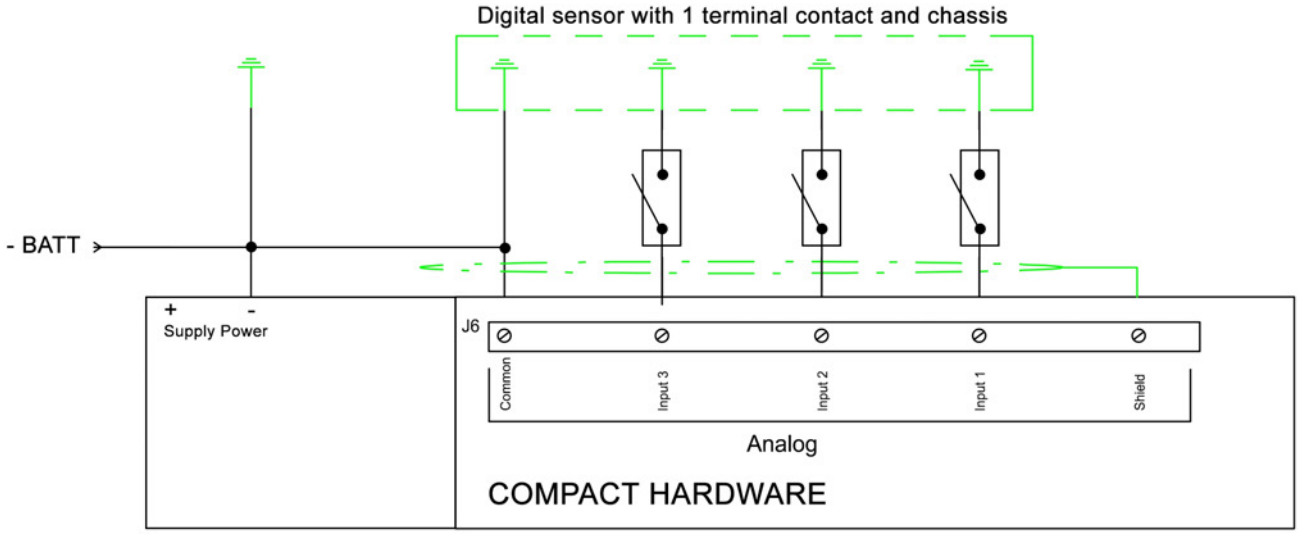
A-2 : Analog Sensor 1 Wire



B-1 : Digital Sensor 2 Wires



B-2 : Digital Sensor 1 Wire



⚠ WARNING

The warranty will be void if the manufacturer's instructions are not respected.

SETTINGS

CIRCUIT BREAKERS

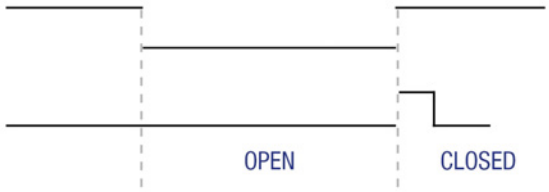
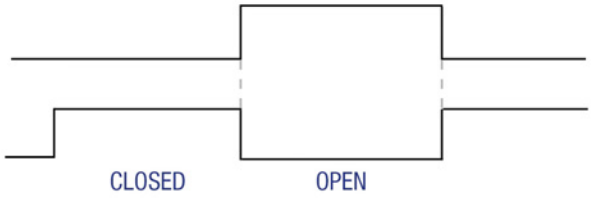
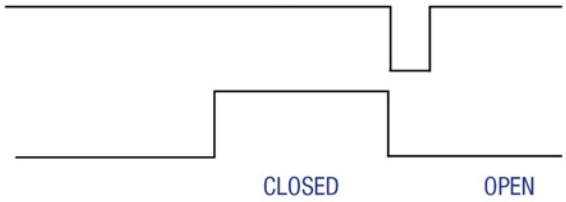
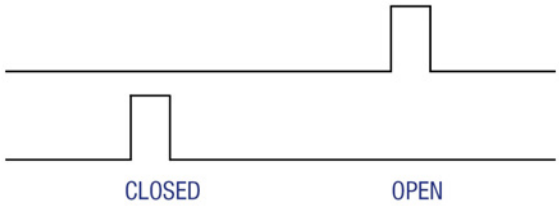
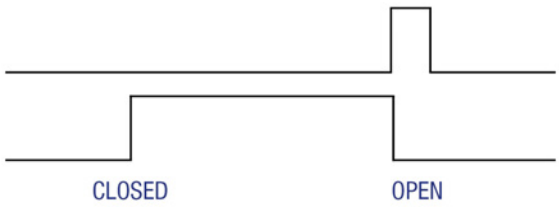
CIRCUIT BREAKER OPERATING MODES

Two logic outputs (relay or transistor) are used to control the circuit breakers - 1 for opening and 2 for closing. These outputs allow different types of circuit-breakers to be controlled.
The settings are accessible from ***CRE Config Software/Configuration/Outputs/BusBreaker*** and ***Configuration/Outputs/Mains Breaker.***

ADVICE	
	**USEFUL INFORMATION** ▪ Adjustment tip ▪ Using the module **Failure to comply with these recommendations may cause the module to malfunction.**

Note: Never switch from one operating mode to another while the plant is running.

CIRCUIT BREAKER CONTROL MODE

Value	Mode	Circuit breaker chronogram
0	1: Continuous contact to open. 2: Positive pulse to close.	
1	1: Continuous contact to open. 2: Continuous contact to close.	
2	1: Under-voltage (MN) coil opening. 2: Pulse to close.	
3	1: Under-voltage coil opening. 2: Continuous contact to close.	
4	1: Pulse to open. 2: Pulse to close.	
5	1: Pulse to open. 2: Continuous contact to close.	

PULSE CONFIGURATION

The settings can be accessed from ***CRE Config Software***.

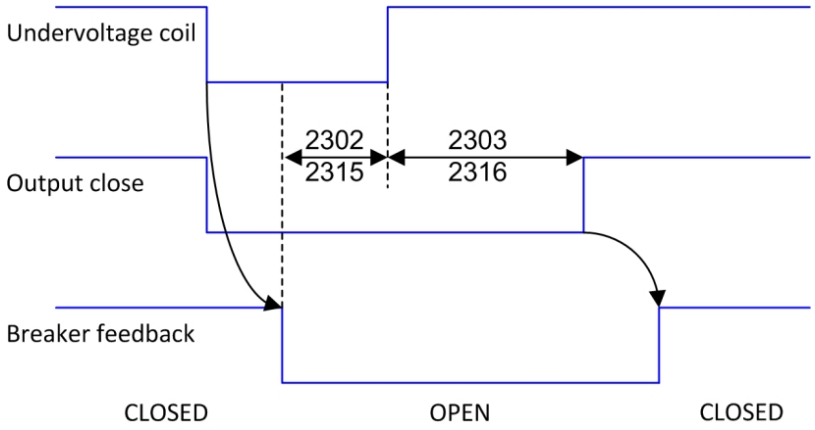
Positive Pulse

Configuration/Outputs/Bus Breaker. The settings of the Mains breaker positive pulse can be found in ***Configuration/Outputs/Mains Breaker*.**
For the positive pulse control of the Bus breaker, set the parameter [2301].
The parameter of the positive pulse control for the Mains breaker is [2314].

Coil Control

Configuration/Outputs/Bus Breaker. The settings of the Mains breaker coil can be found in ***Configuration/Outputs/Mains Breaker***.

For fail-safe control, set parameters [2302], [2303] for the Bus breaker and [2315], [2316] for the Mains breaker.



To detect the position of the circuit breaker, a logic input must be configured as:

Function	Value
Circuit breaker position feedback Power plant	1 = circuit breaker closed (LED displayed on the front panel).
Circuit breaker position feedback Mains	1 = circuit breaker closed (LED displayed on the front panel).

CONFIGURATION OF CIRCUIT BREAKER COMMANDS

Two logic outputs (relay or transistor) must be configured as described in the table below and connected to the circuit breaker.

Function	Description
Close Power plant circuit breaker control	Closing the Power plant circuit breaker (continuous, pulse, MNcoil).
Open Power plant circuit breaker control	Opening the Power plant circuit breaker (continuous, pulse, MNcoil).
Closed Mains breaker control	Closing the Mains circuit breaker (continuous, pulse, MNcoil).
Open Mains circuit breaker control	Opening the Mains circuit breaker (continuous, pulse, MNcoil).

VERIFICATION

DANGER	
	**RISK OF ELECTRIC SHOCK, EXPLOSION OR ARCING** ▪ The module may only be installed and maintained by qualified electricians. ▪ Use personal protective equipment (PPE) ▪ Follow good safety practices for electrical work. ▪ Turn off the power before installing or replacing a fuse, and before installing the module. ▪ Use equipment adapted to the potential voltages to check the absence of voltage. ▪ Do not use a resettable fuse. **Failure to follow these recommendations may result in death or serious injury.**

Follow these instructions in order to check the Bus breaker:

1. Connect the circuit breaker controls and check the breaker feedback.
2. Start the Power plant in **MAN** mode (press MAN), and press ▶.
3. Press O/1 (Bus breaker) when the Power plant is ready (Check that there is no voltage on the other side of the breaker before closing).
4. Check that the Bus circuit breaker is closed and that the Bus circuit breaker LED is lit.
5. If possible apply a load bank (active and reactive) on the Bus and check the powers, currents, voltages and cos (ϕ).
6. Press O/1 (Bus breaker) to open the Bus breaker.
7. Check that the Bus circuit breaker is open and that the Bus circuit breaker LED is off.
8. Press ■ to stop the Power plant.

Follow these instructions in order to check the Mains breaker:

1. Connect the circuit breaker controls and check the breaker feedback.
2. Press MAN to be in **MAN** mode.
3. Check that the Power plant isn't running. If it isn't the case, stop it by pressing ■.
4. Press the breaker close button O/1 (Mains breaker).
5. Check that the Mains circuit breaker is closed and that the Mains circuit breaker LED is lit.
6. If possible, apply a load bank (active and reactive) on the Mains and check the powers, currents, voltages and cos (ϕ).
7. Press O/1 (Mains breaker) to open the Mains breaker.
8. Check that the Mains circuit breaker is open and that the Mains circuit breaker LED is off.

SYNCHRONIZATION

FUNCTIONING

The module launches the synchronization only if the Mains provides at least 80% of the nominal voltage. It manages a correction on frequency and voltage to go and stay on the acceptance windows (can be handled in ***Synchronization)***. When the Mains voltage and the Bus voltage are synchronized, the module allows to close the circuit breaker.

In case of synchronization fails, the action can be set with the variable [2804] in ***Configuration/Synchronization***.

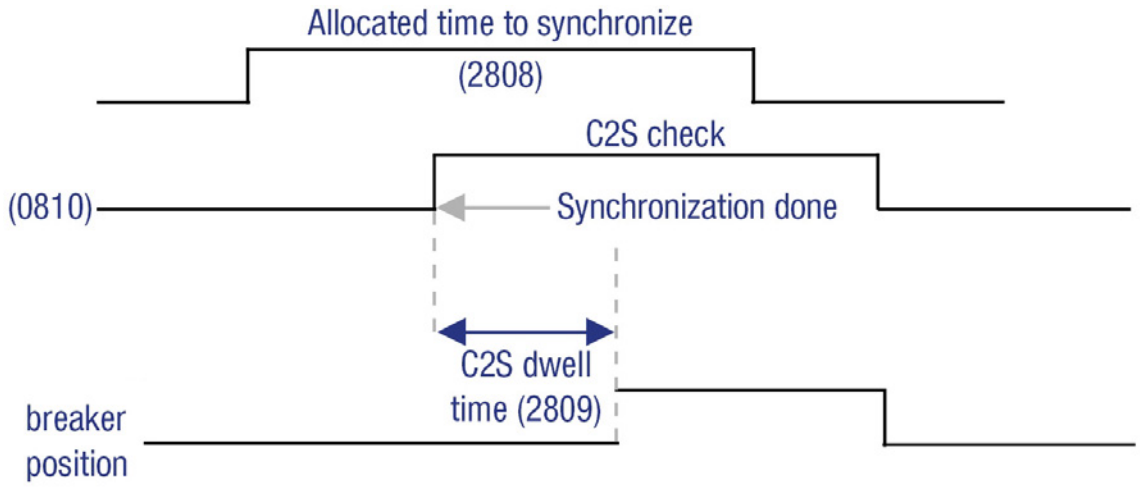
CONDITION

Voltage acceptance [2800].
Frequency acceptance [2801].
Phase angle acceptance [2802].
C2S dwell time (Synchronization dwell time before authorizing to close the breaker) [2809].

VISUALIZING

Label	Description	Variables
Phase sequence match	Phase sequence match to close the circuit breaker.	[306]
Voltage match	Voltage match difference to close the circuit breaker.	[307]
Frequency match	Frequency match deviation to close the circuit breaker.	[308]
Phase match	Phase match deviation to close the circuit breaker.	[309]
Authorization to close breaker	Authorization to close the circuit breaker.	[310]

CHRONOGRAM



ADJUSTMENTS

Prerequisite: In order for the module to correctly control the Power plant (which is controlled with **GENSYS COMPACT PRIME** units), the parameter [2017] must be properly set in each **GENSYS COMPACT PRIME** unit. Each **GENSYS COMPACT PRIME** unit must be in **AUTO** mode without a remote start input activated.

ADJUSTMENT PROCEDURE

DANGER	
	**RISK OF ELECTRIC SHOCK, EXPLOSION OR ARCING** ▪ The module may only be installed and maintained by qualified electricians. ▪ Use personal protective equipment (PPE) ▪ Follow good safety practices for electrical work. ▪ Turn off the power before installing or replacing a fuse, and before installing the module. ▪ Use equipment adapted to the potential voltages to check the absence of voltage. ▪ Do not use a resettable fuse. **Failure to follow these recommendations may result in death or serious injury.**

1. Disconnect the Bus circuit breaker control output on the module.
2. Make sure that there is some voltage on the Mains side. The Mains LED should be lit.
3. Press  to be in **MAN** mode. Press  (Mains breaker) in order to close the Mains breaker. The Mains breaker LED is lit.
4. Start the Power plant by pressing  and check the ***Display/Synchronization*** page.
5. Press  (Bus breaker) in order to start the synchronization.
6. If the Power plant does not synchronize, change the phase PID of the **MASTER** (assuming that the **GENSYS** PID parameters are properly set).

VERIFICATION

1. Disconnect the Bus circuit breaker control output on the module.
2. Make sure that there is voltage on the Mains side. The Mains LED should be lit.
3. Press  to be in **MAN** mode. Press  (Mains breaker) in order to close the Mains breaker. The Mains breaker LED is lit.
4. Start the Power plant by pressing  and check the ***Display/Synchronization*** page.
5. Press  (Bus breaker) when the Power plant is ready.
6. Press  to go to the Information page and check if the module is in synchronizing mode.
7. Go to ***Display/synchronization*** and check the phase difference. When the phase difference is 0° follow the instructions bellow:
   - Check the rotating fields and the concordance of the phases upstream and downstream of the circuit breaker.
   - Check the wiring of the Bus and Mains voltage references.
   - Check the potential difference between Ph1 Bus and Ph1 Mains. The potential difference must be bellow 10% of the nominal voltage. Check the potential difference between Ph2 Bus and Ph2 Mains as well.
8. Stop the Power plant by pressing  .
9. Reconnect the circuit Bus breaker control.
10. Start the Power plant by pressing  .
11. Press  (Bus breaker) when the Power plant is ready. The Power plant should synchronize and then close its Bus breaker.

LOAD/UNLOAD RAMP

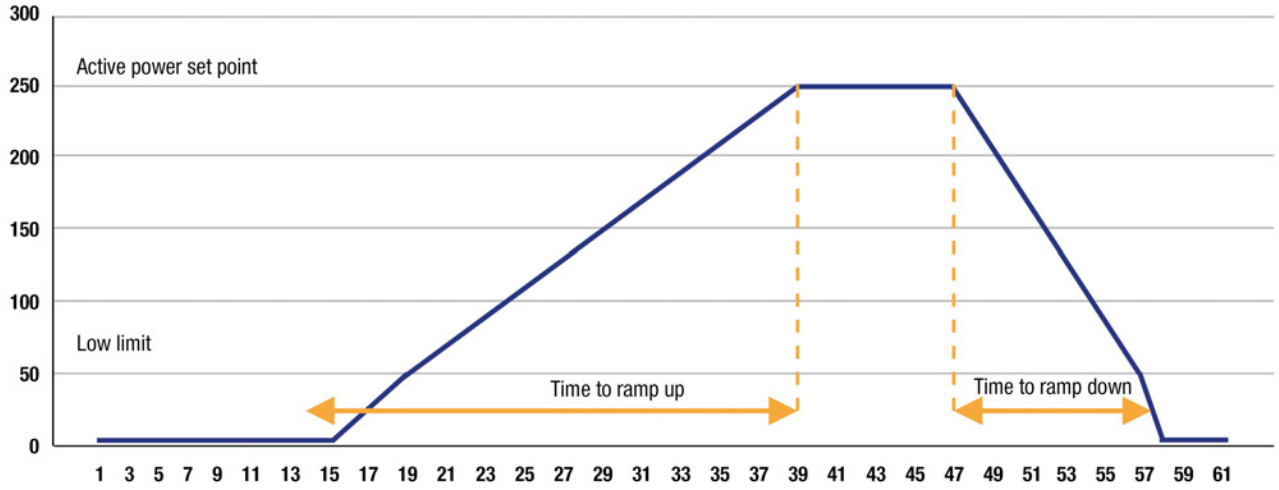
FUNCTIONING

After a synchronization, the module ramps up the Power plant load (soft transfer) to avoid overload or a load impact (hard transfer).
The module calculates the active power set-point according to the configuration (base load, peak shaving and No break change over). It then starts a load ramp to progressively reach this value.
During the ramp, the module keeps a constant power factor, set by the power factor set-point [2253] parameter, in order to start a reactive power ramp.

If the production request is stopped, the module starts an unload ramp to progressively reach the Power plant low limit.

The parameters to be set are the following: Power plant Low limit [2851], Load ramp time [2853], Unload ramp time [2856]. The timers [2853] and [2856] correspond to the time required to reach the nominal load.

Example: Power rating of the Power plant = 500KW, Load Ramp time = 50 seconds, Unload Ramp time = 22 seconds:



Before stopping the Power plant, the module reduces its load to the low limit and then opens the circuit breaker.
If the breaker opening fails at the end of the ramp, the Power plant continues to share the load and shows a breaker opening fault on display.

VERIFICATION

For this test, an available load is important.

1. Check that the power measured per phase is positive and balanced.
   - Go to ***Display***. Otherwise check the currents connections.
2. Check that the current power follows the set-point of KW or KVAR during ramps.

REGULATION KW/KVAR MASTER

FUNCTIONING

The module switches to the regulation mode on KW and on KVAR around its set-point after a load ramp.

The KW set-point is calculated differently depending on the following modes:

- Base load mode: Power plant KW set-point.
- Peak shaving mode: Mains KW set-point.
- No break change over: alternatively: Power plant KW set-point and Mains KW set-point.

The module regulates KVAR according to the power factor set-point [2253]. The parameter **High active power threshold** [2852], configurable in ***CRE Config Software/Configuration/Bus,*** forbids the Power plant to take more active power than the H**igh active power threshold**. The remaining active power goes directly to the Mains.

PROTECTIONS

FUNCTIONING

The protections are triggered by an internal or external event (alarms, faults, logic inputs, soft loss, etc.). In order to protect the process, engine or alternator, an action must be associated with the events. These actions are of different kinds:

- They can just raise an alarm; warning can be viewed on the LCD screen (ANSI30); a report can be retrieved.
- They can protect the equipment: the engine stops, the circuit breaker opens safely... and can activate an output.
- They can use an alternative solution (reconfiguration) that we will call **Fall-back**.

Value	Type	Action	Description
0	–	Off (no action)	–
1	Fall-back	Bus electrical fault	The protection opens the Bus circuit breaker and tries to re-synchronize again after the timer [2806]. The number of resynch attempts is set by variable [2807], it means that if the fault that has tripped the Bus circuit breaker is happening again after each attempt, the Power plant will be stopped. The number of attempts is reset with the reset function.
2	Fall-back	Mains electrical fault	Mains electrical fault: The protection opens the Mains circuit breaker. It is possible to delay the opening command of the Mains circuit breaker to fit with the circuit breaker type [2312]. The Mains electrical fault is also the action to setup on any Mains electrical protection to start the Generator automatically in case of loss of Mains power, this action is set by default to yes, variable [2309] "**Authorization to start on mains electrical fault**". Once the Mains electrical fault is off, it will be automatically reset and the module will allow the Generator to stop after its configured sequence (synchronization and load transfer or change over), a specific timer is available to delay the reset of the Mains electrical fault in order to make sure the Mains power is safe [2009].
3	Alarm	Alarm	Notice as alarm on front panel, displayed information only, no action.
4	Fault	Fault (soft shutdown)	Bus circuit breaker opens allowing the generators to open theirBus circuit breaker and cool down for the duration of the cool down timer before stopping.

These actions have to be configured with ***CRE Config Software***. List of potential alarms/faults can be downloaded via ***CRE Config Software/System/PC transmit/receive: List of actions on alarms-faults***.

A digital output can be configured to indicate that the protection is active.
*Note: The protections are active whatever the operating mode is (**MAN**, **AUTO**, **TEST**).*

All the protections available for the product are explained in the protection chapter Software variables. **Specific protections are explained below.**

EMERGENCY STOP

The emergency stop function can be performed in two ways:

- Connect an **Emergency stop** button to an **Emergency stop** logic input. It is a purely software solution. It is a software treated emergency stop.

- Action on alarm/fault: select **Emergency stop.**

COMMUNICATION

Alarm/Fault	Description	Setting
CANopen	Communication error on CANopen.	[3058]

For **CRE-Link®** errors, check CRE-Link®.

BREAKER

Depending on the status of the module, an alarm or circuit breaker fault may occur. This can be a failure closing circuit breaker, failure opening circuit breaker, unexpected opening of the circuit breaker, unexpected closing of the circuit breaker.
Alarm or fault depends of the severity of the event.

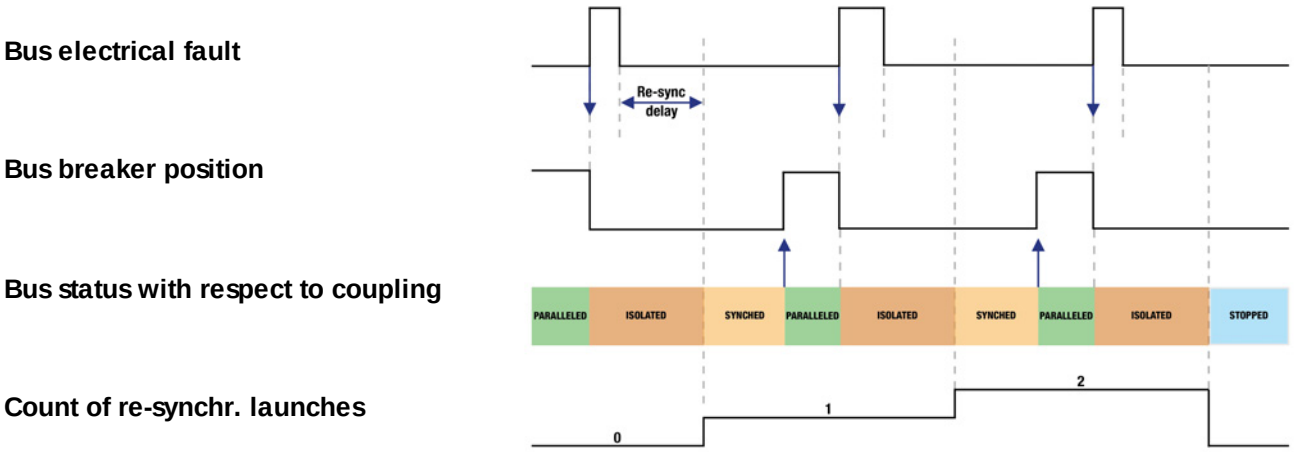
REATTEMPT TO CLOSE AFTER A BUS ELECTRICAL FAULT

A fault detected by the module is associated with a Bus electrical fault or an external fault.
After opening the circuit breaker, the module will reattempt to close it:

In the event of a Bus electrical fault:

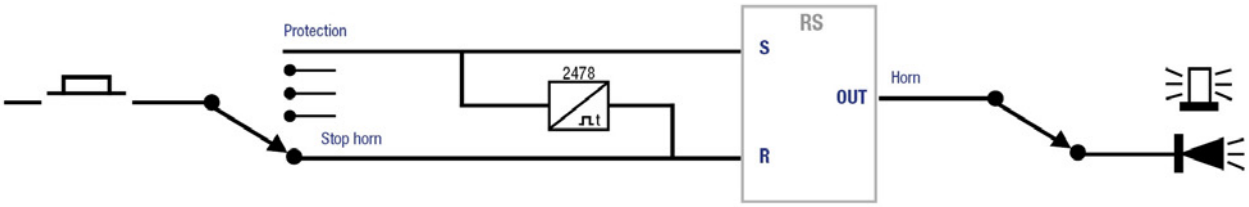
1. The module opens the circuit breaker.
2. The module will try X times according to [2807].
3. The module will wait X seconds between each attempt according to [2806].

Exemple with [2807] = 2:



AUDIBLE OR VISUAL WARNING DEVICE

To trigger an external alarm when a protection trips, connect the alarm to a logic output configured as a "**Horn**".
The signal duration is configurable by [2478] (0 means that the alarm will be activated until manual shutdown); alternatively, an input can be configured as "**Horn Off**" to manually stop the horn:



ALARM/FAULT RESET

To perform an alarm/fault reset:

- Locally:  + 
- Remote: use the "**Reset faults**" input function.

CONTROL LOOP PID

EMPIRICAL PID GAIN TUNING

1. Set all the gains to 0 (except G gain).
2. Increase the P gain until you have a stable oscillation.
3. Increase the D gain until the oscillation is canceled.
4. Repeat steps 2 and 3 until the D gain can't cancel the oscillation caused by the P gain.
5. Go back to the previous values of the P and D gains where the D gain cancels the oscillation caused by the P gain.
6. Increase the I gain in order to correct the error between the actual value and the set-point. Warning: A too high I gain might cause oscillations to the system. The I gain must correct the static error rapidly without oscillations (or small oscillations in order to gain some response time).

ADVANCED SETTINGS

UNLOAD BREAKER CONFIGURATION

FUNCTIONING

Several power management applications require the Power plant to gradually take the load depending on the current nominal power available. The unload breakers configuration allows the user to control, with the module, up to ten additional breakers. These breakers can then close after a "**nominal power available in the Power plant**" threshold and a preset time. The unload breaker priority follows an ascending order (from 1 to 10). All the unload breakers are closed when the Mains is available and the Mains breaker closed. The **Load Dependant Start/Stop** must not be enabled when this functionality is being used.

