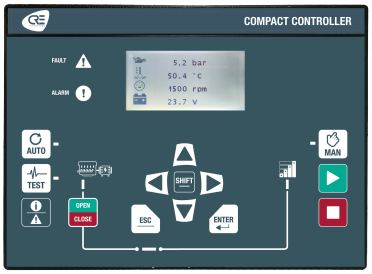
OPERATOR MANUAL

GENSYS COMPACT PRIME



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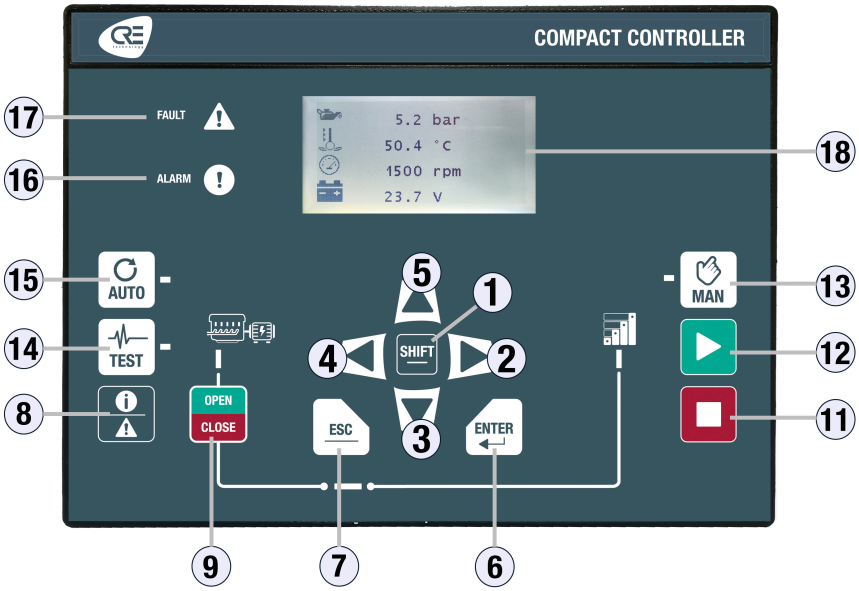
DESCRIPTION

FRONT FACE

Figure 1. Front face of a GENSYS COMPACT PRIME controller



PIN	Buttons	Functions
1	SHIFT button	Additional functions.
2	Right arrow button	Navigation button (Right).
3	Down arrow button	Navigation button (Down).
4	Left arrow button	Navigation button (Left).
5	Up arrow button	Navigation button (Up).
6	ENTER button	Validating entry / **MENU**.
7	ESC button	Cancel entry / escape **MENU**.
8	Information button	Allows access to the active faults, active alarms, events history or information pages.
9	Generator circuit breaker button	Can only be used in **MAN** mode. Generator 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).
11	Stop button	Can only be used in **MAN** mode. Press to stop the Generator. Pressing once this button will set the Generator off load and initiate cooling down sequence
12	Start button	Can only be used in **MAN** mode. Press to start the Generator.
13	MAN button	**MAN** mode. The associated LED lights up when the mode is activated.
14	TEST button	**TEST** mode. The associated LED lights up when the mode is activated.
15	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	Fault indicator	The LED flashes when a fault occurs. The LED is lit when a fault is acknowledged, but not reseted.
18	LCD screen	Screen size: 40mm x 70mm; Back-light : typical 50cd/m², configurable. Type: STN; 256 x 128 pixels.

Note: Pressing the button **STOP** twice will set the Generator offload and stop the engine without cooling down sequence.

Navigation keys

Buttons	Navigation mode	Edition mode
	Scrolling menus/parameters	Modifying parameters values once selected: When up/down arrow buttons are used to modify values, holding the button will accelerate the entry scrolling.
	Right arrow: • Accessing a menu. • Navigating right in display/parameters pages Left arrow: • Return to previous menu. • Navigating left in display/parameters pages.	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 off load, use  to increase/decrease: • The speed when the "Speed control" page is displayed. • The voltage when the "AVR control" page is displayed.
	Returns to previous menu.	Cancels the settings and returns 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 ***Controller settings*** ⇒ ***System*** ⇒ ***Buttons inhibition (i4Gen)*** page. This page shows the list of front panel buttons, tick the corresponding box to inhibit actions on the button.

It is also possible to inhibit the buttons by Modbus by modifying the variable [8102]. Each bit of the variable corresponds to a button. To know the bit associated to each button, please refer to the chapter Software variables *(on page 149)*. Ex : Bit number 6 will inhibit the "Enter" button, bit number 1 will inhibit the "Shift" button.

External requests for button activation

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.

REAR FACE

Figure 2. Rear face of a GENSYS COMPACT PRIME controller

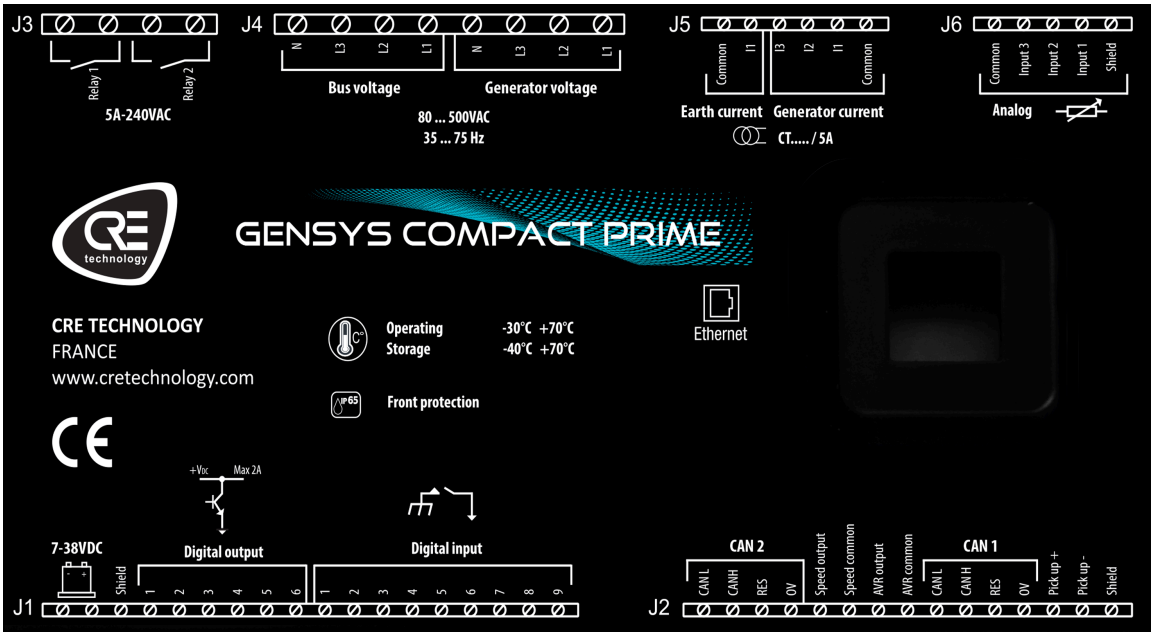
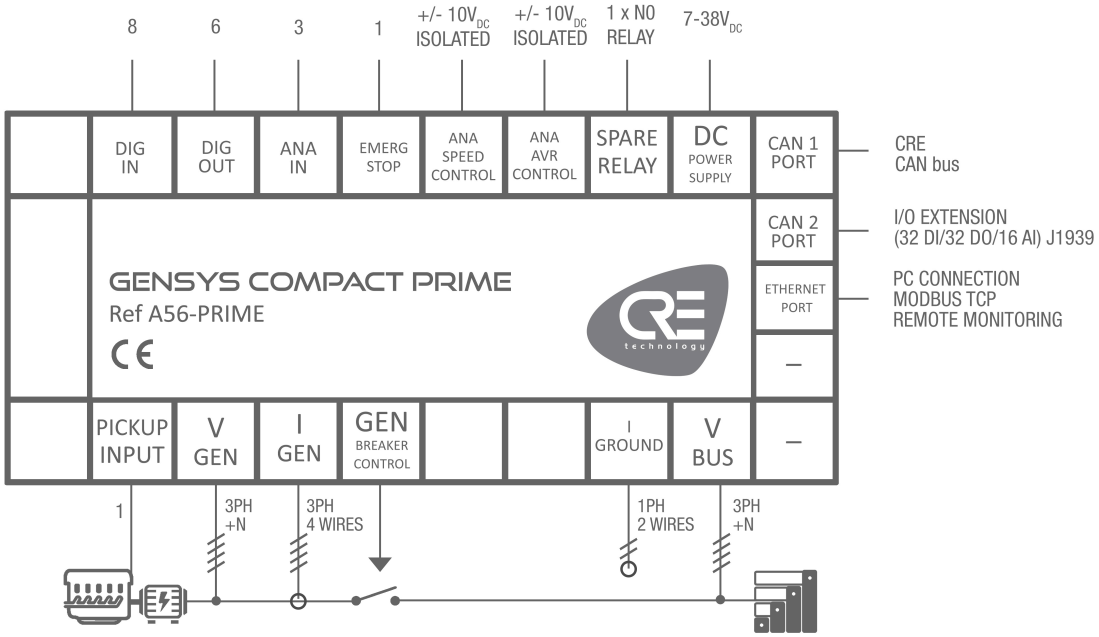


Figure 3. Simplified wiring diagram



PANEL MOUNTING

This unit is designed to be panel mounted, which provides user with access only to the front panel.

⚠ WARNING

THIS UNIT IS NOT GROUNDED
Failure to follow these instructions may damage the unit.

- Take all measures against Electronic Static Discharges.
- Do not try to open 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
- 6 connectors.
- 1 fixing kit composed of 2 parts.
- 4 screws.
- A delivery bill.

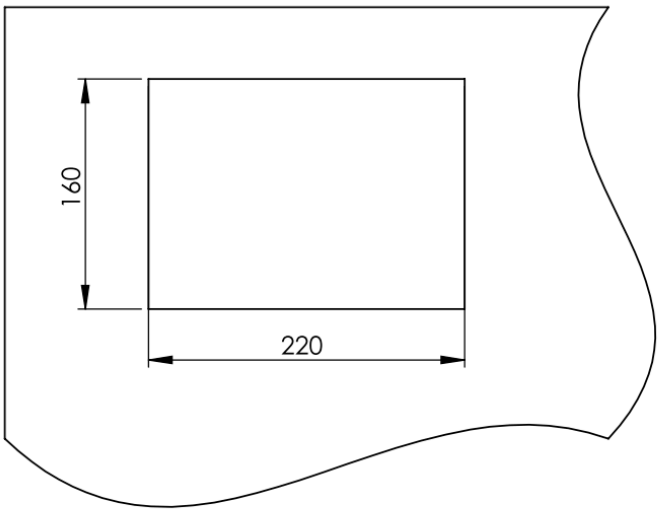
Unpack and keep the packaging in case of return.
Make sure the unit does not show scratches or visible defaults. Otherwise describe them on the RMA sheet (available on CRE TECHNOLOGY website) and return it with the product to your distributor.

Installation

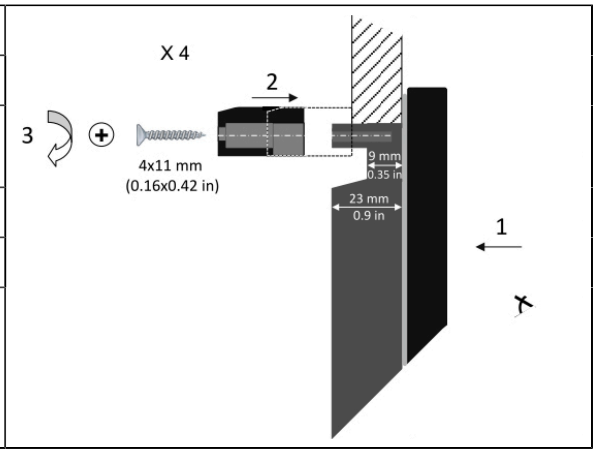
Preparation

- Torque of mounting brackets: 0.4Nm.
- Cut the panel with a dimension of 220x160mm (8.7x6.3in) minimum.
- Make sure the cut-out is smooth and clean.

Figure 4. Panel cutout



Mounting

0	Tool : cross-head screwdriver size 1.	
1	Pass the unit through the mounting surface.	
2	In the rear, cover each of the four spacers using the 2 parts of the fixing kit.	
3	Screw a first corner 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

Note: Skip this chapter if your application does not require to follow the UL specification.

Circuit separation

The wires connected to the terminal blocks for communication, for sensors and for the battery should be separated and secured to maintain at least 1/4” (6mm) separation between the wires connected to the Generator those connected to the Bus unless all conductors are rated 600V or greater.

Other circuits specifications

For information on circuits ratings, see chapter Wiring *(on page 17)*.

Mains specifications

Over-voltage Category

III, 300VAC system voltage.

Generator / Bus Voltage Measurements (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 standard or the equivalent).

Communication Circuits

Must be connected to UL listed equipments.

Output Pilot Duty (J3)

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

Digital outputs (J1)

FET: Fuel shutoff: 63VA, 1.8A max current.

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.

Wiring of the terminals

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.

Advanced wiring diagram

Wiring diagrams are available on the website CRE TECHNOLOGY.

Installation

For information on installing the product, see chapter Panel mounting *(on page 10)*.

USAGE

PASSWORD

The menus will be automatically locked if no operation is performed during the time set in the *Controller settings* ⇒ *System* ⇒ *Password* page (Factory setting: 30 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 one can be set.	Pages of the ***Controller supervision*** menu only.
1	1	User level, settings and commissioning.	Pages of the ***Controller supervision*** and ***Controller settings*** menus.
2	1234	Used to change advanced settings.	Advanced settings.

Passwords can be changed using ***i4Gen Suite*** software.

To access the ***Controller supervision*** menu, press ENTER.

To access the ***Controller settings*** menu, the padlock must be unlocked:

1. Press ∨ to select ***Controller settings***.
2. Press ENTER to switch to password input mode (as for other settings).
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, select the required menu, then press ENTER and enter the level 1 password if necessary (Settings):

Figure 5. Index menu

A black pointer spots the currently selected item/setting.

Two main menus are available on the LCD screen and three in the ***i4Gen Suite*** software:

- The menu ***Controller supervision*** gives all product measurements in real time.
- The menu ***Controller settings*** is used to adjust the controller and system settings (date/time, screen features, ...).
- The menu ***i4Gen*** (only available in the configuration software) is used to adjust the software settings.

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

To cycle through the pages of the actual menu, press > or <.

Edition

To change a setting:

1. Navigate to the setting to be changed.
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 modify the parameters using the Modbus TCP protocol.

Dedicated pages

Dedicated pages includes:

- Active fault: currently active or unacknowledged faults. To reset faults, press SHIFT + ⓘ⚠.
- Active alarm: currently active or unacknowledged alarms. To reset alarms, press SHIFT + ⓘ⚠.

- History: a list of all alarms/faults/events that happened with their state and timestamp.
- Information pages.

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

To return to the previous page, press  or  .

History

Up to 500 archived events can be displayed on the screen.

Each event is time-stamped as follows:

jj/mm/yy hh:mn:ss protection name On (or **Off**).

Information

These pages show the current status of the controller state and of the motor with the time elapsed in each state.

Controller state [4000] displays the current status of the unit regarding the management of the system's automatism.
Engine [4001] displays the current status of the unit regarding the engine.
Information variables: to display any variable, enter the code of the variable to be displayed.

WIRING

Tool: insulated screwdriver Ø1.5 mm (0.04 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
Failure to follow these instructions may damage the unit.
Use external fuses:

- Generator 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.

⚠ DANGER

RISK OF ELECTRIC SHOCK, EXPLOSION OR ARCING
Failure to follow these recommendations may result in death or serious injury.

- 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 check the absence of voltage.
- Do not use a resettable fuse.

General procedure

1. Make sure the cable connectors are not plugged in.
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.

Recommandations

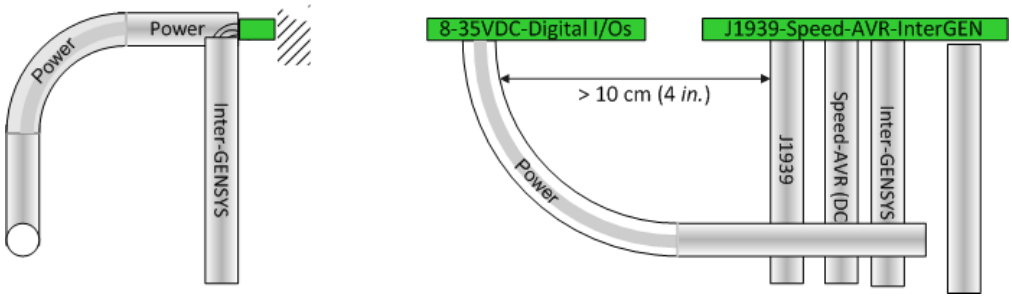
Wires section: 1.5mm²(AWG15).

To avoid ElectroMagnetic Interferences, shield cables appropriately; for CAN bus, see CAN bus good practices *(on page 125)*.

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

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

Figure 6. Wiring recommendations



Wiring diagrams are available on the website CRE TECHNOLOGY.

Upper terminals

⚠ DANGER

EXPOSED TERMINALS

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

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.

Terminal blocks	Label	Description	Note
Relay outputs (J3)			Normally open. Breaking capacity: 5A, 240VAC.
Relay 1		Relay 1 +	
		Relay 1 –	
Relay 2		Relay 2 +	
		Relay 2 –	
AC voltage (J4)			100...480VAC, 35…75Hz, 100mA max; accuracy: 1% fsd.
Bus voltage	N	Neutral of the Bus	Optional.
	L3	Voltage of the phase 3 of the Bus	These lines must be protected externally with 100mA/600VAC fuses.
	L2	Voltage of the phase 2 of the Bus	
	L1	Voltage of the phase 1 of the Bus	
Generator voltage	N	Neutral of the Genera-tor	Optional.
	L3	Voltage of the phase 3 of the Generator	These lines must be protected externally with 100mA/600VAC fuses.
	L2	Voltage of the phase 2 of the Generator	
	L1	Voltage of the phase 1 of the Generator	
Current inputs (J5)			Short-circuit protection available.

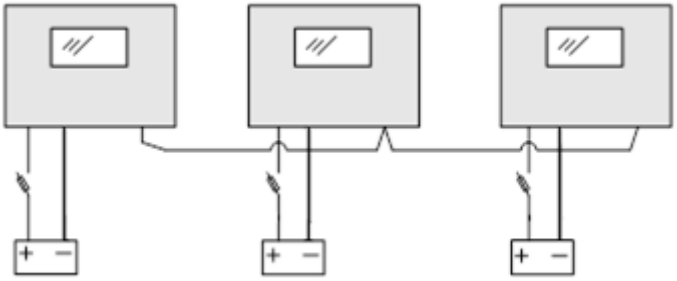
Terminal blocks	Label	Description	Note
Earth current	Common	Common point of the electrical currents.	Connect the common point of the electrical currents to this terminal. **Important:** This terminal must also be connected to the ground. Failure to follow this instruction may damage the controller.
	I1	Current of the phase 1 of the Bus	0…5A. Maximum rating: 15A during 10s. • Load: 1VA. Keep the lead length short to preserve accuracy (up to 0.5% full scale deviation). • Maximum value of the external CT ratio and other details can be found in ***i4Gen Suite***. • This input must be used only for the earth fault protection.
Generator current	I3	Current of the phase 3 of the Generator	0…5A. Maximum rating: 15A during 10s. • Load: 1VA. Keep the lead length short to preserve accuracy (up to 0.5% full scale deviation). • Maximum value of the external CT ratio and other details can be found in ***i4Gen Suite***.
	I2	Current of the phase 2 of the Generator	
	I1	Current of the phase 1 of the Generator	
	Common	Common point of the electrical currents.	Connect the common point of the electrical currents to this terminal. **Important:** This terminal must also be connected to the ground. Failure to follow this instruction may damage the controller.
Analog inputs (J6)			0...500Ω.
Analog	Common	Common of the analog inputs	Connect it to the battery minus terminal.
	Input 3	Analog input 3	
	Input 2	Analog input 2	
	Input 1	Analog input 1	
	Shield	Ground	Connect to the ground.

Lower terminals

⚠ WARNING

RISK OF EQUIPMENT DAMAGE
Failure to follow this instruction can damage the controller.
Connect battery negative to the module terminal 8...35VDC– with 1.5mm² (AWG15) cable.

Figure 7. Wiring of the lower terminals



Terminal block	Label	Description	Notes
Power supply and digital inputs/outputs (J1)			
Power supply (7-38VDC)	-	Power supply -	1.5mm² (AWG15).
	+	Power supply +	7…38VDC, consumed current: 130mA at 24V (standby and operation).
	Shield	Ground	Connect to the ground.
Digital outputs	1	Digital output 1	Free digital output (max: 1.8A). Protected against short circuits. A reactive load is supported. Not isolated from power supply.
	2	Digital output 2	
	3	Digital output 3	
	4	Digital output 4	
	5	Digital output 5	
	6	Digital output 6	
Digital inputs	1	Digital input 1	Free digital input with 10kΩ pull-up. Accepts NO or NC contact to 0V. Not isolated from power supply.
	2	Digital input 2	
	3	Digital input 3	
	4	Digital input 4	
	5	Digital input 5	
	6	Digital input 6	
	7	Digital input 7	
	8	Digital input 8	
	9	Digital input 9	
CAN 2, CAN 1, speed output, AVR output, magnetic pick-up (J2)			
CAN 2 (for J1939 and CANopen)	CAN L	CAN low	Blue wire.
	CAN H	CAN high	White wire.
	RES	Resistor -	Connect to the "CAN H" terminal when the inner resistor must be inserted (bus ends).

Terminal block	Label	Description	Notes
	0V	Shield	Use twisted pair cables. There are two possible wiring for this terminal. First wiring (**recommended in most cases**): do not connect this terminal. Second wiring: • Connect the shield to the 0V terminal on all controllers. CAN1 and CAN2 has galvanic separation, so no ground loops are created. • Do not connect the 0V terminal to the ground.
Speed output. Compatible with all analog speed controllers. Isolated from power supply.	Speed output	Speed output +	Analog output ±10V for a speed governor.
	Speed common	Speed output -	Twisted pair; length. < 5m (16ft) if unshielded, < 50m max if shielded.
AVR output. Compatible with most voltage regulators. Isolated from power supply.	AVR output	AVR output +	Analog output ±10V for a voltage regulator.
	AVR common	AVR output –	Twisted pair; length. < 5m (16ft) if unshielded, < 50m max if shielded.
CAN 1 (for **CRE-Link®**)	CAN L	CAN low	White wire with blue strip (when using a **CRE TECHNOLOGY** cable).
	CAN H	CAN high	Blue wire with white strip (when using a **CRE TECHNOLOGY** cable).
	RES	Resistor - terminal	Connect to the "CAN H" terminal when the inner resistor must be inserted (bus ends).
	0V	Shield	Use twisted pair cables. There are two possible wiring for this terminal. First wiring (**recommended in most cases**): do not connect this terminal. Second wiring: • Connect the shield to the 0V terminal on all controllers. CAN1 and CAN2 has galvanic separation, so no ground loops are created. • Do not connect the 0V terminal to the ground.

Terminal block	Label	Description	Notes
Magnetic pickup	Pickup +		100Hz...10kHz. Voltage limits between + /–2...40VAC. Speed measurement for speed regulation, crank management 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 –		
	Shield	Ground	

⚠ WARNING

RISK OF EQUIPMENT DAMAGE
Failure to follow this instruction can damage the CAN transmitter/receiver.
Switch off the unit before plugging or unplugging the CAN bus connector or disconnecting wires.