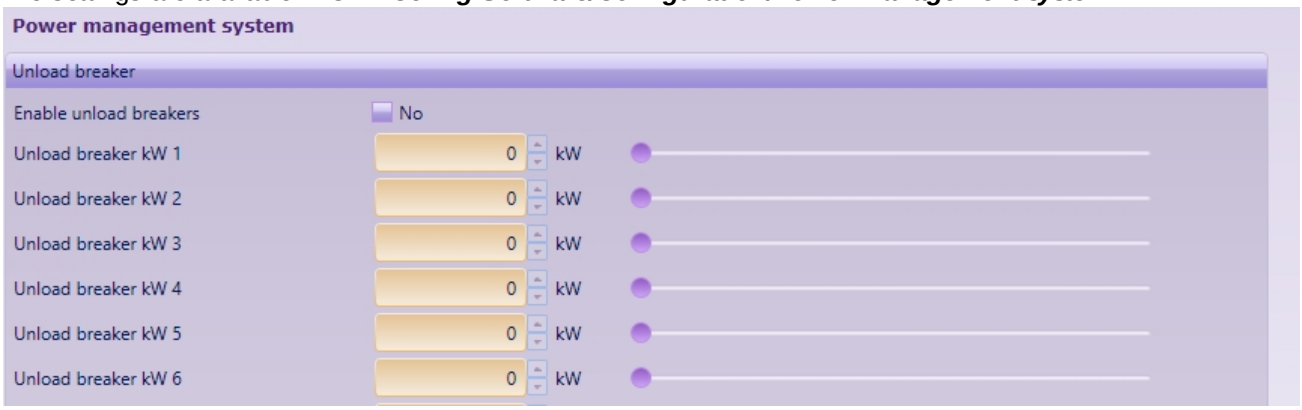
SETTINGS

Variables	Label	Value
[3730]	Enable unload breakers	-
[3731]	Unload breaker KW 1	Unload breaker n°1 active power threshold (KW)
[3732]	Unload breaker KW 2	Unload breaker n°2 active power threshold (KW)
[3733]	Unload breaker KW 3	Unload breaker n°3 active power threshold (KW)
[3734]	Unload breaker KW 4	Unload breaker n°4 active power threshold (KW)
[3735]	Unload breaker KW 5	Unload breaker n°5 active power threshold (KW)
[3736]	Unload breaker KW 6	Unload breaker n°6 active power threshold (KW)
[3737]	Unload breaker KW 7	Unload breaker n°7 active power threshold (KW)
[3738]	Unload breaker KW 8	Unload breaker n°8 active power threshold (KW)
[3739]	Unload breaker KW 9	Unload breaker n°9 active power threshold (KW)
[3740]	Unload breaker KW 10	Unload breaker n°10 active power threshold (KW)
[3720]	Unload breaker timer 1	Time before closing the breaker n°1 (s)
[3721]	Unload breaker timer 2	Time before closing the breaker n°2 (s)
[3722]	Unload breaker timer 3	Time before closing the breaker n°3 (s)
[3723]	Unload breaker timer 4	Time before closing the breaker n°4 (s)
[3724]	Unload breaker timer 5	Time before closing the breaker n°5 (s)
[3725]	Unload breaker timer 6	Time before closing the breaker n°6 (s)
[3726]	Unload breaker timer 7	Time before closing the breaker n°7 (s)
[3727]	Unload breaker timer 8	Time before closing the breaker n°8 (s)
[3728]	Unload breaker timer 9	Time before closing the breaker n°9 (s)
[3729]	Unload breaker timer 10	Time before closing the breaker n°10 (s)
[4721]	Unload breaker n°1	Output value of the unload breaker n°1
[4722]	Unload breaker n°2	Output value of the unload breaker n°2
[4723]	Unload breaker n°3	Output value of the unload breaker n°3

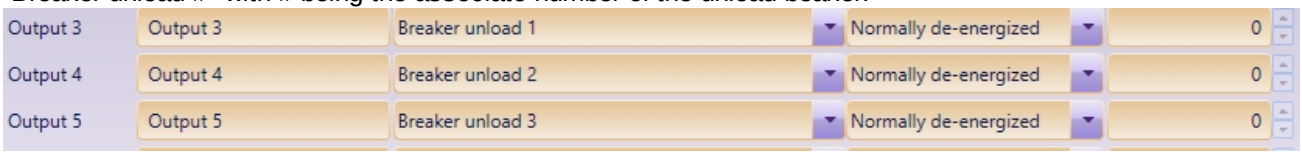
Variables	Label	Value
[4724]	Unload breaker n°4	Output value of the unload breaker n°4
[4725]	Unload breaker n°5	Output value of the unload breaker n°5
[4726]	Unload breaker n°6	Output value of the unload breaker n°6
[4727]	Unload breaker n°7	Output value of the unload breaker n°7
[4728]	Unload breaker n°8	Output value of the unload breaker n°8
[4729]	Unload breaker n°9	Output value of the unload breaker n°9
[4730]	Unload breaker n°10	Output value of the unload breaker n°10

CONFIGURATION WITH CRE CONFIG SOFTWARE

The settings are available in ***CRE Config Software/Configuration/Power management system:***



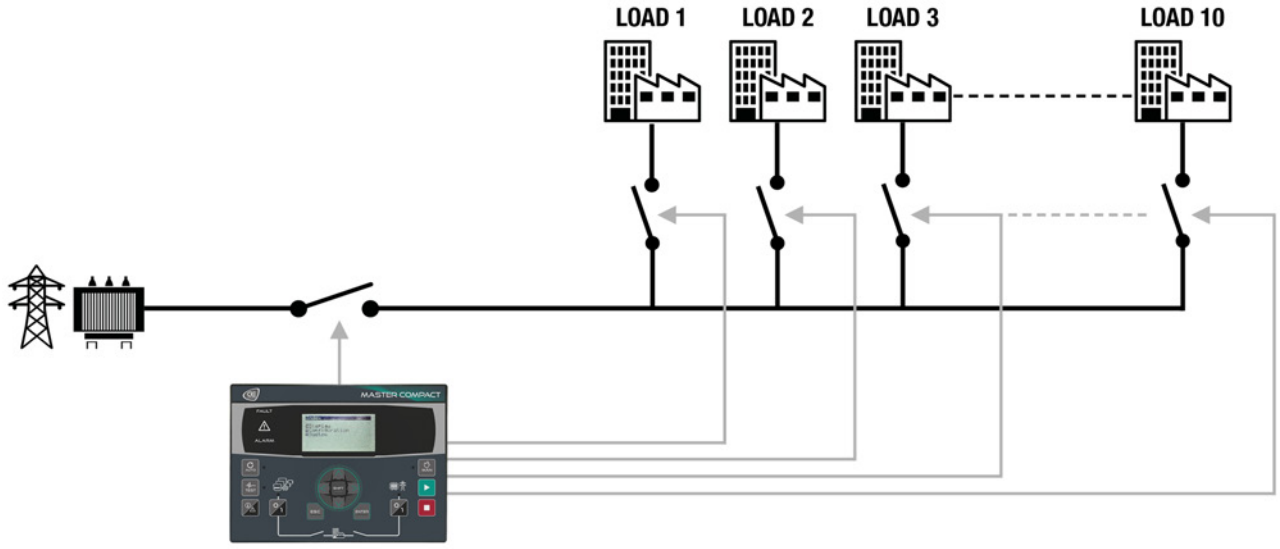
The outputs functions must be configured in ***CRE Config Software/Configuration/Digital outputs/relays*** to "Breaker unload #" with # being the associate number of the unload beaker:



EXAMPLE

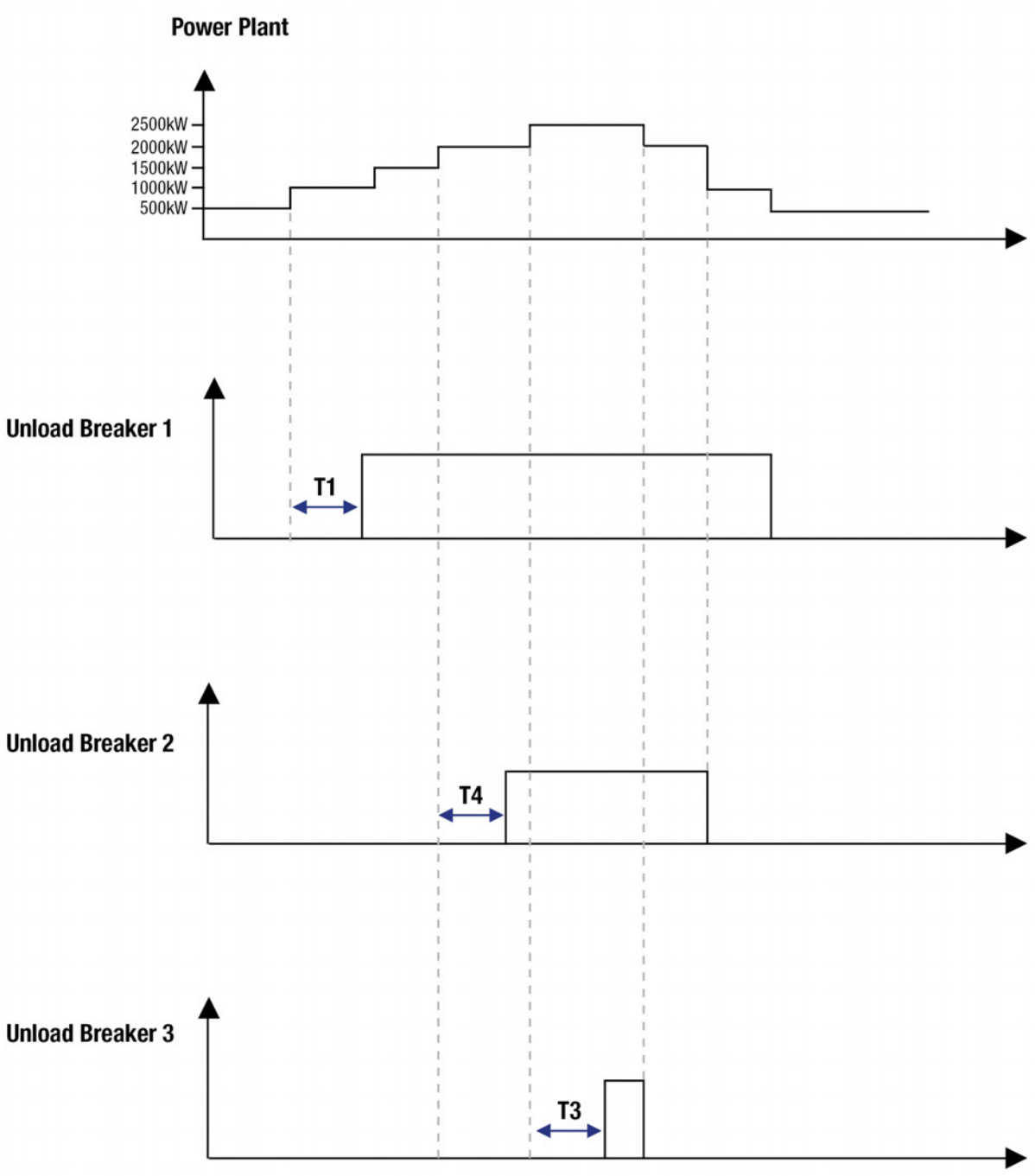
An application has a Power plant composed of 10 generators with a nominal power of 500KW each. The user configured its unload breakers:

Variables	Value
[3730]	1
[3731]	1000
[3732]	700
[3733]	500
[3734]	200
[3735]	1200
[3736]	50
[3737]	170
[3738]	350
[3739]	20
[3740]	800
[3720]	3
[3721]	3
[3722]	3
[3723]	3
[3724]	3
[3725]	3
[3726]	3
[3727]	3
[3728]	3
[3729]	3



The Power plant will take the load as such: When only one Generator is connected to the Bus, the Power plant has a nominal power of 500KW. Even though the load connected to the third breaker could be handled by the Power plant, the third unload breaker will not close due to the fact that the conditions for the first unload breaker to close are not respected. If a second Generator is connected to the Bus, the Power plant will have a nominal power of 1000 KW. The first unload breaker will close after 3 seconds. The second breaker will only close if the Power plant has at least a nominal power of 1700 KW and so on. The first breaker to open will always be the breaker with the highest number.

The behavior of the first three breakers are shown in the figure below:


Power Plant
2500kW
2000kW
1500kW
1000kW
500kW
Unload Breaker 1
T1
Unload Breaker 2
T4
Unload Breaker 3
T3

MAINS APPLICATION

In Mains paralleling applications, if a "Mains electrical fault" is managed (with protections or logic inputs), the Power plant starts and takes the load when the Mains fail, even if the remote start is disconnected. In all cases, a Mains protection must be set to start the Power plant if the Mains disappears.

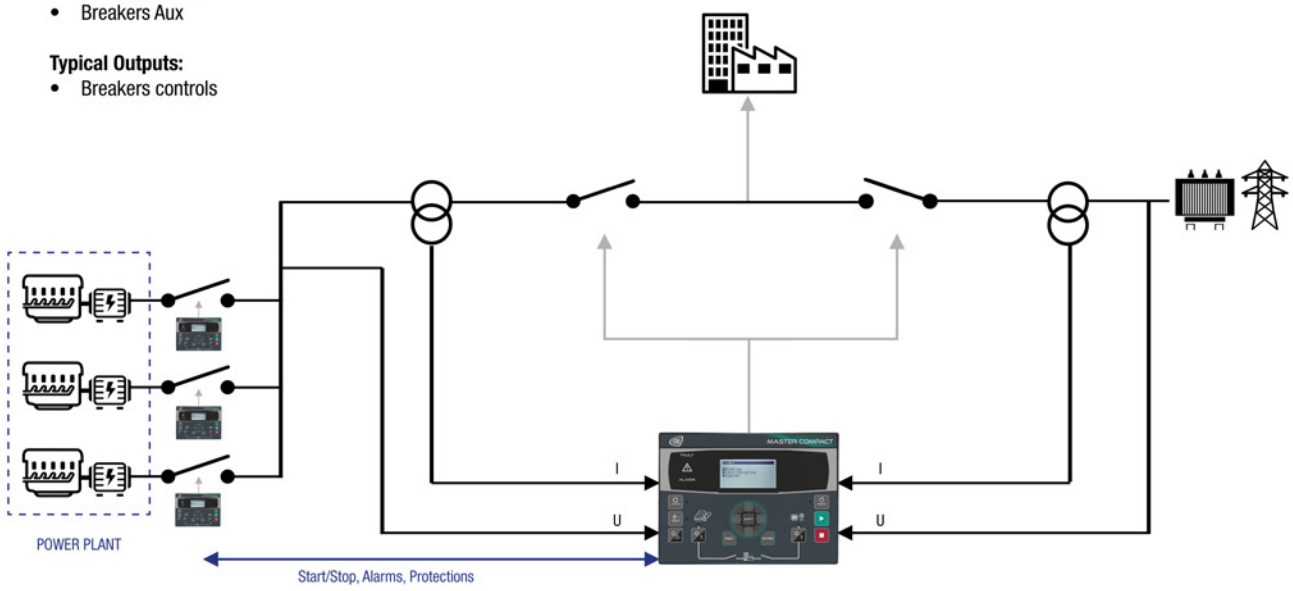
CHANGE-OVER MODE

GENERAL INFORMATION

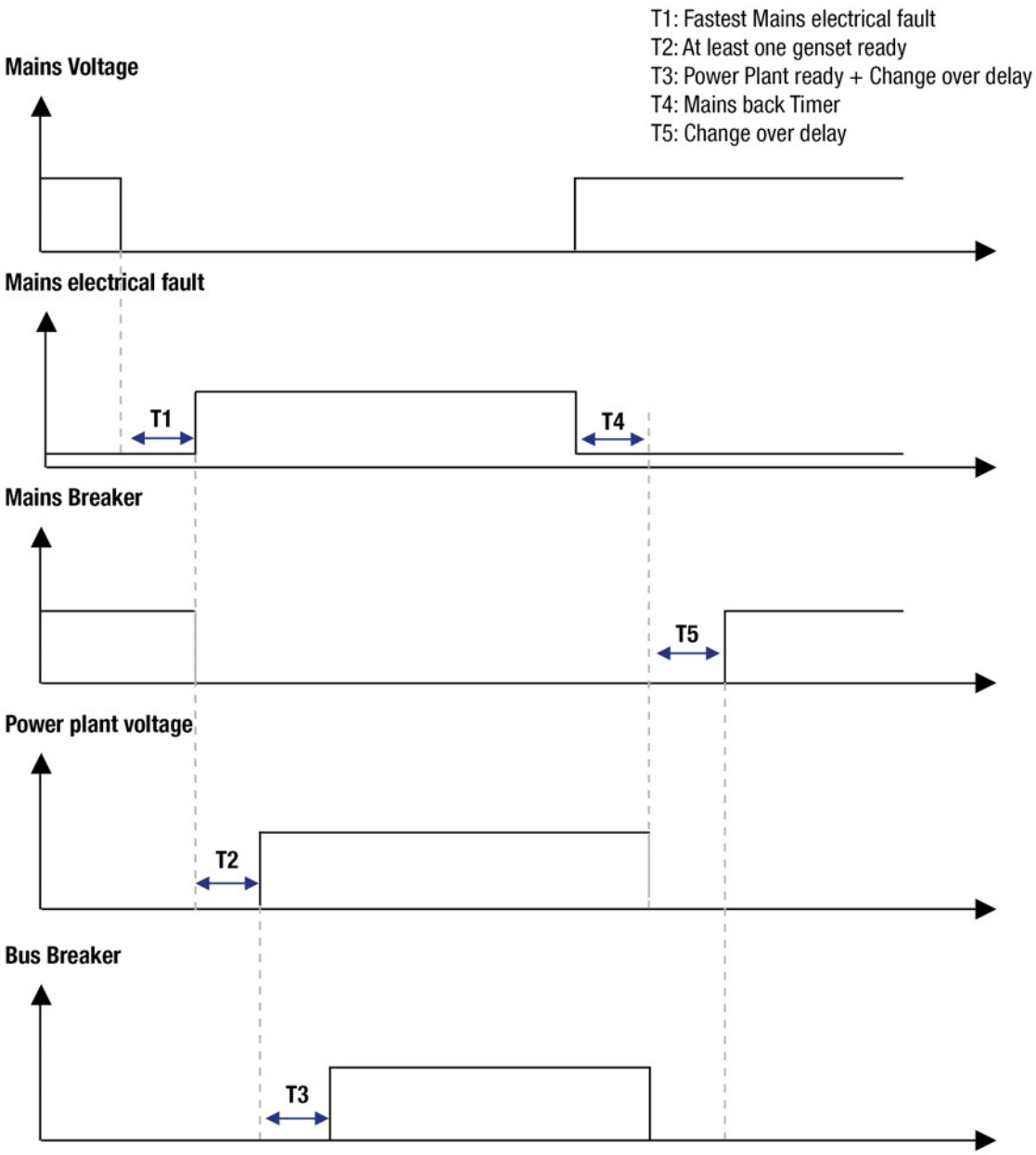
Main Functions:
- Manual mode
- Automatic mode
- Test mode

Typical Inputs
- Remote Start
- Emergency Stop
- Breakers Aux

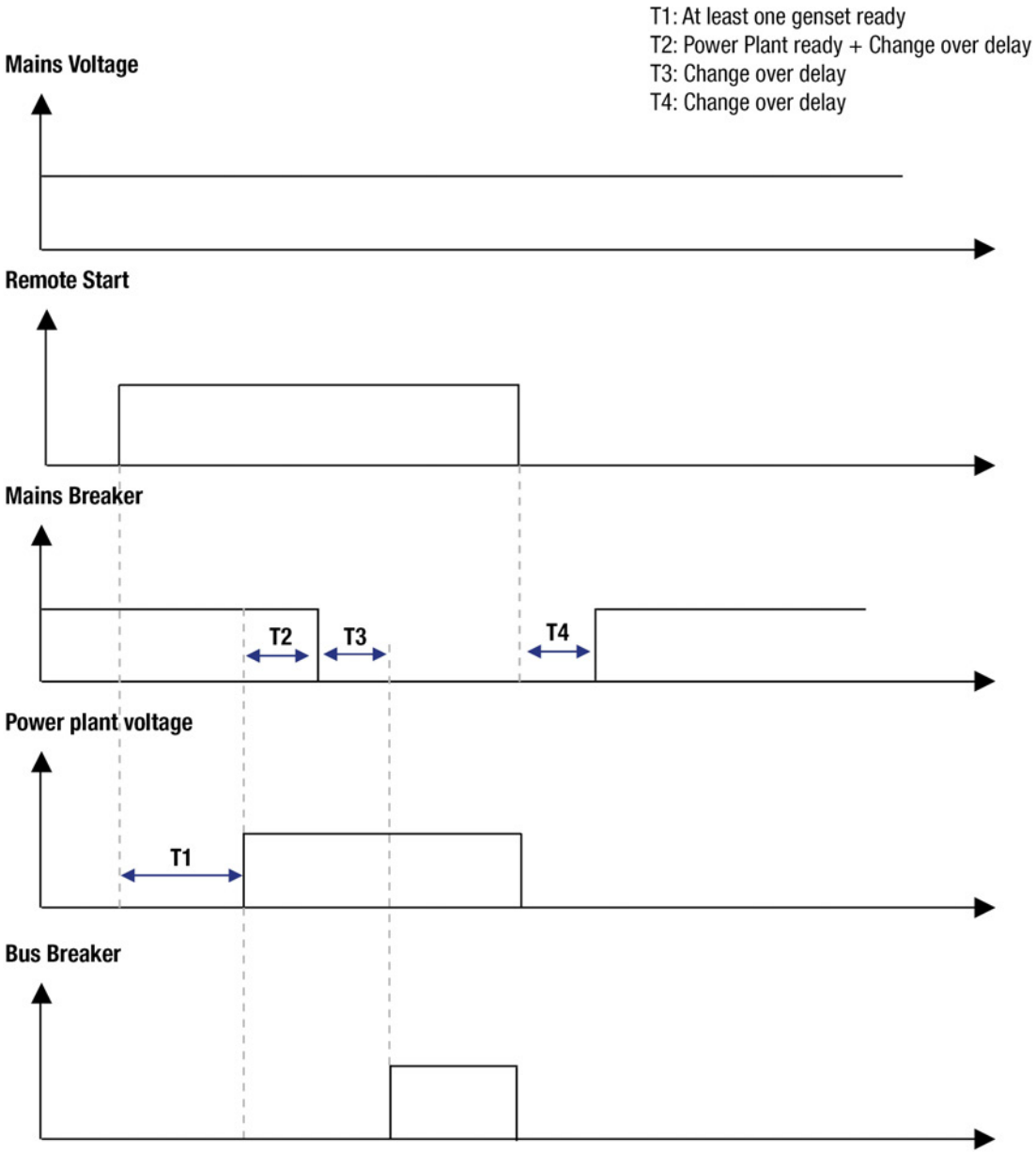
Typical Outputs:
- Breakers controls



In change-over mode the module orders the Power plant to start in the event of a Mains failure. The module opens its Mains breaker and orders the Power plant to close its Generator breakers. The module then waits until the requirements needed for the Power plant to be ready are met (configurable with the parameters [2108] and [2109]) to close its Bus breaker and take the load.
When the Mains returns, the module orders the Power plant to open its Generator circuit-breakers after a preset time, opens its Bus breaker and closes its Mains breaker.



If a remote start is activated when the Mains is present, the module orders the Power plant to start its generators, opens the Mains breaker and orders the Power plant to close its Generator breaker. The **MASTER COMPACT** then waits until the requirements needed for the Power plant to be ready are met (configurable with the parameters [2108] and [2109]) to close its Bus breaker after a preset time and takes the load.



SETTINGS

Variables	Label	Value
[2005]	To mains operation	Change over [0].
[2009]	Mains back timer	Waiting times to ensure a stable return of the Mains.
[2007]	Change over time delay	-
[2000]	Number of generators	Number of generators in the Power plant.
[2108]	Power plant minimum KW	Minimum active nominal power needed to consider the Power plant ready.
[2109]	Power plant minimum number of GE	Minimum number of generators to run needed to consider the Power plant ready.

Note: In order for the module to correctly control the Power plant (which is controlled with **GENSYS COMPACT PRIME** units), the parameter [2017] must be correctly configured in each **GENSYS COMPACT PRIME** unit. Each **GENSYS COMPACT PRIME** unit must be in **AUTO** mode without a remote start input activated.

OPERATING MODE

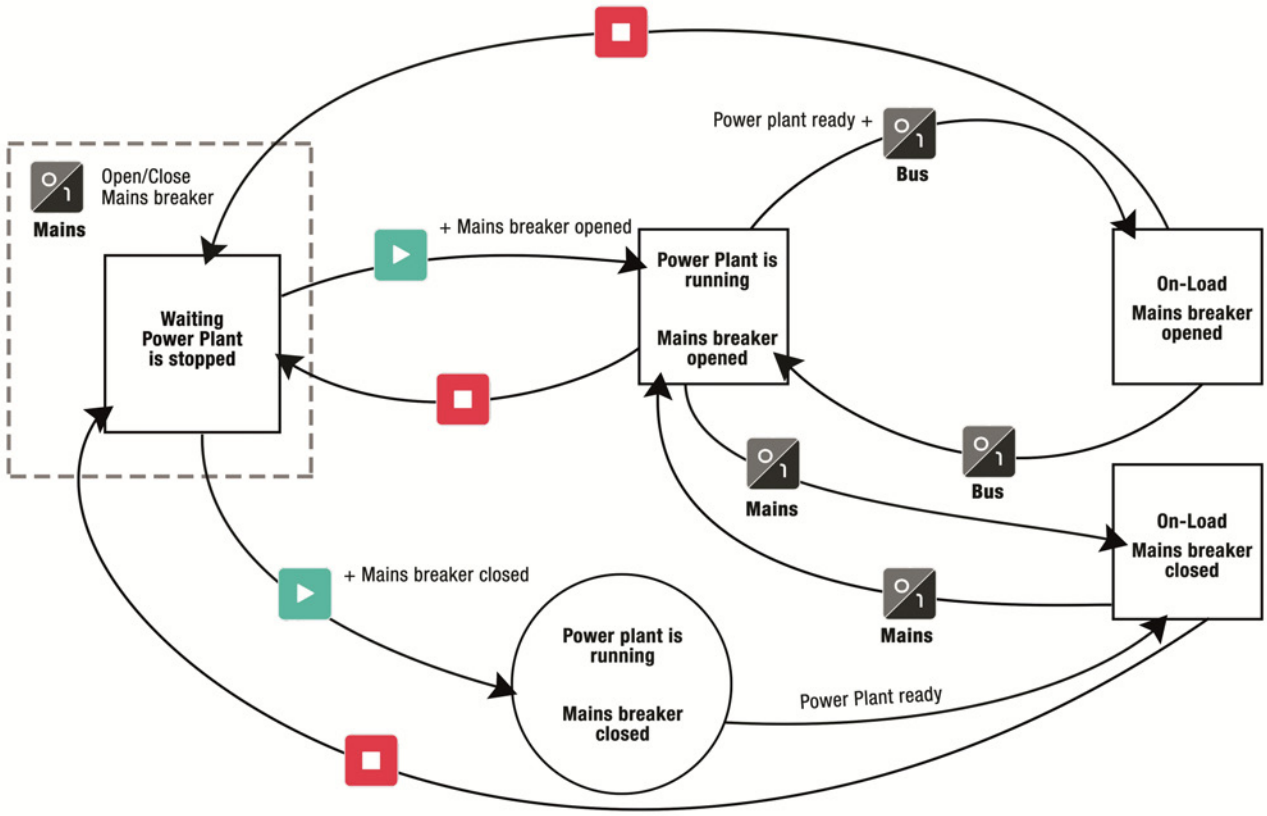
MAN

1. Press 

: the associated LED lights up.
2. Press  : the module orders the Power plant to start.
3. Press  (Mains breaker) to open the Mains breaker (assuming the load is supplied from the Mains at the start of operation).
4. Press  (Bus breaker) to order the generators to load (only possible if the Mains circuit breaker is open).

The Power plant powers the load.

1. Press  (Bus breaker) so that the Power plant leaves the load; the Power plant continues to run.
2. Press  (Mains breaker) to close the Mains breaker (only possible if the Bus breaker is open).
3. Press  to stop the Power plant.



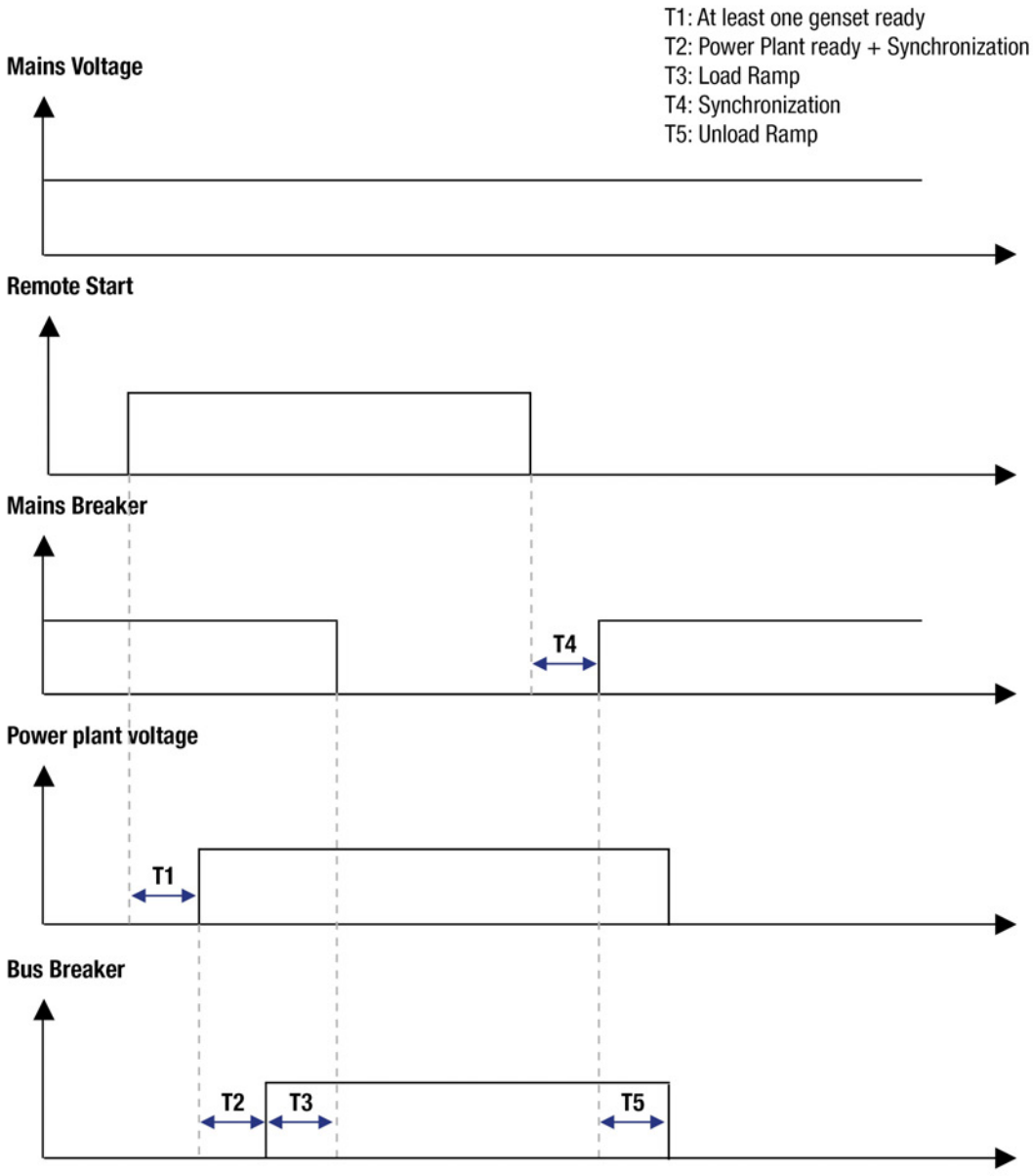
AUTO

AUTO mode requires the use of a logic input configured as **Remote start**.

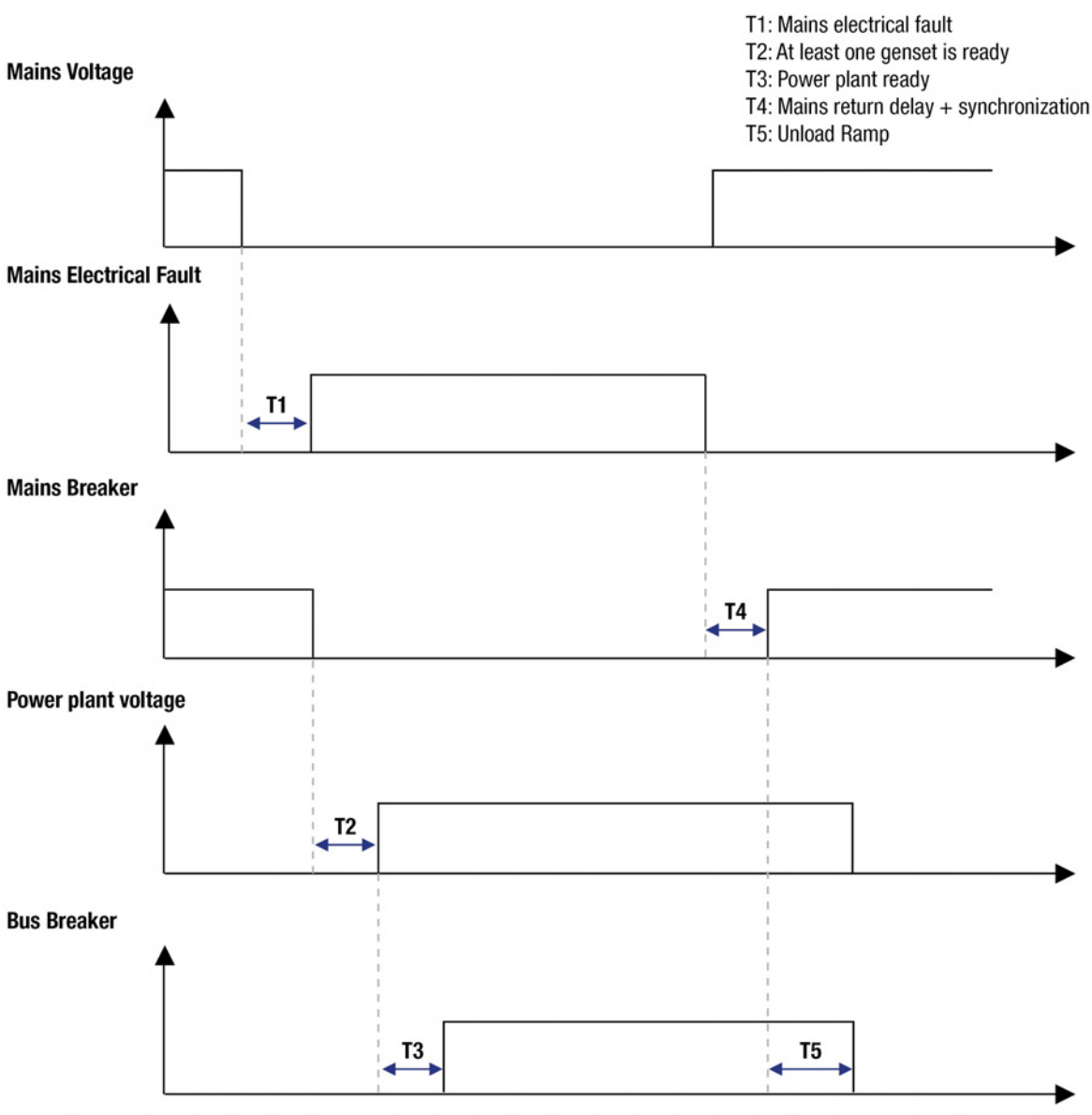
NO BREAK CHANGE OVER

GENERAL INFORMATION

When the remote start is on, the Power plant starts, synchronizes, parallels to the Mains when it is ready (configurable with the parameters [2108] and [2109]) and then takes the load (ramp up). Once the Mains is unloaded, the module opens the Mains breaker as described in the following figure:



When the remote start is off, the module synchronizes the Power plant to the Mains, closes its Mains breaker, parallels with the Power plant and order the Mains to take the load. The module then opens its Bus breaker as described below:



SETTINGS

Variables	Label	Value
[2005]	To mains operation	Change over (Value = 0), No break change over (Value =1) and Permanent (value = 2).
[2008]	Mains low limit	In No break change over mode, the Mains power set-point has to be reached during ramp down load before opening the Mains circuit breaker.
[2253]	Setpoint cos(ϕ)	Power plant cos(ϕ) set-point when the Power plant is in parallel with the Mains (during load and unload ramps).
[2009]	Mains back timer	Waiting times to ensure a stable return of the Mains.
[2108]	Power plant minimum KW	Minimum active power needed to consider the Power plant ready.
[2109]	Power plant minimum number of GE	Minimum number of generators needed to consider the Power plant ready.