Note: In case of a power outage, the unit remains functional for 70ms at 24V, and 20ms at 12V.

Potential transformers ratio definition

The potential transformer can be connected in various ways. According to the type of potential transformer connection, the potential transformer ratio to set in the controller may be different:

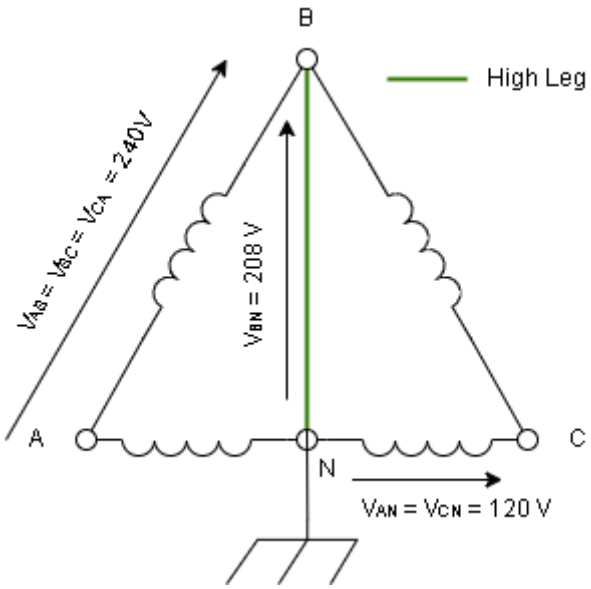
- If the primary winding is connected in star(wye) and the secondary winding is connected in delta, the ratio is: $PTratio = \frac{Unom}{100\sqrt{3}}$
- If the primary and secondary windings are both connected in star(wye), the ratio is: $PTratio = \frac{Unom}{100}$

Other systems of voltage

For a **bi-phase 180°** application, connect voltages and currents to L1-L3 terminals (and N). The same logic applies for I1-I3 (and common).
For a **mono-phase** application, connect voltages and currents to L1-N terminals. The same logic applies for I1 and common.

There are 3 triphase high leg delta systems:

Figure 8. Diagram high leg delta



A wiring to neutral is required to use these systems.

If **Triphase L1-N-L2** is selected, connect the "High leg" voltage (B-N) on L3, both other phases on L1 and L2.
If **Triphase L2-N-L3** is selected, connect the "High leg" voltage (B-N) on L1, both other phases on L2 and L3.
If **Triphase L3-N-L1** is selected, connect the "High leg" voltage (B-N) on L2, both other phases on L3 and L1.

⚠ WARNING

OVER VOLTAGE RISK WITH HIGH LEG DELTA VOLTAGE SYSTEMS

Failure to follow these instructions may damage the unit.

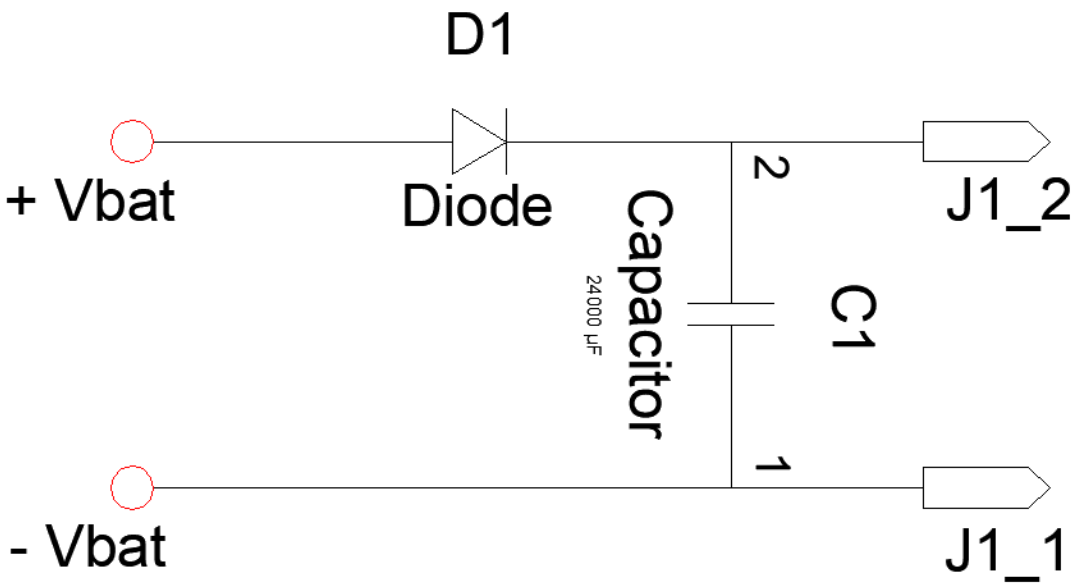
The maximal P-N voltage of the product is 270 VAC (which is equal to 310 VAC for P-P voltage). If higher voltages are required, potential transformers should be used. See Potential transformers ratio definition *(on page 22)*.

Powering the module with a 12VDC battery

A voltage drop from 12V to 6V can occur when the power consumption of the starter is too high and the battery undersized. This drop can reset the module. To counter this problem, a capacitor and a diode need to be wired as indicated in the schematic bellow:

The diode needs to be able to handle high currents (ex: Littelfuse DST2045AX). Typically select a 24000µF capacitor that handles at least 25V or higher (ex : KEMET ALS71A243DB040).

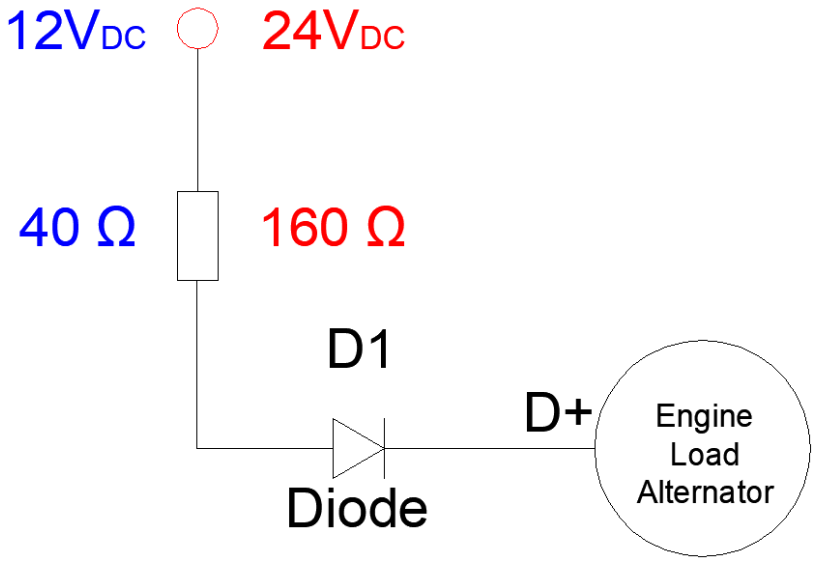
Figure 9. 12VDC power supply wiring



D+ wiring

The D+ line of the alternator needs to be wired as shown below to ensure the magnetization of the field coil:

Figure 10. D+ wiring



DIGITAL INPUTS

Several parameters can be configured for each digital input:

- **Label** (only in ***i4Gen Suite*** software)
- **Function**
- **Direction**
- **Validity**
- **Timer ON**
- **Timer OFF**

Label

This is the name you give to the input. If programmed accordingly, the label will be shown in the following pages: digital inputs, information, alarm, and fault.

Validity

Validity indicates when the digital input is taken into account. This parameter can take four values:

Value	Validity	Description
0	Never	Never active: must be selected if you do not use the input.
1	Always	Always active: the input is monitored as long as the module is powered.
2	After valid protect	The input is monitored at the end of the *Delay before activation of the protections* [2004] delay.(1)
3	When gen ready	The input is monitored when the Generator is ready for use.

*(1) Configure the protection inhibition time in **Controller settings** ⇒ **General** ⇒ **Timers**.*

Direction

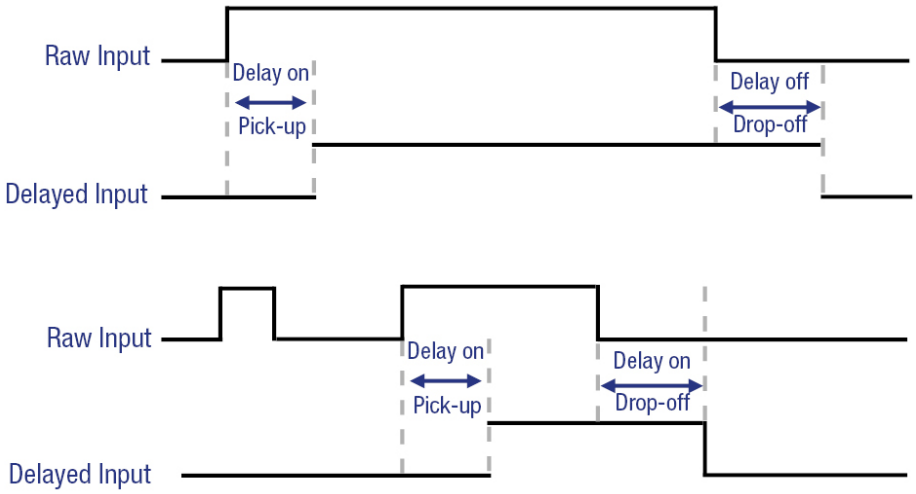
For each input, two options are available:

Value	Label	Function
0	Normally opened	To be used for standard cases unless the input is used as protection.
1	Normally closed	Must be selected if the input is normally connected to 0V (open when active).

Delays

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

Figure 11. Chronogram of the digital inputs delays



Functions

Each input can be configured. To access all functions, use ***i4Gen Suite***.
Function list is available in the chapter Software variables *(on page 149)*.

DIGITAL/RELAYS OUTPUTS

Several parameters can be configured for each digital/relay output:

- **Label** (only in ***i4Gen Suite*** software)
- **Function**
- **Polarity (sometimes referred to as Direction)**
- **Pulse length: 0 means no pulse**
- **Timer ON**

Polarity

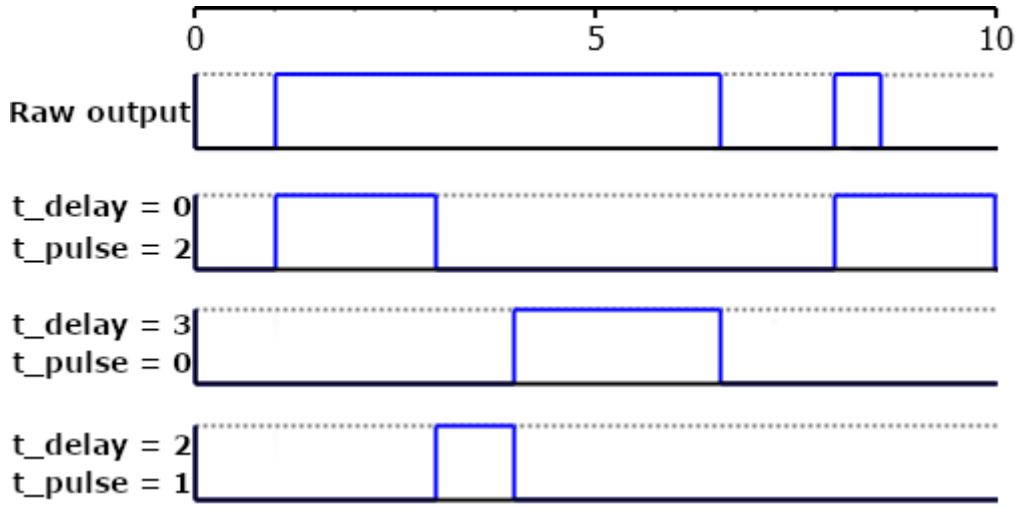
Each output can be:

- **Normally energized**: the output is de-energized when its function is activated.
- **Normally de-energized**: the output is energized when its function is activated.

Pulse length and activation delay

Each digital/relays output can be configured to act as a pulse. The pulses lengths are defined with the parameters [2761] to [2766] for digital outputs and [2767] to [2768] for relays output. As soon as a pulse begins, it will last for the configured duration even if the associated function is not active anymore.
Set to 0 in order to have a continuous output (no pulse).
It is also possible to delay the output activation using parameters [2793] to [2798] for digital outputs and [8250] to [8251] for relays output.
Setting the activation delay to 0 means there will be no delay.

Figure 12. Chronogram of the digital/relays outputs pulse length and activation delay



Functions

Each output can be configured. To access all functions, use ***i4Gen Suite***.
Function list is available in the chapter Software variables *(on page 149)*.

ANALOG INPUTS

General analog input configuration

1. **Label**: Analog input's label (limited to 14 characters).
2. **Type**: Defines the way you want to use your analog input : unused, analog input, digital input.

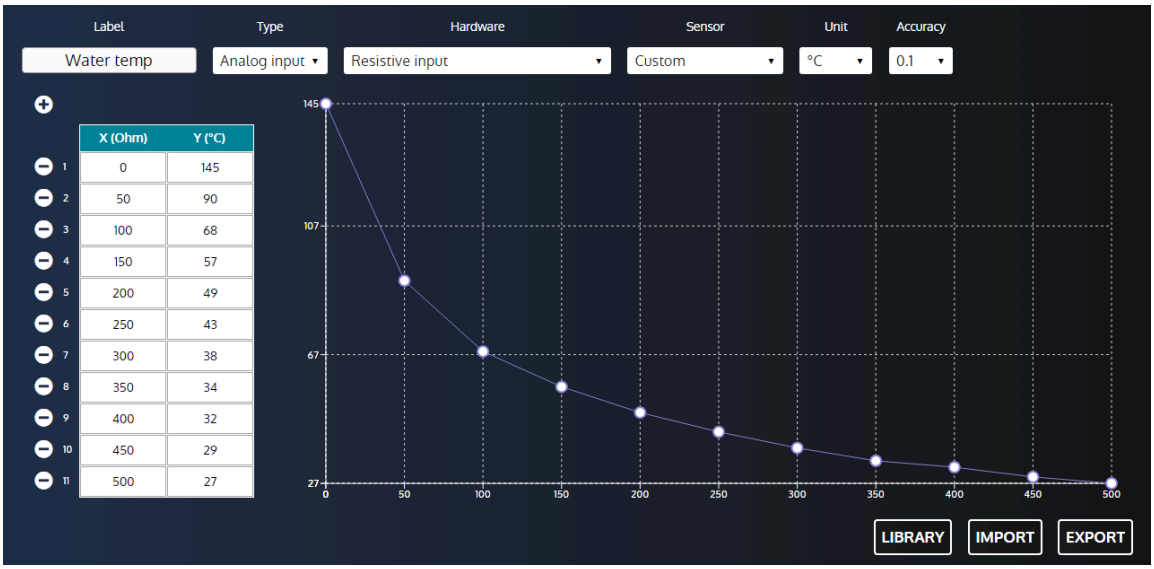
The analog input configuration page changes according to the selected type.

Type set to unused

No configuration available.

Type set to analog input

Figure 13. Analog input configuration

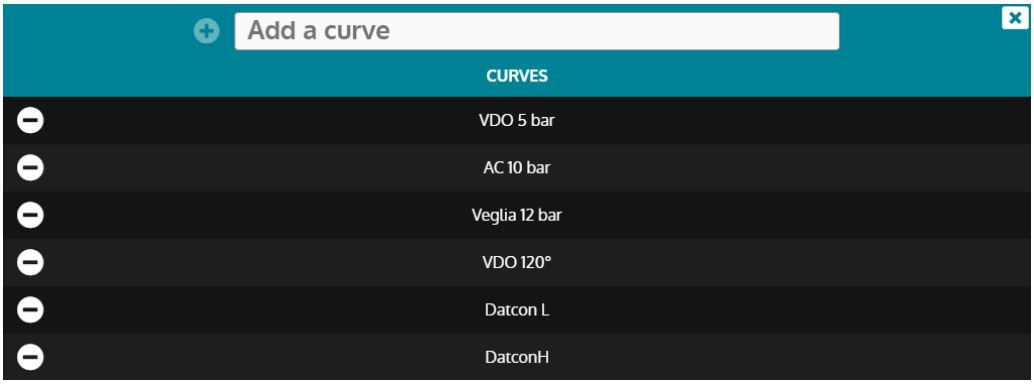


1. **Hardware**: Defines the hardware type of the analog input (resistive / 20mA transducer).
2. **Sensor**: Defines the sensor type of the analog input (custom / oil pressure / water temperature). This setting is not present on all kinds of **COMPACT** controllers.
    - Oil pressure can only be assigned to Analog input 1.
    - Water temperature can only be assigned to Analog input 2.
3. **Unit**: Defines the unit of the analog input.
4. **Accuracy**: Defines the accuracy of the analog input (i.e. number of decimal digits to display the measured value).
5. **Calibration points table** (up to 31 points):

    Calibration is used to estimate a reading from a resistance/current value by interpolation between 2 resistance/current values. Negative values are supported.

    To set calibration points:
    - Press the + button to add a new point.
    - Press the - button to remove an existing point.
    - To set the X-axis coordinate of a point, fill the corresponding X input.
    - To set the Y-axis coordinate of a point, fill the corresponding Y input.
6. **Curve display**: Display of the calibration points on a curve in X-axis ascending order.
7. **Library**: Opens the curve library.

Figure 14. Analog input curve library



Enter a name in the input and press the + button to save the current curve into the library.
Press the - button to remove a saved curve (not available for factory curves).
Click on a curve to load it into the analog input configuration.

8. **Import**: Opens the file browser to import a curve file into the analog input configuration.
9. **Export**: Opens the file browser to export a curve file.

How to connect analog sensors

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

Note: Our recommendations: In each case you must always connect the analog inputs' "common" terminal (J6) to the power supply minus terminal (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).

Figure 15. A-1 : 2 wires analog sensor

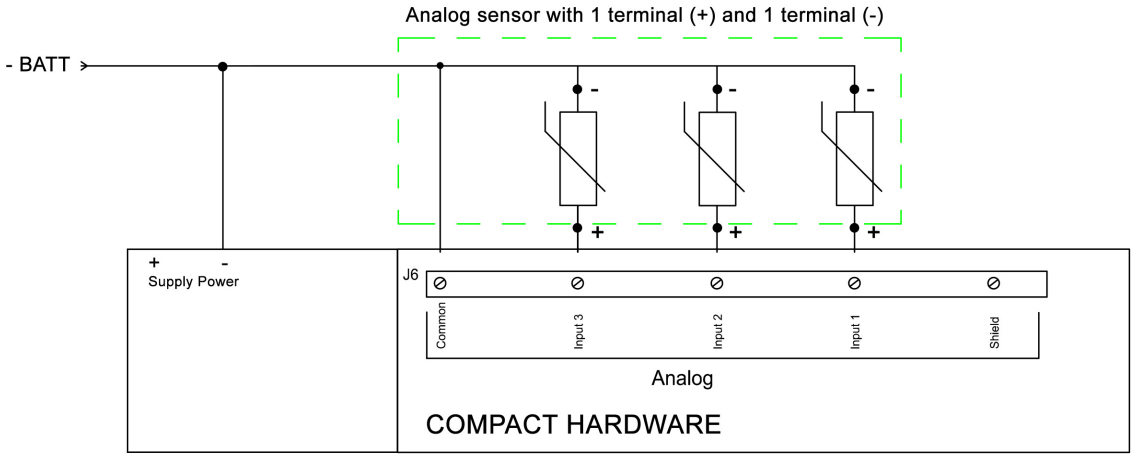
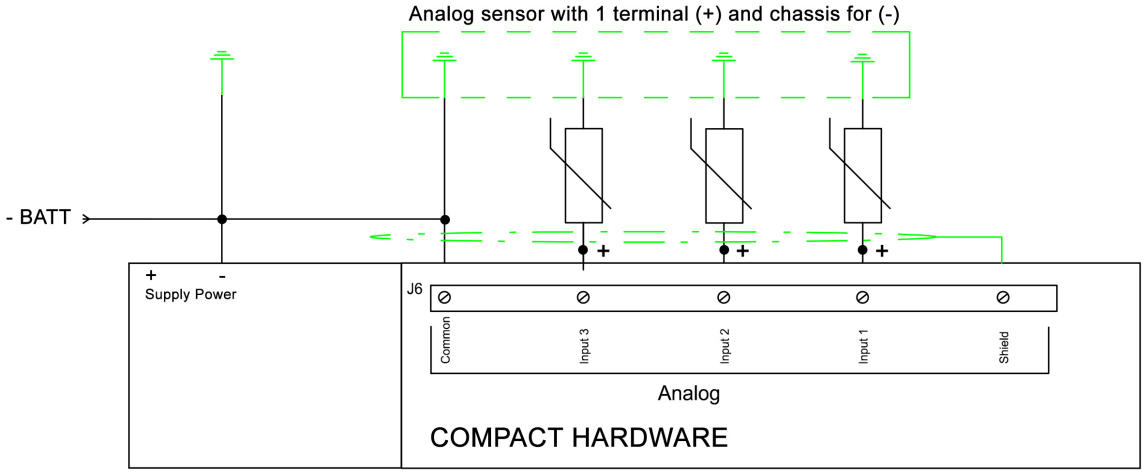


Figure 16. A-2 : 1 wire analog sensor



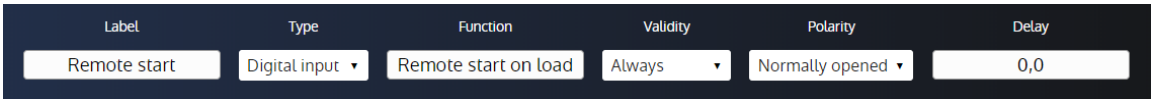
⚠ WARNING

THE WARRANTY WILL BE VOIDED IF THE MANUFACTURER'S INSTRUCTIONS ARE NOT RESPECTED.

To act as a 0...20mA input or 4...20mA, connect the input with a 39Ω resistor between the analog input and the analog common.
The calibration of the 20mA transducer can then be performed as on a resistive analog input depending on the characteristics of the sensor.

Type set to digital input

Figure 17. Digital input configuration



1. **Function**: Defines the digital input function.
2. **Validity**: Condition to take the digital input into account.
    - Never: The input will never be taken into account.
    - Always: The input will always be taken into account.
    - When gen ready: The input will be taken into account when the Generator is ready.
    - After valid protect: The input will be taken into account when the variable *Protection validation* [4681] is equal to 1. (check the chapter Digital inputs *(on page 25)* for more information)
3. **Polarity**: Digital input's polarity.
4. **Delay**: Delay until the input becomes active.

How to connect digital sensors

When an analog input is used as a logic input, applying a 0V to the input enables it, applying nothing disables it.

Figure 18. B-1 : Digital sensor 2 wires

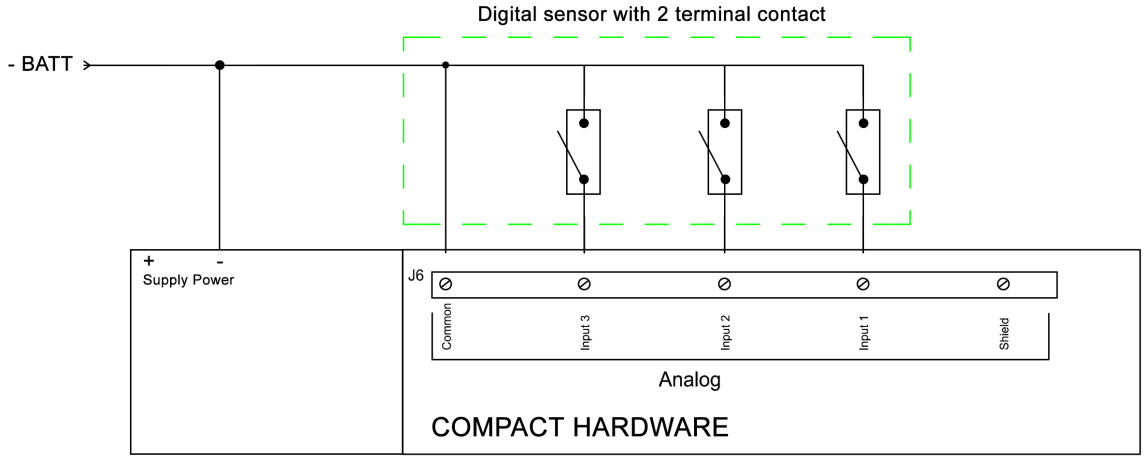
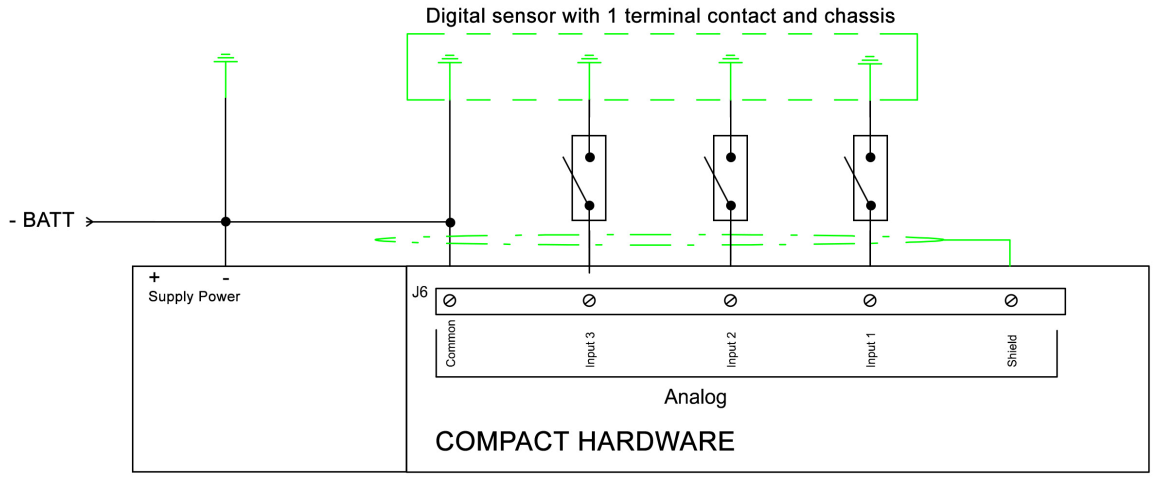


Figure 19. B-2 : Digital sensor 1 wire



⚠ WARNING

THE WARRANTY WILL BE VOIDED IF THE MANUFACTURER'S INSTRUCTIONS ARE NOT RESPECTED.

Protections

Available for analog inputs when sensor type is set to **Custom**. If sensor type is set to **Water temperature** or **Oil pressure**, refer to dedicated protections.

Several parameters can be configured from the ***Controller settings*** ⇒ ***Protections*** ⇒ ***Other protections*** ⇒ ***Analog inputs*** page:

- Level (LV): Limit value before triggering the protection. It can be a low or high threshold.
- Delay (TM): Time after which the protection is triggered.
- Control (CT): Control of the protection. It defines the action related to the protection
- Direction (SS): Polarity of the protection. It defines if the limit value is a low or high threshold

These parameters are available in the ***Controller settings*** ⇒ ***Protections*** ⇒ ***Other protections*** ⇒ ***Analog inputs*** page.

	Protections				
	Threshold	**Timer**	**Control**	**Direction**	**Function**
Analog input 1 level 1	[2600]	[2601]	[2602]	[2606]	[2678]
Analog input 1 level 2	[2603]	[2604]	[2605]		
Analog input 2 level 1	[2608]	[2609]	[2610]	[2614]	[2679]
Analog input 2 level 2	[2611]	[2612]	[2613]		
Analog input 3 level 1	[2616]	[2617]	[2618]	[2622]	[2680]
Analog input 3 level 2	[2619]	[2620]	[2621]		

HYSTERESIS (DIGITAL INPUT)

For a given hysteresis, three different digital signals are required:

- Two digital inputs are used respectively as low threshold and high threshold signals.
- One digital output is used to control an equipment with a hysteresis

The hysteresis settings can be found in the ***Controller settings*** ⇒ ***Inputs/Outputs*** ⇒ ***Digital inputs*** ⇒ ***Hysteresis on digital input*** page. Each hysteresis proposes the following parameters (the first hysteresis is taken as example):

- ***Hysteresis 1 enable for digital input***
- ***Pulse length DO 1***
- ***Direction hysteresis 1***

Hysteresis 1 enable for digital input

Enables/disables the hysteresis.

Pulse length DO 1

The delay to wait when the condition is met (reaching the low/high threshold) before activating the hysteresis output.

Direction hysteresis 1

For each hysteresis, two options are available:

Value	Label	Function
0	Set on low threshold, reset on high	The associated digital output will be set when the digital input assigned to the low threshold is activated and it will reset once the digital input assigned to the high threshold is activated. Please not that once the digital output is activated, the state of the digital input assigned to the low threshold will not matter. The digital output state can only change when the digital input assigned to the high threshold is activated.
1	Set on high threshold, reset on low	The associated digital output will be set when the digital input assigned to the high threshold is activated and it will reset once the digital input assigned to the low threshold is activated. Please not that once the digital output is activated, the state of the digital input assigned to the high threshold will not matter. The digital output state can only change when the digital input assigned to the low threshold is activated.

Setting inputs for your hysteresis

To select the required digital input signals, please refer to Digital inputs *(on page 25)*. the digital input functions to be used can be found in the **Hysteresis** section of the search engine.

Setting an output for your hysteresis

To select the digital output controlled by the hysteresis, please refer to Digital/Relays outputs *(on page 27)*. The digital output function to be used can be found in the **Hysteresis** section of the search engine.

HYSTERESIS

For a given Hysteresis, two different signals are required:

- One variable for the measure
- One digital output for the hysteresis to activate

Open the ***Controller settings*** ⇒ ***Programming*** ⇒ ***Hysteresis (i4Gen)*** page. Each hysteresis proposes the following parameters (the first hysteresis is taken as example):

- ***Enable Hysteresis 1***
- ***Hysteresis 1***
- ***Low level threshold***
- ***Timer on low level threshold***
- ***High level threshold***
- ***Timer on high level threshold***
- ***Hysteresis Direction 1***

Enable Hysteresis 1

Enables/disables the hysteresis.

Hysteresis 1

Chooses one among all of the variables of the product to bind the hysteresis with.

Low level threshold

The hysteresis output will be activated when the variable reaches a value lower than or equal to the configured low level threshold value.

Timer on low level threshold

The delay to wait once the variable value reaches the low level threshold before activating the hysteresis output.

High level threshold

The hysteresis output will be activated when the variable reaches a value greater than or equal to the configured high level threshold value.

Timer on high level threshold

The delay to wait once the variable value reaches the high level threshold before activating the hysteresis output.

Hysteresis Direction 1

For each hysteresis, two options are available:

Value	Label	Function
0	Set on low threshold, reset on high	The associated digital output will be set when the low threshold value is reached and it will reset on reaching the high threshold value. Please not that once the digital output is activated, the low threshold value will not matter. The digital output state can only change on reaching the high threshold value.
1	Set on high threshold, reset on low	The associated digital output will be set when the high threshold value is reached and it will reset on reaching the low threshold value. Please not that once the digital output is activated, the high threshold value will not matter. The digital output state can only change on reaching the low threshold value.

Setting an output for your hysteresis

To set a digital output, please refer to Digital/Relays outputs *(on page 27)*. The functions to use can be found in the **Hysteresis** section of the search engine.

SETTINGS

ENGINE

Internal start sequence

During the start sequence, the module controls the prelub, preglow, crank and fuel outputs when proper conditions are met, whereas the protections are inhibited. This concerns all engine protections.

Main start phases:

1. The engine is considered as started when its speed reaches the starter rpm stop threshold configured in the ***Controller settings*** ⇒ ***Engine/ECU/ECM*** ⇒ ***Engine*** ⇒ ***Starter*** page.
2. The module checks if the speed of the engine is in an acceptable range (between 95% and 105% of the nominal speed) during an amount of time set by variable [3469] to consider the speed as stable and get to the next sequence. If the speed does not respect these stability conditions during the time defined in variable [2393], the product treats the issue as an alarm or a fault depending on the configuration of variable [2394]. If an alarm is configured, the module will constantly check for the stability of the engine speed until ordered to stop the engine or until the speed is considered as stable.
3. The module checks if the voltage of the alternator is in an acceptable range (between 95% and 105% of the nominal voltage) during an amount of time set by variable [2056] to consider the voltage as stable and get to the next sequence. If the voltage does not respect these stability conditions during the time defined in variable [2395], the product treats the issue as an alarm or a fault depending on the configuration of variable [2396]. If an alarm is configured, the module will constantly check for the stability of the alternator voltage until ordered to stop the engine or until the voltage is considered as stable.
4. The Generator is ready; the protections are activated unless the parameter *Delay before activation of the protections* [2004] is set to extend their inhibition time.

Figure 20. Chronogram for Diesel Engine

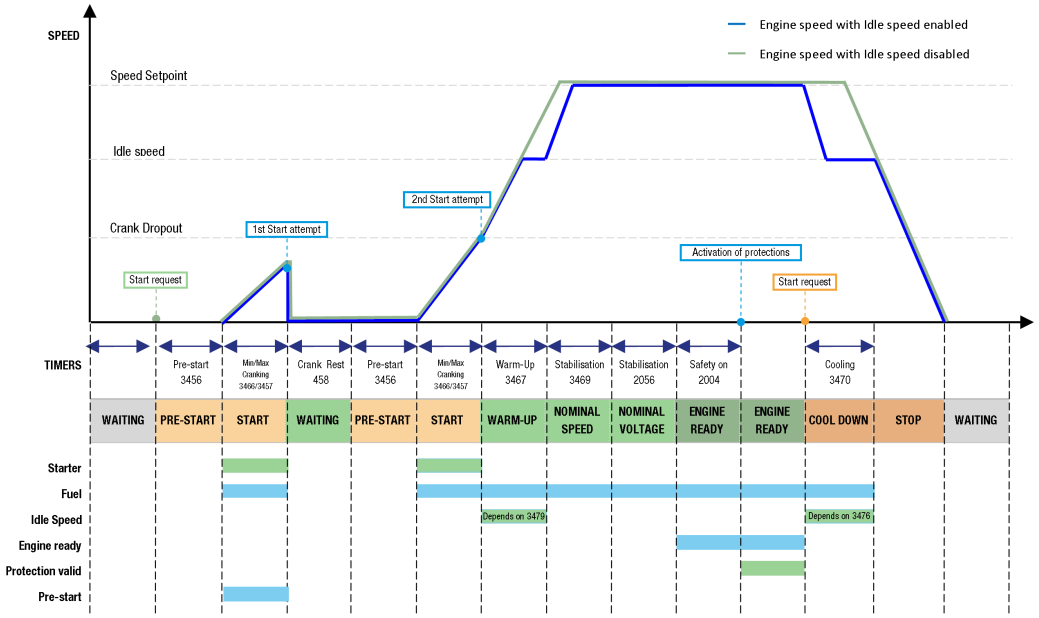
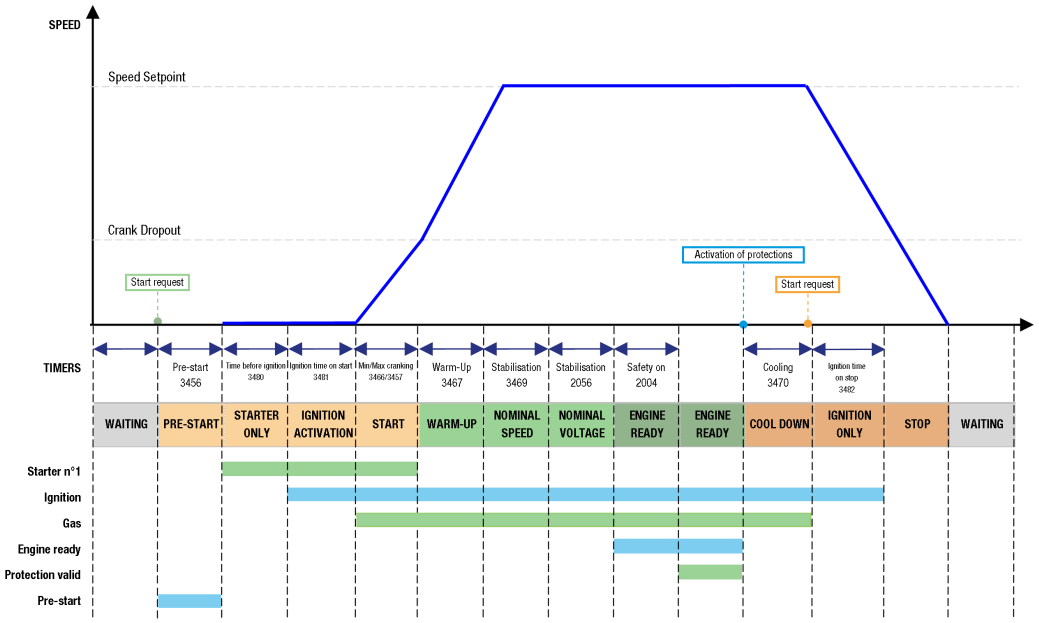


Figure 21. Chronogram for Gas Engine



Starter

With multiple starters, digital outputs must be preset to Crank2 and Crank3. The starters are attempted according to the starter numbers as long as the engine fails to start.

Setting	Label	Description	By default
[3459]	*Activation order of starters*	This parameter determines the order in which the starters will activate if there are multiple starters configured. 2 choices are possible: - Alternative : The automated system activates the starters one after the other and repeats with the first. - Consecutive : Each starter executes several trials consecutively before handing over to the next starter.	0
[3460]	*First starter*	This parameter determines the first starter that the module will activate if there are several starters configured.	1
[3461]	*Number of attempts per starter*	This parameter determines the number of start attempts made on each starter before stopping the sequence with a fault display.	3

Example:

Examples with 3 starters, with the *First starter* parameter set to 2 and the *Number of attempts per starter* parameter set to 3:

- In alternative mode, the sequence will be 2-3-1-2-3-1-2-3-1.
- In consecutive mode, the sequence will be 2-2-2-3-3-3-1-1-1.

Note: *For each starter's functions (starters 1 to 3), in the **Controller settings** ⇒ **Engine/ECU/ECM** ⇒ **Engine** ⇒ **Starter** page, there are separate lower thresholds under which the starter drops out. The values depend on starter type (electric, pneumatic...).*

Idle speed

To prevent a cold engine to run at full speed, the module can run it at idle speed for a short time on startup.

For this purpose, the module feeds an idle speed command to the speed controller when:

- The engine is in state **Start**, **Warm up** with internal start sequence (according to [3479]).
- Until the Generator is ready with external start sequence.
- The engine is in cooling down (according to [3476]).

The idle speed is fixed by the speed controller. Parameter [3468] allows to indicate to module the idle speed.

Smoke limiter

To prevent a cold engine from over-emitting, the module can feed a smoke limiter command to a speed controller (with smoke limit input) when the module is in states **Start**, **Warm up** and **Nominal speed**.

Air conditioning

Output function *Cooling fan* [4688] can be used to control a cooling fan in order to prevent overheat. The output is activated when the engine water temperature is higher than a temperature threshold [3475]. The output is deactivated when the engine water temperature is below 90% of this temperature threshold.

Verification

1. Start the Generator in MAN mode 

, and press 
2. Check that the delays (pre-lubrication, preheating, stabilization,...) correspond to your expectations.
3. If you wish to simulate the starter and oil pump sequences, disconnect the corresponding outputs. Navigate in the ***Controller supervision*** ⇒ ***Inputs/Outputs (i4Gen)*** menu where the status of the outputs is displayed in real time, then, check the activation of the starter and the fuel.
4. Check that the Generator led lights up.
5. Check that the engine speed and that the Generator voltages are stable (e.g.: **1500rpm, 50Hz, 400VAC**); the data are visible in the ***Controller supervision*** menu.

SPEED/VOLTAGE CONTROL

The module allows speed or voltage control with the following possibilities:

- Correction with two analog signals (speed and voltage) +/- 10VDC with amplitude and adjustable offset.
- Correction with pulses output (+speed/-speed and +voltage/-voltage).
- Correction with J1939 frames only for speed.

[4404] is the speed/KW correction applied to speed governor (value given in percent).

[4408] is the voltage/KVAR correction applied to voltage regulator (value given in percent).

Speed/Voltage controlled by analog outputs

The speed output fixes the required frequency setpoint to the speed controller during synchronization and kW control (load sharing, ramp load/unload). The full range of this output is -10V...10V_{DC} and must be adjusted in amplitude and offset to control the speed of the engine in a range of +/- 2.5Hz around the nominal frequency.

The voltage output fixes the required voltage setpoint to the voltage regulator during voltage synchronization and reactive load sharing. The full range of this output is -10V...10V_{DC} and must be adjusted in amplitude and offset to control the voltage of the alternator in a range of +/-30V around the nominal phase-phase voltage.

Automatic speed/voltage calibration

The module provides a feature to automatically set the proper speed/voltage outputs' amplitude and offset in order to control the speed/voltage within the right range.

This feature is accessible from ***Controller settings*** ⇒ ***Dynamic*** ⇒ ***Easy Calib®***

Following conditions are required before starting an automatic calibration:

- The module must be in **MAN** mode.
- The engine should be started.
- The Generator circuit breaker must be in open position.
- Speed and/or voltage must be controlled through analog signals. If both speed and voltage are controlled by pulse signals, then Easy Calib is irrelevant.

1. To start the calibration, press the **ENT** button.
2. During the calibration, the different steps of calibration are displayed on the screen.
3. The calibration can be cancelled at any time by pressing the **ESC** button.
4. When calibration process is completed, a message is displayed on the screen.

If the calibration failed, an error message will be displayed to inform you about the source of the problem.

Note:

- If the error message contains an error code, please contact CRE Technology for more information.
- Easycalib configures only the analog speed output and analog voltage output of the product. In the case of a pulse or J1939 control (in the case of speed), no calibration is necessary (automatic or manual) and Easy Calib will not change the overall behaviour of the system: in this case the quality of the speed/voltage control is relative to the regulations.
- If the speed is driven by pulse and the voltage driven by analog output, or vice versa, Easy Calib will skip the one configured in pulse.

It is also possible to set the speed/voltage output amplitude and offset manually.

Important: Follow carefully the configuration procedures (amplitude and offset adjustment) in this chapter in order to obtain efficient synchronization, load sharing and droop mode.

Manual speed calibration

1. First make sure that the speed output of the module is not connected to the speed regulator.
2. Start the Generator in **MAN** mode by pressing 

and then  .
3. Adjust the speed value on the speed governor to get the nominal frequency (typically 50Hz or 60Hz).
4. Connect the "Speed output" and "Speed common" terminals to the speed regulator. Adjust the offset parameter to obtain a frequency of 50Hz (or 60Hz).
5. Increase the engine speed manually up to its maximum (100%) by pressing 

+  , then adjust the amplitude to obtain a frequency of 52.5Hz (or 62.5Hz).
6. Return to a 0% speed correction by pressing 

+  , then adjust the offset again if necessary to obtain a 50Hz (or 60Hz) frequency.
7. Change the speed correction to minimum (-100%) by pressing 

+  and check that the frequency is 47.5Hz (or 57.5Hz).
8. Return to 0% speed correction by pressing 

+  .
9. Press  to stop the Generator.

Application note **COMPACT PLATFORM_SPEED GOVERNOR WIRING ADJUSTMENTS_EN** lists parameter values to be set for several speed governor models. To use the module with other models, adjust the amplitude and offset as explained above.

Manual voltage calibration

1. Start the Generator in **MAN** mode by pressing 

and then  .
2. Adjust the voltage value on the voltage regulator to get a nominal phase-phase voltage of 400V (or 480V).
3. Connect the "AVR output" and "AVR common" terminals to the voltage regulator. Adjust the offset to obtain a voltage of 400V.
4. Increase the Generator voltage manually up to its maximum (+100%) by pressing 

+  , then adjust the amplitude to obtain a voltage of 430V (or 510V).
5. Return to a 0% voltage correction, then adjust the offset again if necessary to obtain a voltage of 400V.
6. Change the voltage correction to minimum (-100%) by pressing 

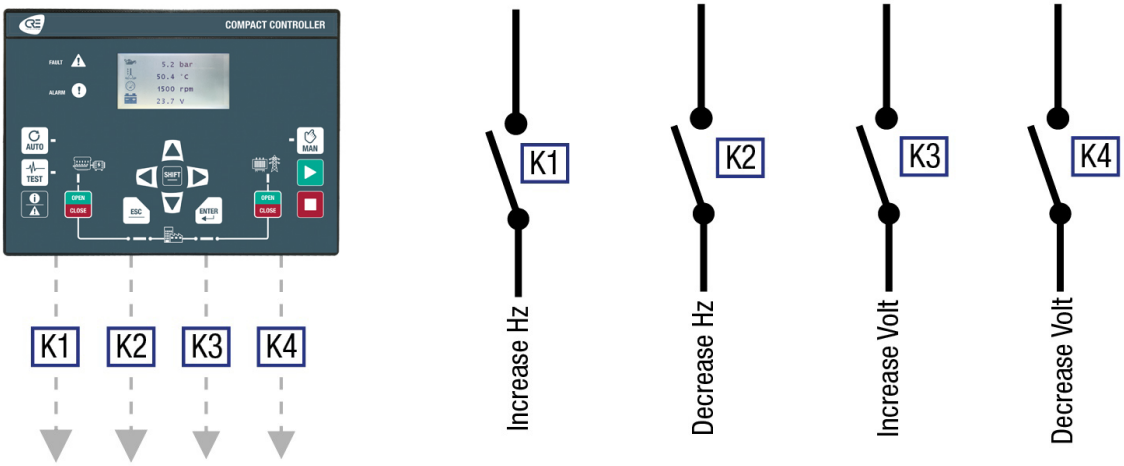
+  to check that the voltage is 370V (or 450V).
7. Return to 0% voltage correction.
8. Press  to stop the Generator.

Application note **COMPACT PLATFORM_AVR-DVR WIRING ADJUSTMENTS_EN** list parameter values to be set for several AVR models. To use the module with other models, adjust the amplitude and offset as explained above.

Speed/Voltage controlled by contacts/pulses

When digital outputs are connected to the speed governor and/or AVR, the module changes the state of these outputs according to the result of the active PID:

Figure 22. Speed/Voltage controlled by digital outputs



A digital potentiometer converting pulses into analog values can be used. A digital potentiometer has its own parameters: ΔU0 (fsd) and timer.
In the ***Controller settings*** ⇒ ***Inputs/Outputs*** ⇒ ***Digital/relays outputs*** page, set the respective functions (increase/decrease speed by pulse and increase/decrease voltage by pulse) to the desired +speed/-speed and +voltage/-voltage outputs.