Note: In order for the module to correctly control the Power plant (which is controlled with **GENSYS COMPACT PRIME** units), the parameter [2017] must be correctly configured in each **GENSYS COMPACT PRIME** unit. Each **GENSYS COMPACT PRIME** unit must be in **AUTO** mode without a remote start input activated.

OPERATING MODE

MAN

1. Press 

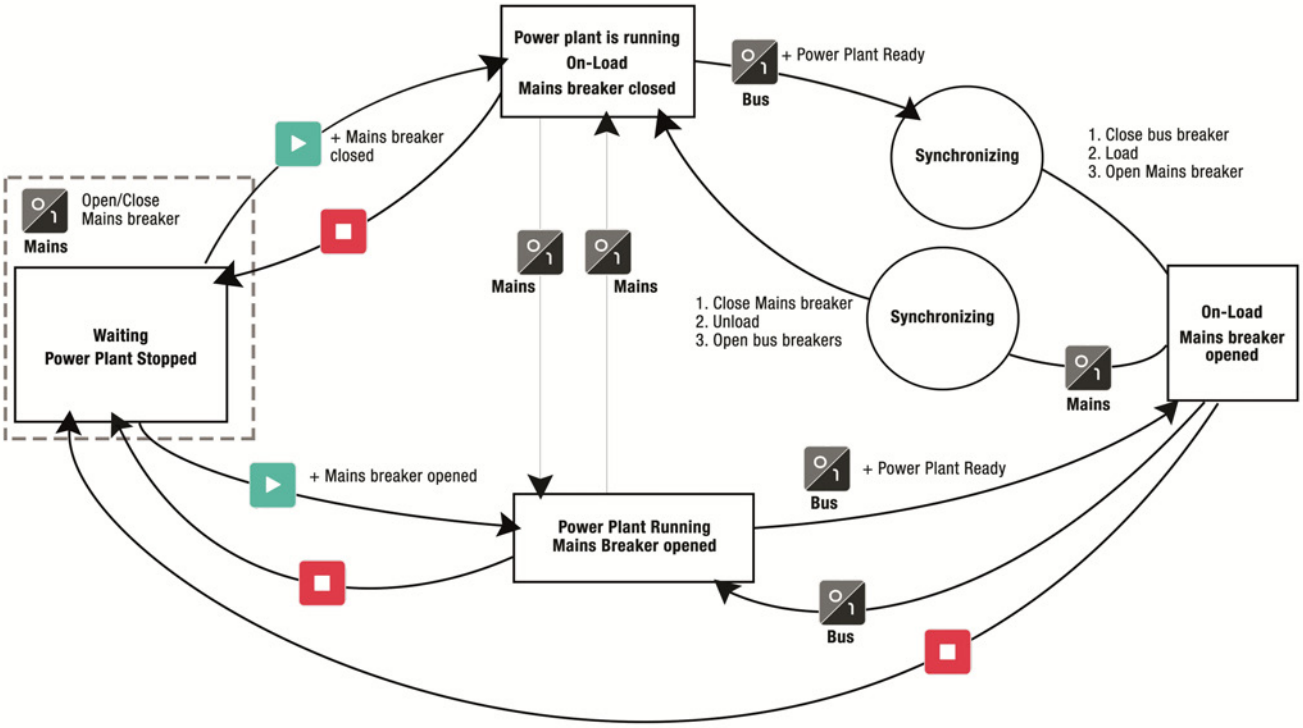
: the associated LED lights up.
2. Press  : the module starts the Power plant. The power plant's generators close their breakers.
3. Press 

(Bus breaker) to synchronize the Power plant to the Mains, start a load ramp and open the Mains circuit breaker.

The Power plant sets is on load:

1. Press 

(Mains breaker) to synchronize the Power plant to the Mains, start an unload ramp and open the Bus circuit breaker.
2. Press  to order the Power plant to stop.



AUTO

AUTO mode requires using a logic input configured as **Remote start**.
All sequences are managed automatically, as on previous picture.

Failure to synchronize

After a Mains fault, the Power plant is alone on the load. When the Mains comes back and the return to Mains temporization is over, the module tries to synchronize to the Mains.
If a failure to synchronize is configured as Soft shut down, the Bus breaker opens and the Mains breaker closes.

Operator controlled return to mains

Normal operation: In case of Mains failure, the Power plant starts and takes the load. When the Mains voltage returns, the Power plant re-synchronizes to the Mains and automatically gives back the load.
The "**Operator controlled return to mains**" special function allows the operator to control the moment the Power plant will return the load to the Mains.
To do this, a digital input of the module should be set as "**Manual mains back**". The unit will wait the synchronization order provided by the digital input before re-synchronizing the Power plant to the Mains.
Note: If the synchronization order is issued by Modbus TCP, the parameter [2010]-Manual Mains back should

be set to Yes-1.

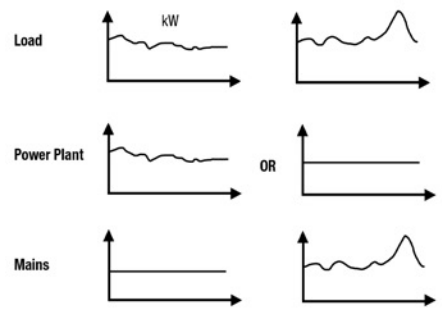
PERMANENT

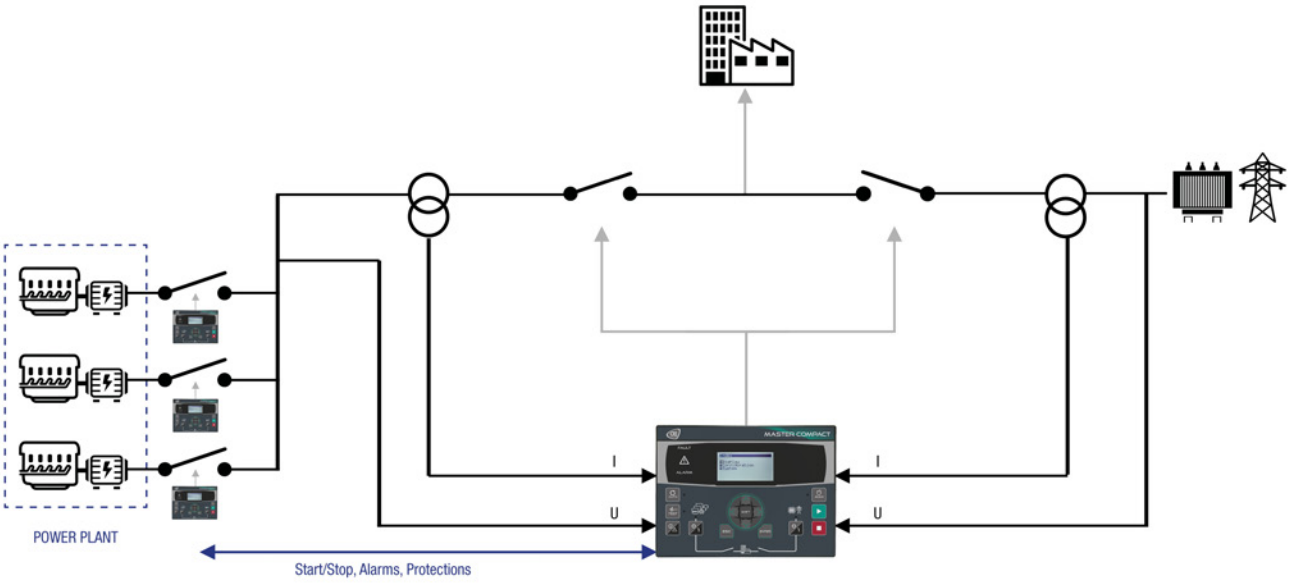
GENERAL INFORMATION

Main Functions:
- Manual mode
- Automatic mode
- Test mode

Typical Inputs
- Remote Start
- Emergency Stop
- Breakers Aux

Typical Outputs:
- Breakers controls





When the remote start is on, the module starts the Power plant, synchronizes and parallels the Power plant to the Mains when it is ready (configurable with the parameters [2108] and [2109]), then ramps up load until it reaches its set-point.

On base load mode, the Power plant has a constant load and the Mains takes the utility load variations. If the utility load is less than the Power plant set-point, the Mains is in reverse power.

In the peak shaving mode, the Mains has a constant load and the Power plant takes the utility load variations.

SETTINGS

Variables	Label	Value
[2005]	To mains operation	Permanent [2].
[2006]	Mains paralleling mode	Peak shaving [0]. Base load [1].
[2254]	Setpoint cos(ϕ)	Power plant cos (ϕ) set-point when the Power plant is in parallel with the Mains. This is an inductive power factor.
[2154]	Peak shaving instruction KW	Mains KW power set-point on peak shaving mode.

Variables	Label	Value
[2109]	Base load instruction KW	Bus KW power set-point on base load mode.
[2009]	Mains back timer	Waiting times to ensure a stable return of the Mains.
[2108]	Power plant minimum KW	Minimum active power needed to consider the Power plant ready.
[2109]	Power plant minimum number of GE	Minimum number of generators needed to consider the Power plant ready.

Note: In order for the module to correctly control the Power plant (which is controlled with **GENSYS COMPACT PRIME** units), the parameter [2017] must be correctly configured in each **GENSYS COMPACT PRIME** unit. Each **GENSYS COMPACT PRIME** unit must be in **AUTO** mode without a remote start input activated.

OPERATING MODE

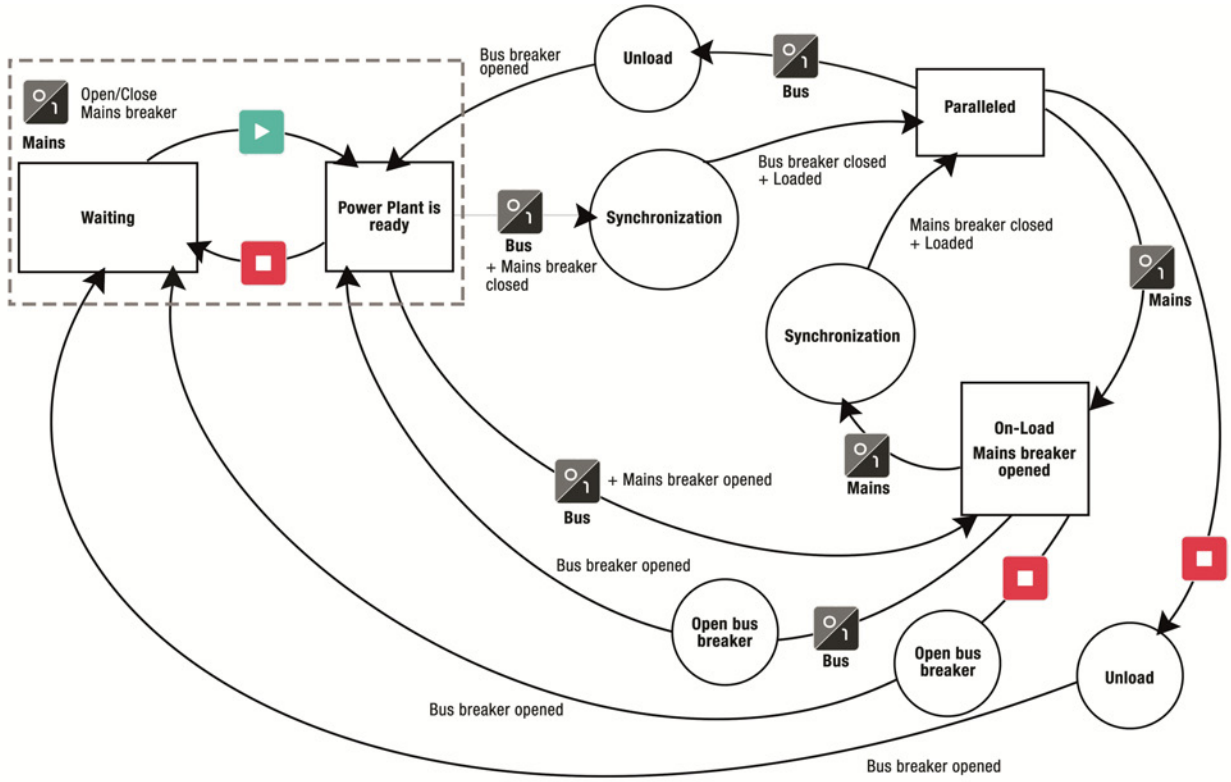
MAN

1. Press 

: the associated LED lights up.
2. Press  : the module orders the Power plant to start and close its Generator breakers.
3. Press  (Bus breaker) to synchronize the Power plant to the Mains and do a load ramp to the KW set-point (Bus KW set-point in base load or Mains KW set-point in peak shaving) when it is ready.

The Power plant set is in parallel to the Mains and provides active power according to its configuration.

1. Press  (Bus breaker) to do an unload KW ramp and open the Bus circuit breaker.
2. Press  to order the Power plant to stop running and open its Generator breakers.



AUTO

AUTO mode requires using a logic input configured as "**External start**".
All sequences are managed automatically.

Failure to synchronize

After a Mains fault, the Power plant is alone on the load. When the Mains comes back and the return to Mains temporization is over, the module tries to synchronize to the Mains.
If a failure to synchronize is configured as Soft shut down, the Bus breaker opens and the Mains breaker closes

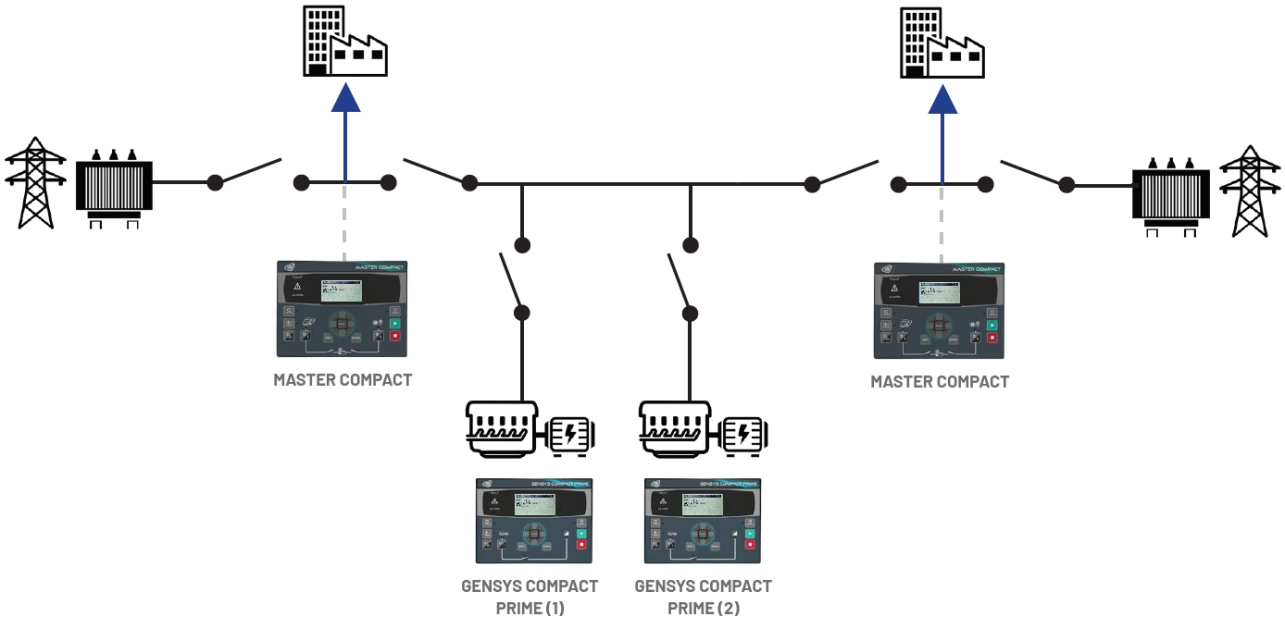
Operator controlled return to mains

Normal operation: In the case of Mains failure, the Power plant starts and takes the load. When the Mains voltage returns, the Power plant re-synchronizes to the Mains when it is ready and automatically gives back the load.
The "**Operator controlled return to mains**" special function allows the operator to control the moment the Power plant will return the load to the Mains.
To do this, a digital input of the module should be set as "**Manual mains back**". The unit will wait the synchronization order provided by the digital input before re-synchronizing the Power plant to the Mains.

Note: If the synchronization order is issued by Modbus TCP, the parameter [2010]-Manual mains back should be set to Yes-1.

SEVERAL MAINS

GENERAL INFORMATION



The **MASTER COMPACT** and the **MASTER COMPACT 1B** allow you to manage power plants with several Mains.
All **MASTER COMPACT** units communicate with each other to ensure that Mains are never paralleled (except in **MAN** Mode).

There are 2 different cases in which the **MASTER COMPACT** units communicate with each other in order to avoid paralleling between several Mains:

1. The generators are stopped, each Mains provides KW to its load. In this case, if the remote start of the **MASTER COMPACT** units are activated at the same time (less than 2 seconds between each activation), the **MASTER COMPACT** units communicate with each other so that the first to perform its sequence is the one with the lowest number. The global sequence will always be **MASTER COMPACT 1**, **MASTER COMPACT 2**, **MASTER COMPACT 3**, etc...
2. The 2 Mains circuit breakers are open. The 2 loads are supplied by the generators. In this case, if the remote start of the **MASTER COMPACT** units are disabled at the same time (less than 2 seconds between each deactivation), the **MASTER COMPACT** units communicate with each other so that the first to perform its sequence is the one with the highest number. The global sequence will always be **MASTER COMPACT** XX, ..., **MASTER COMPACT 3**, **MASTER COMPACT 2**, **MASTER COMPACT 1**, etc... The rule is the same when several Mains reappear simultaneously.

Here are several rules to respect which depend on the 2 cases seen above:

- The number of each **MASTER COMPACT** is not important if all **MASTER COMPACT** units are configured as no break change over.
- In the case of several **MASTER COMPACT** (2 circuit-breakers), there can only be one **MASTER COMPACT** in permanent mode. The **MASTER COMPACT** which is in permanent mode must have the highest number in order not to block the sequence (the Mains cannot be in parallel).
- No matter the number of the **MASTER COMPACT** in change over mode, they perform their sequence immediately since there is no risk of paralleling between the Mains.

SETTINGS

Variables	Label	Value
[2001]	My number	Parameter used to prioritize the sequences of the **MASTER COMPACT**.
[2005]	To mains operation	Only 1 **MASTER** in permanent mode per application. Must have the highest number [2001].

ADVANCED FUNCTIONS

SCHEDULER

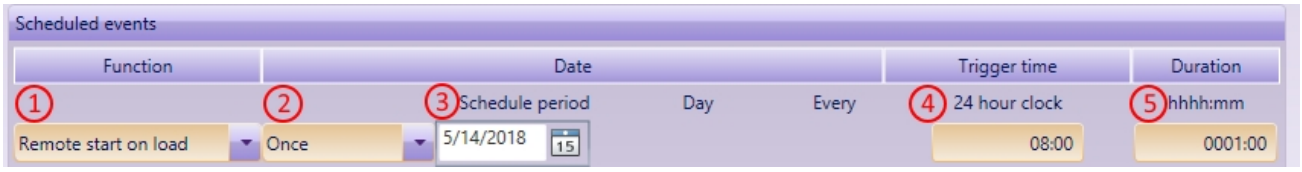
PRESENTATION

The Scheduler can activate any function that can be controlled by logic input. These functions can be activated once or repeatedly.

FUNCTIONING

The Scheduler is presented in table form. Each row in this table corresponds to an event. There are 2 types of events

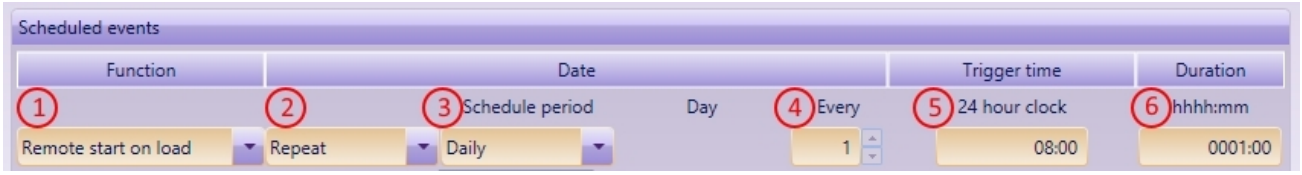
One-time Event



1. Function active during the event.
2. The event is punctual.
3. Date on which the event will take effect.
4. Time at which the event will activate. 24-hour format.
5. The length of time the event is active. Accuracy per minute.

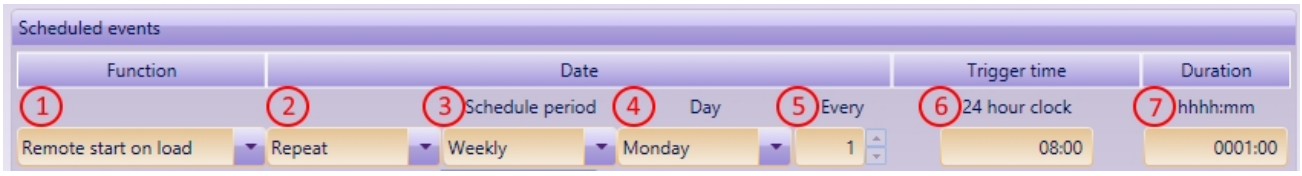
Repeated Events

Daily



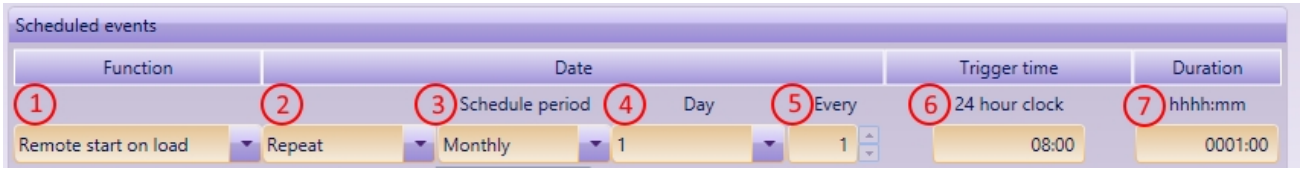
1. Function active during the event.
2. The event is repeated.
3. The event will be repeated every day (or every X day according to the parameter "every").
4. Allow to skip days.
5. Time at which the event will activate. 24-hour format.
6. The length of time the event is active. Accuracy per minute.

Weekly



1. Function active during the event.
2. The event is repeated.
3. The event will be repeated every week (or every X week according to the parameter "every").
4. Day of the week on which the event will take effect.
5. Allow to skip weeks.
6. Time at which the event will activate. 24-hour format.
7. The length of time the event is active. Accuracy per minute.

Monthly



1. Function active during the event.
2. The event is repeated.
3. The event will be repeated every month (or every X month according to the parameter "every").
4. Day of the month on which the event will take effect.
5. Allow to skip months.
6. Time at which the event will activate. 24-hour format.
7. The length of time the event is active. Accuracy per minute.

ALTERNATIVE SELECTIONS

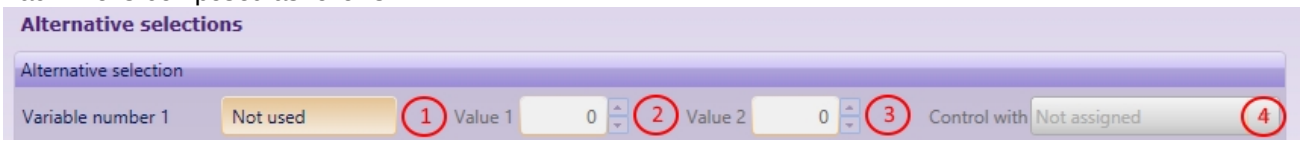
PRESENTATION

The **Alternative selections** function allows one or more parameters to be switched between two values via a digital input.

FUNCTIONING

This function can be set using the ***CRE Config Software/Configuration/Alternative selections***.

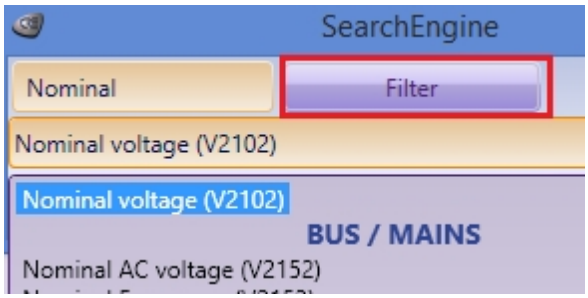
Each line is composed as follows:



1. Selection of the parameter using the search engine.
2. First value the parameter can take. This value is assigned to the parameter when the associated digital input is inactive.
3. Second value that the parameter can take. This value is assigned to the parameter when the associated digital input is active.
4. Variable to toggle between the 2 values. This variable must be assigned to a digital input. Using the same variable on several lines allows several parameters to be modified with one digital input.

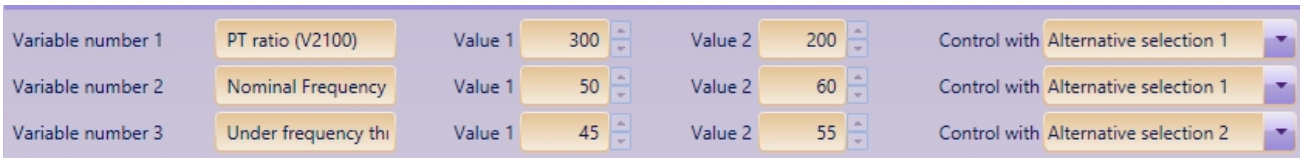
SEARCH ENGINE

To select a variable, click on the orange box to display the search engine. The **Filter** button allows you to quickly find the desired parameter:

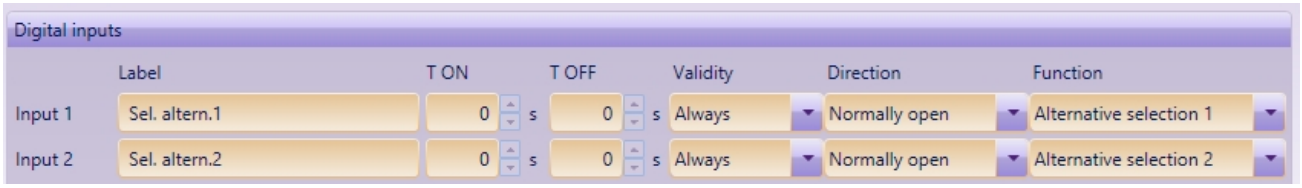


EXAMPLE

Page ***Configuration/Alternative selections***:



Page ***Configuration/Digital inputs***:



In the example above, digital input 1 allows you to modify the PT ratio and the Nominal Frequency parameters, and digital input 2 allows you to modify the **Under frequency threshold** parameter:

- Digital input 1 inactive: PT ratio = 300 and Nominal Frequency = 50Hz.
- Digital input 1 active: PT ratio = 200 and Nominal Frequency = 60Hz.
- Digital input 2 inactive: Under frequency threshold = 45Hz.
- Digital input 2 active: Under frequency threshold = 55Hz.

EASY FLEX®

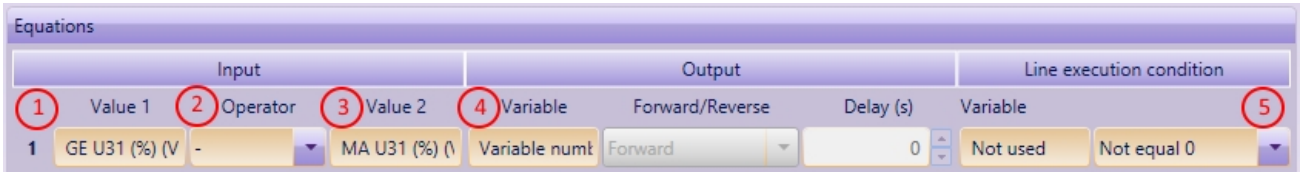
PRESENTATION

Easy Flex® offers a simple and innovative way of programming, allowing you to adapt the controller to your needs.

FUNCTIONING

Easy Flex® is presented in the form of a table. Each line of this table corresponds to an operation between 2 values. There are 2 types of operator.

CALCULATION OPERATOR



1. The first value of the operation can be a variable or a constant.
2. Transaction between value 1 and value 2. A calculation operator returns any type of value.
3. The second value of the operation can be a variable or a constant.
4. The result of the operation is stored in the selected parameter.
5. By default an operation is always executed (100ms cycle). The execution of the line can be conditioned by various variables. This mechanism allows the realization of an "if/else" condition.

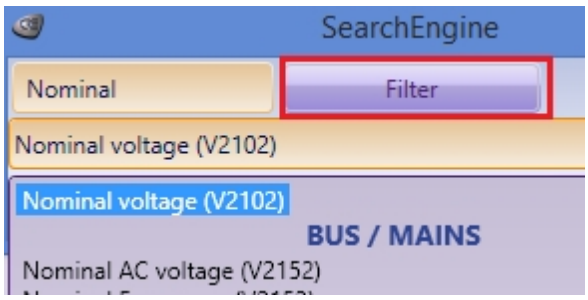
Overflow
When the operation between value 1 and value 2 is outside the range of the selected output parameter, the module will raise an alarm.
The number of the concerned line is indicated. The result of the operation is limited by the minimum or maximum value of the output parameter.

COMPARISON OPERATOR

1. The first value of the operation can be a variable or a constant.
2. Transaction between value 1 and value 2. A comparison operator always returns 0 or 1.
3. The second value of the operation can be a variable or a constant.
4. The result of the operation is stored in the selected parameter. Only boolean parameters can be selected.
5. Forward: 1 when the operation is right / 0 when the operation is wrong. Reverse: 0 when the operation is right / 1 when the operation is wrong.
6. The output changes to 1 (or 0 if **Reverse** is selected), if the operation is valid for X seconds (adjustable parameter). Default setting: no delay is applied.
7. An operation is always executed (100ms cycle). The execution of the line can be conditioned by various variables. This mechanism allows the realization of an "if/else" condition.

SEARCH ENGINE

To select a variable, click on the orange box to display the search engine. The **Filter** button allows you to quickly find the desired parameter.



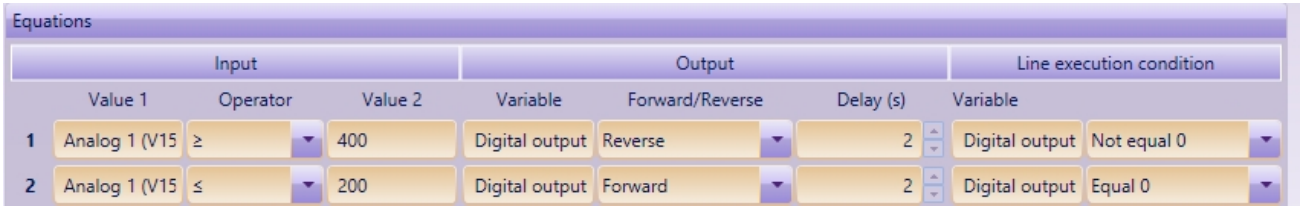
USER VARIABLES

To allow intermediate result storage, "**User variables**" are available. These variables can be used to:

- Perform calculations between more than 2 variables.
- Store a test to perform an if/else on the following lines.
- Store a result for reading by Modbus TCP.

EXAMPLE

Realization of a hysteresis:



WARNING EASY FLEX®

Variable [4214] provides more information about the **Easy Flex®** Warning alarm.

Here is how variable 4214 is calculated:
[4214] = (100 * Line concerned) + Error type

Here are the different types of errors:
1 : Operand 1 or 2 is invalid.
2 : Unknown operator.
3 : The variable "result" is 0.
4 : The variable "result" is read-only.
5 : The result is outside the allowed range of the target variable.
6 : Exceeding on at least one equation.
7 : Division by 0.

MODBUS TCP MAPPING

CONFIGURABLE BLOCK

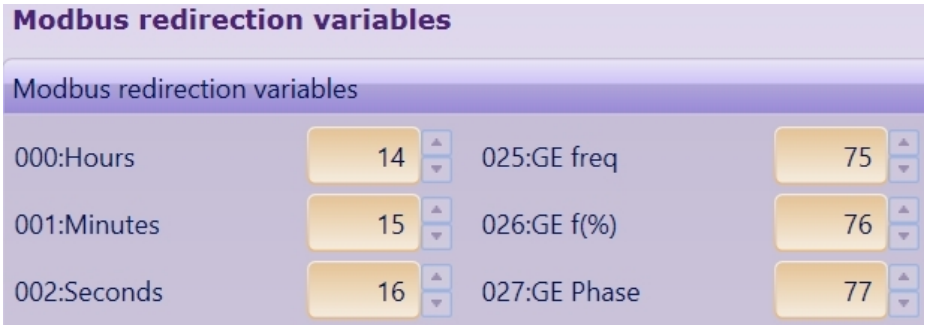
To create your own blocks, use the variables [10000]…[10299] in ***CRE Config Software/Configuration/Modbus redirection***.

There are two ways to configure these blocks:

1. Configuration in ***CRE Config Software/Configuration/Modbus redirection***: enter the codes of the variables to read; the readings on the registers [10000]…[10299] will be the pointed values.
2. Configuration by an external device; this device must request the following:
    - Write 1 to [3016] to enter into the configuration mode.
    - Write the codes to the desired registers ([10000]…[10299]).
    - Write 0 to [3016] to enter into the read mode.

Then to read your own block, you just need to read by Modbus TCP the register [10000]…[10299].

Example:
If the configuration is as follows [10000] = 14; [10001]=15; [10002]=16, the reading by Modbus TCP of the 3 registers will give to you the hours/minutes/seconds of the module.



LOGGER

The **Logger** tool is used to track value or status changes up to 10 variables at the user's choice. Power status variable is always recorded as long as the logger is not set to Off. This function is available in ***CRE Config Software/Configuration/Logger***.

Additional Functions

For each variable you can set a log period down to tenth of a second (example: 0.1s).
To use this function, select **Interval** in **Log on** box.
The **Erase logger** button will delete all recorded variables from the module.

A lot of variables can be recorded, (see Software variable appendix to select the needed variable).

COMMUNICATIONS

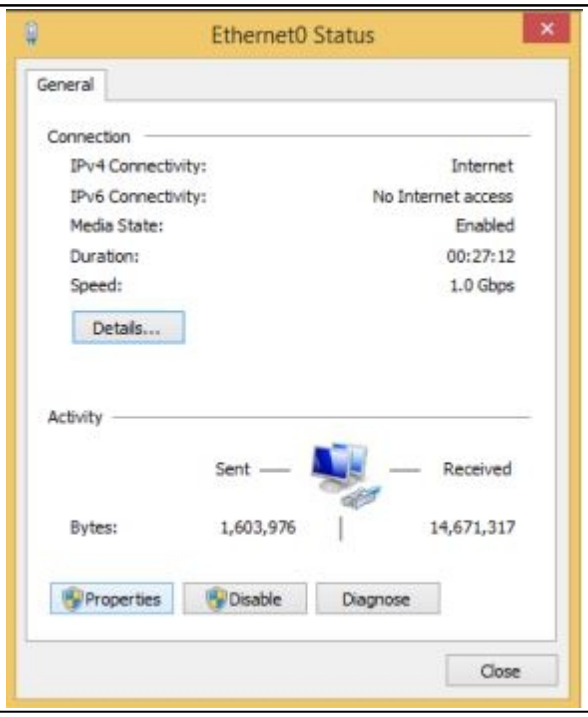
NETWORK

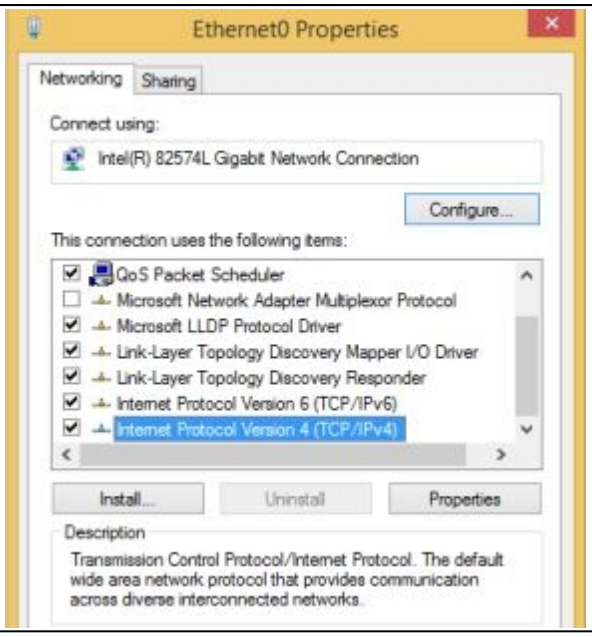
SETTING UP YOUR PC CONNECTION

Materials required:

- A CAT 5 cross Ethernet cable (marked CROSSOVER CABLE along its sheath) for direct connection to the module from your computer.
- The CAT 5 straight Ethernet cable (marked PATCH CABLE or STRAIGHT-THROUGH CABLE along its sheath) can only be used with an Ethernet switch.

CONFIGURING THE COMPUTER IP ADDRESS

Connect the module with a 100Ω Ethernet cord	Direct connection to PC: use a crossover cord. Connection through a switch: you can use either a direct or a crossover cable such as 3-m long A53W1, as long as your switch uses auto MDI/MDIX technology.
Power up the module using a stabilized power supply.	
Open Windows control panel	
Open **Network** and **Sharing Center** / Change **adapter settings** / (Connection to) LAN / **Properties** (Windows 7 & 8 & 10).	

Click on **Properties** (Windows 7 or 8 or 10).	

CHANGE THE IP ADDRESS OF THE MODULE

Using ***CRE Config Software*** (or LCD display), in the ***System/Network Configuration*** menu.
The module supports DHCP: in this case, the module must be connected to a network equipped with a DHCP server.
On power-up, the module obtains an IP address from the DHCP Server.
If the DHCP protocol fails, the fixed IP address of the module is used (Factory setting: 192.168.11.1).

On core module, you can reset the IP address (192.168.11.1) by holding the button on the rear face when the module is powered.

Note: Contact your network administrator to configure your router and/or the units according to your needs.

HOSTNAME

It is possible to assign a device name to the module in relation to its IP address;
You can then use this device name in ***CRE Config Software*** to connect to the module.
The device name can be change in ***CRE Config Software/System/Network Configuration*** menu.
Maximum length: 16 characters.
In Windows, the last character defines the type of service (0 is the usual value).
Allowed characters: reduced ANSI set;"-" and"." are allowed except as first and last characters.

MODBUS TCP/IP

ABILITIES

The complete list of variables is described in Software variables.
Through Ethernet communication where the module acts as a Modbus slave, you can:

- Upload many readings and module internal variables.
- Download values for many module internal variables.

Type	Range	Fault access right
Readings (measurements, states,..).	[0000] … [1999]	Read only.
Parameters.	[2000] … [3999]	Read/Write.
Modes, statuses, settings,...	[4000] … [9999]	Read.
Readings associated with digital inputs.	[4500] … [4649]	Write (subject to activation).

SUPPORTED FUNCTIONS

In addition, the following functions are supported:

- Reading bit-fields, listed in a dedicated tab of the file and organized in 16-bit words. These variables are listed in Software variables.
- Reading contiguous configurable data block.

Those functions allow a significant performance gain and help reducing the load on an Ethernet network.

CONFIGURATION

To communicate through Modbus TCP, define the following settings:

- Module IP address set in ***System/Ethernet.***
- Modbus TCP port [3014], generally 502, set in ***System/Ethernet.***
- Modbus TCP rights: see further.

The module handles up to 4 simultaneous connections. This can be used for multiple HMIs for example.
For more details on the Ethernet configuration, see Network.

FUNCTIONS

The module supports the following Modbus functions:

Functions	Description
01, 02	Read logical data (Coil status, discrete input status).
03, 04	Read holding/input registers (16 bit).
05	Write logical value (single coil).
06	Write single register (16-bit variable).
15 (0x0F)	Write multiple logical values (multiple coils).
16 (0x10)	Write multiple registers.

All module variables are 16-bit registers. Yet it might be useful to consider them as logical values (if they are only set to 0 or 1) to simplify Modbus TCP communication with some external PLC. If function 01 or 02 is used to read an internal register that is different from 0, then returned value will be 1.
The module registers start from address 0. Depending on your Modbus TCP client equipment-software, you may need to use an offset of 1 when reading/writing registers as addresses may start from address 1. In this case, request address/register number 1 to access variable 0000 inside the module.

The 32-bit variables can only be written using 0x10 function.
If a digital input modifies a piece of data also to be written by Modbus, the latest request takes over the other.

Data [10000]…[10299] can be read by block (see further).

ACCESS RIGHTS

The access rights depend on the parameter type and on Modbus access permissions. To manage access rights, set to 1 the corresponding bits in the word [3015]:

Description	Bit #	Default value
Writing to date/ time	0	0
Writing to Engine counters	1	0
Not used	2	0
Writing to digital input function register	3	1
Not used	4	0
Not used	5	0
Not used	6	0
Not used	7	0
Reading via Modbus TCP	8	1
Writing via Modbus TCP	9	1

Using ***CRE Config Software/System/Network configuration/Modbus TCP access rights***, you can tick check-boxes to set those:

Bit #	Label	Use
0	Writing to date/ time	Module time synchronization.
1	Writing to Engine counters	Manual counter adjustment (see following table).
3	Writing to digital input function register	Opens the possibility to activate a digital input function using Modbus TCP.
8	Reading using Modbus TCP	Opens the possibility to grant reading individual permissions.
9	Writing using Modbus TCP	Opens the possibility to grant writing individual permissions.

The counters, encoded on 32 bits, include:

Meters (MSB|LSB)	Label
0080|0079	Generator KWh
0082|0081	Generator KVARh
0084|0083	Engine running hours

BITFIELDS

Bit-fields are meant for decreasing communication bus load. They pack up to 16 logic variables inside a single register. This way, a single Modbus TCP request can be used to read a chunk of information. Each variable contains the current value of 16 logic variables such as breaker positions, faults, alarms…

They are listed out in Software variables.
The bit-fields [0956]…[0969] have latched values: a reset is required for them to return to 0.

*Note: Available data are related only to faults that occurred after the latest power up sequence. Events that occurred before the module has been power cycled are listed in the **FAULT** pages but not among the variables.*

MODBUS COMMUNICATION EXAMPLE

The table below shows a Modbus TCP client sending a reading request (function 04) of 6 registers starting from variable [0079].

Client request		**Module server response**	
Field	Value	Field	Value
Function code	04	Required function.	04
Starting Register (MSB)	00	Data bytes (=2*Nb of registers requested).	6
Starting Register (LSB)	79	Value of register 0079 (MSB).	*D0*
Count of registers (MSB)	00	Value of register 0079 (LSB).	*D1*
Count of registers (LSB)	06	Value of register 0080 (MSB).	*D2*
		Value of register 0080 (LSB).	*D3*
		Value of register 0081 (MSB).	*D4*
		Value of register 0081 (LSB).	*D5*

CRE-LINK®

PRESENTATION

This CAN bus is used as a communication means between units of a single Power plant, featuring:

- Active and reactive load sharing.
- Automatic load/unload.
- Static paralleling.
- Dead bus management.
- Segments and Power plant management.
- Other data exchange.

Standard CAN bus rules apply here. Refer to CAN bus good practices to connect units properly on CAN bus.

CAN BUS ALARMS/FAULTS

CAN communication between **CRE Technology** units is continuously checked by each unit on the CAN bus. The count of units connected to CAN bus must be the same as the count of units declared inside each unit. In case of a problem on the bus, alarms or faults can occur:

- Missing product: One or several **GENSYS COMPACT PRIME** are missing on the **CRE-Link®**.
- Missing master: One or several **MASTER COMPACT**/**BTB COMPACT**/**MASTER 1B COMPACT** are missing on **CRE-Link®.**
- Isolated product: The communication with the other products is lost. Check that the 120Ω termination resistors are used correctly (see CAN bus good practices). Check that CAN bus cable is properly connected.
- Unknown product: An incompatible product is connected on the CAN bus. The module will not start the Generator.
- Mismatch version: A module with an incompatible version is connected on the CAN bus. The module will share the load using droop.

Note: Problems can occur if two or more unit have the same Generator number.

For **Missing product**, **Missing master** and **Isolated product**, you can configure the behavior to be adopted in case of a CAN fault.

CANOPEN

CANopen extension modules can be used to increase the number of digital inputs and outputs of the module. Overall max. count of added inputs/outputs: 32 I and 32 O. They are read/written every 100ms.

CONFIGURATION

Setting	Label	Value	Description
[3151]	CANopen config	1 2 3 4	8 inputs + 8 outputs of coupler ID# 1 16 inputs + 16 outputs of coupler ID# 1 32 inputs + 32 outputs of coupler ID# 1 Custom configuration, defined by more settings.
[3153] [3154] [3155]	CANopen ID# 1 CANopen IN 1 CANopen OUT 1	0 … 255 0 … 32 0 … 32	Identifier of the first coupler. Count of inputs on the first coupler. Count of outputs on the first coupler.
[3156] [3157] [3158]	CANopen ID# 2 CANopen IN 2 CANopen OUT 2	0 … 255 0 … 32 0 … 32	Identifier of the second coupler. Count of inputs on second coupler. Count of outputs on the second coupler.
[3159] [3160] [3161]	CANopen ID# 3 CANopen IN 3 CANopen OUT 3	0 … 255 0 … 32 0 … 32	Identifier of the third coupler. Count of inputs on the third coupler. Count of outputs on the third coupler.
[3162] [3163] [3164]	CANopen ID# 4 CANopen IN 4 CANopen OUT 4	0 … 255 0 … 32 0 … 32	Identifier of the fourth coupler. Count of inputs on the fourth coupler. Count of outputs on the fourth coupler.

The assignment of I/Os is done in the order of couplers and the lower variable number is associated to the lower message number configured.

The CANopen inputs and outputs have the same attributes as regular inputs and outputs except the delay on drop-off of inputs:

Setting	Attribute
Digital inputs 1 … 32	
[3200] … [3231]	Function
[3232] … [3263]	Delay on pick-up
[3264] … [3295}	Validity
[3296] … [3327]	Direction
Digital outputs 1 … 32	
[3350] … [3381]	Function
[3382] … [3413]	Mode (direction): 0: Normally de-energized 1: Normally energized

On power-up, the configuration is automatically launched. The status [3150] turns to 1.
The error time-out [3152] is 10.0s by default.

VARIABLE MAPPING AND INPUTS/OUTPUTS

CANopen inputs and outputs are accessed by their code:

- Inputs: [0800]…[0831]
- Outputs: [4751]…[4782]

CAN BUS GOOD PRACTICES

This chapter describes rules to be used to ensure reliable CAN communication. These rules must be applied to all CAN communications, including **CRE-Link®** and ECU/remote I/O CAN bus.
In an EMI environment, use a shielded cable to connect CAN bus. The table below lists the DB9 CAN standard wiring:

Terminal	Standard CAN	Mandatory
1	Reserved	
2	*CAN L*	*X*
3	CAN GND	X
4	Reserved	
5	CAN SHLD (optional)	
6	GND (optional)	
7	*CAN H*	*X*
8	Reserved	
9	CAN V+ (optional)	
SHIELD		*X*

CABLES

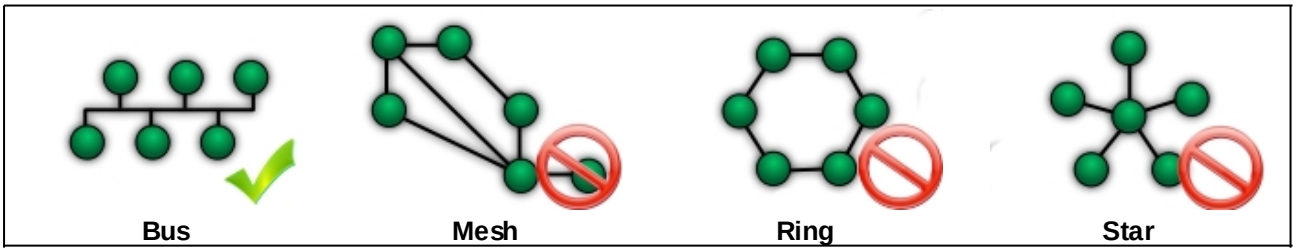
WARNING

RISK OF EQUIPMENT DAMAGE

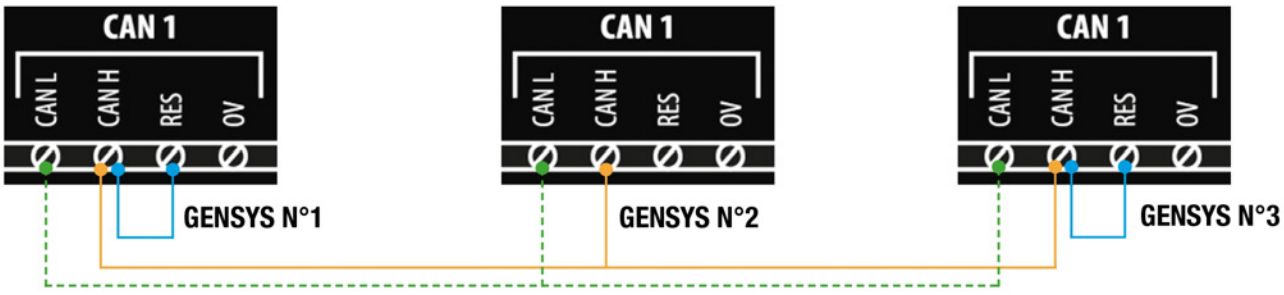
Switch off the unit before plugging or unplugging the CAN bus connector or disconnecting the wires.

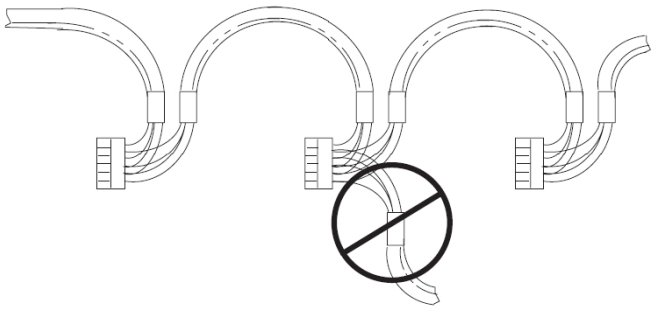
Failure to follow this instruction can damage the CAN transmitter/receiver.

Cables used must be selected to respond to CAN bus specificities. Always use shielded twisted wire pairs. Deploy the CAN bus (no mesh, ring or star topology) as shown below:



Both ends of the CAN bus must be terminated with a 120Ω resistor. The module has a 120Ω resistor for this purpose. Wiring the terminal RES to CAN H will link CAN L and CAN H with a resistor.
The next figure gives the example of three units connected through a CAN bus. Do NOT install any resistor nor link the terminal RES and CAN H together in the middle unit.





CRE Technology provides a complete range of products aimed at installing your CAN bus (cords, wires, connectors…).
Please contact your local **CRE Technology** distributor to help you to choose equipment that fits your needs.

MAXIMUM LENGTH & BIT RATE

The maximal length of a CAN bus depends mostly on the communication speed, but also on the quality of wires and connectors used.

The following table shows the maximal length of a CAN bus depending on the bit rate:

Bit rate (Kbits/s)	10	20	50	125	250	500	800
Maximal length (m)	5000	2500	1000	500	250	100	50

The next table lists the standard bit rate of each CAN protocol that can be used by a **CRE Technology** unit:

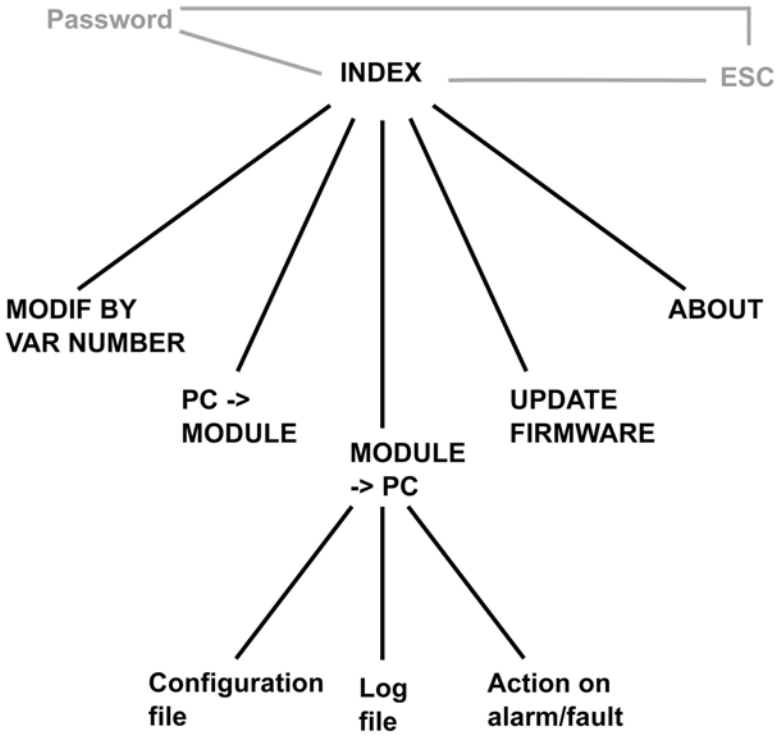
Bus	**Protocol**	**Bit rate (Kbits/s)**	**Note**
CAN1	**CRE-Link®**	125	Fixed.
CAN2	CANopen	125 (default)	Can be selected between 125/250/500/1000kbit/s (By ***CRE Config Software*** or modification by variable number).
	J1939	250 (default)	Switch automatically to the right speed when selecting an ECU type.

WEBSITE

ACCESS

MENU TREES

During navigation on the PC, press the **ESC** button to return to the parent menu of the page displayed in the browser.



ACCESS TO THE WEBSITE

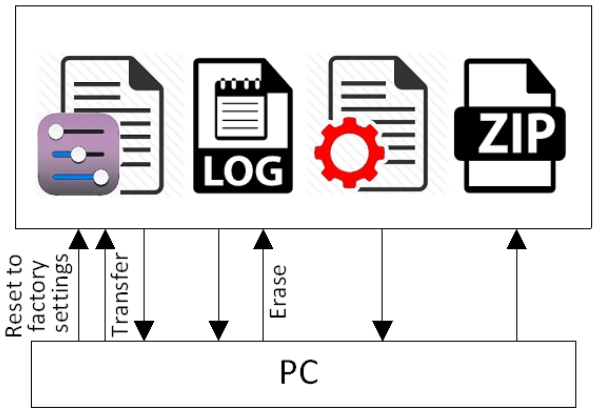
1. Connect a PC to the module via an Ethernet connector.
2. Use a web browser such as Firefox or Internet Explorer for example.
3. Enter the IP address (factory setting: http://192.168.11.1), or the module Hostname.
4. Enter the module password when the **Password** page appears (see chapter Password).

FILE TRANSFER

ADVICE	
	USEFUL INFORMATION
	▪ Adjustment tip ▪ Using the module
	Failure to comply with these recommendations may cause the module to malfunction.

File transfer is only possible when the engine is stopped.

These files can be transferred from or to the module.
For this, use ***CRE Config Software*** or the embedded website.



Note: CRE Technology strongly recommend using CRE Config Software to edit module settings to prevent any kind of error with manual editing in the configuration file.

FILE TRANSFER MODULE → PC

This page allows to download a file from the module to the PC:

- Configuration file.
- Log file.
- List of actions on alarms/faults.

Configuration File

To view the current module configuration in a web browser, select **Configuration File**.
In the browser, save this file in.txt format.

Data Backup File (log)

To display the module log in a web browser, select **Log file** and save this file in .txt format.

List of Actions on Alarms/Faults

By selecting "**Alarm/fault effect**", a file containing all potential alarms and faults and their usage is downloaded.

Example:

```
S/N:0114A0001
Type:A56Z0
Version:v1.00
Bootversion:v1.00
Date:28/06/15
Hour:12h25m21s

***** Alarm/fault effect *****

0 : Desactive
1 : Defaut Gen electrique
2 : Defaut Bus electrique
3 : Alarme
4 : Defaut non critique
5 : Defaut critique
6 : Help+Defaut non crit
7 : Help+Defaut Gen.Elec
8 : Statisme

Potentiel Alarm./Def.       Parametre actuel  ANSI C37-2
V00600 Etat CAN1          <-- V03052 = 8
V00602 CAN2 etat          <-- V03053 = 0
V04200 Survitesse         <-- V02352 = 3                    12
V04201 Sous vitesse       <-- V02355 = 0                    14
……
```

FILE TRANSFER PC → MODULE

This page allows you to send a configuration file, or a language file.
When the transfer operation is complete, the transfer result is displayed on the screen.

Note:

- *Before making a change to the module configuration, it is recommended to save the current configuration. File transfer is only possible when the Power plant is stopped (The module must be in the "**Waiting**" power state).*
- *Reset to factory settings must be done using **CRE Config Software** (password level 2 mandatory).*

FIRMWARE UPDATE

PREREQUISITES

1. Upgrading software is done via an Ethernet connection. It is mandatory to have a PC connected to the module (Use an Ethernet cable from module to PC without using LAN).
2. Stop the Power plant (The module must be in the **Waiting power** state).
3. Save the current configuration as a text file. Otherwise the default settings will be enforced (except for the Ethernet settings).
4. Disconnect all terminals, except the power supply and Ethernet connections.

Note: Be sure there is no Modbus request on the module during upgrading.

START UPGRADE

1. Connect to ***CRE Config Software/System/PC transmit/receive*** or to module website.
2. Select ***Update firmware*** and browse the archive.
3. Click on the ***Update*** button.
4. Alarm/fault LEDs blink and state is displayed on LCD screen.
5. Wait until ***Update firmware successful*** shows.
6. If needed, restore the settings from the text file previously saved.

*Note: The module will restart during the update process. Please wait for the "**Update firmware successful**" message before starting to use the module (about 2 minutes).*

APPENDICES

TROUBLESHOOTING

To get a history of alarms-faults, stop the Generator, connect to ***CRE Config Software/System/PC transmit/receive/Download log file from module***, and click **Download**.

To restore factory settings into ***CRE Config Software***, navigate to ***CRE Config Software/System/PC transmit/receive/Reset factory settings***, and click **Reset**.

Message "Isolated product"
Check the related connections, including the one of internal resistor (jumper).
Check the related settings: count of generators, number of each Generator.

Message "Missing product"
Check the other products. One of them is not supplied or disconnected.

Message "Missing master"
Check the **MASTER COMPACT**/**MASTER 1B COMPACT**/**BTB COMPACT** products. One of them is not supplied or disconnected.

Message "Unknown product"
Check the other products. One of them is not compatible.

Message "Mismatch version"
Check the other products. One of them uses a version which is not compatible.

Cannot connect with PC
Consider deactivating the firewall and adding an Anti-virus exception.
Check the network wiring, see Network.

Error Messages When Transferring a File to the Module

Note: "…" indicate a variable number, a label number or a text number according the error message. It will help you to locate your error in your configuration file.

ERROR 001: Only when GENSET is STOP

File transfer between computer and the unit should be done only when all conditions below are met i.e. when engine is stopped.

ERROR 002: Unknown file type

The file type sent is unknown. Check the selected file.

ERROR 004: Write data or checksum error

ERROR 008: Update failed. Please restart update.

Writing memory error during update process. Restart module update.

ERROR 011: No write right on variable ….