A pulse is generated when the absolute value of the correction applied exceeds the dead band. The larger the correction signal ([4404] for speed and [4408] for voltage), the longer the pulses are and the shorter the time between each pulse is. The **Pulse divider** parameter is used to reduce or increase the pulse length for the same correction value.

1. Adjust the speed/voltage regulator to its nominal value (unless the controller connection is direct).
2. If the Generator makes too much or too little correction during an active phase (synchronization, load sharing...), the **Pulse divider** is not adapted:
   - Decrease *Frequency pulse divider* [3652] / *Voltage pulse divider* [3653] to increase the action on the regulator/the AVR.
   - Increase *Frequency pulse divider* [3652] / *Voltage pulse divider* [3653] to reduce the action on the regulator/the AVR.
3. If the Generator oscillates around the set-point or fails to reach the setpoint, the dead band is not adapted:
   - Decrease the dead band *Pulse frequency dead band* [3650] / *Pulse voltage dead band* [3651] to improve accuracy around setpoint.
   - Increase the dead band *Pulse frequency dead band* [3650] / *Pulse voltage dead band* [3651] if the Generator oscillates in frequency or voltage or power.
4. If a digital potentiometer is connected between the module and the regulator, set ΔU (fsd) and the delay time; if the compensation is not as expected, check the following points:
   - Is the potentiometer active when the module sends a signal ?
   - Is the range managed by the potentiometer sufficient ?

CIRCUIT BREAKERS

Circuit breakers operating modes

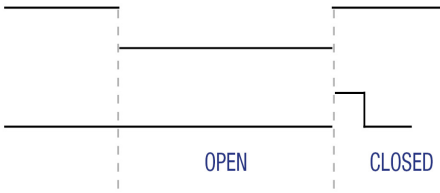
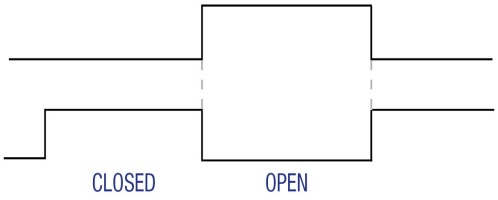
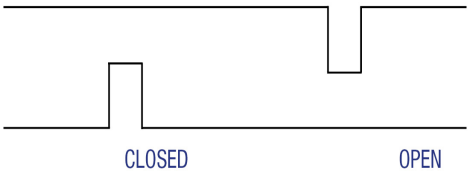
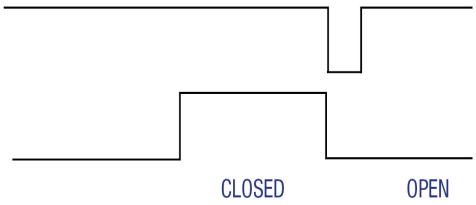
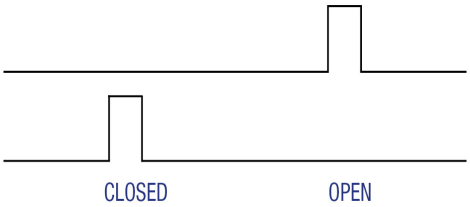
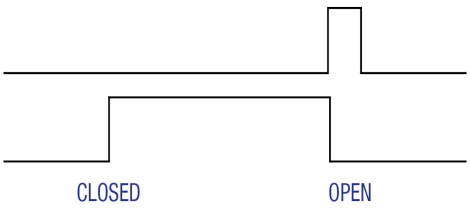
Two digital outputs (relay or transistor) are used to control the circuit breakers - 1 for opening and 1 for closing. These outputs allow different types of circuit-breakers to be controlled.

The Generator circuit breaker settings are accessible from ***Controller settings*** ⇒ ***Inputs/Outputs*** ⇒ ***Breaker*** ⇒ ***Generator breaker***.

Important: Failure to comply with the following recommendations may cause malfunctions.

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

Circuit breaker control mode

Value	Mode	Circuit breakers chronogram
0	1: Continuous contact to open. 2: 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 ***i4Gen Suite*** software.

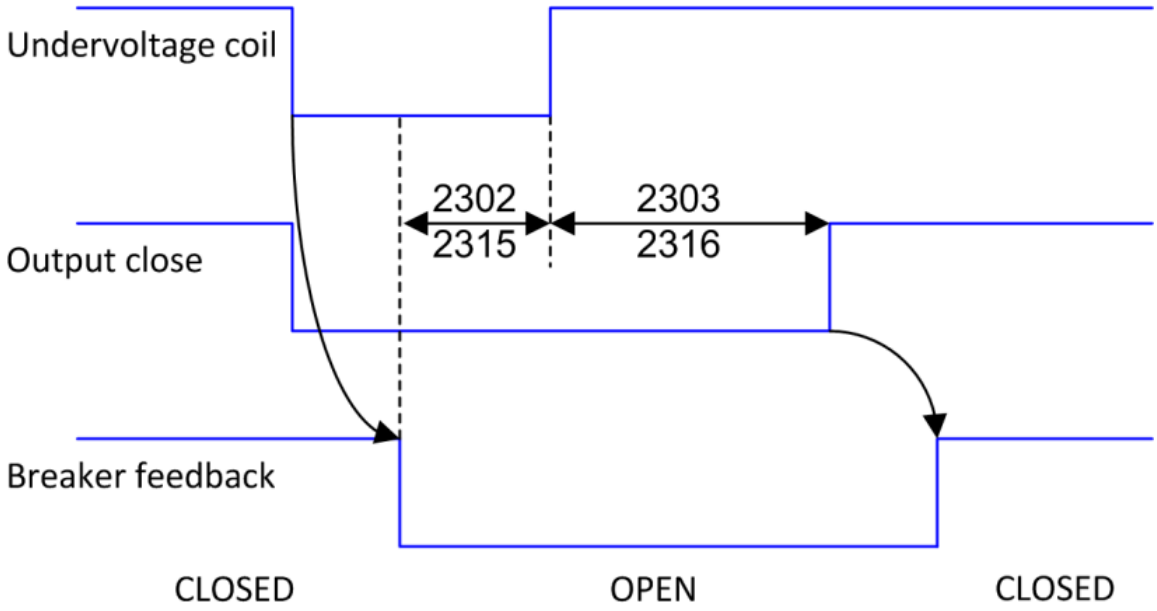
Pulse

The settings of the Generator breaker pulse can be found in the ***Controller settings*** ⇒ ***Inputs/Outputs*** ⇒ ***Breaker*** ⇒ ***Generator breaker*** page.
For the pulse control of the Generator breaker, set the parameter [2301].

Coil Control

The settings of the Generator breaker coil can be found in the ***Controller settings*** ⇒ ***Inputs/Outputs*** ⇒ ***Breaker*** ⇒ ***Generator breaker*** page.
For the fail-safe control of the Generator breaker, set the parameters [2302] and [2303].

Figure 23. Coil control chronogram



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

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

Note: If the circuit breaker position feedback is not assigned to a digital input then the breaker position will always be assumed to match the breaker control output of the module.

Configuration of circuit breaker commands

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

Function	Description
Generator breaker close	Command to close the breaker. Output signal (pulse or continue) will depend on configuration in Breaker settings. (continuous, pulse, MNcoil).
Generator breaker open	Command to open the breaker. Output signal (pulse or continue) will depend on configuration in Breaker settings. (continuous, pulse, MNcoil).

Verification

⚠ DANGER

RISK OF ELECTRIC SHOCK, EXPLOSION OR ARCING
Failure to follow these recommendations may result in death or serious injury.

- 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 check the absence of voltage.
- Do not use a resettable fuse.

Follow these instructions in order to check the Generator breaker:

1. Connect the circuit breaker position feedbacks and check them on the product. The corresponding LED should light up when the circuit breaker is closed.
2. Start the Generator in **MAN** mode by pressing 

and then  .
3. Once the Generator is ready and if there is no voltage on the other side of the breaker, press the button Generator breaker  .
4. Check that the Generator circuit breaker is closed and that the Generator 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. To open the Generator breaker, press the button Generator breaker  .
7. Check that the Generator circuit breaker is open and that the Generator circuit breaker LED is off.
8. Press  to stop the Generator.

SYNCHRONIZATION

Functionning

The module launches the synchronization only if the Bus 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 ***Controller settings*** ⇒ ***Electrical*** ⇒ ***Synchronisation check***). When the Generator 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 ***Controller settings*** ⇒ ***Electrical*** ⇒ ***Synchronisation check***.

Another module is elected if load dependant start stop mode is selected.

Condition

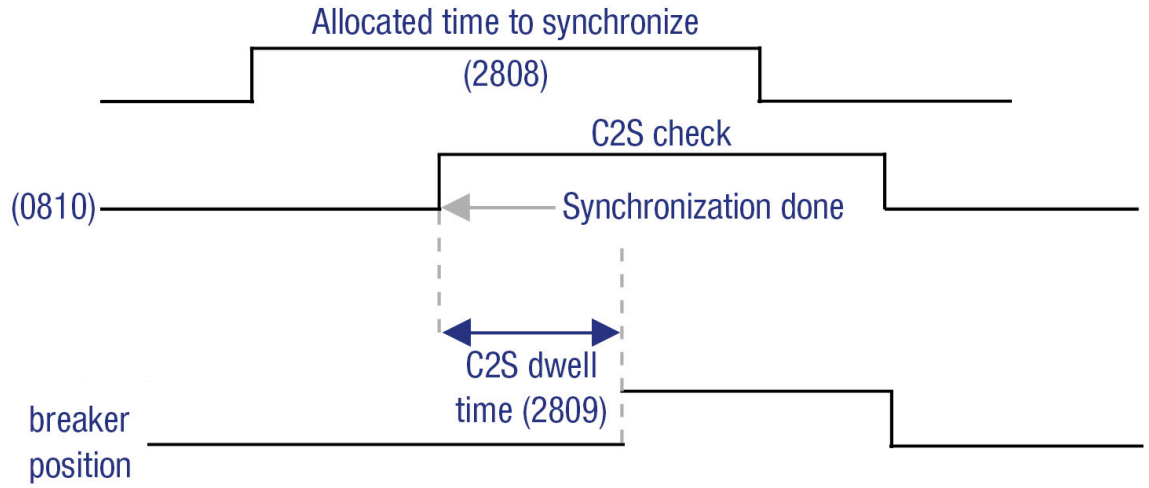
- *Voltage acceptance* [2800].
- *Frequency acceptance* [2801].
- *Phase Angle acceptance* [2802].
- *C2S dwell time* (Synchronization dwell time before authorizing to close the breaker) [2809].

Visualization

Label	Description	Variables
Phase sequence match	Identical phase order on both sides of the circuit breaker (OK = 1 or NOK = 0)	[306]
Voltage match	Identical voltage amplitudes on both sides of the circuit breaker (OK = 1 or NOK = 0)	[307]
Frequency match	Identical frequencies on both sides of the circuit breaker (OK = 1 or NOK = 0)	[308]
Phase match	The phase difference between the voltages on either side of the circuit breaker is zero (OK = 1 or NOK = 0)	[309]
Synch check relay OK	Active if the sources are synchronized on both sides of circuit breaker (OK = 1 or Not OK = 0). Do not confuse with the closing order.	[310]

Chronogram

Figure 24. Synchronization chronogram



Adjustments

Prerequisite: The speed and voltage outputs control must be set as described in Speed/Voltage Control *(on page 39)*. The voltage and the frequency of the Bus must be in their nominal value. The PID parameters can be set using the menu ***Controller settings*** ⇒ ***Dynamic*** ⇒ ***Synchronization PID***.

⚠ DANGER

RISK OF ELECTRIC SHOCK, EXPLOSION OR ARCING
Failure to follow these recommendations may result in death or serious injury.

- 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 check the absence of voltage.
- Do not use a resettable fuse.

Adjustment procedure

1. Disconnect the Generator circuit breaker control output on the module.
2. Make sure that there is some voltage on the Bus side. The Bus LED should be lit.
3. Press 

to be in **MAN** mode.
4. Start the Generator by pressing  and check the ***Controller supervision*** ⇒ ***Synchronization (i4Gen)*** page.
5. Press the button Generator breaker  in order to start the synchronization.
6. The Generator should synchronize within 5 seconds. If it is not the case, isolate the cause (voltage, frequency or phase). Depending on the source of the issue (voltage, frequency or phase) change the corresponding PID parameters available in the menu ***Controller settings*** ⇒ ***Dynamic*** ⇒ ***Synchronization PID***. Refer to Control loop PID *(on page 59)* chapter to see how to manage PID settings.

Verification

1. Disconnect the Generator circuit breaker control output on the module.
2. Make sure that there is voltage on the Bus side. The Bus LED should be lit.
3. Press  to be in **MAN** mode.
4. Start the Generator by pressing the button  and check the ***Controller supervision*** ⇒ ***Synchronization (i4Gen)*** page.
5. Once the engine is ready, press the button Generator breaker  .
6. Press  to go to the Information page and check if the module is in synchronizing mode.
7. Go to the menu ***Controller supervision*** ⇒ ***Synchronization (i4Gen)*** and check the phase difference. When the phase difference is 0° follow the instructions bellow:
    a. Check the phase sequence and the concordance of the phases upstream and downstream of the circuit breaker.
    b. Check the wiring of the Generator and Bus voltage references.
    c. Check the potential difference between Ph1 Generator and Ph1 Bus. The potential difference must be bellow 10% of the nominal voltage. Check the potential difference between Ph2 Generator and Ph2 Bus as well.
8. Stop the Generator by pressing  .
9. Reconnect the Generator circuit breaker control.
10. Start the Generator by pressing  .
11. Once the Generator is ready, press the button Generator breaker  . The Generator should synchronize and then, the product will close the Generator breaker.

Control on dead bus management

In case of an emergency start of the Power plant (no voltage on the busbar), the units communicate through **CRE-Link®** to elect a module which will close first its circuit breaker on the busbar: it is the arbitration procedure, to avoid closing 2 circuit breakers at the same time, when the generators are not synchronized. With a failure of the **CRE-Link®** communication, the units switch on a safe mode to protect the circuit breaker closing procedure. Each closing commands will be delayed depending on the number of the unit.

Formula:
Generator #n will close its circuit breaker after ([2306]/10) + (7 * n) seconds.
[2306]: Delay to close breaker if there is a CAN bus fault. Default value: 15.0s.

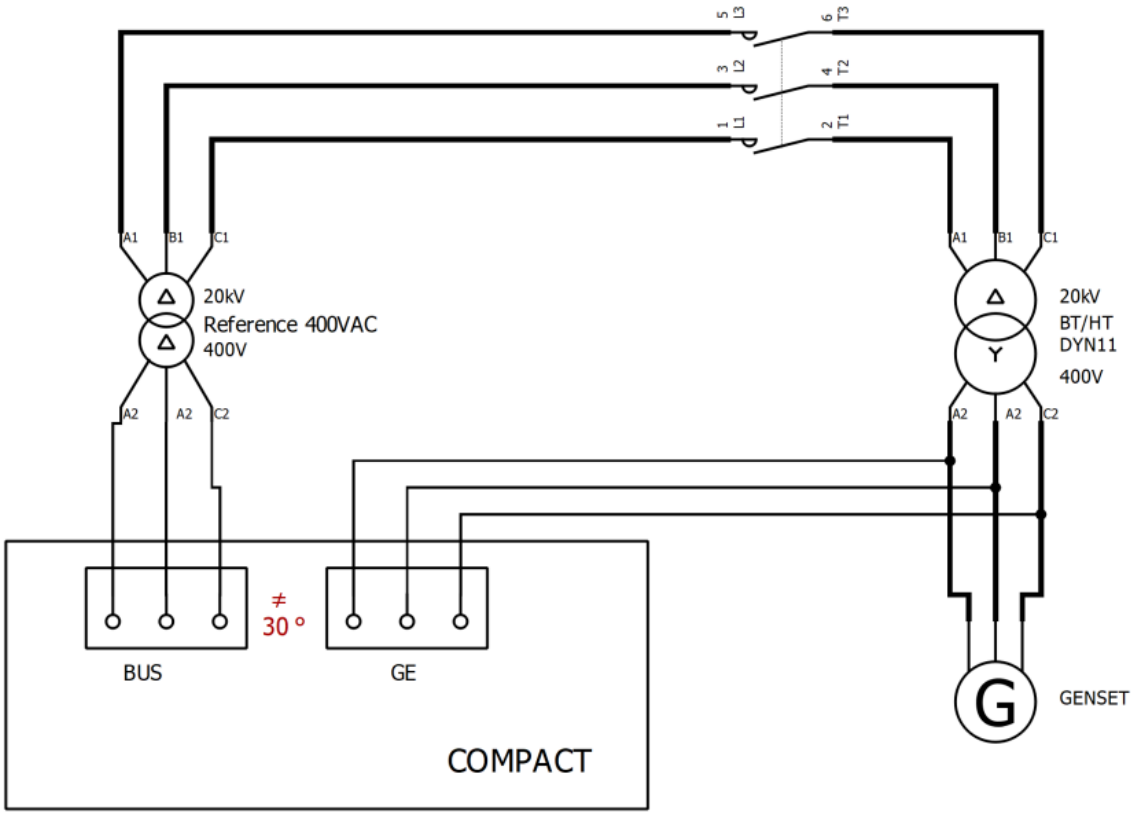
Formula:

Generator #n will close its circuit breaker after ([2306]/10) + (7 * n) seconds.
[2306]: Delay to close breaker if there is a CAN bus fault. Default value: 15.0s.

Phase offset

This advanced function, only available when the option is enabled, allows a phase offset between the Generator and the Bus during the synchronization phase. In this setup, the module will command the breaker to close with the selected phase angle shift. The phase offset modification can be done in ***Controller settings*** ⇒ ***Electrical*** ⇒ ***Synchronisation check***. An example of an application can be seen in the schematic bellow.

Figure 25. Application example using phase offset



⚠ WARNING

MODIFYING THE SETTING IN AN APPLICATION WHERE PHASE SHIFTING IS NOT REQUIRED WILL DAMAGE YOUR ENGINE. BE CAUTIOUS WHEN MODIFYING THIS SETTING.

LOAD/UNLOAD RAMP

Functionning

After a synchronization, the module ramps up the Generator load to avoid overload or a load impact.

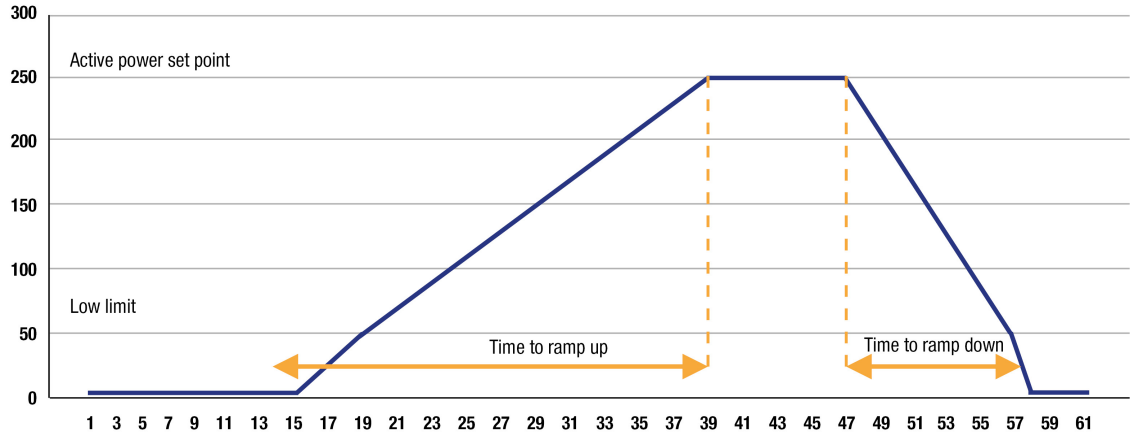
The module calculates the average of the active power read from the **CRE-Link®** CAN bus. It then starts a load ramp to progressively reach this value (KW regulation).
During the ramp, the module keeps a constant power factor, set by the Bus power factor before closing the Generator breaker, in order to start a reactive power ramp.

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

The parameters to be set are the following: *Low kW active power threshold* [2866], [2867], *Load ramp timer* [2853], *Unload ramp timer* [2856]. The timers [2853] and [2856] correspond to the time required to reach the nominal load.

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

Figure 26. Load/Unload ramp chronogram



Before stopping the Generator, 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 Generator continues to share the load and shows a breaker opening fault on display.

Adjustments

Prerequisite: The speed and voltage outputs control must be set as described in Speed/Voltage Control *(on page 39)*.

The PID settings parameters are settable in the menu ***Controller settings*** ⇒ ***Dynamic*** ⇒ ***Isochronous load sharing PID***.

Verification

For this test, an available load is important.

After the synchronization sequences, the module switches to power management mode.

1. Check that the power measured per phase is positive and balanced.
    - Go to the menu ***Controller supervision***. Otherwise check the currents connections.

2. Check that the current power follows the setpoint of KW and KVAR during ramps.
    - Go to the menus ***Controller settings*** ⇒ ***Dynamic*** ⇒ ***Isochronous load sharing PID*** ⇒ ***Active power / Frequency*** and ***Controller settings*** ⇒ ***Dynamic*** ⇒ ***Isochronous load sharing PID*** ⇒ ***Reactive power / Voltage***. Change the settings if necessary.

KW/KVAR REGULATION

Functionning

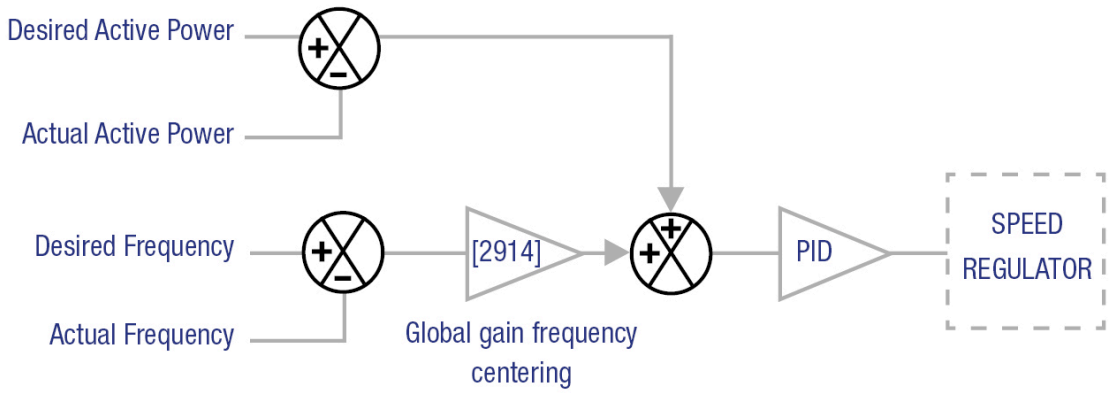
The module switches to active and reactive power regulation mode around its setpoint after a load ramp.

The module calculates the active and reactive power it should supply using the information received from the **CRE-Link®** protocol.
Each module provides an active and a reactive power according to its nominal power.

Example:
Example: On a Power plant with two generators, Generator 1 with a nominal power of 100KW and Generator 2 with a nominal power of 200KW: Generator 1 will take 33.3% of the active power of the Bus load while Generator 2 will take 66.6% of the active power of the Bus load.