Access to this variable is not allowed. Only parameter can be modified.

ERROR 012: No write right on label ….

Access to this label is not allowed. Check your configuration file.

ERROR 013: Text …. doesn't exist.

Access to this text is not possible because it does not exist. Check compatibility of the version/type of the module and the configuration file.

ERROR 014: No write right on …. Unit

Access to this unit is not allowed. Check your configuration file.

ERROR 015: Need password 2 to write on …. Variable

Actual password is not sufficient to access such configuration/control level.

ERROR 017: Configuration not allowing …. variable value

The actual setting of the module does not allow modifying this parameter with this value. Check your configuration file and the value of the parameter before sending again your configuration file.

ERROR 018: Variable …. out of range

The value of the parameter is out of range. Check your configuration file before sending again.

ERROR 019: Wrong value for …. variable

An unexpected value has been detected on this parameter. Check the value of the parameter before sending again.

Ex: a text character has been detected instead of a number.

ERROR 020: Unknown language file

The language file sent does not correspond to a language file for the module. Check the selected language file.

ERROR 021: Too many languages already downloaded

The maximum number of language supported by the module has been reached.

ERROR 022: Wrong language file version

The language file version is above the module version. Upgrade your module with the latest version available or catch the language file compatible with your module version.

ERROR 023: Label …. does not exist.

Modifying this label is not allowed. Check the label number before sending the configuration file again.

ERROR 024: Unit …. does not exist.

Modifying this unit is not allowed. Check the unit number before sending the configuration file again.

ERROR 025: Wrong accuracy value on …. (0,1,2 or 3)

The value of the accuracy is out of range. The value must be between 0 and 3.

ERROR 026: Wrong unit value on …. (from 0 to xxx)

The value of the unit is out of range. The value must be between 0 and xxx.

ERROR 027: No header in language file

No header or wrong header of the language file. Check the selected language file before send it again.

ERROR 028: No filename found or too long

No filename or filename is too long. The maximum size of a filename is 40 characters. Rename file and send it again.

ERROR 029: Wrong accuracy on parameter ….

The value of the modified parameter has not the right accuracy. Check the value of your parameter before sending again your configuration file.
Ex: Below, it is missing the digit a the tenth 5.0**0**

V02205	5.0_	ESG amplitude +000.00+010.00V

*ERROR 030: Data out of range in **Easy Flex**®*

The result of the operation is outside the range value of the output variable.

ERROR 031: Invalid TXT file version

The TXT file is not valid because it comes from a non-compatible firmware.

For example: TXT file from 1.xx version are only compatible with product using 1.xx version. TXT file from 2.xx version are only compatible with product using 2.xx version. Etc…

Warning

Warnings do not prevent the module to work but inform the user of a potential problem in its configuration file.

WARNING 001: Wrong size of label ….
WARNING 002: Wrong character entered in label ….
WARNING 003: Wrong size of text ….
WARNING 004: Wrong character entered in text ….
These advices indicate that entered labels/texts are too long or that a character is not supported by the module.

Invalid characters will be replaced by "?". The valid characters are the followings:

0123456789.-
ABCDEFGHIJKLMNOPQRSTUVWXYZ
!#$()+/:;=[]^_?*
abcdefghijklmnopqrstuvwxyz

The maximum size of a label is 14 characters and 28 characters for a text.
Modify labels/texts according to the rules above.

WARNING 005: Too many errors…
All errors/warnings messages could not be displayed. There are probably other problems in your configuration file. Solve displayed problems and send your configuration file again in order to display the additional error/warning messages.

WARNING 006: No unit specify on unit ….
WARNING 007: No value specify on parameter ….
WARNING 008: No text specify on text ….
WARNING 009: No label specify on label ….
These warnings indicate that no value has been filled inside the configuration file for a unit/parameter/text or label. The values will stay unchanged.

WARNING 011: Variable …. does not exist.
The parameter does not exist. Check compatibility of the version/type of the module and the configuration file.

STANDARDS FOR GENERATOR

ISO 8528-1 CLASSES AND POWER DESIGNATIONS

Various load-duration profiles are defined. Here is the correspondence between classes and powers:

Run	ISO designation	Conditions	Power designation	Conditions	Controller
Unlimited # of hours	PRIME RATING	Allowable average power output over a 24-hour period is 70% of the prime rating. 10% overload.	Prime Running Power (changing load).	Overload: max: 1 h over a 12-h period total: 25 h/ year.	**GENSYS COMPACT PRIME**
	CONTINUOUS RATING (base load rating)		Continuous operating power.	Fixed load.	**ACGEN2.0** (no paralleling)
Limited # of hours	STANDBY RATING	Maximum 200 hours per year. Allowable average power output over a 24-hour period is 70% of the standby rating. No overload.	Emergency stand-by power (changing load).	25h/ year at 100%. No overload 200 h/year at 80%	**TCGEN2.0** (no paralleling)
	MISSION-CRITICAL RATING	Maximum 500 hours per year. Allowable average power output is 85% of the nameplate rating.	Limited-time running power.	Fixed load.	

ISO 3046

- Part 1: Power: DBR (intermittent) and MCR (Max Continuous Rating).

The **COMPACT RANGE** offers the possibility to activate air conditioning and a cooling fan.

- Part 4: Speed governor

Governor performance classes	G1	G2	G3	G4
Speed droop	≤ 8%	≤ 5%	≤ 3%	By agreement
Regulation stages	P, PI or PID	P, PI or PID	PI or PID	PI or PID

NEC700 AND NFPA110

Start in static paralleling to meet the 10s time limit (NEC700). Type 10 as per NFPA110.
According to NFPA110, Black start is where the stored energy system has the capability to start the prime mover without using energy from another source. Such a Generator can be used to start a turbine.
NFA110 defines classes according to fuel tank autonomy; it requires that emergency power supply has a manual remote stop (A5.6.5.6). NFA110 fault list includes 15 signals (warning or shut-down).

CERTIFICATIONS

DECLARATION OF CONFORMITY

DECLARATION UE DE CONFORMITE
EU DECLARATION OF CONFORMITY

Cette Déclaration de Conformité est conforme à la norme européenne EN17050-1 :2004 "Critères généraux pour les déclarations de conformité des fournisseurs".

This Declaration of Conformity is suitable to the European Standard EN 17050-1:2004 "General criteria for supplier's declaration of conformity".

Nous, **We,** CRE Technology

Adresse du fabricant : **Manufacturer's Address:** 130, Allée Charles Victor NAUDIN
Zone des Templiers - Sophia Antipolis
06410 BIOT
FRANCE

déclarons sous notre seule responsabilité, que les produits délivrés:
declare under our sole responsibility that the products as originally delivered:

Nom du produit : **Product Name:** MASTER Compact HMI
MASTER Compact CORE

Référence produit : **Regulatory Model:** A56-MASTER-00-x (HMI)
A56-MASTER-10-x (CORE)

Version(s) produit : **Product Version:** All

satisfont aux exigences essentielles des Directives Européennes ci-dessous et portent en conséquence le marquage CE :
Comply with the essential requirements of the following applicable European Directives, and carries the CE marking accordingly:

Low Voltage Directive 2014/35/EU
EMC Directive 2014/30/EU

CEM/*EMC*	Standard	Date	Description
	EN61326-1 CISPR11 EN55011 EN55022	2013 2010 + A1 (2011) 2012	EMC general requirements – Industrial environment - class A
	EN61000-4-2	2009	Electrostatic Discharges
	EN61000-4-3	2006 + A2 (2010)	Radiated, RF, electromagnetic field immunity test
	EN61000-4-4	2013	Electrical Fast Transients
	EN61000-4-5	2014	Surge immunity test
	EN61000-4-6	2014	Conducted disturbances immunity
	EN61000-6-2	2006	Generic standards. Immunity for industrial environments
	EN61000-6-4	2010	Generic standards. Emissions for industrial environments
Sécurité/*Safety*	**Standard**	**Date**	**Description**
	EN60950	2013	Information technology equipment. Safety. General requirements

Cette Déclaration de Conformité s'applique aux produits listés ci-dessus et placés sur le marché après le: June 28, 2018
This DoC applies to above-listed products placed on the market after:

SIGNATURE

BIOT – France for CRE technology
Responsable Qualité
Quality Manager

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ISO CERTIFICATE - 2015

afaq
AFNOR CERTIFICATION

Certificat
Certificate

N° 2009/33725.3

AFNOR Certification certifie que le système de management mis en place par :
AFNOR Certification certifies that the management system implemented by:

CRE TECHNOLOGY

pour les activités suivantes :
for the following activities:

CONCEPTION, FABRICATION, FORMATIONS ET SERVICES ASSOCIES
A LA COMMERCIALISATION DE PRODUITS DE CONTROLES ET DE PROTECTION
POUR LES GROUPES ELECTROGENES.

DESIGN, MANUFACTURING, TRAINING & SERVICES RELATED TO THE SALE
OF CONTROL AND PROTECTION PRODUCTS FOR POWER GENERATORS.

a été évalué et jugé conforme aux exigences requises par :
has been assessed and found to meet the requirements of:

ISO 9001 : 2015

et est déployé sur les sites suivants :
and is developed on the following locations:

130 Allée Charles Victor Naudin Sophia Antipolis FR-06410 BIOT

Ce certificat est valable à compter du (année/mois/jour) 2017-12-12 Jusqu'au 2020-12-11
This certificate is valid from (year/month/day) *Until*

Franck LEBEUGLE
Directeur Général d'AFNOR Certification
Managing Director of AFNOR Certification

Flashez ce QR Code pour vérifier la validité du certificat

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afnor CERTIFICATION

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SOFTWARE VARIABLES

SOFTWARE VARIABLES

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List of variables

Configuration

General

Power plant

Variable	Number of generator (2000)
Unit	-
Min	1
Max	32
Init	2
Description	Number of generator on the power plant. This parameter is used for the CAN communication between products.

Variable	My number (2001)
Unit	-
Min	1
Max	32
Init	1
Description	MASTER/MASTER 1B/BTB number. This parameter is the ID of the product used for the CAN communication between products. It must be different on each MASTER/BTB/MASTER 1B unit (combined).

Variable	Number of MASTER/BTB (2017)
Unit	-
Min	0
Max	32
Init	1
Description	Total number of MASTER/BTB/MASTER 1B COMPACT (combined)

Variable	Segment number (2020)
Unit	-
Min	1
Max	33
Init	1
Description	Segment number of the unit/ Source A segment number

Variable	To mains operation (2005)
Unit	-
Min	0
Max	3
Init	1
Description	This setpoint is used to select the functionning mode between the generator and with the mains. 3 setpoints can be used : - Change Over (value 0) : Transfer switch operation without paralleling function. - No break change over (value 1) : Synchronization and transfer load between bus and the Mains. - Permanent (value 2) : Mains paralleling in permanent condition : Need to select Mains power setpoint (Peak shaving) or bus power setpoint (Base Load).

Variable	Mains paralleling mode (2006)
Unit	-
Min	0
Max	1
Init	0
Description	This setpoint is used to select the mains paralleling mode if permanent paralleling has been selected. 2 setpoints can be used : - Peak Shaving (value 0) : Mains KW power setpoint. - Base load (value 1) : Generator KW power setpoint.

Variable	Voltage system (2003)
Unit	-
Min	0
Max	2
Init	2
Description	This setpoint is used to select the alternator voltage architecture. 3 setpoints can be used : - Single phase (value 0) : Connection of 1 active phase wiring and 1 neutral wiring for bus and for Mains. - biphases 180° (value 1) : Connection of 2 active phases wiring and 1 neutral wiring for bus and for Mains. - three phases 180° (value 1) : Connection of 3 active phases wiring and 1 neutral wiring for bus and for Mains. If the neutral wiring is not connected , the product will internally recalculate a virtual one.

Variable	Phase control (2805)
Unit	-
Min	0
Max	7
Init	0
Description	This setpoint is used to select a protection if the module detects a wrong voltage apply on the product, if triphase system is set, and you apply a biphase system, this protection will detect it. Internally, it is a phase voltage detection. 5 setpoints can be used : - Unused : no action. - Bus electrical fault : The protection opens the Bus breaker and tries to re-synchronize again. Count of attempts set by variable 2807. - Mains electrical fault : The protection opens the Mains breaker. - Alarm : Notice as alarm on front panel. - Fault (softShutDown) : Bus breaker opens allowing the power plant to stop.

Variable	Power Factor setpoint (Inductive) (2253)
Unit	-
Min	0
Max	1.00
Init	100
Description	This setpoint adjusts the power factor setpoint regulation, during the mains paralleling operation. This value will be manage as an inductive power factor. The product must be connected to the automatic voltage regulator.

Variable	Inhib. remote start MASTER (2018)
Unit	-
Min	0
Max	1
Init	0
Description	Allows a unit to ignore the MASTER's commands in the same segment

Mode

Variable	Power up in mode (2012)
Unit	-
Min	0
Max	2
Init	0
Description	This setpoint is used to select the mode of the product when the power supply is applied. 3 setpoints can be used : - Manual (Value 0) : The product will switch-on on Manual mode - Test (Value 1) : The product will switch-on on Test mode - Auto (Value 2) : The product will switch-on on Auto mode

Variable	Test mode (2014)
Unit	-
Min	0
Max	2
Init	0
Description	This setpoint is used to select the actions for test mode on the product. 3 setpoints can be used : - On load (Value 0) : The Module will start as auto mode, and will manage sequence to close the breaker and manage the load. - Off load (Value 1) : The Module will start as auto mode, will manage sequences but will not close the bus breaker. - On load with timer (Value 2) :The Module will start as auto mode, will run without load during this timer and after to close the breaker to manage the load.

Variable	On load with timer (3478)
Unit	s
Min	0.0
Max	6553.5
Init	18 000
Description	Delay starting for a remote start with timer

Variable	Test active timer on (2015)
Unit	-
Min	0
Max	1
Init	0
Description	This setpoint is used to activate a timer function for test mode. During this timer, the test mode is activated. At the end of this timer, the Module will order the power plant to stop and will be forced on auto mode.

Variable	Test active timer (2016)
Unit	s
Min	0.0
Max	6553.5
Init	6000
Description	This setpoint is a timer in seconds. During this timer, and if setpoint E2015 is ON (Test active timer on) the test mode is activated. At the end of this timer, the Module will order the power plant to stop, and will be forced on auto mode.

Permanent mode

Variable	Peak shaving kW power setpoint (2154)
Unit	kW
Min	−32 768
Max	32 767
Init	100
Description	This setpoint adjusts the kW level for the peak shaving operation : kW level reach for the Mains power during the Mains paralleling operation. This kW regulation will be manage internally thank to a PID regulation, for time response and stability. This KW level can be positive : import from the Mains. This kW level can be negative : export to the Mains.

Variable	Base load kW power setpoint (2107)
Unit	kW
Min	1
Max	32 500
Init	100
Description	This setpoint adjusts the kW level for the base load operation : kW level reach for the power plant power during the Mains paralleling operation.

Mains timers

Variable	Mains back timer (2009)
Unit	s
Min	0.0
Max	999.9
Init	100
Description	This setpoint is a timer in seconds. If the mains is back (after a failure), start internally this timer. During it, mains voltage and frequency are controlled in term of stability, and availability. At this end of timer, if the mains is considered stable, the product, will change over to provide load from bus to the Mains (on synchronization, or in Change over, regarding settings).

Variable	Change over timer (2007)
Unit	s
Min	0.1
Max	999.9
Init	10
Description	This setpoint is a timer in seconds. This timer determinate the time of black out for the change over operation, it determinates the time between open the MAINS breaker and close the bus breaker, or the opposite. To set this setpoint, it is also important to check the breakers characteristics, in term of open/close response time.

Power management system

Unload breaker

Variable	Enable unload breakers (3730)
Unit	-
Min	0
Max	1
Init	0
Description	Enable unload breakers

Variable	Unload breaker kW 1 (3731)
Unit	kW
Min	0
Max	65 535
Init	0
Description	Unload breaker n°1 active power threshold (kW)

Variable	Unload breaker timer 1 (3720)
Unit	s
Min	0.0
Max	999.9
Init	0
Description	Time before closing the breaker n°1 (s)

Power plant

Power plant

Variable	Power plant measure (2110)
Unit	-
Min	0
Max	1
Init	0
Description	0 : The bus power is calculated by summing the generator powers (CAN bus) / 1 : The bus power is calculated using the current inputs (CT)

Variable	Nominal voltage (2102)
Unit	V
Min	0
Max	65 535
Init	400
Description	This setpoint adjusts the nominal voltage U (for phase-phase value). All the electrical protections for U on % will be calculated around this nominal value. For low voltage application (400VAC, 440VAC, 480VAC,etc...) or High Voltage application (20.000 VAC, 33.000VAC, etc ..), this setpoint must be adapted.

Variable	PT ratio (2100)
Unit	-
Min	0.00
Max	655.35
Init	100
Description	This setpoint adjusts the PT ratio to adapt alternator voltage measurement on the module. This setpoint is calculated with Bus Voltage / voltage measurement on the controller. Example : Voltage on bus 20.000Vac / voltage on controller 100 Vac : value of PT ratio = 20.000/100 = 200. This PT ratio can be calculated or indicated on the step down measurement transformer.

Variable	CT ratio (2101)
Unit	-
Min	0.1
Max	3250.0
Init	2000
Description	This setpoint adjusts the CT ratio to adapt alternator current measurement on the module. This setpoint is calculated with Bus power current / current measurement on the controller. Globally, standard current measurement will be 5 amps or 1 amp on CT secondary. Example : Current on bus 1000A / current on controller 5 amps : value of CT ratio = 1000/5 = 200. This CT ratio can be calculated or indicated on the step down current measurement transformer.

Variable	Low kW active power threshold (2866)
Unit	%
Min	0
Max	100.0
Init	50
Description	This setpoint adjusts the kW low limit treshold in case of load sharing mode, or paralleling with mains. This kW threshold is the level to reach immedialty after the closure of the bus breaker. When the active power of the bus reaches the low kW threshold, a load ramp is executed from this point. When an unload ramp occurs, the power plant active power decreases until its value is the low limit threshold. This limit of kW is mainly used to avoid a kW reverse power on the power plant. Basically, this limit will be calculated at around 5-10% of the power plant nominal kW.

Variable	High kW active power threshold (2867)
Unit	%
Min	0
Max	100.0
Init	950
Description	This setpoint adjusts the power plant kW high limit threshold in case of mains paralleling. The power plant will never exceed this kW during Mains paralleling operation. Basically, this limit will be calculated at around 90 - 100 % of the power plant nominal kW.

Variable	Load ramp timer (2853)
Unit	s
Min	0.0
Max	1600.0
Init	300
Description	This setpoint adjusts the load ramp timer, for load sharing or mains paralleling mode. 100 % of this timer corresponds to transfer 100% of the total power plant nominal kW. For a ramp, to transfer, from 10% to 60% of nominal kW, the time will be 50% of the set timer.

Variable	Unload ramp timer (2856)
Unit	s
Min	0.0
Max	1600.0
Init	300
Description	This setpoint adjusts the unload ramp timer, for load sharing or mains paralleling mode. 100 % of this timer corresponds to transfer 100% of the total power plant nominal kW. For a ramp, to transfer, from 60% to 10% of nominal kW, the time will be 50% of the set timer.

Variable	Power plant minimum kW (2108)
Unit	kW
Min	0
Max	65 535
Init	0
Description	Minimum active nominal power needed to consider the power plant ready

Variable	Power plant minimum number of GE (2109)
Unit	-
Min	0
Max	32
Init	1
Description	Minimum number of generators to run needed to consider the power plant ready

Electrical fault

Variable	Synchronization back timer (2806)
Unit	s
Min	0.0
Max	999.9
Init	0
Description	This setpoint adjusts the synchronization back timer. It sets the time to wait to start again a synchronization sequence after a "bus electrical fault" protection.

Variable	Synchronization Back attemps number (2807)
Unit	-
Min	0
Max	15
Init	3
Description	This setpoint adjusts the synchronization back attempts number. It sets the attempts number to start again a synchornization of the bus after a "bus electrical fault" protection.

Mains

Mains

Variable	Mains kW measure type (2155)
Unit	-
Min	0
Max	4
Init	0
Description	This setpoint is used to select the "Mains kW measure type" . That is determinated the type of input to measure kW on the Mains. 3 setpoints can be used : - CT (Value 0) : kW mains will be read with a x 1 Mains CT connected. - mA - Analog 1 (Value 1) : kW mains will be read with a 4-20mA signal connected on Analog input 1. - mA - Analog 2 (Value 2) : kW mains will be read with a 4-20mA signal connected on Analog input 2. - mA - Analog 3 (Value 3) : kW mains will be read with a 4-20mA signal connected on Analog input 3. - Unused : no kW mains read.

Variable	CT ratio (2151)
Unit	-
Min	0.1
Max	3250.0
Init	2000
Description	This setpoint adjusts the CT ratio to adapt Mains current measurement on the module. This setpoint is calculated with Mains Bus power current / current measurement on the controller. Globally, standard current measurement will be 5 amps or 1 amp on CT secondary. Example : Current on Mains bus 1000A / current on controller 5 amps : value of CT ratio = 1000/5 = 200. This CT ratio can be calculated or indicated on the step down current measurement transformer.

Variable	PT ratio (2150)
Unit	-
Min	0.00
Max	655.35
Init	100
Description	This setpoint adjusts the PT ratio to adapt voltage measurement on the module. This setpoint is calculated with Voltage / voltage measurement on the controller. Example : Voltage on bus/Mains/source 20.000Vac / voltage on controller 100 Vac : value of PT ratio = 20.000/100 = 200. This PT ratio can be calculated or indicated on the step down measurement transformer.

Variable	Nominal voltage (2152)
Unit	V
Min	0
Max	65 535
Init	400
Description	This setpoint adjusts the bus/mains nominal voltage U (for phase-phase value). All the electrical protections for U on % will be calculated around this nominal value. For low voltage application (400VAC, 440VAC, 480VAC,etc...) or High Voltage application (20.000 VAC, 33.000VAC, etc ..), this setpoint must be adapted.

Variable	Nominal Frequency (2153)
Unit	Hz
Min	0.00
Max	100.00
Init	5000
Description	This setpoint adjusts the bus/mains nominal frequency. All the electrical protections for F on % will be calculated around this nominal value. For industrial application, 50 or 60 Hz, this setpoint must be adapted.

Variable	External MCB low kW trip (2156)
Unit	-
Min	0
Max	1
Init	0
Description	This setpoint is used to activate an "External MCB low kW trip". With an external devices, which can detect 3 currents phases, we can use it to detect 0 kW per phases and provide a digital information to the controller. When this one will be activated, the Mains breaker MCB will be opened. A digital input must be configured as : "External Mains Low Treshold".

Electrical fault

Variable	Selection of breaker to open after mains electrical fault (2311)
Unit	-
Min	0
Max	2
Init	0
Description	Circuit Breaker openned in case of Mains electrical fault (0= Mains /1=Generator/ 2=Both)

Variable	Authorization to start on mains electrical fault (2309)
Unit	-
Min	0
Max	1
Init	1
Description	Authorize to start after Mains electrical fault (Off=0 : On=1)

Variable	Mains breaker tripping mode on mains fault (2312)
Unit	-
Min	0
Max	3
Init	0
Description	Mains breaker opening mode on Mains electrical fault (0 : Immediatly/1 :After start/2 :After power plant ready/3 :After timer)

Variable	Timer to open mains breaker on mains fault (2313)
Unit	s
Min	0.0
Max	999.9
Init	10
Description	Delay before MCB open command on fault if E2312 = 3

Protections

Bus protections

Over/under frequency

Over frequency protection

Variable	Threshold (2400)
Unit	%
Min	0.0
Max	200.0
Init	1050
Description	Over-frequency Bus Protection Threshold

Variable	Timer (2401)
Unit	s
Min	0.0
Max	999.9
Init	300
Description	Timer acceptance before protection activation when Bus Frequency has reached the over-frequency protection threshold

Variable	Control (2402)
Unit	-
Min	0
Max	7
Init	4
Description	Control selection when Bus Over-frequency protection become active.The selections are the following : - Unused : no action. - Bus electrical fault : The protection opens the Bus breaker and tries to re-synchronize again. Count of attempts set by variable 2807. - Mains electrical fault : The protection opens the Mains breaker. - Alarm : Notice as alarm on front panel. - Fault (softShutDown) : Bus breaker opens allowing the power plant to stop.

Under frequency protection

Variable	Threshold (2403)
Unit	%
Min	0.0
Max	200.0
Init	900
Description	Under-frequency Bus Protection Threshold

Variable	Timer (2404)
Unit	s
Min	0.0
Max	999.9
Init	100
Description	Timer acceptance before protection activation when Bus Frequency has reached the Under-frequency protection threshold

Variable	Control (2405)
Unit	-
Min	0
Max	7
Init	0
Description	Control selection when Bus Under-frequency protection become active.The selections are the following : - Unused : no action. - Bus electrical fault : The protection opens the Bus breaker and tries to re-synchronize again. Count of attempts set by variable 2807. - Mains electrical fault : The protection opens the Mains breaker. - Alarm : Notice as alarm on front panel. - Fault (softShutDown) : Bus breaker opens allowing the power plant to stop.

Over frequency protection 2

Variable	Threshold (2436)
Unit	%
Min	0.0
Max	200.0
Init	1100
Description	Over-frequency Bus Protection Threshold 2

Variable	Timer (2437)
Unit	s
Min	0.0
Max	999.9
Init	100
Description	Timer 2 acceptance before protection activation when Bus Frequency has reached the over-frequency protection threshold

Variable	Control (2438)
Unit	-
Min	0
Max	7
Init	0
Description	Control 2 selection when Bus Over-frequency protection become active.The selections are the following : - Unused : no action. - Bus electrical fault : The protection opens the Bus breaker and tries to re-synchronize again. Count of attempts set by variable 2807. - Mains electrical fault : The protection opens the Mains breaker. - Alarm : Notice as alarm on front panel. - Fault (softShutDown) : Bus breaker opens allowing the power plant to stop.

Under frequency protection 2

Variable	Threshold (2439)
Unit	%
Min	0.0
Max	200.0
Init	900
Description	Under-frequency Bus Protection Threshold 2

Variable	Timer (2440)
Unit	s
Min	0.0
Max	999.9
Init	100
Description	Timer 2 acceptance before protection activation when Bus Frequency has reached the Under-frequency protection threshold

Variable	Control (2441)
Unit	-
Min	0
Max	7
Init	0
Description	Control 2 selection when Bus Under-frequency protection become active.The selections are the following : - Unused : no action. - Bus electrical fault : The protection opens the Bus breaker and tries to re-synchronize again. Count of attempts set by variable 2807. - Mains electrical fault : The protection opens the Mains breaker. - Alarm : Notice as alarm on front panel. - Fault (softShutDown) : Bus breaker opens allowing the power plant to stop.

Over/under voltage

Over voltage protection

Variable	Threshold (2406)
Unit	%
Min	0.0
Max	200.0
Init	1100
Description	Over-voltage Bus Protection Threshold

Variable	Timer (2407)
Unit	s
Min	0.0
Max	999.9
Init	100
Description	Timer acceptance before protection activation when Bus voltage has reached the over-voltage protection threshold

Variable	Control (2408)
Unit	-
Min	0
Max	7
Init	4
Description	Control selection when Bus Over-voltage protection become active.The selections are the following : - Unused : no action. - Bus electrical fault : The protection opens the Bus breaker and tries to re-synchronize again. Count of attempts set by variable 2807. - Mains electrical fault : The protection opens the Mains breaker. - Alarm : Notice as alarm on front panel. - Fault (softShutDown) : Bus breaker opens allowing the power plant to stop.

Under voltage protection

Variable	Threshold (2409)
Unit	%
Min	0.0
Max	200.0
Init	900
Description	Under-voltage Bus Protection Threshold

Variable	Timer (2410)
Unit	s
Min	0.0
Max	999.9
Init	200
Description	Timer acceptance before protection activation when Bus voltage has reached the Under-voltage protection threshold

Variable	Control (2411)
Unit	-
Min	0
Max	7
Init	0
Description	Control selection when Bus Under-voltage protection become active.The selections are the following : - Unused : no action. - Bus electrical fault : The protection opens the Bus breaker and tries to re-synchronize again. Count of attempts set by variable 2807. - Mains electrical fault : The protection opens the Mains breaker. - Alarm : Notice as alarm on front panel. - Fault (softShutDown) : Bus breaker opens allowing the power plant to stop.

Over voltage protection 2

Variable	Threshold (2442)
Unit	%
Min	0.0
Max	200.0
Init	1100
Description	Over-voltage Bus Protection Threshold 2

Variable	Timer (2443)
Unit	s
Min	0.0
Max	999.9
Init	100
Description	Timer 2 acceptance before protection activation when Bus voltage has reached the over-voltage protection threshold

Variable	Control (2444)
Unit	-
Min	0
Max	7
Init	0
Description	Control 2 selection when Bus Over-voltage protection become active.The selections are the following : - Unused : no action. - Bus electrical fault : The protection opens the Bus breaker and tries to re-synchronize again. Count of attempts set by variable 2807. - Mains electrical fault : The protection opens the Mains breaker. - Alarm : Notice as alarm on front panel. - Fault (softShutDown) : Bus breaker opens allowing the power plant to stop.

Under voltage protection 2

Variable	Threshold (2445)
Unit	%
Min	0.0
Max	200.0
Init	900
Description	Under-voltage Bus Protection Threshold 2

Variable	Timer (2446)
Unit	s
Min	0.0
Max	999.9
Init	200
Description	Timer 2 acceptance before protection activation when Bus voltage has reached the Under-voltage protection threshold

Variable	Control (2447)
Unit	-
Min	0
Max	7
Init	0
Description	Control 2 selection when Bus Under-voltage protection become active.The selections are the following : - Unused : no action. - Bus electrical fault : The protection opens the Bus breaker and tries to re-synchronize again. Count of attempts set by variable 2807. - Mains electrical fault : The protection opens the Mains breaker. - Alarm : Notice as alarm on front panel. - Fault (softShutDown) : Bus breaker opens allowing the power plant to stop.

Reverse kW/kVar

Reverse kW

Variable	Threshold (2418)
Unit	%
Min	0.0
Max	200.0
Init	100
Description	Reverse KW Bus Protection Threshold

Variable	Timer (2419)
Unit	s
Min	0.0
Max	999.9
Init	100
Description	Timer acceptance before protection activation when power plant Active Power has reached the Reverse KW protection threshold

Variable	Control (2420)
Unit	-
Min	0
Max	7
Init	4
Description	Control selection when Bus Reverse KW protection become active.The selections are the following : - Unused : no action. - Bus electrical fault : The protection opens the Bus breaker and tries to re-synchronize again. Count of attempts set by variable 2807. - Mains electrical fault : The protection opens the Mains breaker. - Alarm : Notice as alarm on front panel. - Fault (softShutDown) : Bus breaker opens allowing the power plant to stop.

Reverse kVAR

Variable	Threshold (2427)
Unit	%
Min	0.0
Max	200.0
Init	200
Description	Reverse KVAR Bus Protection Threshold

Variable	Timer (2428)
Unit	s
Min	0.0
Max	999.9
Init	200
Description	Timer acceptance before protection activation when Bus Reactive Power has reached the Reverse KVAR protection threshold

Variable	Control (2429)
Unit	-
Min	0
Max	7
Init	0
Description	Control selection when Bus Reverse KVAR protection become active.The selections are the following : - Unused : no action. - Bus electrical fault : The protection opens the Bus breaker and tries to re-synchronize again. Count of attempts set by variable 2807. - Mains electrical fault : The protection opens the Mains breaker. - Alarm : Notice as alarm on front panel. - Fault (softShutDown) : Bus breaker opens allowing the power plant to stop.

Reverse kW 2

Variable	Threshold (2454)
Unit	%
Min	0.0
Max	200.0
Init	100
Description	Reverse KW Bus Protection Threshold 2

Variable	Timer (2455)
Unit	s
Min	0.0
Max	999.9
Init	200
Description	Timer 2 acceptance before protection activation when Bus Active Power has reached the Reverse KW protection threshold

Variable	Control (2456)
Unit	-
Min	0
Max	7
Init	0
Description	Control 2 selection when Bus Reverse KW protection become active.The selections are the following : - Unused : no action. - Bus electrical fault : The protection opens the Bus breaker and tries to re-synchronize again. Count of attempts set by variable 2807. - Mains electrical fault : The protection opens the Mains breaker. - Alarm : Notice as alarm on front panel. - Fault (softShutDown) : Bus breaker opens allowing the power plant to stop.

Reverse kVAR 2

Variable	Threshold (2463)
Unit	%
Min	0.0
Max	200.0
Init	100
Description	Reverse KVAR Bus Protection Threshold 2

Variable	Timer (2464)
Unit	s
Min	0.0
Max	999.9
Init	200
Description	Timer 2 acceptance before protection activation when Bus Reactive Power has reached the Reverse KVAR protection threshold

Variable	Control (2465)
Unit	-
Min	0
Max	7
Init	0
Description	Control 2 selection when Bus Reverse KVAR protection become active.The selections are the following : - Unused : no action. - Bus electrical fault : The protection opens the Bus breaker and tries to re-synchronize again. Count of attempts set by variable 2807. - Mains electrical fault : The protection opens the Mains breaker. - Alarm : Notice as alarm on front panel. - Fault (softShutDown) : Bus breaker opens allowing the power plant to stop.

Maxi kW/mini kW

Maxi kW

Variable	Threshold (2415)
Unit	%
Min	0.0
Max	200.0
Init	1100
Description	Maximum KW Bus Protection Threshold

Variable	Timer (2416)
Unit	s
Min	0.0
Max	999.9
Init	600
Description	Timer acceptance before protection activation when power plant Active Power has reached the Maximum KW protection threshold

Variable	Control (2417)
Unit	-
Min	0
Max	7
Init	0
Description	Control selection when Bus Maximum KW protection become active.The selections are the following : - Unused : no action. - Bus electrical fault : The protection opens the Bus breaker and tries to re-synchronize again. Count of attempts set by variable 2807. - Mains electrical fault : The protection opens the Mains breaker. - Alarm : Notice as alarm on front panel. - Fault (softShutDown) : Bus breaker opens allowing the power plant to stop.

Mini kW

Variable	Threshold (2412)
Unit	%
Min	0.0
Max	200.0
Init	100
Description	Minimum KW Bus Protection Threshold

Variable	Timer (2413)
Unit	s
Min	0.0
Max	999.9
Init	1200
Description	Timer acceptance before protection activation when power plant Active Power has reached the Minimum KW protection threshold

Variable	Control (2414)
Unit	-
Min	0
Max	7
Init	0
Description	Control selection when Bus Minimum KW protection become active.The selections are the following : - Unused : no action. - Bus electrical fault : The protection opens the Bus breaker and tries to re-synchronize again. Count of attempts set by variable 2807. - Mains electrical fault : The protection opens the Mains breaker. - Alarm : Notice as alarm on front panel. - Fault (softShutDown) : Bus breaker opens allowing the power plant to stop.

Maxi kW 2

Variable	Threshold (2451)
Unit	%
Min	0.0
Max	200.0
Init	1100
Description	Maximum KW Bus Protection Threshold 2

Variable	Timer (2452)
Unit	s
Min	0.0
Max	999.9
Init	600
Description	Timer 2 acceptance before protection activation when Bus Active Power has reached the Maximum KW protection threshold

Variable	Control (2453)
Unit	-
Min	0
Max	7
Init	0
Description	Control 2 selection when Bus Maximum KW protection become active.The selections are the following : - Unused : no action. - Bus electrical fault : The protection opens the Bus breaker and tries to re-synchronize again. Count of attempts set by variable 2807. - Mains electrical fault : The protection opens the Mains breaker. - Alarm : Notice as alarm on front panel. - Fault (softShutDown) : Bus breaker opens allowing the power plant to stop.

Mini kW 2

Variable	Threshold (2448)
Unit	%
Min	0.0
Max	200.0
Init	100
Description	Minimum KW Bus Protection Threshold 2

Variable	Timer (2449)
Unit	s
Min	0.0
Max	999.9
Init	1200
Description	Timer 2 acceptance before protection activation when Bus Active Power has reached the Minimum KW protection threshold

Variable	Control (2450)
Unit	-
Min	0
Max	7
Init	0
Description	Control 2 selection when Bus Minimum KW protection become active.The selections are the following : - Unused : no action. - Bus electrical fault : The protection opens the Bus breaker and tries to re-synchronize again. Count of attempts set by variable 2807. - Mains electrical fault : The protection opens the Mains breaker. - Alarm : Notice as alarm on front panel. - Fault (softShutDown) : Bus breaker opens allowing the power plant to stop. .

Maxi kVAR/mini kVAR

Maxi kVAR

Variable	Threshold (2424)
Unit	%
Min	0.0
Max	200.0
Init	1100
Description	Maximum KVAR Bus Protection Threshold

Variable	Timer (2425)
Unit	s
Min	0.0
Max	999.9
Init	300
Description	Timer acceptance before protection activation when power plant Reactive Power has reached the Maximum KVAR protection threshold

Variable	Control (2426)
Unit	-
Min	0
Max	7
Init	0
Description	Control selection when Bus Maximum KVAR protection become active.The selections are the following : - Unused : no action. - Bus electrical fault : The protection opens the Bus breaker and tries to re-synchronize again. Count of attempts set by variable 2807. - Mains electrical fault : The protection opens the Mains breaker. - Alarm : Notice as alarm on front panel. - Fault (softShutDown) : Bus breaker opens allowing the power plant to stop. .

Mini kVAR

Variable	Threshold (2421)
Unit	%
Min	0.0
Max	200.0
Init	100
Description	Minimum KVAR Bus Protection Threshold

Variable	Timer (2422)
Unit	s
Min	0.0
Max	999.9
Init	1200
Description	Timer acceptance before protection activation when power plant Reactive Power has reached the Minimum KVAR protection threshold

Variable	Control (2423)
Unit	-
Min	0
Max	7
Init	0
Description	Control selection when Bus Minimum KVAR protection become active.The selections are the following : - Unused : no action. - Bus electrical fault : The protection opens the Bus breaker and tries to re-synchronize again. Count of attempts set by variable 2807. - Mains electrical fault : The protection opens the Mains breaker. - Alarm : Notice as alarm on front panel. - Fault (softShutDown) : Bus breaker opens allowing the power plant to stop.

Maxi kVAR 2

Variable	Threshold (2460)
Unit	%
Min	0.0
Max	200.0
Init	1100
Description	Maximum KVAR Bus Protection Threshold 2

Variable	Timer (2461)
Unit	s
Min	0.0
Max	999.9
Init	300
Description	Timer 2 acceptance before protection activation when Bus Reactive Power has reached the Maximum KVAR protection threshold

Variable	Control (2462)
Unit	-
Min	0
Max	7
Init	0
Description	Control 2 selection when Bus Maximum KVAR protection become active.The selections are the following : - Unused : no action. - Bus electrical fault : The protection opens the Bus breaker and tries to re-synchronize again. Count of attempts set by variable 2807. - Mains electrical fault : The protection opens the Mains breaker. - Alarm : Notice as alarm on front panel. - Fault (softShutDown) : Bus breaker opens allowing the power plant to stop.

Mini kVAR 2

Variable	Threshold (2457)
Unit	%
Min	0.0
Max	200.0
Init	100
Description	Minimum KVAR Bus Protection Threshold 2

Variable	Timer (2458)
Unit	s
Min	0.0
Max	999.9
Init	1200
Description	Timer 2 acceptance before protection activation when Bus Reactive Power has reached the Minimum KVAR protection threshold

Variable	Control (2459)
Unit	-
Min	0
Max	7
Init	0
Description	Control 2 selection when Bus Minimum KVAR protection become active.The selections are the following : - Unused : no action. - Bus electrical fault : The protection opens the Bus breaker and tries to re-synchronize again. Count of attempts set by variable 2807. - Mains electrical fault : The protection opens the Mains breaker. - Alarm : Notice as alarm on front panel. - Fault (softShutDown) : Bus breaker opens allowing the power plant to stop.

Voltage unbalance

Voltage unbalance

Variable	Threshold (2486)
Unit	%
Min	0.0
Max	200.0
Init	50
Description	Voltage Unbalance Bus Protection Threshold

Variable	Timer (2487)
Unit	s
Min	0.0
Max	999.9
Init	30
Description	Timer acceptance before protection activation when Bus voltage has reached the Voltage Unbalance protection threshold

Variable	Control (2488)
Unit	-
Min	0
Max	7
Init	0
Description	Control selection when Bus Voltage Unbalance protection become active.The selections are the following : - Unused : no action. - Bus electrical fault : The protection opens the Bus breaker and tries to re-synchronize again. Count of attempts set by variable 2807. - Mains electrical fault : The protection opens the Mains breaker. - Alarm : Notice as alarm on front panel. - Fault (softShutDown) : Bus breaker opens allowing the power plant to stop.

Voltage unbalance 2

Variable	Threshold (2489)
Unit	%
Min	0.0
Max	200.0
Init	100
Description	Voltage Unbalance Bus Protection Threshold 2

Variable	Timer (2490)
Unit	s
Min	0.0
Max	999.9
Init	30
Description	Timer 2 acceptance before protection activation when bus voltage has reached the Voltage Unbalance protection threshold

Variable	Control (2491)
Unit	-
Min	0
Max	7
Init	0
Description	Control 2 selection when Bus Voltage Unbalance protection become active.The selections are the following : - Unused : no action. - Bus electrical fault : The protection opens the Bus breaker and tries to re-synchronize again. Count of attempts set by variable 2807. - Mains electrical fault : The protection opens the Mains breaker. - Alarm : Notice as alarm on front panel. - Fault (softShutDown) : Bus breaker opens allowing the power plant to stop.

Mains protections

Over/under frequency

Over frequency protection

Variable	Threshold (2500)
Unit	%
Min	0.0
Max	200.0
Init	1100
Description	Over-frequency Mains Protection Threshold

Variable	Timer (2501)
Unit	s
Min	0.0
Max	999.9
Init	100
Description	Timer acceptance before protection activation when Mains Frequency has reached the over-frequency protection threshold

Variable	Control (2502)
Unit	-
Min	0
Max	7
Init	0
Description	Control selection when Mains Over-frequency protection become active.The selections are the following : - Unused : no action. - Bus electrical fault : The protection opens the Bus breaker and tries to re-synchronize again. Count of attempts set by variable 2807. - Mains electrical fault : The protection opens the Mains breaker. - Alarm : Notice as alarm on front panel. - Fault (softShutDown) : Bus breaker opens allowing the power plant to stop.

Under frequency protection

Variable	Threshold (2503)
Unit	%
Min	0.0
Max	200.0
Init	900
Description	Under-frequency Mains Protection Threshold

Variable	Timer (2504)
Unit	s
Min	0.0
Max	999.9
Init	100
Description	Timer acceptance before protection activation when Mains Frequency has reached the Under-frequency protection threshold

Variable	Control (2505)
Unit	-
Min	0
Max	7
Init	2
Description	Control selection when Mains Under-frequency protection become active.The selections are the following : - Unused : no action. - Bus electrical fault : The protection opens the Bus breaker and tries to re-synchronize again. Count of attempts set by variable 2807. - Mains electrical fault : The protection opens the Mains breaker. - Alarm : Notice as alarm on front panel. - Fault (softShutDown) : Bus breaker opens allowing the power plant to stop.

Over frequency protection 2

Variable	Threshold (2530)
Unit	%
Min	0.0
Max	200.0
Init	1100
Description	Over-frequency Mains Protection Threshold 2

Variable	Timer (2531)
Unit	s
Min	0.0
Max	999.9
Init	100
Description	Timer 2 acceptance before protection activation when Mains Frequency has reached the over-frequency protection threshold

Variable	Control (2532)
Unit	-
Min	0
Max	7
Init	0
Description	Control 2 selection when Mains Over-frequency protection become active. The selections are the following : - Unused : no action. - Bus electrical fault : The protection opens the Bus breaker and tries to re-synchronize again. Count of attempts set by variable 2807. - Mains electrical fault : The protection opens the Mains breaker. - Alarm : Notice as alarm on front panel. - Fault (softShutDown) : Bus breaker opens allowing the power plant to stop.

Under frequency protection 2

Variable	Threshold (2533)
Unit	%
Min	0.0
Max	200.0
Init	900
Description	Under-frequency Mains Protection Threshold 2

Variable	Timer (2534)
Unit	s
Min	0.0
Max	999.9
Init	100
Description	Timer 2 acceptance before protection activation when Mains Frequency has reached the Under-frequency protection threshold

Variable	Control (2535)
Unit	-
Min	0
Max	7
Init	0
Description	Control 2 selection when Mains Under-frequency protection become active. The selections are the following : - Unused : no action. - Bus electrical fault : The protection opens the Bus breaker and tries to re-synchronize again. Count of attempts set by variable 2807. - Mains electrical fault : The protection opens the Mains breaker. - Alarm : Notice as alarm on front panel. - Fault (softShutDown) : Bus breaker opens allowing the power plant to stop.

Over/under voltage

Over voltage protection

Variable	Threshold (2506)
Unit	%
Min	0.0
Max	200.0
Init	1100
Description	Over-voltage Mains Protection Threshold

Variable	Timer (2507)
Unit	s
Min	0.0
Max	999.9
Init	100
Description	Timer acceptance before protection activation when Mains voltage has reached the over-voltage protection threshold

Variable	Control (2508)
Unit	-
Min	0
Max	7
Init	0
Description	Control selection when Mains Over-voltage protection become active.The selections are the following : - Unused : no action. - Bus electrical fault : The protection opens the Bus breaker and tries to re-synchronize again. Count of attempts set by variable 2807. - Mains electrical fault : The protection opens the Mains breaker. - Alarm : Notice as alarm on front panel. - Fault (softShutDown) : Bus breaker opens allowing the power plant to stop.

Under voltage protection

Variable	Threshold (2509)
Unit	%
Min	0.0
Max	200.0
Init	900
Description	Under-voltage Mains Protection Threshold

Variable	Timer (2510)
Unit	s
Min	0.0
Max	999.9
Init	200
Description	Timer acceptance before protection activation when Mains voltage has reached the Under-voltage protection threshold

Variable	Control (2511)
Unit	-
Min	0
Max	7
Init	2
Description	Control selection when Mains Under-voltage protection become active.The selections are the following : - Unused : no action. - Bus electrical fault : The protection opens the Bus breaker and tries to re-synchronize again. Count of attempts set by variable 2807. - Mains electrical fault : The protection opens the Mains breaker. - Alarm : Notice as alarm on front panel. - Fault (softShutDown) : Bus breaker opens allowing the power plant to stop.

Over voltage protection 2

Variable	Threshold (2536)
Unit	%
Min	0.0
Max	200.0
Init	1100
Description	Over-voltage Mains Protection Threshold 2

Variable	Timer (2537)
Unit	s
Min	0.0
Max	999.9
Init	100
Description	Timer 2 acceptance before protection activation when Mains voltage has reached the over-voltage protection threshold

Variable	Control (2538)
Unit	-
Min	0
Max	7
Init	0
Description	Control 2 selection when Mains Over-voltage protection become active. The selections are the following : - Unused : no action. - Bus electrical fault : The protection opens the Bus breaker and tries to re-synchronize again. Count of attempts set by variable 2807. - Mains electrical fault : The protection opens the Mains breaker. - Alarm : Notice as alarm on front panel. - Fault (softShutDown) : Bus breaker opens allowing the power plant to stop.

Under voltage protection 2

Variable	Threshold (2539)
Unit	%
Min	0.0
Max	200.0
Init	900
Description	Under-voltage Mains Protection Threshold 2

Variable	Timer (2540)
Unit	s
Min	0.0
Max	999.9
Init	200
Description	Timer 2 acceptance before protection activation when Mains voltage has reached the Under-voltage protection threshold

Variable	Control (2541)
Unit	-
Min	0
Max	7
Init	0
Description	Control 2 selection when Mains Under-voltage protection become active. The selections are the following : - Unused : no action. - Bus electrical fault : The protection opens the Bus breaker and tries to re-synchronize again. Count of attempts set by variable 2807. - Mains electrical fault : The protection opens the Mains breaker. - Alarm : Notice as alarm on front panel. - Fault (softShutDown) : Bus breaker opens allowing the power plant to stop.

Reverse kW/kVar

Reverse kW

Variable	Threshold (2518)
Unit	kW
Min	0
Max	65 535
Init	100
Description	Reverse KW Mains Protection Threshold

Variable	Timer (2519)
Unit	s
Min	0.0
Max	999.9
Init	200
Description	Timer acceptance before protection activation when Mains Active Power has reached the Reverse KW protection threshold

Variable	Control (2520)
Unit	-
Min	0
Max	7
Init	0
Description	Control selection when Mains Reverse KW protection become active.The selections are the following : - Unused : no action. - Bus electrical fault : The protection opens the Bus breaker and tries to re-synchronize again. Count of attempts set by variable 2807. - Mains electrical fault : The protection opens the Mains breaker. - Alarm : Notice as alarm on front panel. - Fault (softShutDown) : Bus breaker opens allowing the power plant to stop.

Reverse kVAR

Variable	Threshold (2527)
Unit	kVAR
Min	0
Max	65 535
Init	200
Description	Reverse KVAR Mains Protection Threshold

Variable	Timer (2528)
Unit	s
Min	0.0
Max	999.9
Init	200
Description	Timer acceptance before protection activation when Mains Reactive Power has reached the Reverse KVAR protection threshold

Variable	Control (2529)
Unit	-
Min	0
Max	7
Init	0
Description	Control selection when Mains Reverse KVAR protection become active. The selections are the following : - Unused : no action. - Bus electrical fault : The protection opens the Bus breaker and tries to re-synchronize again. Count of attempts set by variable 2807. - Mains electrical fault : The protection opens the Mains breaker. - Alarm : Notice as alarm on front panel. - Fault (softShutDown) : Bus breaker opens allowing the power plant to stop.

Reverse kW 2

Variable	Threshold (2548)
Unit	kW
Min	0
Max	65 535
Init	100
Description	Reverse KW Mains Protection Threshold 2

Variable	Timer (2549)
Unit	s
Min	0.0
Max	999.9
Init	200
Description	Timer 2 acceptance before protection activation when Mains Active Power has reached the Reverse KW protection threshold

Variable	Control (2550)
Unit	-
Min	0
Max	7
Init	0
Description	Control 2 selection when Mains Reverse KW protection become active. The selections are the following : - Unused : no action. - Bus electrical fault : The protection opens the Bus breaker and tries to re-synchronize again. Count of attempts set by variable 2807. - Mains electrical fault : The protection opens the Mains breaker. - Alarm : Notice as alarm on front panel. - Fault (softShutDown) : Bus breaker opens allowing the power plant to stop.

Reverse kVAR 2

Variable	Threshold (2557)
Unit	kVAR
Min	0
Max	65 535
Init	200
Description	Reverse KVAR Mains Protection Threshold 2

Variable	Timer (2558)
Unit	s
Min	0.0
Max	999.9
Init	200
Description	Timer 2 acceptance before protection activation when Mains Reactive Power has reached the Reverse KVAR protection threshold

Variable	Control (2529)
Unit	-
Min	0
Max	7
Init	0
Description	Control selection when Mains Reverse KVAR protection become active. The selections are the following : - Unused : no action. - Bus electrical fault : The protection opens the Bus breaker and tries to re-synchronize again. Count of attempts set by variable 2807. - Mains electrical fault : The protection opens the Mains breaker. - Alarm : Notice as alarm on front panel. - Fault (softShutDown) : Bus breaker opens allowing the power plant to stop.

Maxi kW/mini kW

Maxi kW

Variable	Threshold (2515)
Unit	kW
Min	0
Max	65 535
Init	110
Description	Maximum KW Mains Protection Threshold

Variable	Timer (2516)
Unit	s
Min	0.0
Max	999.9
Init	600
Description	Timer acceptance before protection activation when Mains Active Power has reached the Maximum KW protection threshold

Variable	Control (2517)
Unit	-
Min	0
Max	7
Init	0
Description	Control selection when Mains Maximum KW protection become active.The selections are the following : - Unused : no action. - Bus electrical fault : The protection opens the Bus breaker and tries to re-synchronize again. Count of attempts set by variable 2807. - Mains electrical fault : The protection opens the Mains breaker. - Alarm : Notice as alarm on front panel. - Fault (softShutDown) : Bus breaker opens allowing the power plant to stop.

Mini kW

Variable	Threshold (2512)
Unit	kW
Min	0
Max	65 535
Init	100
Description	Minimum KW Mains Protection Threshold

Variable	Timer (2513)
Unit	s
Min	0.0
Max	999.9
Init	1200
Description	Timer acceptance before protection activation when Mains Active Power has reached the Minimum KW protection threshold

Variable	Control (2514)
Unit	-
Min	0
Max	7
Init	0
Description	Control selection when Mains Minimum KW protection become active.The selections are the following : - Unused : no action. - Bus electrical fault : The protection opens the Bus breaker and tries to re-synchronize again. Count of attempts set by variable 2807. - Mains electrical fault : The protection opens the Mains breaker. - Alarm : Notice as alarm on front panel. - Fault (softShutDown) : Bus breaker opens allowing the power plant to stop.

Maxi kW 2

Variable	Threshold (2545)
Unit	kW
Min	0
Max	65 535
Init	110
Description	Maximum KW Mains Protection Threshold 2

Variable	Timer (2546)
Unit	s
Min	0.0
Max	999.9
Init	600
Description	Timer 2 acceptance before protection activation when Mains Active Power has reached the Maximum KW protection threshold

Variable	Control (2547)
Unit	-
Min	0
Max	7
Init	0
Description	Control 2 selection when Mains Maximum KW protection become active. The selections are the following : - Unused : no action. - Bus electrical fault : The protection opens the Bus breaker and tries to re-synchronize again. Count of attempts set by variable 2807. - Mains electrical fault : The protection opens the Mains breaker. - Alarm : Notice as alarm on front panel. - Fault (softShutDown) : Bus breaker opens allowing the power plant to stop.

Mini kW 2

Variable	Threshold (2542)
Unit	kW
Min	0
Max	65 535
Init	100
Description	Minimum KW Mains Protection Threshold 2

Variable	Timer (2543)
Unit	s
Min	0.0
Max	999.9
Init	1200
Description	Timer 2 acceptance before protection activation when Mains Active Power has reached the Minimum KW protection threshold

Variable	Control (2544)
Unit	-
Min	0
Max	7
Init	0
Description	Control 2 selection when Mains Minimum KW protection become active. The selections are the following : - Unused : no action. - Bus electrical fault : The protection opens the Bus breaker and tries to re-synchronize again. Count of attempts set by variable 2807. - Mains electrical fault : The protection opens the Mains breaker. - Alarm : Notice as alarm on front panel. - Fault (softShutDown) : Bus breaker opens allowing the power plant to stop.

Maxi kVAR/mini kVAR

Maxi kVAR

Variable	Threshold (2524)
Unit	kVAR
Min	0
Max	65 535
Init	100
Description	Maximum KVAR Mains Protection Threshold

Variable	Timer (2525)
Unit	s
Min	0.0
Max	999.9
Init	300
Description	Timer acceptance before protection activation when Mains Reactive Power has reached the Maximum KVAR protection threshold

Variable	Control (2526)
Unit	-
Min	0
Max	7
Init	0
Description	Control selection when Mains Maximum KVAR protection become active.The selections are the following : - Unused : no action. - Bus electrical fault : The protection opens the Bus breaker and tries to re-synchronize again. Count of attempts set by variable 2807. - Mains electrical fault : The protection opens the Mains breaker. - Alarm : Notice as alarm on front panel. - Fault (softShutDown) : Bus breaker opens allowing the power plant to stop.

Mini kVAR

Variable	Threshold (2521)
Unit	kVAR
Min	0
Max	65 535
Init	200
Description	Minimum KVAR Mains Protection Threshold

Variable	Timer (2522)
Unit	s
Min	0.0
Max	999.9
Init	1200
Description	Timer acceptance before protection activation when Mains Reactive Power has reached the Minimum KVAR protection threshold

Variable	Control (2523)
Unit	-
Min	0
Max	7
Init	0
Description	Control selection when Mains Minimum KVAR protection become active.The selections are the following : - Unused : no action. - Bus electrical fault : The protection opens the Bus breaker and tries to re-synchronize again. Count of attempts set by variable 2807. - Mains electrical fault : The protection opens the Mains breaker. - Alarm : Notice as alarm on front panel. - Fault (softShutDown) : Bus breaker opens allowing the power plant to stop.

Maxi kVAR 2

Variable	Threshold (2554)
Unit	kVAR
Min	0
Max	65 535
Init	100
Description	Maximum KVAR Mains Protection Threshold 2

Variable	Timer (2555)
Unit	s
Min	0.0
Max	999.9
Init	300
Description	Timer 2 acceptance before protection activation when Mains Reactive Power has reached the Maximum KVAR protection threshold

Variable	Control (2556)
Unit	-
Min	0
Max	7
Init	0
Description	Control 2 selection when Mains Maximum KVAR protection become active. The selections are the following : - Unused : no action. - Bus electrical fault : The protection opens the Bus breaker and tries to re-synchronize again. Count of attempts set by variable 2807. - Mains electrical fault : The protection opens the Mains breaker. - Alarm : Notice as alarm on front panel. - Fault (softShutDown) : Bus breaker opens allowing the power plant to stop.

Mini kVAR 2

Variable	Threshold (2551)
Unit	kVAR
Min	0
Max	65 535
Init	200
Description	Minimum KVAR Mains Protection Threshold 2

Variable	Timer (2552)
Unit	s
Min	0.0
Max	999.9
Init	1200
Description	Timer 2 acceptance before protection activation when Mains Reactive Power has reached the Minimum KVAR protection threshold

Variable	Control (2553)
Unit	-
Min	0
Max	7
Init	0
Description	Control 2 selection when Mains Minimum KVAR protection become active. The selections are the following : - Unused : no action. - Bus electrical fault : The protection opens the Bus breaker and tries to re-synchronize again. Count of attempts set by variable 2807. - Mains electrical fault : The protection opens the Mains breaker. - Alarm : Notice as alarm on front panel. - Fault (softShutDown) : Bus breaker opens allowing the power plant to stop.

Vector jump/ROCOF (df/dt)

Vector jump protection

Variable	Threshold (2560)
Unit	°
Min	1
Max	100
Init	20
Description	Vector Jump Protection Threshold

Variable	Control (2561)
Unit	-
Min	0
Max	5
Init	0
Description	Control selection when Vector Jump protection become active. The selections are the following : - Unused : no action. - Bus electrical fault : The protection opens the Bus breaker and tries to re-synchronize again. Count of attempts set by variable 2807. - Mains electrical fault : The protection opens the Mains breaker. - Alarm : Notice as alarm on front panel. - Fault (softShutDown) : Bus breaker opens allowing the power plant to stop.

ROCOF (df/dt) protection

Variable	Threshold (2562)
Unit	Hz/s
Min	0.1
Max	10.0
Init	10
Description	df/dt (Rocof) Protection Threshold

Variable	Control (2563)
Unit	-
Min	0
Max	5
Init	0
Description	Control selection when df/dt (Rocof) protection become active. The selections are the following : - Unused : no action. - Bus electrical fault : The protection opens the Bus breaker and tries to re-synchronize again. Count of attempts set by variable 2807. - Mains electrical fault : The protection opens the Mains breaker. - Alarm : Notice as alarm on front panel. - Fault (softShutDown) : Bus breaker opens allowing the power plant to stop.

Initialising delay after mains paralleling

Variable	Timer (2564)
Unit	s
Min	0.0
Max	6553.5
Init	20
Description	Timer Initialisation after mains paralleling to activate Vector Jump and/or df/dt (Rocof) protections

Voltage/current unbalance

Voltage unbalance

Variable	Threshold (2565)
Unit	%
Min	0.0
Max	200.0
Init	50
Description	Voltage Unbalance Mains Protection Threshold

Variable	Timer (2566)
Unit	s
Min	0.0
Max	999.9
Init	30
Description	Timer acceptance before protection activation when Mains voltage has reached the Voltage Unbalance protection threshold

Variable	Control (2567)
Unit	-
Min	0
Max	7
Init	0
Description	Control selection when Mains Voltage Unbalance protection become active. The selections are the following : - Unused : no action. - Bus electrical fault : The protection opens the Bus breaker and tries to re-synchronize again. Count of attempts set by variable 2807. - Mains electrical fault : The protection opens the Mains breaker. - Alarm : Notice as alarm on front panel. - Fault (softShutDown) : Bus breaker opens allowing the power plant to stop.

Voltage unbalance 2

Variable	Threshold (2568)
Unit	%
Min	0.0
Max	200.0
Init	100
Description	Voltage Unbalance Mains Protection Threshold 2

Variable	Timer (2569)
Unit	s
Min	0.0
Max	999.9
Init	30
Description	Timer 2 acceptance before protection activation when Mains voltage has reached the Voltage Unbalance protection threshold

Variable	Control (2570)
Unit	-
Min	0
Max	7
Init	0
Description	Control 2 selection when Mains Voltage Unbalance protection become active. The selections are the following : - Unused : no action. - Bus electrical fault : The protection opens the Bus breaker and tries to re-synchronize again. Count of attempts set by variable 2807. - Mains electrical fault : The protection opens the Mains breaker. - Alarm : Notice as alarm on front panel. - Fault (softShutDown) : Bus breaker opens allowing the power plant to stop.