The KW/KVAR and frequency/voltage regulations are controlled by two controllers of PID. It allows the module to correctly get to its KW/Frequency and KVAR/Voltage setpoints by controlling the speed governor and the AVR system. The schematic diagram of a controller of PID is shown in the figure below:

Figure 27. kW/kVAR and Frequency/Voltage PID schematic diagram



Note: A similar controller of PID regulates the reactive power and the nominal voltage by controlling the AVR system. The Global Gain for Nominal Voltage centering is the parameter [2958].

The PID parameters can be found in the page: ***Controller settings*** ⇒ ***Dynamic*** ⇒ ***Isochronous load sharing PID***.

The frequency/voltage and the active/reactive power are controlled simultaneously. The higher the parameters [2914] and [2958] are, the higher the frequency/voltage error will have an impact on the controller.

To know how to correctly set up the PID parameters in order to have a correct regulation, see Control loop PID *(on page 59)*.

Adjustments

Prerequisite: The speed and voltage outputs control must be set as described in Speed/Voltage Control *(on page 39)*.
The PID controller adjustment must be set as described in Control loop PID *(on page 59)*.
On all units, adjusting the regulation is needed in order to have an acceptable response time, and a perfect stability in KW and KVAR regarding load and different sequences.

In case of an unbalanced load sharing:

1. Check that the measured power for each phase is positive and balanced in the ***Controller supervision*** ⇒ ***Generator (i4Gen)*** page. Otherwise check the wiring direction of the current transformers.
2. Check that the speed/voltage control is set (amplitude for speed and voltage correction, must be maximum at +/- 8% of nominal value).
3. Check that all Generators are stable. If one or more Generators oscillate in frequency/voltage (even slightly), this oscillation may affect the load sharing. Keep in mind that an instability on the speed governor or the AVR system cannot be corrected by PID on the module.

PROTECTIONS

Functionning

The protections are triggered by an internal or external event (internal protection, digital inputs, CAN bus loss, etc.). In order to protect the system, an action can be associated with the triggering of a protection. These actions are of different kinds :

- These actions can just trigger an alarm. An orange LED will flash on the product and the title of the triggered protection will appear in the alarms/faults page.
- These actions can protect the different equipments by carrying out actions that depend on the type of action configured. In this case, the LED will blink orange as long as no human intervention is required, the LED will blink red if a human intervention is required. If the LED flashes orange, the title of the protection that has been triggered can be consulted in the alarms page. If the LED flashes red, the name of the protection that has been tripped can be viewed in the faults page.

Value	Type	Action	Description
0	–	Unused (no action)	–
1	Alarm/ Fault	Generator electrical fault	The protection opens the Generator 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 Generator circuit breaker is happening again after each attempt, the Generator will be stopped.
3	Alarm	Alarm	The protection is displayed in the alarm page. No action is performed.
4	Fault	Fault (soft shutdown)	The Generator circuit breaker opens, the engine cool down for the duration of the cool down timer, then the engine stops.
5	Fault	Security (hard shutdown)	Generator breaker opens and engine stops immediately without cooling down; "**serious fault**" shows as information.
6	Fault	Fault (soft shutdown) + Help	The "+ Help" option allows a faulty Generator to ask another available Generator, through the **CRE-Link®** protocol, to start in order to replace the faulty generator. Once the new Generator is on the bus, the faulty Generator stops and waits for the fault to be reset. If there are already enough Generators on the Bus to support the load without the faulty Generator, then option "+ Help" acts like a normal fault and no extra Generator is called for help. This option is only available when Load Dependent Start/Stop is activated
7	Fault	Generator electrical fault + Help	The "+ Help" option allows a faulty Generator to ask another available Generator to start through **CRE-Link®** in order to replace the faulty generator. Once the new Generator is on the bus, the faulty Generator makes a predetermined number of attempts of resynchronizing before stopping. If the attempts were unsuccessful the Generator waits for the fault to be reset. If there are already enough Generators on the Bus to support the load without the faulty Generator, then option "+ Help" acts like a normal electrical fault and no extra Generator is called for help. This option is only available when Load Dependent Start/Stop is activated
8	Alarm	Droop Hz/V + Alarm	For **CRE-Link®** protocol failure only: The control of the load is switched on frequency and voltage droop mode and an alarm is triggered. This mode must be used to manage active and reactive power load sharing.
10	Alarm	Droop Hz only + Alarm	For **CRE-Link®** protocol failure only: The control of the load is switched on frequency droop mode and an alarm is triggered. This mode must be used to manage active power load sharing only.

These actions have to be configured in ***i4Gen Suite*** software. List of potential alarms/faults can be downloaded using the SAVE button beside "Protections configuration" in the ***i4Gen*** ⇒ ***File transfer*** page. A digital output can be configured to indicate that a 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 chapter Software variables *(on page 149)***.**
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 software treated emergency stop.
- Action on an alarm or a fault : select **Security (hard shutdown)**.

Note: In addition of the controller emergency stop management, a physical management of the emergency stop must be installed. The system must provide a physical cut off of the starters, the circuit breakers commands and the fuel command.

Communication

Alarm/Fault	Description	Setting
J1939	Communication error on the J1939 protocol.	[3058]
CANopen	Communication error on the CANopen protocol.	[3059]

For **CRE-Link®** protocol errors, check CRE-Link® *(on page 102)*.

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 an electrical fault

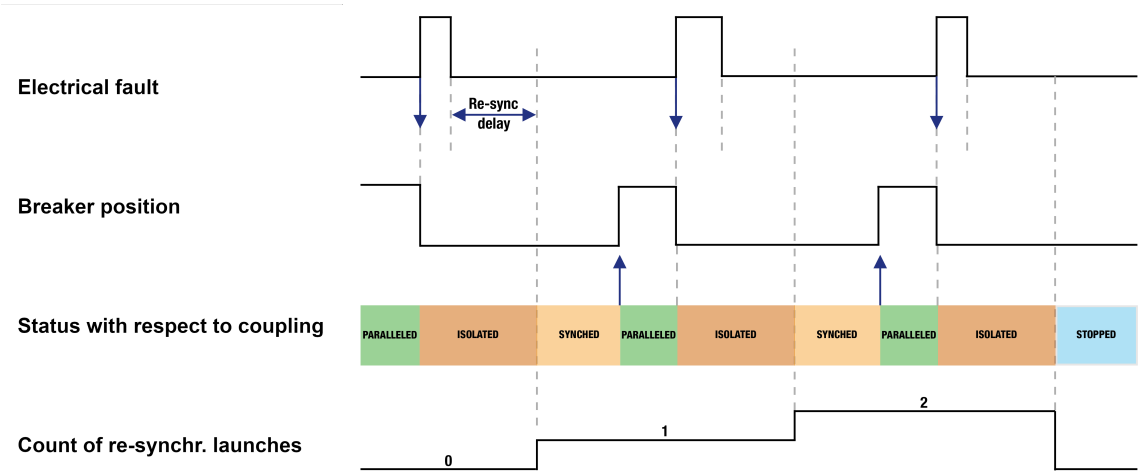
In the event of an electrical fault:

1. The module opens the circuit breaker.
2. The module will try X times according to the value configured in the parameter *Number of closing attempts* [2807].
3. The module will wait X seconds between each attempt according to the value configured in the parameter *Delay before new attempt* [2806].

Example:

Example with [2807] = 2:

Figure 28. Reattempt to close after an electrical fault



Custom fault and alarm

User variables [8000] to [8099] can be set as alarm or fault using ***i4Gen Suite***. The label of the alarms/faults can be customized by changing the label of the related user variable. A user variable set as alarm or fault can be triggered via Modbus or **Easy Flex®**.

Audible or visual warning device

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

Reset of alarms and faults

To perform an alarms/faults reset:

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

Request for help

The module can request help from another Generator to replace it when an internal fault configured as protection 6 or 7. This request can also come from the activation of a logic input configured as a help request.

The two functions/protections differ in their stop sequence:

- Fault (soft shutdown) + Help: The faulty Generator will ask another Generator to start through **CRE-Link®** to replace it, once the new generator is available, the faulty generator stops after cooling down according to the settings set and waits for a fault reset. In case there are already enough generator on the Bus to support the load supply by the faulty generator, the input is considered as normal fault and there is no extra generator starting or available.
- Generator electrical fault + Help: The faulty Generator will ask another generator to start through **CRE-Link®** to replace it. Once the new generator is available, the faulty generator tries to resynchronize or stops (depending on the settings set) and waits for reset. In case there are already enough generator on the Bus to support the load supply by the faulty generator, the input is considered as normal fault and there is no extra generator starting or available.

EVENTS

Functionning

Events are actions performed on the installation that can be monitored by the controller. They are managed in the same way as an alarms and faults, thus they can be seen in the "history" menu where all alarms/faults/events history is listed. Events are also included in the log file together with alarms and faults. Each event can be enabled/disabled in the ***Controller settings*** ⇒ ***General*** ⇒ ***Events*** page.

Variable number	Label	Description
[5000]	*Power up*	This event is recorded each time the controller is powered on.
[5001]	*Engine start*	This event is recorded if the engine speed is equal to 0 and it changes (even if the controller didn't start the engine by itself).
[5002]	*Engine stop*	This event is recorded if the engine speed is different than 0 and it reaches 0 (even if the controller didn't stop the engine by himself).
[5005]	*Generator breaker closed*	This event is recorded if the controller can read the "closed breaker feedback" from the Generator's breaker (even if the controller didn't close the Generator's breaker by itself). If breaker position feedbacks are not used, the event is triggered on breaker close command instead.
[5006]	*Generator breaker opened*	This event is recorded if the controller can read the "opened breaker feedback" from the Generator's breaker (even if the controller didn't open the Generator's breaker by himself). If breaker position feedbacks are not used, the event is triggered on breaker open command instead.
[5009]	*Manual mode*	This event is recorded when the controller is switched to **MAN** mode (Pressing **MAN** when the controller is already in **MAN** mode won't trigger the event).
[5010]	*Automatic mode*	This event is recorded when the controller is switched to **AUTO** mode (Pressing **AUTO** when the controller is already in **AUTO** mode won't trigger the event).
[5011]	*Test mode*	This event is recorded when the controller is switched to **TEST** mode (Pressing **TEST** when the controller is already in **TEST** mode won't trigger the event).

CONTROL LOOP PID

Empirical adjustment of a PID control loop

1. Set all the gains to 0 (except G gain).
2. Increase the P gain until you have a stable oscillation.
3. Increase the gain D until the oscillation is no longer present.
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

DROOP

Functioning

In order to maintain load sharing, the droop is used if one or several of the following problems are detected on the **CRE-Link®**:

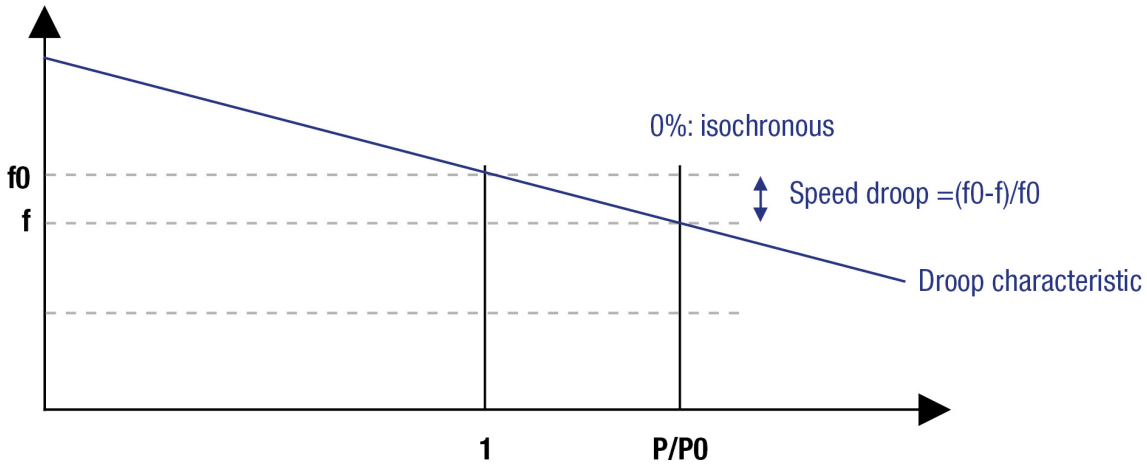
- *Controller communication fault* (if [3052] is set to 8 or 9).
- *Missing GENSYS COMPACT PRIME* (if [3054] is set to 8 or 9).
- *Missing MASTER COMPACT or BTB COMPACT* (if [3057] is set to 8 or 9).
- *Missing HYBRID COMPACT* (if [3060] is set to 8 or 9).
- *Missing BAT COMPACT* (if [3061] is set to 8 or 9).
- *Mismatch vers.*

It can be forced by changing the **GPID** mode parameter [2013]. As droop is allowed, the control does not use any integral.

Frequency Droop

Speed droop = (Rated no-load frequency – Base frequency)/Rated no-load frequency. In the Power plant, the Generators were requested to run in proportion to their rated power i.e. with the same P/P0. As they are set with the same droop, they share the same droop characteristic. As the load demand increases, they respond to the fall in frequency by increasing their active power outputs simultaneously. The increase in the active power output counteracts the reduction in frequency. Thus they do not fight one another to control the load (no "hunting").

Figure 29. Droop characteristic



Voltage Droop

Use of voltage instead of frequency.

Droop is set in the controller configuration, not in the ESGs/AVRs :
All the products must be set to the same relative deviations in the parameters [2204] and [2250].

⚠ CAUTION

Follow strictly the adjustment procedures (amplitude and offset) in order to obtain the best load sharing results possible when in droop.

GENERATORS START/STOP

Functioning

This function allows to automatically start and stop generators of a power plant according to different criteria in order to keep generators running at their optimal load when possible (for most generators it is recommended to run between 70% to 85% of load) or to prevent overload depending on your application requirements. There are three different start/stop criteria (set by the variable [2879]):

- Automatically start and stop the generator according to load levels
- Automatically start and stop the generator according to a reserve power threshold relative to the power plant nominal power (in percent)
- Automatically start and stop the generator according to a power reserve threshold (in kW).

Conditions required to correctly enable the automatic start/stop:

- The remote start must be permanently active on each module; otherwise, the generator cannot start.
- At least two generators must be equipped with a **CRE TECHNOLOGY** module, all with identical **Generators Start/Stop** settings.
- All the modules must be in **AUTO** mode.

Important: Notion of "remote start"

Each generator should have a "remote start" activated in order to be eligible for starting/stopping according to the generator start/stop function settings. A generator in **AUTO** mode without a remote start will never start even if the conditions are matching its settings.

The source of a "remote start" may vary depending on your needs and can be provided through the following:

- A digital input (functions *Remote start on load* [4502] and *Remote start off load* [4611]). This is the default scenario for applications equipped with only ***GENSYS COMPACT PRIME*** controllers.
- The CAN bus, coming from another **CRE TECHNOLOGY** controller. This is the default scenario for applications equipped with ***MASTER COMPACT***, ***MASTER COMPACT 1B*** and ***BAT COMPACT***.
- Modbus/TCP (It is usually used to meet specific application criteria or when the controllers should have a "master" that is not a **CRE TECHNOLOGY** controller i.e an external PLC.) It is advised to contact **CRE TECHNOLOGY** for this type of scenario.

Note: All sources can be used simultaneously.

Once a generator is in **AUTO** mode and has a remote start active, there are two possible scenarios:

- At least one function is activated in the menu ***Controller settings*** ⇒ ***Electrical*** ⇒ ***Power management*** ⇒ ***Generators Start/Stop***, the controller will first check the settings and start only if they match the current situation.
- There is no function activated in the menu ***Controller settings*** ⇒ ***Electrical*** ⇒ ***Power management*** ⇒ ***Generators Start/Stop***, the controller will start the generator.

The same principle applies once the remote start is removed.

A digital input preset to "***Unload generator if load-dependent start-stop rules OK***" [4543] can be used to stop the related generator. The generator will only stop if the remaining generators can absorb the load without being overloaded. Unlike the signal **Fault (soft shutdown) + Help**, this input does not substitute the target generator with another one. The module must not have been given priority by input function [4538].
The generator will not restart until the digital input "***Unload generator if load-dependent start-stop rules OK***" [4543] is released and the generator is elected to start (see Start/Stop priority criteria below).

To setup this function, see ***Controller settings*** ⇒ ***Electrical*** ⇒ ***Power management*** ⇒ ***Generators Start/Stop***. The protections **Fault (soft shutdown) + Help** and **Generator electrical fault + Help** are available in this mode (for more information, see Protections *(on page 54)*).

Note: If a ***BTB COMPACT*** is used in the power plant, load dependent start/stop will be applied separately on each segment when the tie-breaker is open.

Load dependant generators start/stop

When the start/stop mode parameter [2879] is set to **Start/stop load levels**, ***GENSYS COMPACT PRIME*** will start/stop its generator according to the load:

- If the load exceeds the high limit threshold of active power for a configurable period of time, the controller will start its generator.
- If the load decreases under the low limit threshold of active power for a configurable period of time, the controller will stop its generator.

Parameters

[2879]

Select the load dependant start/stop mode

[2854]

Start threshold (%)

[2855]

Timer before starting the generator (s)

[2857]

Stop threshold (%)

[2858]

Timer before stopping the generator (s)

[140]

Running generators active power (kW)

Definitions

Running generators nominal active power (kW) = Sum of the nominal active power of every generator connected to the bus

Conditions

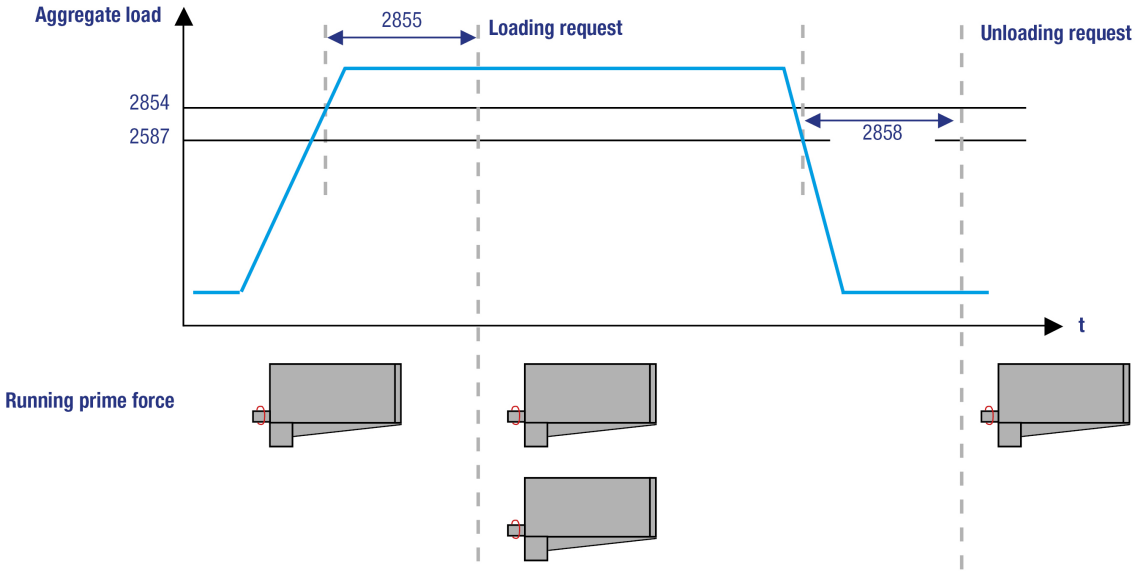
Condition to start

Running generators active power > Start threshold * Running generators nominal active power

Condition to stop

Running generators active power < Stop threshold * Running generators nominal active power

Figure 30. Load dependant generators start/stop



Example:

A 4x100kW power plant supplies a load that increases linearly from 0 to 400kW and then decreases to 0kW.
The start threshold [2854] is set to 80% and the stop threshold [2857] is configured to 20%.
The timer to start a generator [2855] is set to 10s and the timer to stop a generator [2858] is set to 20s.

Generator #1 is permanently running. When the load increases above the start threshold for at least 10 seconds, Generator #2 starts to supplement Generator #1. If the load increases again above the start threshold for at least 10 seconds then Generator #3 joins #1 and #2 and so on until all 4 generators are running. Now when the load decreases below the stop threshold for at least 20s, Generator #4 will stop. If the load decreases further below the stop threshold for at least 20s, then Generator #3 will stop etc.

Important: Notion of "reserve power"

The reserve power function is used to maintain at all time (when possible) an available margin of power on the running generators of the power plant while optimising the number of running generators. The reserve power is enabled by setting the start/stop mode to either **Reserve power (%)** or **Reserve power (kW)**.

Generators start/stop according to reserve power (%)

When the start/stop mode parameter [2879] is set to **Reserve power (%)**, ***GENSYS COMPACT PRIME*** will start/stop its generator according to the reserve power in percentage:

- If the reserve power of the power plant is lower than a configurable threshold in percentage of the load, the controller will start its generator.
- If the reserve power of the power plant is higher than a configurable threshold in percentage of the load (considering the stop of the generator related to the controller), the controller will stop its generator.

The value set by the parameter [2880] defines the percentage of load margin to always keep available on the running generators. The value set by the parameter [2887] defined the percentage of load margin to reach in order to stop a generator.

Parameters

[2879]

Select the load dependant start/stop mode

[2880]

Start threshold (%)

[2855]

Timer before starting the generator (s)

[2887]

Stop threshold (%)

[2858]

Timer before stopping the generator (s)

Definitions

Generators reserve power (kW) = Running generators nominal active power - Running generators active power

Conditions

Condition to start

Generators reserve power < (Start threshold * Running generators nominal active power)

Condition to stop

Generators reserve power - Outgoing generator nominal active power > Stop threshold * (Running generators nominal active power - Outgoing generator nominal active power)

Example:

A 4x100kW power plant supplies a load that increases linearly from 0 to 400kW and then decreases to 0kW. The power margin dependent start threshold [2880] is set to 40% and the stop threshold [2887] is set to 60%. The timer to start a generator [2855] is set to 10s and the timer to stop a generator [2858] is set to 20s.

Generator #1 is permanently running. When the load rises above 60kW for at least 10s, Generator #2 starts to supplement Generator #1. When the load rises above 120kW for at least 10s Generator #3 starts. When the load rises above 180kW for at least 10s Generator #4 starts. Generator #4 stops when the load gets under 120kW for at least 20s, Generator #3 stops when the load gets under 80 kW for at least 20s and Generator #2 stops when the load gets under 40 kW for at least 20s.

Generators start/stop according to reserve power (KW)

When the start/stop mode parameter [2879] is set to **Reserve power (kW)**, ***GENSYS COMPACT PRIME*** will start/stop its generator according to the reserve power in kW:

- If the reserve power of the power plant is lower than a configurable threshold in kW , the controller will start its generator.
- If the reserve power of the power plant is higher than a configurable threshold in kW (considering the stop of the generator related to the controller), the controller will stop its generator.

The value set by the parameter [2881] defines a fixed kW load margin to always keep available on the running generators. The value set by the parameter [2887] defined a fixed kW load margin to reach in order to stop a generator.

Parameters

[2879]

Select the load dependant start/stop mode

[2881]

Start threshold (kW)

[2855]

Timer before starting the generator (s)

[2888]

Stop threshold (kW)

[2858]

Timer before stopping the generator (s)

Definitions

Generators reserve power = Running generators nominal active power - Running generators active power (kW)

Conditions

Condition to start

Generators reserve power < Start threshold

Condition to stop

Generators reserve power - Outgoing generator nominal active power > Stop threshold

Example:

A 4x100kW power plant supplies a load that increases linearly from 0 to 400kW and then decreases to 0kW.
The power margin dependent start threshold [2881] is configured to 40kW and the stop threshold [2888] is configured to 60kW.
The timer to start a generator [2855] is set to 10s and the timer to stop a generator [2858] is set to 20s.