Current unbalance

Variable	Threshold (2572)
Unit	%
Min	0.0
Max	200.0
Init	400
Description	Current Unbalance Mains Protection Threshold

Variable	Timer (2573)
Unit	s
Min	0.0
Max	999.9
Init	30
Description	Timer acceptance before protection activation when Mains Current has reached the Current Unbalance protection threshold

Variable	Control (2574)
Unit	-
Min	0
Max	7
Init	0
Description	Control selection when Mains Current Unbalance protection become active. The selections are the following : - Unused : no action. - Bus electrical fault : The protection opens the Bus breaker and tries to re-synchronize again. Count of attempts set by variable 2807. - Mains electrical fault : The protection opens the Mains breaker. - Alarm : Notice as alarm on front panel. - Fault (softShutDown) : Bus breaker opens allowing the power plant to stop.

Current unbalance 2

Variable	Threshold (2575)
Unit	%
Min	0.0
Max	200.0
Init	600
Description	Current Unbalance Mains Protection Threshold 2

Variable	Timer (2576)
Unit	s
Min	0.0
Max	999.9
Init	30
Description	Timer 2 acceptance before protection activation when Mains Current has reached the Current Unbalance protection threshold

Variable	Control (2577)
Unit	-
Min	0
Max	7
Init	0
Description	Control 2 selection when Mains Current Unbalance protection become active. The selections are the following : - Unused : no action. - Bus electrical fault : The protection opens the Bus breaker and tries to re-synchronize again. Count of attempts set by variable 2807. - Mains electrical fault : The protection opens the Mains breaker. - Alarm : Notice as alarm on front panel. - Fault (softShutDown) : Bus breaker opens allowing the power plant to stop.

Other protections

Analog inputs protection

Analog input 1 protection

Variable	AN1 min/max (Customisable) (4206)
Unit	-
Min	0
Max	3
Init	-
Description	This value is to customize the label of analog input 1 protection. The maximum number of caracters is of 14. This protection use the analog input 1 set in the "Analog inputs" chapiter (variable 150).

Variable	Threshold (2600)
Unit	-
Min	−32 767
Max	32 767
Init	0
Description	This setpoint adjusts the threshold level for analog input 1 protection. The setting of this setpoint is according to the unit selected for the analog input 1 (variable 150).

Variable	Timer (2601)
Unit	s
Min	0.0
Max	999.9
Init	0
Description	This setpoint adjusts the delay of the threshold level for analog input 1 detection. This setpoint can be set from 0s to 999,9s. If the threshold's analog input 1 is still detected at the end of the delay, then the action of the parameter "Validation" (variable 2602) will be activated. If the threshold's analog input 1 is no more detected during the delay, then the delay will be reset.

Variable	Validation (2602)
Unit	-
Min	0
Max	7
Init	0
Description	This setpoint define the action which will be activated if the threshold level for analog input 1 is detected until the end of the set delay. Possible actions are : - Unused : no action. - Bus electrical fault : The protection opens the Bus breaker and tries to re-synchronize again. Count of attempts set by variable 2807. - Mains electrical fault : The protection opens the Mains breaker. - Alarm : Notice as alarm on front panel. - Fault (softShutDown) : Bus breaker opens allowing the power plant to stop.

Variable	Threshold (level 2) (2603)
Unit	-
Min	−32 767
Max	32 767
Init	0
Description	This setpoint adjusts the second threshold level for analog input 1 protection. The setting of this setpoint is according to the unit selected for the analog input 1 (variable 150).

Variable	Timer (level 2) (2604)
Unit	s
Min	0.0
Max	999.9
Init	0
Description	This setpoint adjusts the delay of the second threshold level for analog input 1 detection. This setpoint can be set from 0s to 999,9s. If the second threshold's analog input 1 is still detected at the end of the delay, then the action of the parameter "Validation" (variable 2605) will be activated. If the second threshold's analog input 1 is no more detected during the delay, then the delay will be reset.

Variable	Validation (level 2) (2605)
Unit	-
Min	0
Max	7
Init	0
Description	This setpoint define the action which will be activated if the second threshold level for analog input 1 is detected until the end of the set delay. Possible actions are : - Unused : no action. - Bus electrical fault : The protection opens the Bus breaker and tries to re-synchronize again. Count of attempts set by variable 2807. - Mains electrical fault : The protection opens the Mains breaker. - Alarm : Notice as alarm on front panel. - Fault (softShutDown) : Bus breaker opens allowing the power plant to stop.

Variable	Direction (2606)
Unit	-
Min	0
Max	1
Init	0
Description	This setpoint define if the both threshold level for analog input 1 are minimum or maximum limit. If the setpoint is on "Minimum" then the action of vaiables 2602 and 2605 will activate from thresholds level set and below. If the setpoint is on "Maximum" then the action of vaiables 2602 and 2605 will activate from thresholds level set and above.

Analog input 2 protection

Variable	AN2 min/max (Customisable) (4207)
Unit	-
Min	0
Max	3
Init	-
Description	This value is to customize the label of analog input 2 protection. The maximum number of caracters is of 14. This protection use the analog input 2 set in the "Analog inputs" chapiter (variable 151).

Variable	Threshold (2608)
Unit	-
Min	−32 767
Max	32 767
Init	0
Description	This setpoint adjusts the threshold level for analog input 2 protection. The setting of this setpoint is according to the unit selected for the analog input 2 (variable 151).

Variable	Timer (2609)
Unit	s
Min	0.0
Max	999.9
Init	0
Description	This setpoint adjusts the delay of the threshold level for analog input 2 detection. This setpoint can be set from 0s to 999,9s. If the threshold's analog input 2 is still detected at the end of the delay, then the action of the parameter "Validation" (variable 2610) will be activated. If the threshold's analog input 2 is no more detected during the delay, then the delay will be reset.

Variable	Validation (2610)
Unit	-
Min	0
Max	7
Init	0
Description	This setpoint define the action which will be activated if the threshold level for analog input 2 is detected until the end of the set delay. Possible actions are : - Unused : no action. - Bus electrical fault : The protection opens the Bus breaker and tries to re-synchronize again. Count of attempts set by variable 2807. - Mains electrical fault : The protection opens the Mains breaker. - Alarm : Notice as alarm on front panel. - Fault (softShutDown) : Bus breaker opens allowing the power plant to stop.

Variable	Threshold (level 2) (2611)
Unit	-
Min	−32 767
Max	32 767
Init	0
Description	This setpoint adjusts the second threshold level for analog input 2 protection. The setting of this setpoint is according to the unit selected for the analog input 2 (variable 151).

Variable	Timer (level 2) (2612)
Unit	s
Min	0.0
Max	999.9
Init	0
Description	This setpoint adjusts the delay of the second threshold level for analog input 2 detection. This setpoint can be set from 0s to 999,9s. If the second threshold's analog input 2 is still detected at the end of the delay, then the action of the parameter "Validation" (variable 2613) will be activated. If the second threshold's analog input 2 is no more detected during the delay, then the delay will be reset.

Variable	Validation (level 2) (2613)
Unit	-
Min	0
Max	7
Init	0
Description	This setpoint define the action which will be activated if the second threshold level for analog input 2 is detected until the end of the set delay. Possible actions are : - Unused : no action. - Bus electrical fault : The protection opens the Bus breaker and tries to re-synchronize again. Count of attempts set by variable 2807. - Mains electrical fault : The protection opens the Mains breaker. - Alarm : Notice as alarm on front panel. - Fault (softShutDown) : Bus breaker opens allowing the power plant to stop.

Variable	Direction (2614)
Unit	-
Min	0
Max	1
Init	0
Description	This setpoint define if the both threshold level for analog input 2 are minimum or maximum limit. If the setpoint is on "Minimum" then the action of vaiables 2610 and 2613 will activate from thresholds level set and below. If the setpoint is on "Maximum" then the action of vaiables 2610 and 2613 will activate from thresholds level set and above.

Analog input 3 protection

Variable	AN3 min/max (Customisable) (4208)
Unit	-
Min	0
Max	3
Init	-
Description	This value is to customize the label of analog input 3 protection. The maximum number of caracters is of 14. This protection use the analog input 3 set in the "Analog inputs" chapiter (variable 152).

Variable	Threshold (2616)
Unit	-
Min	−32 767
Max	32 767
Init	0
Description	This setpoint adjusts the threshold level for analog input 3 protection. The setting of this setpoint is according to the unit selected for the analog input 3 (variable 152).

Variable	Timer (2617)
Unit	s
Min	0.0
Max	999.9
Init	0
Description	This setpoint adjusts the delay of the threshold level for analog input 3 detection. This setpoint can be set from 0s to 999,9s. If the threshold's analog input 3 is still detected at the end of the delay, then the action of the parameter "Validation" (variable 2618) will be activated. If the threshold's analog input 3 is no more detected during the delay, then the delay will be reset.

Variable	Validation (2618)
Unit	-
Min	0
Max	7
Init	0
Description	This setpoint define the action which will be activated if the threshold level for analog input 3 is detected until the end of the set delay. Possible actions are : – Unused : no action. - Bus electrical fault : The protection opens the Bus breaker and tries to re-synchronize again. Count of attempts set by variable 2807. - Mains electrical fault : The protection opens the Mains breaker. - Alarm : Notice as alarm on front panel. - Fault (softShutDown) : Bus breaker opens allowing the power plant to stop.

Variable	Threshold (level 2) (2619)
Unit	-
Min	−32 767
Max	32 767
Init	0
Description	This setpoint adjusts the second threshold level for analog input 3 protection. The setting of this setpoint is according to the unit selected for the analog input 3 (variable 152).

Variable	Timer (level 2) (2620)
Unit	s
Min	0.0
Max	999.9
Init	0
Description	This setpoint adjusts the delay of the second threshold level for analog input 3 detection. This setpoint can be set from 0s to 999,9s. If the second threshold's analog input 3 is still detected at the end of the delay, then the action of the parameter "Validation" (variable 2621) will be activated. If the second threshold's analog input 3 is no more detected during the delay, then the delay will be reset.

Variable	Validation (level 2) (2621)
Unit	-
Min	0
Max	7
Init	0
Description	This setpoint define the action which will be activated if the second threshold level for analog input 3 is detected until the end of the set delay. Possible actions are : - Unused : no action. - Bus electrical fault : The protection opens the Bus breaker and tries to re-synchronize again. Count of attempts set by variable 2807. - Mains electrical fault : The protection opens the Mains breaker. - Alarm : Notice as alarm on front panel. - Fault (softShutDown) : Bus breaker opens allowing the power plant to stop.

Variable	Direction (2622)
Unit	-
Min	0
Max	1
Init	0
Description	This setpoint define if the both threshold level for analog input 3 are minimum or maximum limit. If the setpoint is on "Minimum" then the action of vaiables 2618 and 2621 will activate from thresholds level set and below. If the setpoint is on "Maximum" then the action of vaiables 2618 and 2621 will activate from thresholds level set and above.

Battery protection

Maximum battery voltage protection

Variable	Threshold (2359)
Unit	V
Min	0.0
Max	35.0
Init	300
Description	This setpoint adjusts the warning level for battery overvoltage protection. This protection is mainly electrical protection. This setpoint can be set from 0V to 35V.

Variable	Timer (2360)
Unit	s
Min	0.0
Max	999.9
Init	100
Description	This setpoint adjusts the delay of the battery overvoltage detection. This setpoint can be set from 0s to 999,9s. If the overvoltage is still detected at the end of the delay, then the action of the parameter "Validation" (variable 2361) will be activated. If the overvoltage is no more detected during the delay, then the delay will be reset.

Variable	Validation (2361)
Unit	-
Min	0
Max	7
Init	0
Description	This setpoint define the action which will be activated if a battery overvoltage is detected until the end of the set delay. Possible actions are : - Unused : no action. - Bus electrical fault : The protection opens the Bus breaker and tries to re-synchronize again. Count of attempts set by variable 2807. - Mains electrical fault : The protection opens the Mains breaker. - Alarm : Notice as alarm on front panel. - Fault (softShutDown) : Bus breaker opens allowing the power plant to stop.

Minimum battery voltage protection

Variable	Threshold (2356)
Unit	V
Min	0.0
Max	35.0
Init	180
Description	This setpoint adjusts the warning level for battery undervoltage protection. This protection is mainly electrical protection. This setpoint can be set from 0V to 35V.

Variable	Timer (2357)
Unit	s
Min	0.0
Max	999.9
Init	600
Description	This setpoint adjusts the delay of the battery undervoltage detection. This setpoint can be set from 0s to 999,9s. If the undervoltage is still detected at the end of the delay, then the action of the parameter "Validation" (variable 2358) will be activated. If the undervoltage is no more detected during the delay, then the delay will be reset.

Variable	Validation (2358)
Unit	-
Min	0
Max	7
Init	0
Description	This setpoint define the action which will be activated if a battery undervoltage is detected until the end of the set delay. Possible actions are : - Unused : no action. - Bus electrical fault : The protection opens the Bus breaker and tries to re-synchronize again. Count of attempts set by variable 2807. - Mains electrical fault : The protection opens the Mains breaker. - Alarm : Notice as alarm on front panel. - Fault (softShutDown) : Bus breaker opens allowing the power plant to stop.

Maximum battery voltage protection 2

Variable	Threshold (2377)
Unit	V
Min	0.0
Max	35.0
Init	320
Description	This setpoint adjusts the warning level for battery 2 overvoltage protection. This protection is mainly electrical protection. This setpoint can be set from 0V to 35V.

Variable	Timer (2378)
Unit	s
Min	0.0
Max	999.9
Init	50
Description	This setpoint adjusts the delay of the battery 2 overvoltage detection. This setpoint can be set from 0s to 999,9s. If the overvoltage is still detected at the end of the delay, then the action of the parameter "Validation" (variable 2361) will be activated. If the overvoltage is no more detected during the delay, then the delay will be reset.

Variable	Validation (2379)
Unit	-
Min	0
Max	7
Init	0
Description	This setpoint define the action which will be activated if a battery 2 overvoltage is detected until the end of the set delay. Possible actions are : - Unused : no action. - Bus electrical fault : The protection opens the Bus breaker and tries to re-synchronize again. Count of attempts set by variable 2807. - Mains electrical fault : The protection opens the Mains breaker. - Alarm : Notice as alarm on front panel. - Fault (softShutDown) : Bus breaker opens allowing the power plant to stop.

Minimum battery voltage protection 2

Variable	Threshold (2374)
Unit	V
Min	0.0
Max	35.0
Init	150
Description	This setpoint adjusts the warning level for battery 2 undervoltage protection. This protection is mainly electrical protection. This setpoint can be set from 0V to 35V.

Variable	Timer (2375)
Unit	s
Min	0.0
Max	999.9
Init	100
Description	This setpoint adjusts the delay of the battery 2 undervoltage detection. This setpoint can be set from 0s to 999,9s. If the undervoltage is still detected at the end of the delay, then the action of the parameter "Validation" (variable 2358) will be activated. If the undervoltage is no more detected during the delay, then the delay will be reset.

Variable	Validation (2376)
Unit	-
Min	0
Max	7
Init	0
Description	This setpoint define the action which will be activated if a battery 2 undervoltage is detected until the end of the set delay. Possible actions are : - Unused : no action. - Bus electrical fault : The protection opens the Bus breaker and tries to re-synchronize again. Count of attempts set by variable 2807. - Mains electrical fault : The protection opens the Mains breaker. - Alarm : Notice as alarm on front panel. - Fault (softShutDown) : Bus breaker opens allowing the power plant to stop.

Boost battery

Variable	Enable (2388)
Unit	-
Min	0
Max	1
Init	0
Description	This setpoint activate the boost battery function. This function activate the boost battery output with a low threshold (variable 2386) of the battery voltage and deactivate the output with high threshold (variable 2387).

Variable	Low threshold (2386)
Unit	V
Min	0.0
Max	35.0
Init	200
Description	This setpoint adjusts the low threshold level to activate the boost battery output. This setpoint can be set only if the variable 2388 is activated. This setpoint can be set from 0V to 35V.

Variable	High threshold (2387)
Unit	V
Min	0.0
Max	35.0
Init	280
Description	This setpoint adjusts the high threshold level to deactivate the boost battery output. This setpoint can be set only if the variable 2388 is activated. This setpoint can be set from 0V to 35V. This threshold have to be higher than the low threshold (variable 2386).

Inputs

Digital inputs

Digital inputs

Variable	Timer ON Digital Input 1 (2709)
Unit	s
Min	0.0
Max	6553.5
Init	0
Description	Digital Input 1 activation timer

Variable	Timer OFF Digital Input 1 (2718)
Unit	s
Min	0.0
Max	6553.5
Init	0
Description	Digital Input 1 desactivation timer

Variable	Validity on DI 1 (2727)
Unit	-
Min	0
Max	3
Init	1
Description	Digital Input 1 activation validity (0=Never/1=Always/2=Post Starting/3= rpm & Volt Stabilized)

Variable	Polarity NO/NC on DI 1 (2736)
Unit	-
Min	0
Max	1
Init	0
Description	Direction of Digital Input 1 (0=Normaly Open/1=Normaly Close)

Variable	Function configured on DI 1 (2700)
Unit	-
Min	0
Max	65 535
Init	4500
Description	Digital Input 1 associated function (Default value : Generator breaker feedback)

Hysteresis

Variable	Hysteresis 1 enable for DI (2769)
Unit	-
Min	0
Max	1
Init	0
Description	Enable hysteresis 1 on digital inputs functions

Variable	Timer (2777)
Unit	s
Min	0.0
Max	999.9
Init	0
Description	Timer at activation on digital input of Hysteresis 1

Variable	Direction (2785)
Unit	-
Min	0
Max	1
Init	0
Description	Direction Hysteresis 1 : 0 = Set on low thresh. - Reset on high thresh. / 1 = Set on high thresh. - Reset on low thresh.

Analog inputs

Analog input

Variable	Analog Input 1 function if use in DI (2607)
Unit	-
Min	0
Max	65 535
Init	0
Description	Function associated to Analog input 2 if used as Digital input.

Variable	Analog Input 1 Calibration point 1 (2624)
Unit	-
Min	−32 767
Max	32 767
Init	0
Description	Analog 1 :calibration point 1

Variable	Analog Input 1 Calibration point 2 (2625)
Unit	-
Min	−32 767
Max	32 767
Init	500
Description	Analog 1 :calibration point 2

Variable	Analog Input 1 Calibration point 3 (2626)
Unit	-
Min	−32 767
Max	32 767
Init	1000
Description	Analog 1 :calibration point 3

Variable	Analog Input 1 Calibration point 4 (2627)
Unit	-
Min	−32 767
Max	32 767
Init	1500
Description	Analog 1 :calibration point 4

Variable	Analog Input 1 Calibration point 5 (2628)
Unit	-
Min	−32 767
Max	32 767
Init	2000
Description	Analog 1 :calibration point 5

Variable	Analog Input 1 Calibration point 6 (2629)
Unit	-
Min	−32 767
Max	32 767
Init	2500
Description	Analog 1 :calibration point 6

Variable	Analog Input 1 Calibration point 7 (2630)
Unit	-
Min	−32 767
Max	32 767
Init	3000
Description	Analog 1 :calibration point 7

Variable	Analog Input 1 Calibration point 8 (2631)
Unit	-
Min	−32 767
Max	32 767
Init	3500
Description	Analog 1 :calibration point 8

Variable	Analog Input 1 Calibration point 9 (2632)
Unit	-
Min	−32 767
Max	32 767
Init	4000
Description	Analog 1 :calibration point 9

Variable	Analog Input 1 Calibration point 10 (2633)
Unit	-
Min	−32 767
Max	32 767
Init	4500
Description	Analog 1 :calibration point 10

Variable	Analog Input 1 Calibration point 11 (2634)
Unit	-
Min	−32 767
Max	32 767
Init	5000
Description	Analog 1 :calibration point 11

Hysteresis

Variable	Activating Hysteresis on Analog Input 1 (2657)
Unit	-
Min	0
Max	1
Init	0
Description	Enable hysteresis on analog input 1 with thresholds E2660(Low Level) & E2663(High Level)

Variable	Low level threshold (2660)
Unit	-
Min	0
Max	65 535
Init	0
Description	Low level threshold for digital output activation on hysteresis (analog input 1)

Variable	Timer on low level threshold (2666)
Unit	s
Min	0.0
Max	999.9
Init	30
Description	Timer before set/reset digital output on hysteresis low threshold (analog input 1)

Variable	High level threshold (2663)
Unit	-
Min	0
Max	65 535
Init	0
Description	High level threshold for digital output activation on hysteresis (analog input 1)

Variable	Timer on high level threshold (2669)
Unit	s
Min	0.0
Max	999.9
Init	30
Description	Timer before set/reset digital output on hysteresis high threshold (analog input 1)

Variable	Hysteresis Direction on Analog Input 1 (2672)
Unit	-
Min	0
Max	1
Init	0
Description	Hysteresis Direction on Analog Input 1 (0 : Set on low thresh. - Reset on high thresh. / 1 : Set on high thresh. - Reset on low thresh)

Outputs

Digital outputs/relays

Digital outputs

Variable	Status Digital Output 1 (4350)
Unit	-
Min	0
Max	1
Init	-
Description	Real time displayed status of Digital Output 1

Variable	Function configured DO 1 (2745)
Unit	-
Min	0
Max	65 535
Init	0
Description	Output 1 Associated function

Variable	Polarity NE/ND DO 1 (2751)
Unit	-
Min	0
Max	1
Init	0
Description	Polarity (0=Normaly De-energized / 1=Normaly Energized) Digital output 1

Variable	Pulse Lenght DO 1 (2761)
Unit	s
Min	0.0
Max	6553.5
Init	0
Description	Digital ouput 1 pulse timer (0 = no pulse, continous activation)

Relays

Variable	Status Relay Output 1 (4356)
Unit	-
Min	0
Max	1
Init	-
Description	Real time displayed status of Relay Output 1

Variable	Output function Relay 1 (2757)
Unit	-
Min	0
Max	65 535
Init	4676
Description	Relay 1 Associated function

Variable	Direction NO/NC Relay 1 (2759)
Unit	-
Min	0
Max	1
Init	0
Description	Relay 1 Direction (0=Normaly Open / 1=Normaly Closed)

Variable	Pulse Lenght R 1 (2767)
Unit	s
Min	0.0
Max	6553.5
Init	0
Description	Relay ouput 1 pulse timer (0 = no pulse, continous activation)

Power Plant breaker

Power plant breaker control

Variable	Bus circuit breaker control type (2300)
Unit	-
Min	0
Max	5
Init	1
Description	Control type of the relay for the circuit breakers of the Module (pulse, hold, coil...)

Variable	Fail to open/close breaker timer (2304)
Unit	s
Min	0.0
Max	10.0
Init	50
Description	Circuit breaker max command delay (timer for discrepancy between command and feedback), identical for both generator circuit breaker and mais circuit breaker, is generating a fault.

Settings of pulses

Variable	Bus CB control Pulse length (2301)
Unit	s
Min	0.0
Max	999.9
Init	25
Description	Bus circuit breaker pulse length

Variable	Undervoltage coil hold time BCB (2302)
Unit	s
Min	0.0
Max	999.9
Init	10
Description	Bus circuit breaker : timer of the negative impulsion when low voltage coil

Variable	Undervoltage coil security timer BCB (2303)
Unit	s
Min	0.0
Max	999.9
Init	2
Description	Bus circuit breaker : delay between 2 attempts when low voltage coil negative pulse is used

Mains breaker

Mains breaker control

Variable	Mains circuit breaker control type (2307)
Unit	-
Min	0
Max	5
Init	1
Description	Control type of the relay for the Mains circuit breaker of the genset (pulse, hold, coil...)

Variable	Fail to open/close breaker timer (2304)
Unit	s
Min	0.0
Max	10.0
Init	50
Description	Circuit breaker max command delay (timer for discrepancy between command and feedback), identical for both generator circuit breaker and mais circuit breaker, is generating a fault.

Settings of pulses

Variable	Mains CB control Pulse length (2314)
Unit	s
Min	0.0
Max	999.9
Init	25
Description	Mains circuit breaker pulse length

Variable	Undervoltage coil hold time MCB (2315)
Unit	s
Min	0.0
Max	999.9
Init	10
Description	Mains circuit breaker : timer of the negative impulsion when low voltage coil

Variable	Undervoltage coil security timer MCB (2316)
Unit	s
Min	0.0
Max	999.9
Init	2
Description	Mains circuit breaker : delay between 2 attempts when low voltage coil negative pulse is used

CANopen

CANopen

CANopen

Variable	Configuration (3151)
Unit	-
Min	0
Max	5
Init	4
Description	CANOPEN configuration 8 I/O - 16 I/O - 32 I/O or client configuration

Variable	Coupler ID # 1 (3153)
Unit	-
Min	0
Max	255
Init	1
Description	Coupler identifier, In client Config mode, we can add several couplers and for each coupler a unique identifier is dedicated by the client

Variable	CANopen baud rate (3051)
Unit	-
Min	0
Max	65 535
Init	125
Description	CAN bus 2 baud speed (J1939/CANopen)

Variable	Error timer (3152)
Unit	s
Min	0.0
Max	6553.5
Init	100
Description	CANopen error timer

CANopen customer configuration

Variable	Coupler ID # 1 (3153)
Unit	-
Min	0
Max	255
Init	1
Description	Coupler identifier, In client Config mode, we can add several couplers and for each coupler a unique identifier is dedicated by the client

Variable	CANopen IN 1 (3154)
Unit	-
Min	0
Max	32
Init	0
Description	Each coupler is associated with an input number

Variable	CANopen OUT 1 (3155)
Unit	-
Min	0
Max	32
Init	0
Description	Each coupler is associated with output number

Inputs

Variable	CANopenVal I1 (3264)
Unit	-
Min	0
Max	3
Init	1
Description	Logic input usage mode Never / Always / Post starting / Stabilized

Variable	CANopenTM I1 (3232)
Unit	s
Min	0.0
Max	6553.5
Init	0
Description	Function execution delay, user can add execution delay after logic input status change

Variable	CANopenDir I1 (3296)
Unit	-
Min	0
Max	1
Init	0
Description	Direction of logic input Normally open or Normally closed

Variable	CANopenFuncI1 (3200)
Unit	-
Min	0
Max	65 535
Init	0
Description	selection of the function, which will be executed when the logic input changes state . (see functions on logic inputs for more details about functions)

Outputs

Variable	CANopenModeO1 (3382)
Unit	-
Min	0
Max	1
Init	0
Description	selection of the direction of the logic output, normally energized or de-energized

Variable	CANopenFuncO1 (3350)
Unit	-
Min	0
Max	65 535
Init	0
Description	Status change of the open or closed logic output, depending on the selected function

Timers

Others timers

Variable	Horn Timer (2478)
Unit	s
Min	0.0
Max	6553.5
Init	10
Description	Trigger time Horn. 0 means the horn will buzz until being manually stopped.

Synchronization

Synchronization check relay

Variable	Voltage acceptance (2800)
Unit	%
Min	0.0
Max	12.0
Init	50
Description	Voltage acceptance for synchronization between gensets (or genset/mains)

Variable	Frequency acceptance (2801)
Unit	Hz
Min	0.00
Max	0.20
Init	10
Description	Frequency acceptance for synchronization between gensets (or genset/mains)

Variable	Phase Angle acceptance (2802)
Unit	°
Min	0
Max	30
Init	10
Description	Phase Angle acceptance for synchronization between gensets (or genset/mains)

Variable	Fail to synchronize timer (2803)
Unit	s
Min	0.0
Max	999.9
Init	1200
Description	Timer max for synchronisation

Variable	Control on fail to synchronize (2804)
Unit	-
Min	0
Max	7
Init	3
Description	Validation fail to synch (Default value=Alarm)

Control loops

Synchronization (breaker open)

Variable	Global Gain PID for Syncho (2904)
Unit	-
Min	0
Max	100
Init	10
Description	The phase synchronisation is used to match the phase of our module to the phase of the busbar or mains, in order to close its breaker in good condition. This variable sets the global Gain of phase synchronisation PID. The global Gain is the multiplier of the proportional, integral and derivative values. A too high value will cause a pumping, a too low value will cause a low reaction, We can compare it to a nervousness Gain.

Variable	Proportional Gain for Syncho (2905)
Unit	-
Min	0
Max	100
Init	10
Description	Proportional value to adjust the response of the system to a static, instant error, it increases the precision and speed. A too high setting has the effect of generating an oscillation of the system,

Variable	Integral Gain for Syncho (2906)
Unit	-
Min	0
Max	100
Init	0
Description	The Integral value set the final value of the system without error. It fixes a small mistake which is prolonged. It increases the final accuracy. A too high setting has the effect of generating an oscillation of the system

Variable	Derivate Gain for Syncho (2907)
Unit	-
Min	0
Max	100
Init	0
Description	Derivate value change the increasing time to reach the set point. It increases stability and speed.

Logger

Logger

Variable	Log on/off (3610)
Unit	-
Min	0
Max	3
Init	0
Description	Archiving mode OFF = NEVER / ALWAYS / POST STARTING / STABILIZED, event archiving can be activated depending on engine status. Warning : erase will delete all faults, alarms and archived data.