Generator #1 is permanently running. When the load rises above 60kW for at least 10s, Generator #2 starts to supplement Generator #1. When the load rises above 160kW for at least 10s Generator #3 starts. When the load rises above 260kW for at least 10s Generator #4 starts. Generator #4 stops when the load gets under 240kW for at least 20s, Generator #3 stops when the load gets under 140 kW for at least 20s and Generator #2 stops when the load gets under 40 kW for at least 20s.

Renewable energy power dependant start/stop

This functionality is only accessible on the ***GENSYS COMPACT PRIME*** controller when there is at least one ***HYBRID COMPACT*** controller declared in the ***GENSYS COMPACT PRIME*** controller configuration.

The ***GENSYS COMPACT PRIME*** controller will start/stop its generator according to renewable energy active power:

- If the reserve power of the power plant is too low compared to the possible decrease of the renewable energy production for a configurable period of time, the controller will start its generator.
- If the reserve power of the power plant is high enough (considering the stop of the generator related to the controller) to assume the possible decrease of the renewable energy production for a configurable period of time, the controller will stop its generator.

Parameters

[2883]

Enable the function

[2884]

Start threshold (%)

[2885]

Timer before starting the generators (s)

[2889]

Stop threshold (%)

[2886]

Timer before stopping the generators (s)

Definitions

Generators reserve power = Running generators nominal active power - Running generators active power

Conditions

Condition to start

Generators reserve power < (Start threshold * Renewable energy active power)

Condition to stop

Generators reserve power - Outgoing generator nominal active power > (Stop threshold * Renewable energy active power)

Example:

Let's take for example a power plant with two 100kW generators. At a given moment the power supplied by the generators is 80kW and the power supplied by the renewable energy inverters is 200kW. In this case, the power margin of the generators is 120kW because they supply 80kW and could rise up to 200kW together. If a cloud passes by and the renewable energy production drops from 200kW to 70kW (i.e. a drop of 130kW of production), the 120kw power margin of the generators will not be sufficient and there is a high risk of power failure.

For this reason, it is important to set a minimum power margin on the generators that depends on the current renewable energy power. In this case, the power drop is at 65%. A power margin of 70% of the solar power could have been used in order to maintain the power plant despite the power drop. This value is to be adjusted on each site according to the variations of the renewable energy production, the objective being to avoid a power failure.

Hours dependent start/stop

If the hours dependent start/stop feature is enabled, an available generator with the least running or auxiliary hours will replace the generator of the power plant running with the most running or auxiliary hours once conditions are met. The type of hours (auxiliary or running) taken into account can be set using variable [2882]. The available generator with the least running/auxiliary hours will start when the difference between the hours of the generator supplying the load with the most running/auxiliary hours and its own running/auxiliary hours is over the value set by parameter [2865]. This option will force the start/stop priority criteria (parameter [2850]). This option can be used simultaneously with the load dependent start/stop feature.

Start/stop priority criteria

Once the start/stop conditions are met, an election between the available generators (only if at least two generators are available) is made in order to decide which generator will be started/stopped. The priority criteria can be set using parameter [2850]:

- By generator number: the generator with the smallest generator number (defined by parameter [2001]) between the available generators will be the next one responding to a start demand. The generator running with the largest number will be the next one responding to a stop demand.
- By running hours: the generator with the least running hours will be the next one responding to a start demand. The generator running with the most running hours will be the next one responding to a stop demand.

- By custom configuration: the generator with the smallest custom number (defined by the variable [2863]) between the available generators will be the next one responding to a start demand. The generator running with the largest number will be the next one responding to a stop demand
- By auxiliary hours: the generator with the least auxiliary hours will be the next one responding to a start demand. The generator running with the most auxiliary hours will be the next one responding to a stop demand.

When no generators are already on the bus, you can either set them to start all at once or to start them one by one. To do this, set the desired mode in the following variables:

- *Generators start type on powered bus*[2892]
- *Generators start type on deadbus*[2894]

Note: A Generator that has been started by force in **MAN** mode ignores the start/stop priority rule. It closes its breaker on the bus bar, even if there is no load (dead bus management=Yes). Elections will be held without the generator in manual.

Start type

Once the start/stop conditions are met, an election between the available generators (only if at least two generators are available) is made in order to decide which generator will be started/stopped. The priority criteria can be set using parameter [2850]:

- By generator number: the generator with the smallest generator number (defined by parameter [2001]) between the available generators will be the next one responding to a start demand. The generator running with the largest number will be the next one responding to a stop demand.
- By running hours: the generator with the least running hours will be the next one responding to a start demand. The generator running with the most running hours will be the next one responding to a stop demand.
- By custom configuration: the generator with the smallest custom number (defined by the variable [2863]) between the available generators will be the next one responding to a start demand. The generator running with the largest number will be the next one responding to a stop demand
- By auxiliary hours: the generator with the least auxiliary hours will be the next one responding to a start demand. The generator running with the most auxiliary hours will be the next one responding to a stop demand.

Note: A Generator that has been started by force in **MAN** mode ignores the start/stop priority rule. It closes its breaker on the bus bar, even if there is no load (dead bus management=Yes). Elections will be held without the generator in manual.

GENERATORS START/STOP WITH A HYBRID POWER PLANT

With a ***BAT COMPACT*** and a battery inverter in your power plant, you can take into account the reserve power of the storage batteries in order to reduce the number of running generators. It is even possible to stop all the generators if you have enough battery reserve power and the battery inverter is in grid forming.

In order to configure this enhanced reserve power, you just have to use a generators start/stop function with reserve power (% or KW) and configure it as explained in the previous chapters. The ***BAT COMPACT*** must also be configured but there is no change in the configuration of the ***GENSYS COMPACT PRIME***. Check the documentation of the ***BAT COMPACT*** to configure it and get more information on hybrid power plants.

Important: How to use the "remote start"

If you have a ***BAT COMPACT*** with an inverter in grid forming, you can indeed stop all the generators if you have enough reserve power. To do so, you must not have any "remote start" activated in all the ***GENSYS COMPACT PRIME*** controllers of the power plant. If there is a "remote start" activated in one ***GENSYS COMPACT PRIME***, it will prevent it to stop.

On the other hand, if you have a ***BAT COMPACT*** with an inverter in grid following and no permanent mains, All the ***GENSYS COMPACT PRIME*** must have a "remote start" activated so that there will always be at least one generator closed on bus.

STATIC PARALLELING

Example:

Case studies

- Starting a full plant with multiple generators in an emergency on dead bus: the generators are ready to take load in the shortest possible time, without warm-up.

Bottom line: full plant availability in less than 10s typically. This meets the NEC700 requirements.

- Installation with a high voltage transformer: as the Generator(s) start, the transformer core is magnetized progressively, without peaks (no transient short-circuit).

Note:

- As long as there is a voltage on the Bus, the dynamic paralleling prevails even if static paralleling is configured.
- Static paralleling sequence can be done only when the module is in **AUTO** mode.

Conditions

On equipment:

- The alternators are identical (in particular, same winding pitch).
- The AVRs are set for static paralleling: they wait for excitation command on their first start.
- All breakers must be powered by continuous voltage like 24VDC or 48VDC (so as to close before AC is available).

On module:

- The remote start is activated.
- A digital output is preset to **Excitation** command.

Variable	Label	Default	Description
[2050]	*Static paralleling*	Dynamic	Set it to static
[2051]	*Waiting for de-excitation timer*	30.0s	Alternator de-excitation waiting time during a re-excitation sequence. The module will stop waiting for de-excitation when the timer has elapsed and will attempt to parallel the alternator to the Mains.

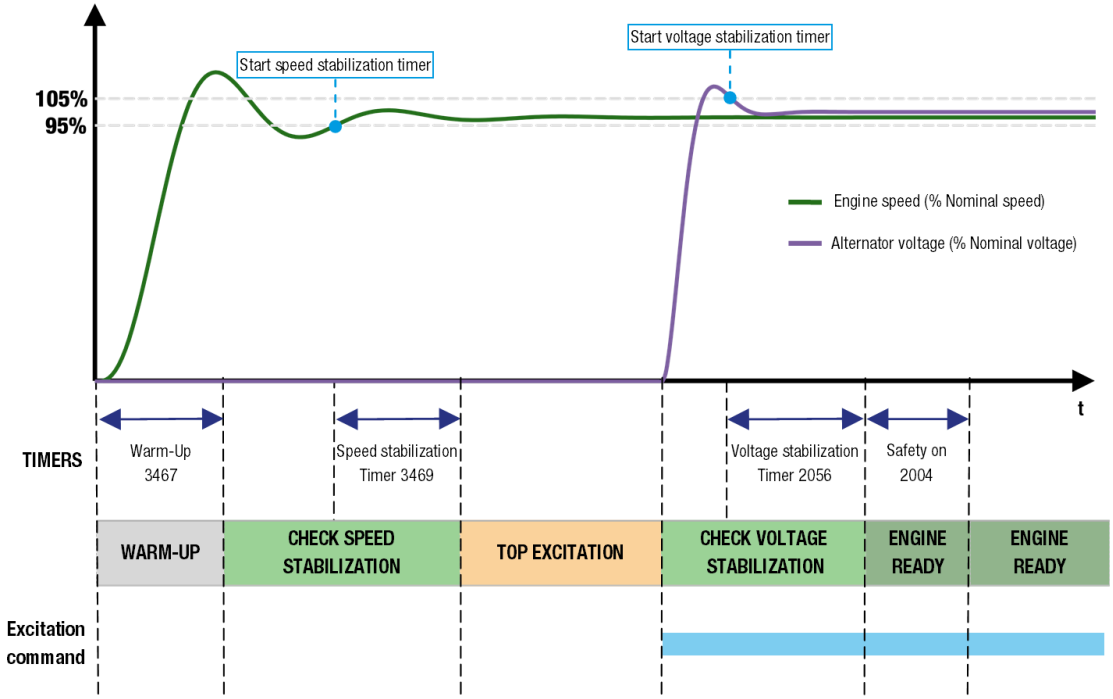
Sequence

The generators are synchronized through **CRE-Link®**:

1. Every remote start is activated at the same time.
2. Every controller closes its breaker and starts its engine.
3. Every controller waits for the speed of its generator to be in the acceptable range (between 95% to 105% of the nominal speed). If variable *Out of speed range control* [2394] of a controller is set as fault and the speed isn't in the accepted range after the delay set by variable *Out of speed range timer* [2393], the controller opens its breaker to allow the other units to continue the sequence.
4. When every remaining unit has its generator in the accepted speed range, the excitation command outputs of the units are activated at the same time.
5. Every unit waits for the voltage of its generator to be in the acceptable range (between 95% to 105% of the nominal voltage). If a unit has its variable *Out of voltage range control* [2396] set as fault and the voltage isn't in the accepted range after a delay set by the variable *Out of voltage range timer* [2395], its breaker opens to allow the other units to continue the sequence.

The module proceeds to a de-excitation of the alternator each time the breaker of a unit opens and no voltage is present on the bus if the engine is still running in order to restart the static paralleling sequence.

Figure 31. Static paralleling



LOAD SHEDDING

Functioning

The load shedding function is the ability to disconnect less important consumers if the Power plant is overloaded even when the full capacity is engaged; this prevents a blackout.
Any module – generally one – in the Power plant can take care of the excessive demand. If the KW demand exceeds the Power plant capacity and/or the frequency has dropped below a threshold for a given time, the dedicated module activates outputs to shed non-essential loads.
You can setup your system to react more or less rapidly depending on the severity of the situation using two levels of thresholds and delays.

Settings

All the settings are explained in the chapter Software variables *(on page 149)***.**
They are set in the ***Controller settings*** ⇒ ***Electrical*** ⇒ ***Power management*** ⇒ ***Load shedding*** page.
Using the ***Controller settings*** ⇒ ***Inputs/Outputs*** ⇒ ***Digital/relays outputs*** page, preset up to 5 outputs to ***1st non essential trip...5th non essential trip***.
In the same manner as for protections, you can trigger an action when the shedding capacity runs out (a specific output "Trip alarm" is signaled if [2862] = 3).

Sequence

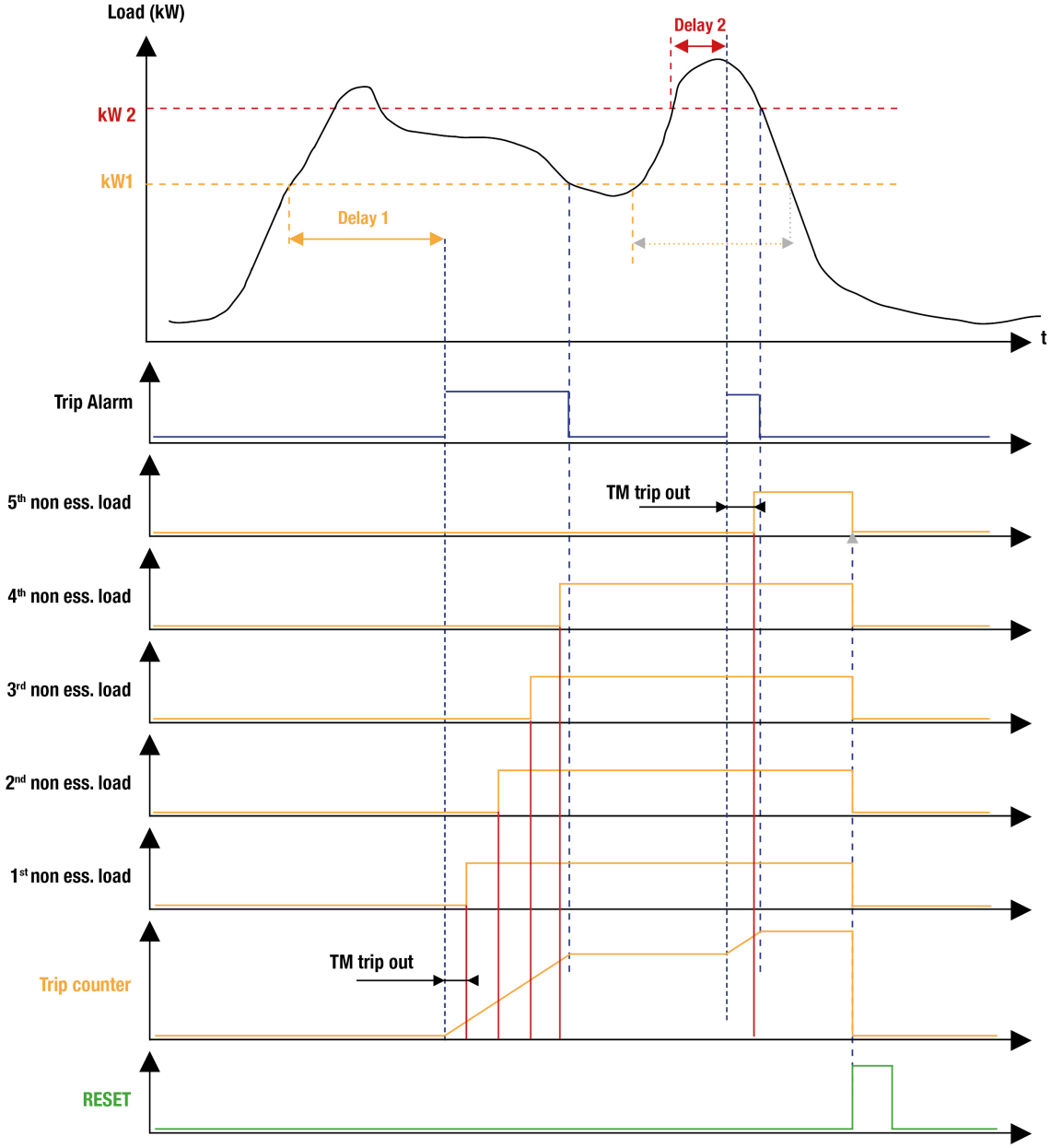
When one of the two levels is reached and its associated delay has expired, a trip alarm is set and a five-tier shedding starts (level 1) or escalates (level 2): at the end of a cycle based on the parameter [2861] an extra non-essential consumer is phased out till the threshold is reversely passed.

When the active power of the generator exceeds the maximum kW threshold configured or when the frequency drops below the minimum frequency threshold configured:

1. Trip alarm is raised after the related delay, as long as one of the threshold is exceeded.
2. The trip outputs are activated successively after an additional delay; they are locked until a manual reset; they can activate a preset output on a non-essential direct trip.

The charts show the trip alarm and trip outputs depending on the Generator load or frequency:

Figure 32. Sequence of load shedding



MAINTENANCE SCHEDULE

Usage

The configuration of the maintenance schedule is carried out from the ***i4Gen Suite*** software.
The current maintenance schedule can be seen in the ***Controller supervision*** ⇒ ***Maintenance (i4Gen)*** page ("off" means that the servicing cycle is not defined).
When a cycle has elapsed, an alarm is displayed and the module's alarm LED flashes.
The expired cycle can be seen in the module alarm page.
Resetting the alarm restarts the servicing cycle.

Note: Maintenance cycles are saved on a non volatile memory.

Maintenance cycle based on operating hours

The counter decreases according to the number of operating hour(s) of the engine:

1. Rename the cycle if necessary.
2. Set the number of hour(s).
3. Press the **Reset** button to reset the counter.

Maintenance cycle based on days

The counter decreases according to the number of days passed no matter if the generator is running or not.

1. Rename the cycle if necessary.
2. Set the number of day(s).
3. Press the **Reset** button to reset the counter.

SYNCHRONIZATION & LOAD SHARING ONLY

"Synchronization & load sharing only" mode is proposed to transform a standard ***GENSYS COMPACT PRIME*** or ***GENSYS COMPACT MAINS*** into an automatic synchronizer & load sharing unit in order to replace analog load sharing systems, analog synchronizers, or any systems combining both of these features (Such as Barber Colman PowRCon, CRE Unigen…). Once this mode is activated, the controller will only launch synchronization on request, and share load once it has received the paralleling information.

Settings

Variables	Label	Description
[2024]	*Synchronization & Load sharing only*	This parameter determines if the product should process only synchronization and kW/kVAR management. 2 values can be selected: - No: Standard operation of the product with management of the faults when the feedback of the circuit breakers is not in conformity with the orders of the product, management of the engine. - Yes: Circuit-breaker faults are not managed, which leaves more flexibility in sequences when circuit-breaker close/open commands are given by a PLC. The engine sequence is not managed. The product will start the synchronization sequence if voltage and frequency are between 95% and 105% of nominal and a digital input configured as 'Remote start on load' is activated. The kW management function is activated as soon as a digital input configured as 'Generator breaker feedback' is activated. In this operating mode, the product can only be used in automatic mode.
[2032]	*Hide engine measurement*	This parameter determines if the product should hide the engine measurements. - No: Engine measurements will be displayed - Yes: Engine measurements will not be displayed

These variables are accessible in ***Controller settings*** ⇒ ***General*** ⇒ ***Application***.

With [2024] set to "Yes", controller will be **forced in AUTO Mode** and the start/stop sequence management will be inhibited, therefore all the starting process of the engine has to be external.

Starting synchronization

Synchronization is started once **remote start** digital input is activated and the the following conditions are met:

- Frequency is stable at its nominal value
- Voltage is stable at its nominal value

Synchronization can be tuned in the dynamic configuration menu for synchronization PIDs and settings.
Synchronization will last as long as the remote start input is active, no alarm or fault will be triggered in this state.

When synchronization check is in the acceptance window, the output configured as *Generator breaker close* [4675] or *Mains breaker close* [4676] will be triggered depending on which synchronization is active (genset synchronization or mains synchronization), this output can be used to control the circuit breaker directly or can be used to be inserted in a closing request process.
Synchronization process will be stopped if remote start is removed or if circuit breaker feedback is received to indicate that the breaker is closed.

Starting load sharing (genset paralleling applications)

Load sharing process is started once *Generator breaker feedback* [4501] is received on a configured digital input (remote start must still be active).
It is possible to bypass synchronization process (in case an external synchronizer is used) by simultaneously activating *Remote start on load* [4502] input and *Generator breaker feedback* [4501].
As long as these two signals are active (*Remote start on load* [4502] and *Generator breaker feedback* [4501]) load sharing will be active.

Load ramp start for load transfer or fixed power/PF management, for mains paralleling applications

The Load control process starts once the input functions *Generator breaker feedback* [4501] & *Mains breaker feedback* [4500] are set on 2 configured digital inputs and are activated (remote start must still be active).
It is possible to bypass the synchronization process (in case an external synchronizer is used) by simultaneously activating *Remote start on load* [4502] input and both *Generator breaker feedback* [4501] & *Mains breaker feedback* [4500].
As long as these 3 signals are active (*Remote start on load* [4502] and *Generator breaker feedback* [4501] and *Mains breaker feedback* [4500]) load control will be active.

End of load sharing/load control

The Load sharing/load control process will stop when the digital input set as *Remote start on load* [4502] input is disabled.
The load will drop to the low limit threshold defined in the variable *Low kW active power threshold* [2866] (accessible in ***Controller settings*** ⇒ ***Electrical*** ⇒ ***Generator*** ⇒ ***General***) and the product will deactivate the *Generator breaker close* [4675] output when the threshold is reached. Another output configured as *Generator breaker open* [4677] can be used to be activated on request to open.
As long as the circuit breaker remains closed, the generator set remains at the power set in the parameter *Low kW active power threshold* [2866].
After circuit breaker has been opened, generator circuit breaker feedback gone, and the remote start removed from the controller, unit will remain in waiting status.

Note:

All protections of **COMPACT** controllers remain available, therefore if any of the protection is configured as shut down or electrical fault, the related circuit breaker output will be deactivated. Another output can also be configured as fault summary in order to provide a tripping information to the external process.
All other programming features and power management functions remain available in this slave mode.
Engine information can be disabled using parameter *Hide engine measurement* [2032].
Genset start/stop commands (fuel output, starter,…) are disabled in this mode.

APPLICATION IN A POWER PLANT

LOAD SHARING

General information

The module is informed of the load measurements of the other Generators via **CRE-Link®**.
They distribute the load in proportion to their rated power.
This distribution method is more reliable and accurate than an analog solution.
Speed control is used to distribute the **active** load.
Voltage control is used to distribute the **reactive** load.

Available measures:

Label	Description	Variables
KW GEx	Active power as percentage of nominal.	[400] to [431]
KVAR GEx	Reactive power as a percentage of nominal.	[465] to [496]
KW nom GEx	Rated active power for each Generator.	[433] to [433]
KVAR nom GEx	Rated reactive power for each Generator.	[498] to [498]

The active and reactive powers taken by the Generators sharing the load are visible in ***i4Gen Suite*** software or on the module screen.

Settings

- Enter the number of Generators and the number of each Generator.
- Set the speed and voltage outputs as explained in Speed/Voltage Control *(on page 39)*.
- Enter the characteristics of your application (rated power, PT ratio, CT ratio, etc...).
- Set circuit breaker acceptable closing conditions (***Controller settings*** ⇒ ***Electrical*** ⇒ ***Synchronisation check***").
- Adjust the synchronization by adjusting the PIDs in frequency, voltage and phase (see Synchronization *(on page 46)*).
- Set the KW and KVAR distribution by adjusting the KW and KVAR PIDs.
- Check the distribution in KW and KVAR (during ramps and load sharing). KW and KVAR must remain within the range of 2% around the plant average. (see kW/kVAR regulation *(on page 52)* and Load/Unload ramp *(on page 50)*).

Note: The average KW/KVAR of the Power plant in % as well as the KW/KVAR measurements of the Generator in % can be viewed on the screen of the PID settings.

Operating Mode

Manual

Start load sharing manually

1. Press MAN: the associated LED lights up.
2. Press ▶: the module starts the Generator.

3. Press  to put the generator on load. Depending on the configuration, the sequence may vary:
   - Synchronization (if a voltage on the Bus-bar is present).
   - Circuit breaker closing.

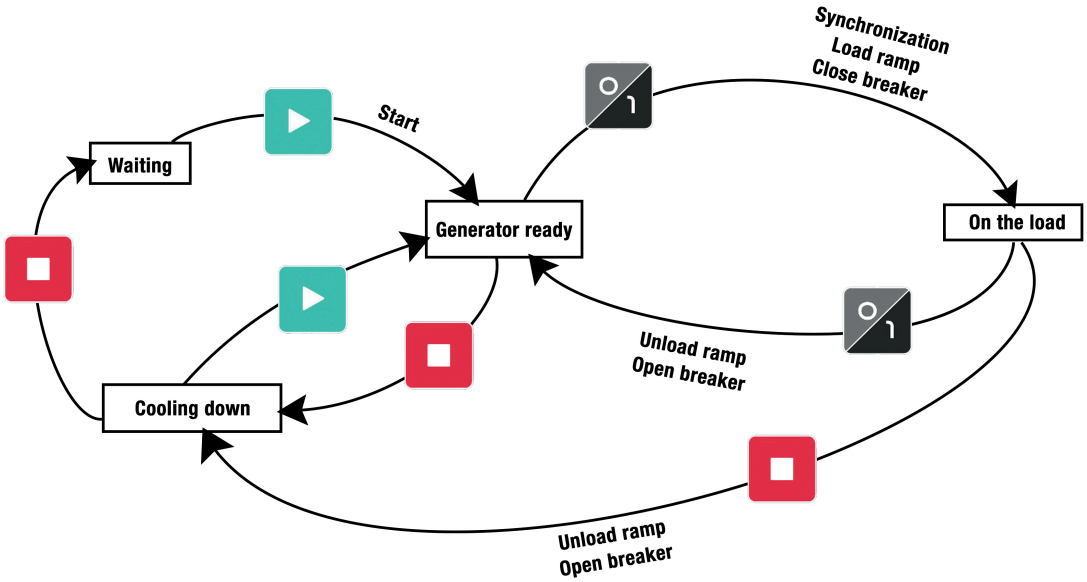
The module controls the load according to the configuration (isochronous load distribution, droop).

Stop the engine manually

1. Press  to remove the load from the generator, involving sometime an unload ramp (if at least one Generator supplies the load), and then opening the breaker without stopping the generator.
2. Press  :
   - Once: to cool the engine and stop it when the time delay has expired.
   - Twice: to stop the engine directly.

GENSYS COMPACT PRIME in manual mode

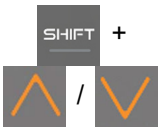
Figure 33. Status diagram of an application with a GENSYS COMPACT PRIME controller in manual mode



Pressing  , when the circuit breaker is closed, initiates an unload sequence, opens the circuit breaker and stops the engine after the cooling delay.

Note: The **MAN** mode does not allow manual control of speed and voltage to synchronize or load control. Synchronization and load control are automatic even in **MAN** mode.

In **MAN** mode, it is possible to start/stop the engine and control the speed/voltage:

Local button	Substitution function
	Manual start / manual stop
	Manual speed/voltage increase/decrease

Automatic

The **AUTO** mode requires the use of a digital input configured as **Remote start**. Until the digital input is activated and the delay has expired, the **AUTO** mode is not active. If the input is deactivated, the module is considered unavailable during the **Start/stop depending on load management**.

BASE LOAD

General information

Contrary to the load sharing mode where the generators automatically share the load according to their nominal, the base load mode allows you to manually define the active power setpoint of the generator.

There are many reasons to use the base load mode :

- The need for fixed active power on a generator
- Paralleling a generator equipped with a ***GENSYS COMPACT PRIME*** with other generator that are not controlled by compatible equipment (The use of droop mode can also be an alternative in this case)
- Paralleling a generator equipped with a ***GENSYS COMPACT PRIME*** with another source that is not regulated (A grid for example)

Settings

To configure a ***GENSYS COMPACT PRIME*** in Base Load mode, follow these steps:

- Go to the page ***Controller settings*** ⇒ ***Electrical*** ⇒ ***Generator*** ⇒ ***Control***
- Set the Parameter *Regulation type* [2013] to "Base load/Base PF"
- Set the Parameter *Base load Generator(s) kW setpoint* [2107] to the desired active power setpoint
- Set the Parameter *Power factor setpoint (inductive)* [2253] to the desired power factor setpoint

Note: When using the base load mode on an application with several ***GENSYS COMPACT PRIME***, the base load mode will only be active if there is at least one other ***GENSYS COMPACT PRIME*** on the busbar in normal mode (This is to avoid frequency deviations).

Note: When using the base load mode on an application with several ***GENSYS COMPACT PRIME***, the base load mode will only be active if the sum of the setpoints of the ***GENSYS COMPACT PRIME*** configured in base load and closed on the busbar is lower than the current load.

Note: In the case of an application with only one ***GENSYS COMPACT PRIME***, the product will always be in base load mode. In this case, it is the user's responsibility to ensure that there is always at least one other source to avoid frequency deviations.

ADVANCED FUNCTIONS

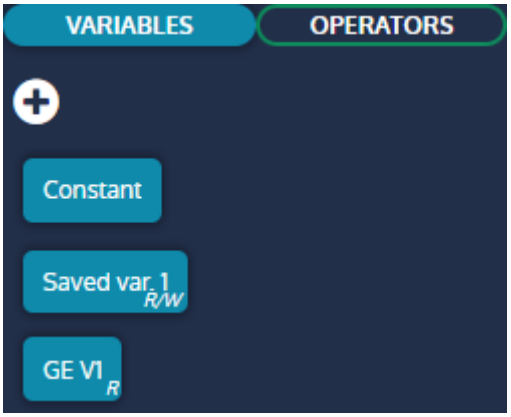
EASY FLEX®

Easy Flex® offers a simple and innovative programming mode, allowing you to adapt the controller to your needs. Its consists of several types of instructions that can be completed with variables and operators to add specific behaviours to the controller.

Variables

The **Easy Flex®** page has an area that contains the list of variables that can be used in the variable fields of the different instructions. Click on the **Variables** tab to display the list of variables.

Figure 34. Easy Flex® list of variables



Constant block

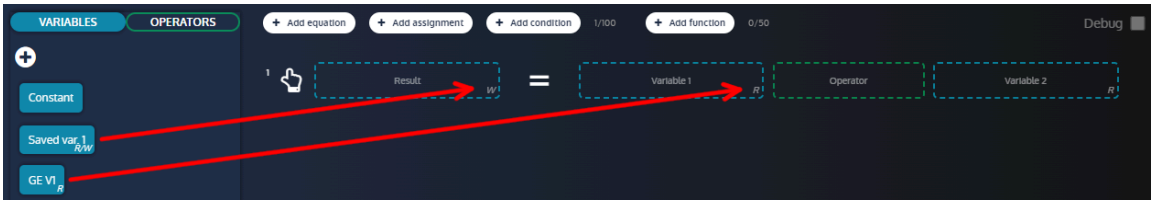
A Constant block is defined by default and must be used when a constant value is required in an instruction.

Variable block

The variables of the controller can be added to the area as variable blocks. This blocks can then be used in the different instructions. there are two types of variable:

- **Read/Write**: Can be used in the read only (R) or write (W) variable fields of an instruction
- **Read only**: Can only be used in the read only (R) variable fields of an instruction (marked with the R letter)

Figure 35. Using read only and read/write variables



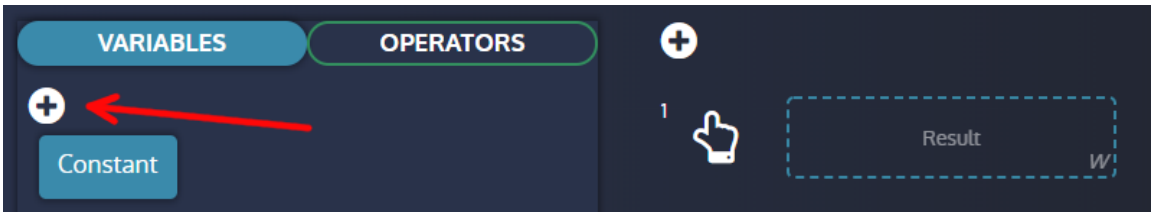
How to add a variable block

To add a variable block to the variables area:

1. Click on the plus button to open the variables search engine
2. Click on a variable with a plus icon
3. Close the search engine

The variable block should now be visible in the area.

Figure 36. Adding a variable block to the Easy Flex® variables area



How to use a variable block in an instruction

To use a variable block in an instruction:

1. Hold the click on the variable block to be used
2. Move the variable block to a variable field of an instruction
3. Release the click to drop the variable block in the field

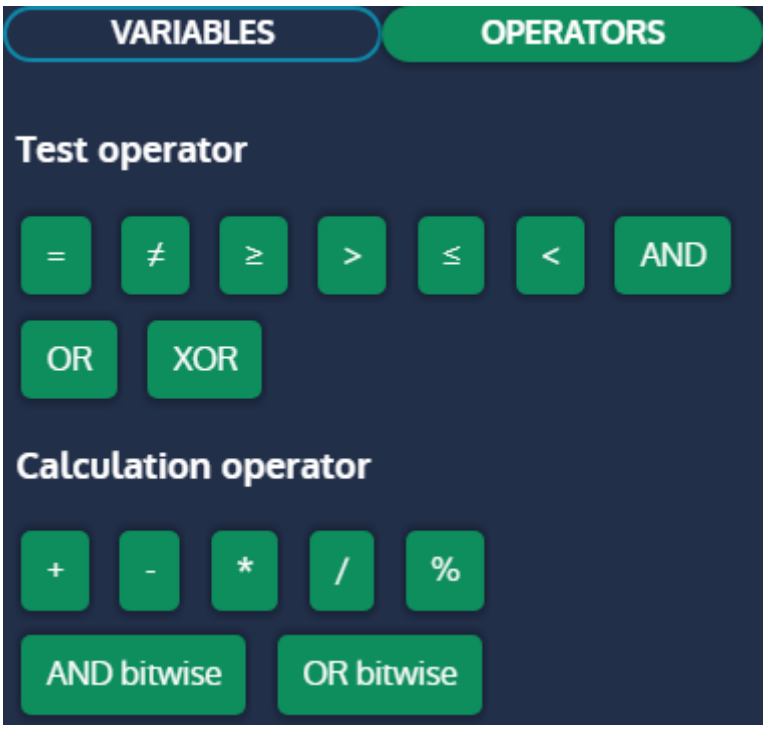
The variable now belong to the instruction and will be interpreted by it.

Figure 37. Drag and drop of a variable in an instruction

Operators

The **Easy Flex®** page has an area that contains the list of operators that can be used in the operator field of the different instructions. Click on the **Operators** tab to display the list of operators.

Figure 38. Easy Flex® list of operators



Test operator

A test operator return a **boolean** value in the result variable.

Calculation operator

A calculation operator return an **analog** value in the result variable.

How to use an operator block in an instruction

To use an operator block in an instruction:

1. Hold the click on the operator block to be used
2. Move the operator block to the operator field of an instruction
3. Release the click to drop the operator block in the field

The operator now belong to the instruction and will be interpreted by it.

Figure 39. Drag and drop of an operator in an instruction

Instructions

There are many types of instructions available in **Easy Flex®**.

Equations

The **equation** instruction is an operation between two variables whose result is stored in a result variable.

Click on the **Add equation** button to add a new equation. A counter is displayed beside the button to indicate the number of equations defined and the maximum number of equations allowed.

Note: The counter is common to the equations, assignments and conditions.

Figure 40. Example of equation

NOT

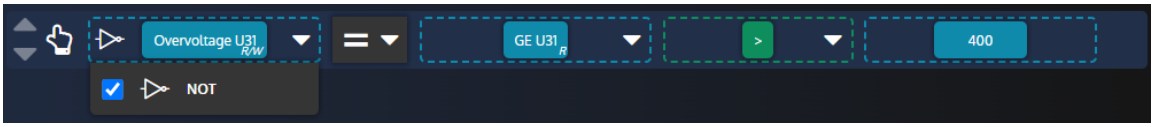
When a variable field of an equation is filled with a variable block and the operator field is filled with a test operator, it is possible to add a NOT function to the variable to revert its boolean value.

How to set a NOT

To set a NOT function:

1. Click on the arrow beside the variable block
2. Click on the NOT checkbox to enable/disable the function

Figure 41. Setting the NOT function of a variable block



Timer ON/Timer OFF

When the operator field of an equation is filled with a test operator, it is possible to add a Timer ON function to delay the update of the result when the test operation is true. Following the same principle, it is also possible to add a Timer OFF to delay the update of the result when the test operation is false.

How to set a Timer ON/Timer OFF

To set a Timer ON/Timer OFF function:

1. Click on the arrow beside the operator block
2. Set the Timer ON value in the input (in seconds) and toggle the checkbox to enable/disable the function
3. Set the Timer OFF value in the input (in seconds) and toggle the checkbox to enable/disable the function

Figure 42. Setting the Timer ON/Timer OFF function of a variable block

Type of assignment

When the operator field of an equation is filled with a test operator, it is possible to change the type of assignment:

- **Equal**: The result of the test operation is stored in the result variable
- **Set**: The result variable is set only when the test operation becomes true
- **Reset**: The result variable is reset only when the test operation becomes true

How to set the type of assignment

To set the type of assignment:

1. Click on the type of assignment list to display the list items
2. Click on the type of assignment you want

Figure 43. Setting the assignment type of an instruction

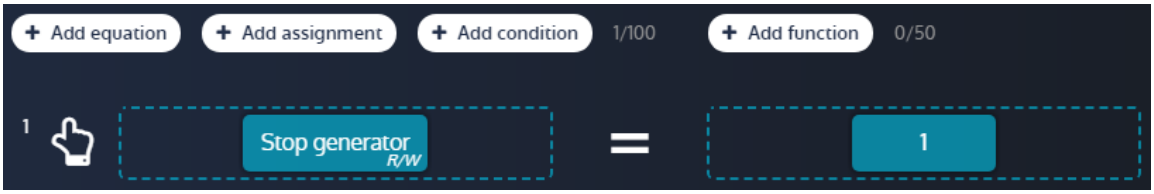
Assignments

The **assignment** instruction assigns the value of a variable to a result variable.

Click on the **Add assignment** button to add a new assignment. A counter is displayed beside the button to indicate the number of assignments defined and the maximum number of assignments allowed.

Note: The counter is common to the equations, assignments and conditions.

Figure 44. Example of assignment



Conditions

The **condition** instruction executes a group of instructions according to a test condition. As for equations, the NOT, Timer ON and Timer OFF functions can be used in the condition instruction.

Click on the **Add condition** button to add a new condition. A counter is displayed beside the button to indicate the number of conditions defined and the maximum number of conditions allowed.

Note: The counter is common to the equations, assignments and conditions. The maximum number of instructions per condition is 10.

How to add/remove instructions to a condition

- Drag and drop instructions into the condition to add them to the condition
- Drag and drop an instruction out of the condition to remove it from the condition

Figure 45. Adding an instruction to a condition

Functions

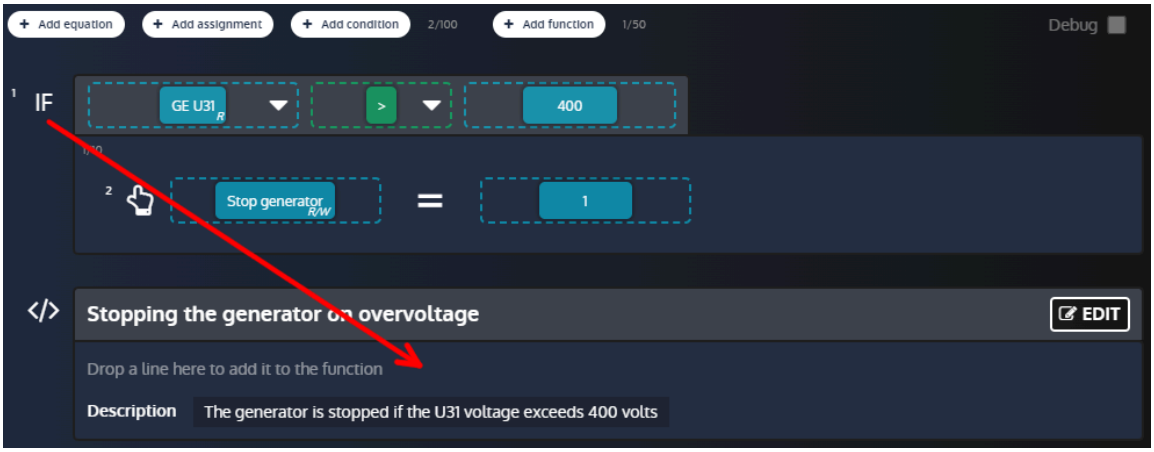
The **function** instruction allows you to group instructions together and to assign a title and a description to this group.

Click on the **Add function** button to add a new function. A counter is displayed beside the button to indicate the number of functions defined and the maximum number of functions allowed.

Add existing instructions to a function

Drag and drop an existing instruction into the function to add it in.

Figure 46. Adding an instruction to a function



Edit a function

Click on the Edit button of a function to open the editing window:

1. Type in the title field to edit the title of the function (up to 100 characters per title for each function).
2. Type in the description field to edit the description of the function (up to 12500 characters shared across all functions).
3. Use the **Add** buttons to add new instructions to the function.
4. Drag and drop an instruction into the dotted area to move it out of the function.
5. Click on the **Save/Back** button to save the parameters of the function and to close the editing window.

Figure 47. Editing a function

Moving a bloc or an instruction

The declared blocks and instructions can be moved using drag and drop:

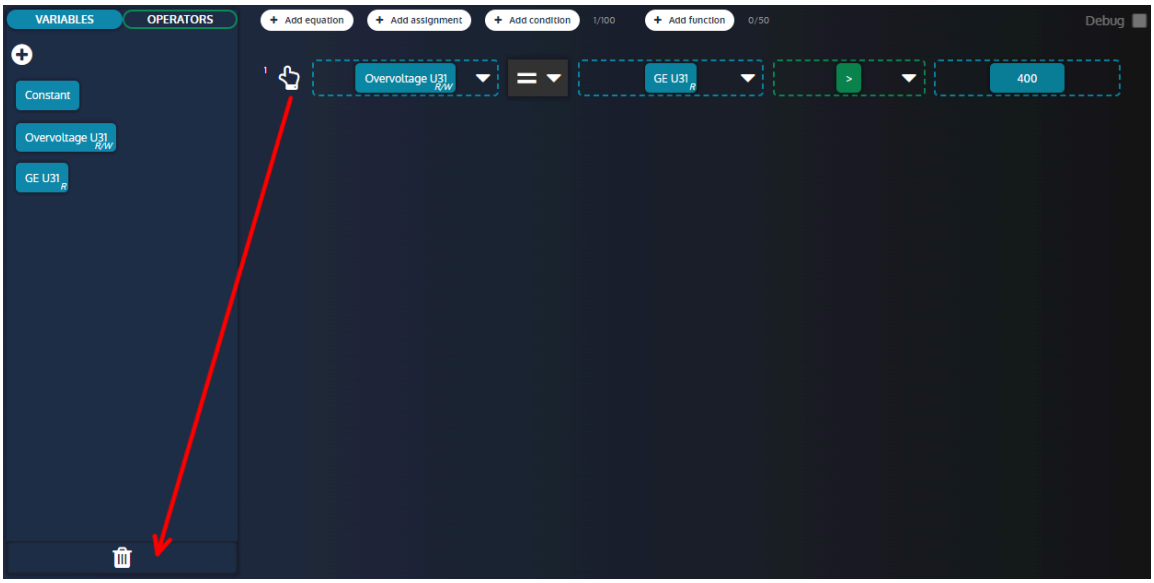
- Operators and variables blocks can be move from a line to another
- Any instruction can be moved above or below other instructions to change the execution order

Deleting a bloc or an instruction

Blocks and instructions can be deleted in different way. To delete a block or instruction:

- Drag and drop the element to delete into the **Trash** area
- Click on the element to delete and click on the **Trash** area
- Click on the element to delete and press the **Delete** key of the keyboard

Figure 48. Deleting an instruction through drag and drop



Confirm/Cancel your changes

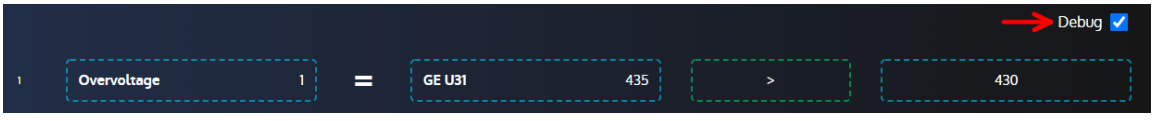
Once you are done setting the various instructions, you can confirm or cancel your changes.

- To confirm your changes, click on the confirm button 
- To cancel your changes, click on the cancel button 

Debug mode

It is possible to activate a debug mode to watch in real time the values of the variables used in the **Easy Flex®** lines. Toggle the check box to enable/disable the debug mode. The debug mode can't be activated while modifications are in progress. Modifications can't be done while debug mode is activated.

Figure 49. Easy Flex® debug mode



Warnings with Easy Flex®

Variable [4214] *Easyflex error code* provides more information in case of an **Easy Flex®** warning alarm. Its value is calculated with the following formula:

[4214] = (100 * line concerned) + type of error

List of different types of errors:

Error 1

Operand 1 or 2 is invalid.

Error 2

Unknown operator.

Error 3

The result variable is empty.

Error 4

The result variable is read-only.

Error 5

The result is outside the range of the target variable.

Error 6

Overflow on at least one equation.

Error 7

Division by 0.

USER VARIABLES

A range of user variables is available to be used in equations.

Starting from the firmware version 2.22, this range has been split into two sub-ranges:

- Saved user variables [8000] to [8049]
- Unsaved user variables [8050] to [8099]

Unsaved user variables values are lost when the module's power supply is switched off while Saved user variables values are saved in a non volatile memory so their values are kept even in case of power loss.

Prefer using Unsaved user variables for better performance if you don't need to save the value of a data in case of power cycling. Otherwise, Saved user variables and Unsaved user variables share the same behaviour as is described below.

User variables properties

Each property of a user variable can be set.

- Label
- Unit
- Accuracy
- Variable type. It defines the way you want to use the user variable:
  - For equations
  - To trigger alarms or faults (depending on the variable type value)

Note: Label, unit and accuracy will change the display of the user variable in the information page.

User variable used for equations

The variable can be used:

- To store the result of an equation line (to be used in another equation line, to be displayed in the information page, to be read by modbus...).
- As an operand in an equation line.