Variable	Log Var 1 (3600)
Unit	-
Min	0
Max	65 535
Init	0
Description	Logger of the variable to archive

Variable	Log1 period (3612)
Unit	s
Min	0
Max	9999
Init	0
Description	Time in second of interval between each archiving

Modbus redirection

Modbus variables 0-99

Modbus redirection variables

Variable	Modbus 000 (10000)
Unit	-
Min	0
Max	65 535
Init	0
Description	Modbus redirection variable, allows to redirect a variable to the modbus address 10,000

List of inputs/outputs - Bitfields

List of inputs

Variable	Bus/Mains breaker feedback (4500)
Description	Mains breaker aux

Variable	Bus breaker feedback (4501)
Description	Bus breaker aux

Variable	Remote start on load (4502)
Description	Remote start on load

Variable	Emergency stop (4505)
Description	Emergency stop

Variable	Fault reset (4506)
Description	Fault reset request

Variable	Bus fault request (4507)
Description	Fault module request

Variable	Mains fault request (4508)
Description	Fault mains request

Variable	Manual start request (4509)
Description	Manual start request

Variable	Manual stop request (4510)
Description	Manual stop request

Variable	Manual mode request (4511)
Description	Manual mode external request

Variable	Manual mode inhibition (4512)
Description	Manual mode inhibition

Variable	Auto mode request (4513)
Description	Auto mode external request

Variable	Bus breaker opening in manual mode (4518)
Description	Bus breaker openning key

Variable	Bus/Mains breaker opening in manual mode (4519)
Description	Mains breaker openning key

Variable	Bus breaker closing in manual mode (4520)
Description	Bus breaker closing key

Variable	Bus/Mains breaker closing in manual mode (4521)
Description	Mains breaker closing key

Variable	Faults inhibition (4522)
Description	Faults inhibition

Variable	Start inhibition (4524)
Description	Start / crank inhibition

Variable	Remote soft shut down (4526)
Description	Remote Soft Shut Down

Variable	Remote alarm (4527)
Description	Remote alarm

Variable	Stop horn (4530)
Description	Remote stop horn

Variable	Manual mains back (4544)
Description	Function allowing to execute a manual main back

Variable	Alternative selection DI 1 (4594)
Description	Digital input 1 for alternative selection

Variable	Alternative selection DI 2 (4595)
Description	Digital input 2 for alternative selection

Variable	Alternative selection DI 3 (4596)
Description	Digital input 3 for alternative selection

Variable	Alternative selection DI 4 (4597)
Description	Digital input 4 for alternative selection

Variable	Alternative selection DI 5 (4598)
Description	Digital input 5 for alternative selection

Variable	Alternative selection DI 6 (4599)
Description	Digital input 6 for alternative selection

Variable	Alternative selection DI 7 (4600)
Description	Digital input 7 for alternative selection

Variable	Alternative selection DI 8 (4601)
Description	Digital input 8 for alternative selection

Variable	Alternative selection DI 9 (4602)
Description	Digital input 9 for alternative selection

Variable	Alternative selection DI 10 (4603)
Description	Digital input 10 for alternative selection

Variable	Alternative selection DI 11 (4604)
Description	Digital input 11 for alternative selection

Variable	Alternative selection DI 12 (4605)
Description	Digital input 12 for alternative selection

Variable	Alternative selection DI 13 (4606)
Description	Digital input 13 for alternative selection

Variable	Alternative selection DI 14 (4607)
Description	Digital input 14 for alternative selection

Variable	Alternative selection DI 15 (4608)
Description	Digital input 15 for alternative selection

Variable	Alternative selection DI 16 (4609)
Description	Digital input 16 for alternative selection

Variable	Remote start off load (4611)
Description	Remote start off load

Variable	Remote start with timer (4612)
Description	Remote start with timer

Variable	Low threshold DI1 (4614)
Description	Digital input : Low threshold 1

Variable	Low threshold DI2 (4615)
Description	Digital input : Low threshold 2

Variable	Low threshold DI3 (4616)
Description	Digital input : Low threshold 3

Variable	Low threshold DI4 (4617)
Description	Digital input : Low threshold 4

Variable	Low threshold DI5 (4618)
Description	Digital input : Low threshold 5

Variable	Low threshold DI6 (4619)
Description	Digital input : Low threshold 6

Variable	Low threshold DI7 (4620)
Description	Digital input : Low threshold 7

Variable	Low threshold DI8 (4621)
Description	Digital input : Low threshold 8

Variable	High threshold DI1 (4622)
Description	Digital input : High threshold 1

Variable	High threshold DI2 (4623)
Description	Digital input : High threshold 2

Variable	High threshold DI3 (4624)
Description	Digital input : High threshold 3

Variable	High threshold DI4 (4625)
Description	Digital input : High threshold 4

Variable	High threshold DI5 (4626)
Description	Digital input : High threshold 5

Variable	High threshold DI6 (4627)
Description	Digital input : High threshold 6

Variable	High threshold DI7 (4628)
Description	Digital input : High threshold 7

Variable	High threshold DI8 (4629)
Description	Digital input : High threshold 8

Variable	Digital output 1 forced (4630)
Description	Digital output 1 forced

Variable	Digital output 2 forced (4631)
Description	Digital output 2 forced

Variable	Digital output 3 forced (4632)
Description	Digital output 3 forced

Variable	Digital output 4 forced (4633)
Description	Digital output 4 forced

Variable	Digital output 5 forced (4634)
Description	Digital output 5 forced

Variable	Digital output 6 forced (4635)
Description	Digital output 6 forced

Variable	Power plant ready (4636)
Description	Power plant ready

Variable	Relay 1 forced (4950)
Description	Relay 1 forced

Variable	Relay 2 forced (4951)
Description	Relay 2 forced

List of outputs

Variable	Order to close bus breaker (4650)
Description	Relay output energise to close Bus breaker

Variable	Order to close mains breaker (4651)
Description	Relay output energise to close mains breaker

Variable	Bus electrical faults summary (4656)
Description	Bus fault

Variable	Mains electrical faults summary (4657)
Description	Mains fault

Variable	Alarms summary (4658)
Description	Alarm

Variable	Soft shut down summary (4659)
Description	Soft shut down

Variable	Horn (4663)
Description	Horn

Variable	Default LED (4664)
Description	Default LED

Variable	Alarm LED (4665)
Description	Alarm LED

Variable	Automatic mode LED (4666)
Description	Automatic mode LED

Variable	Test mode LED (4667)
Description	Test mode LED

Variable	Manual mode LED (4668)
Description	Manual mode LED

Variable	Bus LED (4669)
Description	Bus LED

Variable	Power plant ready (4670)
Description	Power plant ready

Variable	Bus voltage present (4671)
Description	Bus voltage present i.e 3 phases $>$ 10% of nominal voltage

Variable	Power plant active power flow (4672)
Description	Indicate that the power plant kW flowes (i.e Voltage and Bus breaker close)

Variable	Bus breaker close (4675)
Description	Bus breaker closing

Variable	Mains breaker close (4676)
Description	Mains breaker closing

Variable	Bus breaker open (4677)
Description	Bus breaker openning

Variable	Mains breaker open (4678)
Description	Mains breaker openning

Variable	Protection valid (4681)
Description	Safety ON

Variable	Mains voltage presence (4703)
Description	Mains voltage presence

Variable	Set on analog 1 threshold (4710)
Description	Analog 1 digital output

Variable	Set on analog 2 threshold (4711)
Description	Analog 2 digital output

Variable	Set on analog 3 threshold (4712)
Description	Analog 3 digital output

Variable	Digital output activation on DI1 (4713)
Description	Digital output activation on digital input 1

Variable	Digital output activation on DI2 (4714)
Description	Digital output activation on digital input 2

Variable	Digital output activation on DI3 (4715)
Description	Digital output activation on digital input 3

Variable	Digital output activation on DI4 (4716)
Description	Digital output activation on digital input 4

Variable	Digital output activation on DI5 (4717)
Description	Digital output activation on digital input 5

Variable	Digital output activation on DI6 (4718)
Description	Digital output activation on digital input 6

Variable	Digital output activation on DI7 (4719)
Description	Digital output activation on digital input 7

Variable	Digital output activation on DI8 (4720)
Description	Digital output activation on digital input 8

Variable	Unload breaker n°1 (4721)
Description	Unload breaker n°1

Variable	Unload breaker n°2 (4722)
Description	Unload breaker n°2

Variable	Unload breaker n°3 (4723)
Description	Unload breaker n°3

Variable	Unload breaker n°4 (4724)
Description	Unload breaker n°4

Variable	Unload breaker n°5 (4725)
Description	Unload breaker n°5

Variable	Unload breaker n°6 (4726)
Description	Unload breaker n°6

Variable	Unload breaker n°7 (4727)
Description	Unload breaker n°7

Variable	Unload breaker n°8 (4728)
Description	Unload breaker n°8

Variable	Unload breaker n°9 (4729)
Description	Unload breaker n°9

Variable	Unload breaker n°10 (4730)
Description	Unload breaker n°10

Bitfields

SYSTEM INFO (E00950)	
Bit	Description
15	-
14	-
13	-
12	-
11	-
10	-
9	-
8	-
7	-
6	-
5	-
4	Engine running
3	Alarm exist : Alarm LED is on
2	Fault exist : Fault LED is on
1	New alarm occured : Alarm LED is blinking
0	New fault occured : Fault LED is blinking

KEY INHIBITION STATUS (E00951)	
Bit	Description
15	-
14	Auto
13	Test
12	Man
11	Start
10	Stop
9	Generator(AMF/MAINS/PRIME)/bus(MASTER/BTB) open/close breaker
8	Mains(AMF/MAINS/MASTER/MASTER 1 B only) open/close breaker
7	Fault/Alarm/info
6	Esc
5	Enter
4	High arrows
3	Left arrows
2	Low arrows
1	Right arrows
0	Shift

LED STATUS (E00952)	
Bit	Description
15	-
14	-
13	-
12	-
11	-
10	-
9	-
8	Generator (AMF/MAINS/PRIME/SYNCHRO) /bus (MASTER/MASTER 1B) voltage
7	Alarm
6	Generator (AMF/PRIME/MAINS) /bus (BTB/MASTER) breaker
5	TEST
4	Mains breaker (AMF/MAINS/MASTER/MASTER 1B only)
3	MAN
2	AUTO
1	Bus voltage (SYNCHRO/PRIME/BTB) / Mains voltage (AMF/MAINS/MASTER/MASTER 1B)
0	Fault

Digital input raw (E00953)	
Bit	Description
15	-
14	-
13	-
12	-
11	Analog 3 setup as digital input
10	Analog 2 setup as digital input
9	Analog 1 setup as digital input
8	Digital input 9 on hardware
7	Digital input 8 on hardware
6	Digital input 7 on hardware
5	Digital input 6 on hardware
4	Digital input 5 on hardware
3	Digital input 4 on hardware
2	Digital input 3 on hardware
1	Digital input 2 on hardware
0	Digital input 1 on hardware

E00954 (Processed)	
Bit	Description
15	-
14	-
13	-
12	-
11	Analog input 3 setup as digital input
10	Analog input 2 setup as digital input
9	Analog input 1 setup as digital input
8	Digital input 9
7	Digital input 8
6	Digital input 7
5	Digital input 6
4	Digital input 5
3	Digital input 4
2	Digital input 3
1	Digital input 2
0	Digital input 1

E00955 (Processed)	
Bit	Description
15	CANopen digital Input 16
14	CANopen digital Input 15
13	CANopen digital Input 14
12	CANopen digital Input 13
11	CANopen digital Input 12
10	CANopen digital Input 11
9	CANopen digital Input 10
8	CANopen digital Input 9
7	CANopen digital Input 8
6	CANopen digital Input 7
5	CANopen digital Input 6
4	CANopen digital Input 5
3	CANopen digital Input 4
2	CANopen digital Input 3
1	CANopen digital Input 2
0	CANopen digital Input 1

E00956 (Processed)	
Bit	Description
15	CANopen digital Input 32
14	CANopen digital Input 31
13	CANopen digital Input 30
12	CANopen digital Input 29
11	CANopen digital Input 28
10	CANopen digital Input 27
9	CANopen digital Input 26
8	CANopen digital Input 25
7	CANopen digital Input 24
6	CANopen digital Input 23
5	CANopen digital Input 22
4	CANopen digital Input 21
3	CANopen digital Input 20
2	CANopen digital Input 19
1	CANopen digital Input 18
0	CANopen digital Input 17

E00957 (Processed)	
Bit	Description
15	-
14	-
13	-
12	-
11	-
10	-
9	-
8	-
7	Relay 2
6	Relay 1
5	Digital output 6
4	Digital output 5
3	Digital output 4
2	Digital output 3
1	Digital output 2
0	Digital output 1

E00958 (Processed)	
Bit	Description
15	CANopen digital Output 16
14	CANopen digital Output 15
13	CANopen digital Output 14
12	CANopen digital Output 13
11	CANopen digital Output 12
10	CANopen digital Output 11
9	CANopen digital Output 10
8	CANopen digital Output 9
7	CANopen digital Output 8
6	CANopen digital Output 7
5	CANopen digital Output 6
4	CANopen digital Output 5
3	CANopen digital Output 4
2	CANopen digital Output 3
1	CANopen digital Output 2
0	CANopen digital Output 1

E00959 (Processed)	
Bit	Description
15	CANopen digital Output 32
14	CANopen digital Output 31
13	CANopen digital Output 30
12	CANopen digital Output 29
11	CANopen digital Output 28
10	CANopen digital Output 27
9	CANopen digital Output 26
8	CANopen digital Output 25
7	CANopen digital Output 24
6	CANopen digital Output 23
5	CANopen digital Output 22
4	CANopen digital Output 21
3	CANopen digital Output 20
2	CANopen digital Output 19
1	CANopen digital Output 18
0	CANopen digital Output 17

RESET MAINTENANCE & METERS (E10400)	
Bit	Description
15	Meters : Generator total kWh
14	Meters : Generator total kVARh
13	Meters : Mains total kWh
12	Meters : Mains total kVARh
11	Meters : Engine running hours
10	Meters : Number of attempts to start
9	Maintenance cycle 5 in days
8	Maintenance cycle 4 in days
7	Maintenance cycle 3 in days
6	Maintenance cycle 2 in days
5	Maintenance cycle 1 in days
4	Maintenance cycle 5 in hours
3	Maintenance cycle 4 in hours
2	Maintenance cycle 3 in hours
1	Maintenance cycle 2 in hours
0	Maintenance cycle 1 in hours

RESET MAINTENANCE & METERS 2 (E10401)	
Bit	Description
15	-
14	-
13	-
12	-
11	-
10	-
9	-
8	-
7	-
6	-
5	-
4	-
3	-
2	-
1	Override hours
0	Generator auxiliary run hours

KEY INHIBITION (E8102)	
Bit	Description
15	-
14	Auto
13	Test
12	Man
11	Start
10	Stop
9	Generator(AMF/MAINS/PRIME)/bus(MASTER/BTB) open/close breaker
8	Mains(AMF/MAINS/MASTER/MASTER 1 B only) open/close breaker
7	Fault/Alarm/info
6	Esc
5	Enter
4	High arrows
3	Left arrows
2	Low arrows
1	Right arrows
0	Shift

MODBUS ACCESS (E3015)	
Bit	Description
15	-
14	-
13	-
12	-
11	-
10	-
9	Writing using Modbus/tcp
8	Reading using Modbus/tcp
7	-
6	-
5	-
4	-
3	Writing to input functions
2	-
1	Writing to engine meters
0	Writing to date/time

E00960 (Alarm)		
Bit	Var	Description
15	4171	Bus breaker close suddently
14	4159	Bus breaker open suddently
13	4158	Fail to open bus breaker
12	4157	Fail to close bus breaker
11	4205	Engine maximum water temperature level 2
10	4205	Engine maximum water temperature level 1
9	4204	Engine minimum oil pressure level 2
8	4204	Engine minimum oil pressure level 1
7	4203	Engine battery max volt level 2
6	4203	Engine battery max volt level 1
5	4202	Engine battery min volt level 2
4	4202	Engine battery min volt level 1
3	4201	Engine under speed level 2
2	4201	Engine under speed level1
1	4200	Engine overspeed level2
0	4200	Engine overspeed level1

E00961 (Fault)		
Bit	Var	Description
15	4171	Bus breaker close suddently
14	4159	Bus breaker open suddently
13	4158	Fail to open bus breaker
12	4157	Fail to close bus breaker
11	4205	Engine maximum water temperature level 2
10	4205	Engine maximum water temperature level 1
9	4204	Engine minimum oil pressure level 2
8	4204	Engine minimum oil pressure level 1
7	4203	Engine battery max volt level 2
6	4203	Engine battery max volt level 1
5	4202	Engine battery min volt level 2
4	4202	Engine battery min volt level 1
3	4201	Engine under speed level 2
2	4201	Engine under speed level1
1	4200	Engine overspeed level2
0	4200	Engine overspeed level1

E00962 (Alarm)		
Bit	Var	Description
15	4257	Generator/Power plant minimum kVAR level2
14	4257	Generator/Power plant minimum kVAR level1
13	4256	Generator/Power plant reverse kW level2
12	4256	Generator/Power plant reverse kW level1
11	4255	Generator/Power plant maximum kW level2
10	4255	Generator/Power plant maximum kW level1
9	4254	Generator/Power plant minimum kW level2
8	4254	Generator/Power plant minimum kW level1
7	4253	Generator/Power plant under voltage level2
6	4253	Generator/Power plant under voltage level1
5	4252	Generator/Power plant over voltage level2
4	4252	Generator/Power plant over voltage level1
3	4251	Generator/Power plant under frequency level 2
2	4251	Generator/Power plant under frequency level1
1	4250	Generator/Power plant over frequency level2
0	4250	Generator/Power plant over frequency level1

E00963 (Fault)		
Bit	Var	Description
15	4257	Generator/Power plant minimum kVAR level2
14	4257	Generator/Power plant minimum kVAR level1
13	4256	Generator/Power plant reverse kW level2
12	4256	Generator/Power plant reverse kW level1
11	4255	Generator/Power plant maximum kW level2
10	4255	Generator/Power plant maximum kW level1
9	4254	Generator/Power plant minimum kW level2
8	4254	Generator/Power plant minimum kW level1
7	4253	Generator/Power plant under voltage level2
6	4253	Generator/Power plant under voltage level1
5	4252	Generator/Power plant over voltage level2
4	4252	Generator/Power plant over voltage level1
3	4251	Generator/Power plant under frequency level 2
2	4251	Generator/Power plant under frequency level1
1	4250	Generator/Power plant over frequency level2
0	4250	Generator/Power plant over frequency level1

E00964 (Alarm)		
Bit	Var	Description
15	4267	Earth fault level 2
14	4267	Earth fault level 1
13	4112	Last trip out
12	4266	Uneven voltage
11	4265	Uneven speed
10	4264	Uneven kVAR
9	4263	Uneven kW
8	4262	Generator overcurrent
7	4261	Generator maximum neutral current level2
6	4261	Generator maximum neutral current level1
5	4260	Generator maximum current level2
4	4260	Generator maximum current level1
3	4259	Generator/Power plant reverse kVAR level2
2	4259	Generator/Power plant reverse kVAR level1
1	4258	Generator/Power plant maximum kVAR level2
0	4258	Generator/Power plant maximum kVAR level1

E00965 (Fault)		
Bit	Var	Description
15	4267	Earth fault level 2
14	4267	Earth fault level 1
13	4112	Last trip out
12	4266	Uneven voltage
11	4265	Uneven speed
10	4264	Uneven kVAR
9	4263	Uneven kW
8	4262	Generator overcurrent
7	4261	Generator maximum neutral current level2
6	4261	Generator maximum neutral current level1
5	4260	Generator maximum current level2
4	4260	Generator maximum current level1
3	4259	Generator/Power plant reverse kVAR level2
2	4259	Generator/Power plant reverse kVAR level1
1	4258	Generator/Power plant maximum kVAR level2
0	4258	Generator/Power plant maximum kVAR level1

E00966 (Alarm)		
Bit	Var	Description
15	4307	Bus/Mains minimum kVAR level2
14	4307	Bus/Mains minimum kVAR level1
13	4306	Bus/Mains reverse kW level2
12	4306	Bus/Mains reverse kW level1
11	4305	Bus/Mains maximum kW level2
10	4305	Bus/Mains maximum kW level1
9	4304	Bus/Mains minimum kW level2
8	4304	Bus/Mains minimum kW level1
7	4303	Bus/Mains under voltage level2
6	4303	Bus/Mains under voltage level1
5	4302	Bus/Mains over voltage level2
4	4302	Bus/Mains over voltage level1
3	4301	Bus/Mains under frequency level 2
2	4301	Bus/Mains under frequency level1
1	4300	Bus/Mains over frequency level2
0	4300	Bus/Mains over frequency level1

E00967 (Fault)		
Bit	Var	Description
15	4307	Bus/Mains minimum kVAR level2
14	4307	Bus/Mains minimum kVAR level1
13	4306	Bus/Mains reverse kW level2
12	4306	Bus/Mains reverse kW level1
11	4305	Bus/Mains maximum kW level2
10	4305	Bus/Mains maximum kW level1
9	4304	Bus/Mains minimum kW level2
8	4304	Bus/Mains minimum kW level1
7	4303	Bus/Mains under voltage level2
6	4303	Bus/Mains under voltage level1
5	4302	Bus/Mains over voltage level2
4	4302	Bus/Mains over voltage level1
3	4301	Bus/Mains under frequency level 2
2	4301	Bus/Mains under frequency level1
1	4300	Bus/Mains over frequency level2
0	4300	Bus/Mains over frequency level1

E00968 (Alarm)		
Bit	Var	Description
15	661	J1939 : DM1 malfunction
14	660	J1939 : DM1 red
13	659	J1939 : DM1 amber
12	658	J1939 : DM1 protect
11	657	J1939 : High overspeed
10	656	J1939 : Overspeed
9	655	J1939 : Very low oil pressure
8	654	J1939 : Low oil pressure
7	653	J1939 : Very high coolant temeprature
6	652	J1939 : High coolant temeprature
5	4311	Df/dt (Rocof)
4	4310	Vector jump
3	4309	Bus/Mains reverse kVAR level2
2	4309	Bus/Mains reverse kVAR level1
1	4308	Bus/Mains maximum kVAR level2
0	4308	Bus/Mains maximum kVAR level1

E00969 (Fault)		
Bit	Var	Description
15	661	J1939 : DM1 malfunction
14	660	J1939 : DM1 red
13	659	J1939 : DM1 amber
12	658	J1939 : DM1 protect
11	657	J1939 : High overspeed
10	656	J1939 : Overspeed
9	655	J1939 : Very low oil pressure
8	654	J1939 : Low oil pressure
7	653	J1939 : Very high coolant temeprature
6	652	J1939 : High coolant temeprature
5	4311	Df/dt (Rocof)
4	4310	Vector jump
3	4309	Bus/Mains reverse kVAR level2
2	4309	Bus/Mains reverse kVAR level1
1	4308	Bus/Mains maximum kVAR level2
0	4308	Bus/Mains maximum kVAR level1

E00970 (Alarm)		
Bit	Var	Description
15	4478	Fail to stabilize voltage
14	4477	Fail to stabilize speed
13	4170	Generator breaker close suddently
12	4156	Generator breaker open suddently
11	4155	Fail to open generator breaker
10	4154	Fail to close generator breaker
9	4208	Minimum/maximum analog measure 3 (level2)
8	4208	Minimum/maximum analog measure 3 (level1)
7	4207	Minimum/maximum analog measure 2 (level2)
6	4207	Minimum/maximum analog measure 2 (level1)
5	4206	Minimum/maximum analog measure 1 (level2)
4	4206	Minimum/maximum analog measure 1 (level1)
3	-	-
2	600	CAN1 isolated product
1	77	Phase mesure discordance
0	4051	Fail to synchronize

E00971 (Fault)		
Bit	Var	Description
15	-	-
14	-	-
13	4170	Generator breaker close suddently
12	4156	Generator breaker open suddently
11	4155	Fail to open generator breaker
10	4154	Fail to close generator breaker
9	4208	Minimum/maximum analog measure 3 (level2)
8	4208	Minimum/maximum analog measure 3 (level1)
7	4207	Minimum/maximum analog measure 2 (level2)
6	4207	Minimum/maximum analog measure 2 (level1)
5	4206	Minimum/maximum analog measure 1 (level2)
4	4206	Minimum/maximum analog measure 1 (level1)
3	-	-
2	600	CAN1 isolated product
1	77	Phase mesure discordance
0	4051	Fail to synchronize

E00972 (Alarm)		
Bit	Var	Description
15	-	-
14	859	Maintenance days n°5
13	858	Maintenance days n°4
12	857	Maintenance days n°3
11	856	Maintenance days n°2
10	855	Maintenance days n°1
9	854	Maintenance hours n°5
8	853	Maintenance hours n°4
7	852	Maintenance hours n°3
6	851	Maintenance hours n°2
5	850	Maintenance hours n°1
4	19	Overload microcontroler
3	4108	Trip alarm (non essential load)
2	4153	Breaker alarm
1	650	J1939 alarm
0	4750	CANopen alarm

E00973 (Fault)		
Bit	Var	Description
15	-	-
14	-	-
13	-	-
12	-	-
11	-	-
10	-	-
9	650	J1939 fault
8	4750	CANopen fault
7	4152	Breaker fault
6	4451	Sensor lost
5	4475	Fail to start
4	4473	Generator not ready
3	4472	Fail to stop
2	4505	Emergency stop
1	4504	Coolant temperature fault
0	4503	Oil pressure fault

E00974 (Alarm)		
Bit	Var	Description
15	607	CAN1 mismatch protocole version
14	-	-
13	605	CAN1 missing product
12	4212	Maximum AVR output
11	4211	Minimum AVR output
10	4210	Maximum speed output
9	4209	Minimum speed output
8	4213	Overflow in equation
7	4314	Mains voltage unbalance (level2)
6	4314	Mains voltage unbalance (level1)
5	4269	Generator current unbalance (level2)
4	4269	Generator current unbalance (level1)
3	4268	Generator/bus voltage unbalance (level2)
2	4268	Generator/bus voltage unbalance (level1)
1	4316	Bus measure error
0	608	CAN1 missing MASTER

E00975 (Fault)		
Bit	Var	Description
15	-	-
14	606	CAN1 unknown product
13	605	CAN1 missing product
12	4212	Maximum AVR output
11	4211	Minimum AVR output
10	4210	Maximum speed output
9	4209	Minimum speed output
8	-	-
7	4314	Mains voltage unbalance (level2)
6	4314	Mains voltage unbalance (level1)
5	4269	Generator current unbalance (level2)
4	4269	Generator current unbalance (level1)
3	4268	Generator/bus voltage unbalance (level2)
2	4268	Generator/bus voltage unbalance (level1)
1	-	-
0	608	CAN1 missing MASTER

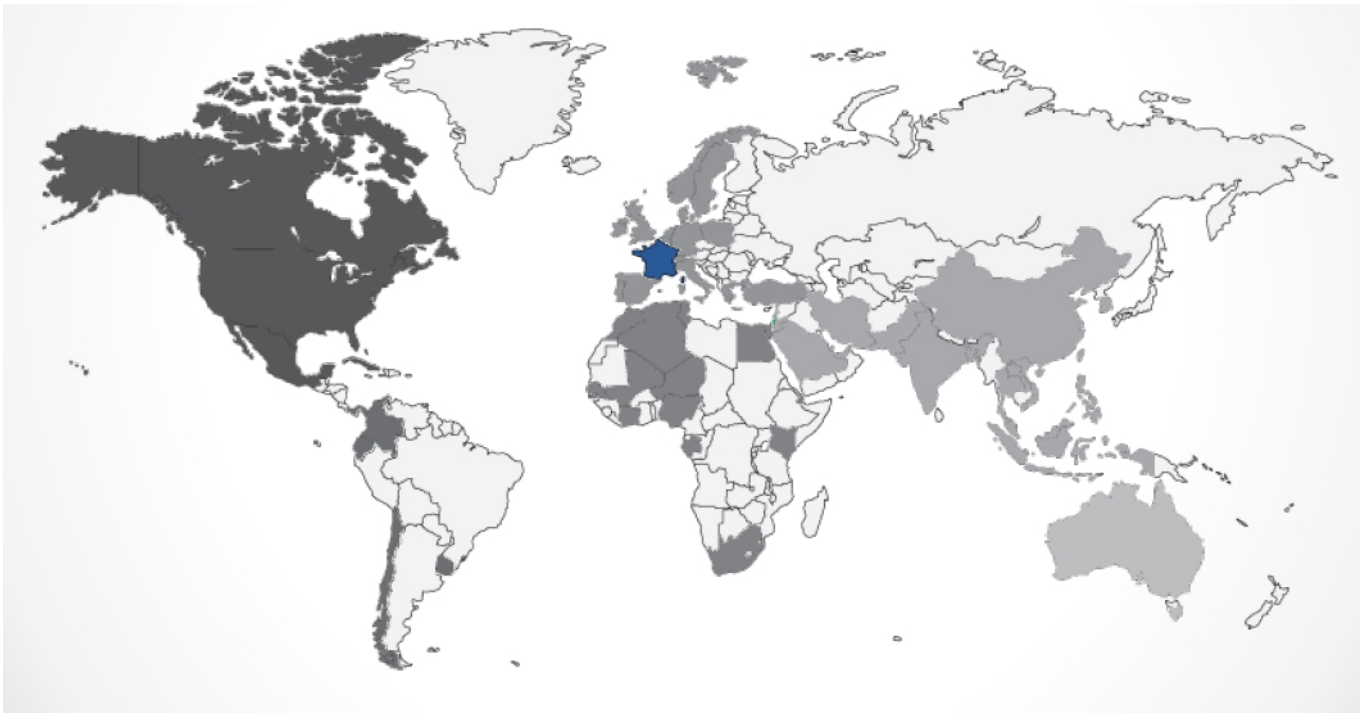
CRE TECHNOLOGY

Based in Sophia Antipolis, **CRE Technology** is a French manufacturer, ISO 9001 certified, employs nearly 25 employees, all experts in their field.
CRE Technology offers electronic products and electrical solutions dedicated to the control and the protection of industrial and marine generators: battery chargers, Generator sets controllers and synchronizing and paralleling equipments.

We are known for our skills, expertise and value-added solutions but also highly appreciated for our pre/after sales services.
CRE Technology's product development is focused on innovation.
The key to our strategy is the availability of our products with a large stock capacity.
Our company is highly recognized for technical achievements with over 1500 paralleling solutions sold each year, 35 years of experience, and partners in 27 countries.
10% of our annual turnover is reinvested in R&D and we offer 7 new products per year and have the best flexibility/price ratio on the market.

The next few years will see the expansion of our distribution network and our innovative product portfolio.

A WORLDWIDE DISTRIBUTION NETWORK



Consult the complete list of our worldwide distributors on our website https://www.cretechnology.com/en/cre-distributors.

THE COMPANY AT A GLANCE

1983
CRE TECHNOLOGY is born. At the time, the company is a custom-product manufacturer. We enlarge our product range and services to high standard technical units, particularly in the paralleling sector. Today with 35 years of experience, this custom expertise and our passion for technical challenges are still the company's best assets.

2002

GENSYS is launched. It will become **CRE TECHNOLOGY**'s best-seller and the basis of its notoriety.
Today, **CRE TECHNOLOGY** provides 3000 paralleling solutions each year. Most of them are ordered directly by OEMs which appreciate our technical efficiency.

2006

CRE TECHNOLOGY, a member of the **DSF** Engineering and Distribution Generator, becomes independent from **DSF** Technologies. The company realizes its ambitions: to develop new ranges and expand its distribution network. **CRE TECHNOLOGY** now provides an extensive range of products in the genset control and paralleling market. Its worldwide network grows continuously, covering lots of new countries every year. **CRE TECHNOLOGY** now provides an extensive range of products in the genset control and paralleling market.

2009

CRE TECHNOLOGY is ISO 9001 certified with the 2008 version. DNV certification is added to the other **GENSYS MARINE** approvals: Lloyds and BV.

2010
CRE TECHNOLOGY diversifies its ranges of products by introducing a wide range of battery chargers within its range.

2012
CRE TECHNOLOGY keeps developing new products in accordance with the market. The paralleling range now includes the **GENSYS 2.0** core and the RDM 2.0, as well as the marine range with the **GENSYS 2.0 MARINE** (DNV approved).

2015
The new **GENSYS COMPACT** is in the range, and fully available for success, Lloyds Register marine approvals on **GENSYS2.0** marine, with the exisiting DNV-GL marine approval.

2017
The new **UNIGEN 2.0** has been added to the range, to extend our offer on parallel and solutions. The global range is constantly improved with a new PLC Solutions in order to customize even more our outcomes. A new **AVR COMPACT** is being added to our catalog to extend our capabilities.

TOMORROW

New products, new members in the distribution network, and new exciting projects to build and win with you!

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