User variable used to trigger alarms and faults

In that case, the value of the user variable is used to trigger an alarm or a fault according to the user variable value:

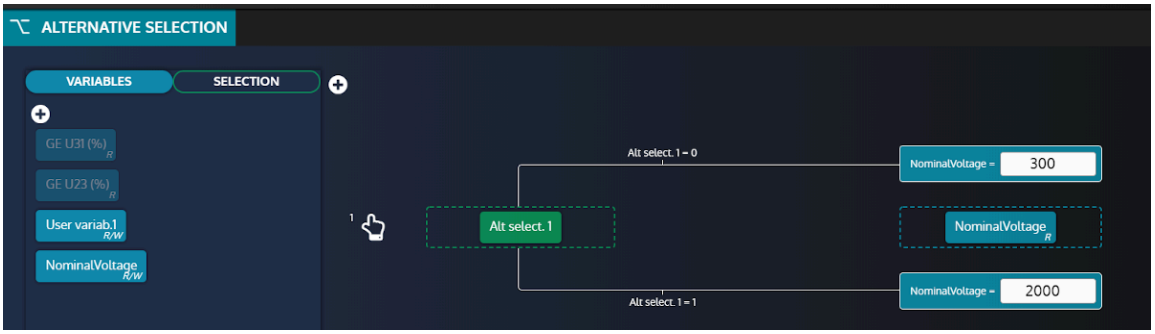
- If the user variable = 0, the alarm/fault is not active.
- If the user variable > 0, the alarm/fault is active and is displayed in the alarms/faults log (with the label set before).

ALTERNATIVE SELECTION

The **Alternative selection** page offers a supplement to **Easy Flex®** programming.

This function is presented as 16 selections between two values:

Figure 50. Page of the function Alternative selection



Adding variables

To add new variables from the list of variables, click on the "+" button in the "Variables" tab(see below) :

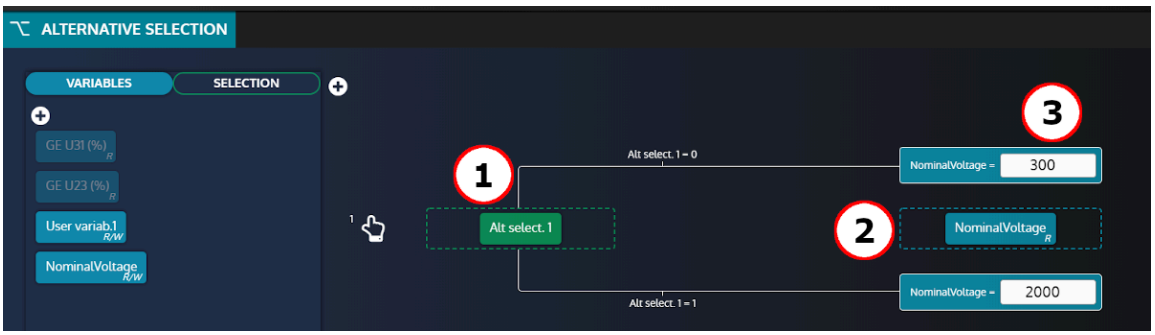
Figure 51. Adding variables button

Use the **search engine** to find and select the variables you want to use.

Adding selections

Selection variables are **booleans** (0 or 1) used to assign different values to the associated parameter (see below):

Figure 52. Equation block definition



1. Selection variable (one among the 16 proposed in the SELECTION section).
2. Associated parameter.
3. Value to assign to the associated parameter depending on the value of the selection variable

Using the example above, **NominalVoltage** parameter will take 2 different values depending on **Alt select 1** :

- When **Alt select 1 = 0** then **NominalVoltage** will be set to **300**.
- When **Alt select 1 = 1** then **NominalVoltage** will be set to **2000**.

Note: If a variable is set in the "Alternative selection" mode, modifying its value from the front face, via Modbus or any other source will always result of the overwrite of the value by the "Alternative selection" mode.

SCHEDULER

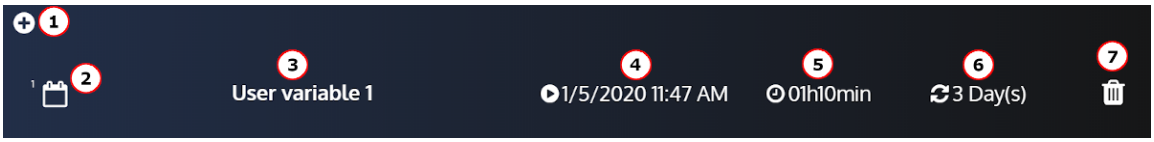
The scheduler can activate any function that can be controlled by a digital input. These functions can be activated one or many times.

Scheduled items are presented as a list. Each line (item) in this list corresponds to a scheduled event.

Scheduler list

In the ***Controller settings*** ⇒ ***Programming*** ⇒ ***Scheduler (i4Gen)*** page, you will have access to all events that you created.

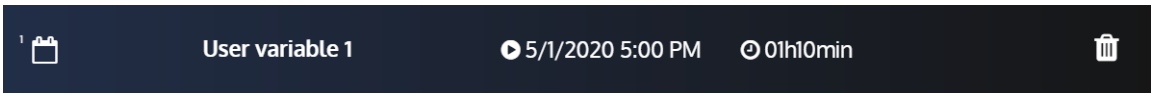
Figure 53. Scheduler icons definition



1. Add an event.
2. Number of the event.
3. Active function during the event.
4. First time the event will take effect.
5. Duration of the event.
6. Frequency.
7. Delete the event.

It is also possible to have an event without periodicity. The event will occur only once:

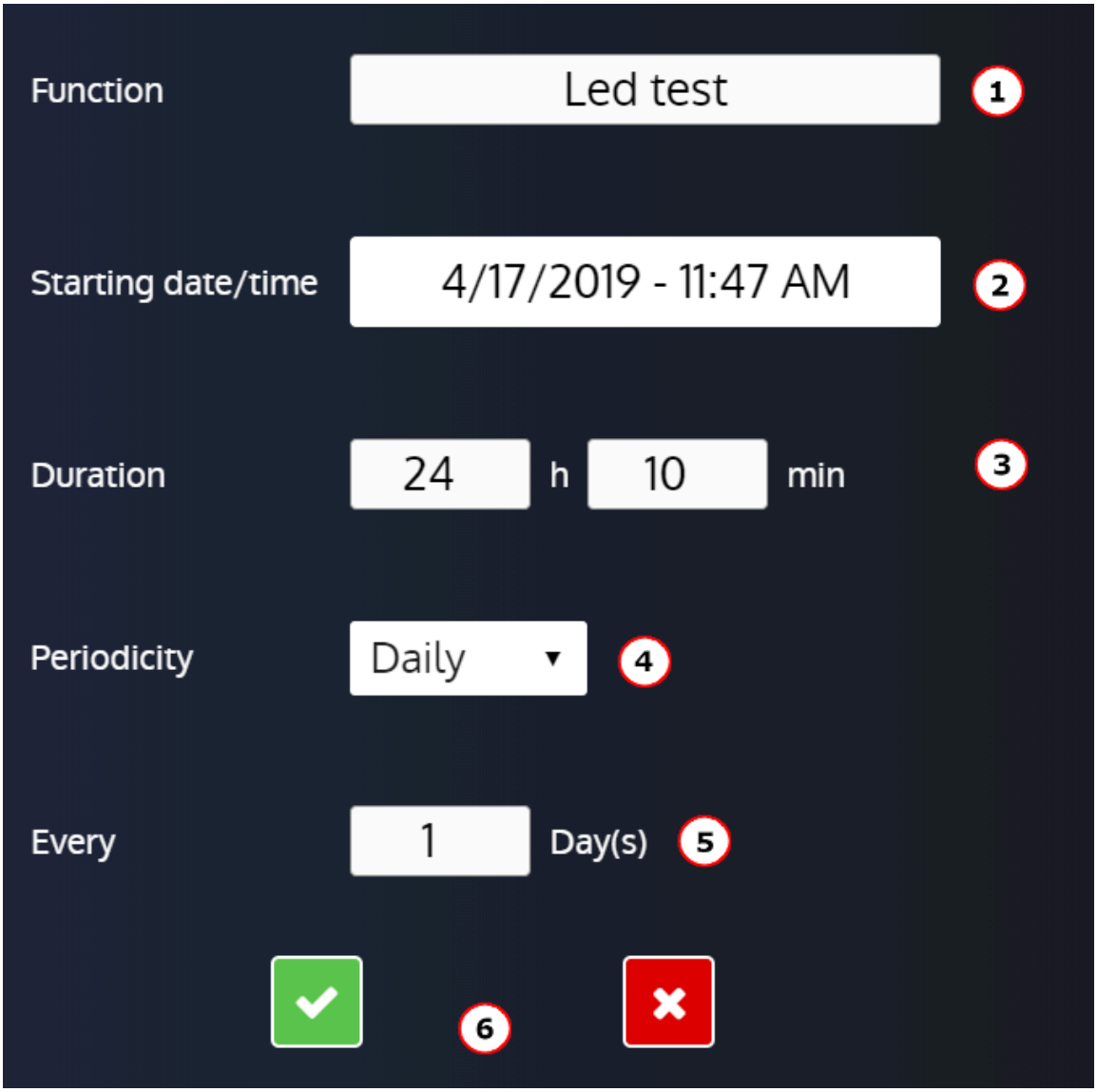
Figure 54. Scheduler with an event without periodicity



Scheduler settings

By clicking on the event you want to modify, you will have access to these parameters which will allow you to configure the event:

Figure 55. Form of the scheduler

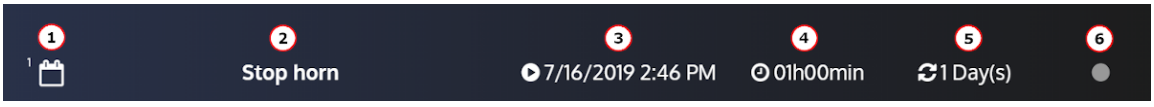


1. Function active during the event.
2. First date and time the event will take effect.
3. Duration of the event.
4. Expected periodicity (Only once or period on a daily, weekly, monthly basis).
5. Setting the repetition of the periodicity (X period (s)).
6. Confirm or cancel the event settings.

Scheduler supervision

Available in the ***Controller supervision*** ⇒ ***Scheduler (i4Gen)*** page.

Figure 56. Scheduler supervision



1. Number of the event.
2. Function active during the event.

3. The next time the event will take effect (the value can be different from the configuration because this one is actualised).
4. Duration of the event.
5. Periodicity.
6. Indicator On / Off.

MODBUS TCP MAPPING

Configurable block

To create your own Modbus blocks, use variables [10000]…[10299] in the ***Controller settings*** ⇒ ***Programming*** ⇒ ***Modbus*** ⇒ ***Modbus redirection (i4Gen)*** page.

There are two ways to configure these blocks:

1. Configuration in the ***Controller settings*** ⇒ ***Programming*** ⇒ ***Modbus*** ⇒ ***Modbus redirection (i4Gen)*** page: enter the codes of the variables to read; Modbus readings on registers [10000]…[10299] will be the values of the pointed variables.
2. Configuration by an external device; this device must follow the following steps:
    - Write 1 in the variable [3016] to enter the modbus redirection configuration mode.
    - Write the codes of the variables to be read to the desired registers ([10000]…[10299]).
    - Write 0 in the variable [3016] to switch back to the modbus redirection display mode.

You can then read your own block, by reading the registers [10000]...[10299] through Modbus TCP.

Example:
If the configuration is as follows [10000] = 14; [10001]=15; [10002]=16, reading these 3 registers through Modbus TCP will give you the hours/minutes/seconds of the module (respectively the values of variables [14], [15] and [16]).

LOGGER

The **Logger** tool is used to track value or status changes up to 10 variables at the user's choice.

The variables *Generator state* and *Engine state* are always recorded as long as the Logger is not set to Off.

This function is available in the ***Controller settings*** ⇒ ***Programming*** ⇒ ***Logger*** ⇒ ***Activation (i4Gen)*** page.

Logger recording modes

Several modes are available to capture events depending on the Generator status:

Off

No recording of selected variables

Always ON

FIFO recording of selected variables until the Logger is Off.

Post starting

FIFO recording of selected variables when the Generator is running.

Stabilized

FIFO recording of selected variables as long as the Generator is in a stabilized state.

Additional Functions

For each variable you can set a log period down to the second (example: 1s).
To use this function, select **Interval** in the ***Log variable 1 on*** field.

The **Erase Logger** button will delete all recorded variables from the module.

A lot of variables can be recorded. The list of the available variables can be found in the Software variables *(on page 149)* appendix.

COMMUNICATIONS

NETWORK

Setting up 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.
- A CAT 5 straight Ethernet cable (marked PATCH CABLE or STRAIGHT-THROUGH CABLE along its sheath) can only be used with an Ethernet switch.

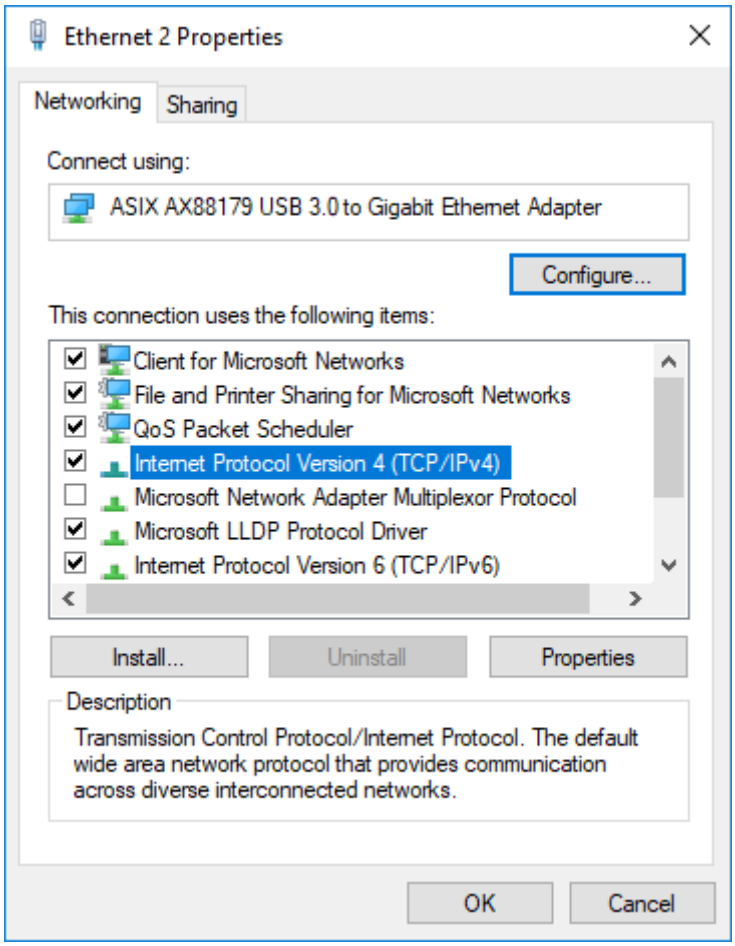
Configuring the computer IP address

1. 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.
2. Power up the module using a stabilized power supply.
3. Open Windows control panel
4. Open the network interface properties window. For this do the following steps:

   a. Open the page **Network and Sharing Center**

   b. Click on **Change adapter settings**

   c. Right click on your network interface and select **Properties** (Windows 7 and above)



Change the IP address of the module

IP settings of the module can be modified in ***Controller settings*** ⇒ ***System*** ⇒ ***Network***.

There are two different types of configuration:

- **DHCP (automatic)**: The module supports DHCP. If DHCP is enabled, the module must be connected to a network equipped with a DHCP server to obtain an IP address.
  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).
- **Manual setup**: To manually configure the device network settings, disable the **DHCP** setting, then fill in the **IP address** and **Subnet Mask** fields.

Modbus/TCP port and HTTP port numbers can be set in both configurations.

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

Note: For most networks, it is not necessary to set the gateway or to change port numbers. For complex networks, please contact your network administrator to configure your router and/or the units according to your needs.

MODBUS TCP/IP

Abilities

An Ethernet communication can be established between a Modbus master device and the controller which acts as a Modbus slave.

The complete list of variables accessed through ***i4Gen*** is described in the chapter Software variables *(on page 149)*.

The complete list of every variable is described in the documentation **Modbus table** available in our website.

The Modbus master device can read/write many internal variables of the controller according to their access rights described below.

Type	Range	Default access right
Readings (measurements, states,..).	[0000] … [1999]	Read only.
Parameters.	[2000] … [3999]	Read/Write.
Modes, statuses, settings,... Readings associated with digital inputs.	[4000] … [9999] [4500] … [4649], [4950]...[4999]	Read. Write (subject to activation).

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 the **Modbus table** documentation.
- 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:

- The module IP address set in the ***Controller settings*** ⇒ ***System*** ⇒ ***Network*** page.
- The *Modbus TCP port* [3014], generally 502, set in the ***Controller settings*** ⇒ ***System*** ⇒ ***Network*** page.
- The Modbus/TCP rights: see further.

The module handles up to 6 simultaneous connections. This can be used for multiple HMIs for example. For more details on the Ethernet configuration, see the chapter Network *(on page 97)*.

Warning:
Connecting the controller to an ***i4Gen*** device or the ***i4Gen Suite*** software will utilize one Modbus connection.

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 the Modbus/TCP protocol 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 via 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 register [3015]:

Description	Bit #	Default value
Writing date/ time	0	0
Writing engine counters	1	0
Not used	2	0
Writing 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 the ***Controller settings*** ⇒ ***Programming*** ⇒ ***Modbus*** ⇒ ***Modbus rights (i4Gen)*** page, you can tick check-boxes to set those:

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

The counters, encoded on 32 bits, include:

Meters (MSB|LSB)	Label
[80] | [79]	*Generator KWh*
[82] | [81]	*Generator KVARh*
[84] | [83]	*Number of hours generator running*

Bit fields

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 group of information. Each variable contains the current value of 16 logic variables such as breaker positions, faults, alarms…

They are listed out in the chapter Software variables *(on page 149)*.
The bit fields [956]…[969] 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.

Example:

The table below shows a Modbus/TCP client sending a reading request (function 04) of 6 registers starting from variable [79].

Client request		Module server response	
Field	**Value**	**Field**	**Value**
Function code	04	Required function.	04
Starting Register (MSB)	00	Data bytes (= 2 * Number of requested registers).	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 to provide the following features:

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

Standard CAN bus rules apply here. Refer to CAN bus good practices *(on page 125)* to connect units properly on CAN bus.

Alarms/faults of the CAN bus

The CAN communication between all **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 in each unit. In case of a problem on the bus, alarms or faults can occur:

Missing GENSYS COMPACT PRIME

The **CRE-Link®** protocol cannot see one or several ***GENSYS COMPACT PRIME***. The controllers might not be correctly wired on the bus CAN1 or misconfigured.

Missing MASTER COMPACT or BTB COMPACT

The **CRE-Link®** protocol cannot see one or several ***MASTER COMPACT/BTB COMPACT/MASTER COMPACT 1B***. The controllers might not be correctly wired on the bus CAN1 or misconfigured.

Missing HYBRID COMPACT

The **CRE-Link®** protocol cannot see one or several ***HYBRID COMPACT***. The controllers might not be correctly wired on the bus CAN1 or misconfigured.

Missing BAT COMPACT

The **CRE-Link®** protocol cannot see one or several ***BAT COMPACT***. The controllers might not be correctly wired on the bus CAN1 or misconfigured.

Controller communication fault

The communication with the other products is lost. Check that the 120Ω termination resistors are used correctly (see CAN bus good practices *(on page 125)*). Check that CAN bus cable is properly connected.

CAN1 unknown

An incompatible product is connected on the CAN bus. The module will not start the Generator.

Mismatch vers.

A module with an incompatible version is connected on the CAN bus. The module will share the load using droop control.

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

For *Missing GENSYS COMPACT PRIME*, *Missing MASTER COMPACT or BTB COMPACT*, *Missing BAT COMPACT*, *Missing HYBRID COMPACT* and *Controller communication fault*, you can configure the behavior to be adopted in case of a CAN fault.

If a remote start occurs on a module working in **AUTO** mode and set up to manage dead bus and the *Controller communication fault* alarm has already been triggered, the module starts its engine and closes its breaker (if there is no voltage on the busbar) after a delay that depends on the Generator number. If there is voltage on the busbar, the module synchronizes the Generator before connecting to the busbar. See Control on dead bus management *(on page 48)*.

CANOPEN

CANopen extension modules (i.e. CANopen couplers) can be used to increase the number of digital inputs/outputs and analog inputs of the module. Overall max. count of added inputs/outputs: 64 digital inputs, 64 digital outputs and 16 analog inputs. The CANopen protocol inputs/outputs are read/written every 100ms.

Configuration

Setting	Label	Value	Description
[3153]	*Coupler ID #1*	0 … 255	Identifier of the first coupler.
[3154]	*Number of digital inputs #1*	0 … 64	Number of digital inputs on the first coupler.
[3155]	*Number of digital outputs #1*	0 … 64	Number of digital outputs on the first coupler.
[3165]	*Number of analog inputs #1*	0 … 16	Number of analog inputs on the first coupler.
[3156]	*Coupler ID #2*	0 … 255	Identifier of the second coupler.
[3157]	*Number of digital inputs #2*	0 … 64	Number of digital inputs on second coupler.
[3158]	*Number of digital outputs #2*	0 … 64	Number of digital outputs on the second coupler.
[3166]	*Number of analog inputs #2*	0 … 16	Number of analog inputs on the second coupler.
[3159]	*Coupler ID #3*	0 … 255	Identifier of the third coupler.
[3160]	*Number of digital inputs #3*	0 … 64	Number of digital inputs on the third coupler.
[3161]	*Number of digital outputs #3*	0 … 64	Number of digital outputs on the third coupler.
[3167]	*Number of analog inputs #3*	0 … 16	Number of analog inputs on the third coupler.
[3162]	*Coupler ID #4*	0 … 255	Identifier of the fourth coupler.
[3163]	*Number of digital inputs #4*	0 … 64	Number of digital inputs on the fourth coupler.
[3164]	*Number of digital outputs #4*	0 … 64	Number of digital outputs on the fourth coupler.
[3168]	*Number of analog inputs #4*	0 … 16	Number of analog inputs on the fourth coupler.

Note: The CANopen couplers ID max range changes according to the number of configured inputs/outputs (for more details, refer to ***CiA 301*** standard).

Important: When the engine MTU MDEC protocol is selected on port CAN 2 of the controller, CANopen protocol is automatically switched to port CAN 1 which is also used as inter-controller protocol **CRE-Link®** so all CANopen couplers are connected with all **COMPACT** controllers through a single CAN bus. This means that each CANopen coupler on the CAN bus must be assigned to a unique coupler ID.

The assignment of I/Os is done by order of the couplers declared in the settings (not by id). The lowest variable number is associated to the lowest message number configured.

The digital inputs/outputs of the CANopen protocol have the same attributes as regular inputs/outputs except for the delay at the drop of inputs.

Each CANopen analog input value can be adjusted using a gain and an offset.

Setting	Attribute
Digital inputs 1 … 64	
[3200] … [3231], [8550] … [8581]	Function
[3232] … [3263], [8582] … [8613]	Delay
[3264] … [3295], [8614] … [8645]	Validity
[3296] … [3327], [8646] … [8677]	Polarity
Digital outputs 1 … 64	
[3350] … [3381], [8700] … [8731]	Function
[3382] … [3413], [8732] … [8763]	Polarity: • 0: Normally de-energized • 1: Normally energized
Analog inputs 1 … 16	
[8351], [8353], [8355] … [8381]	Gain
[8350], [8352], [8354] … [8380]	Offset

An overflow alarm (variable [609]) is available for analog inputs. When it is active, you can look at the variable [610] to know which analog inputs triggered the alarms. If you have several analog inputs causing a problem, you'll have to solve each problem one by one.

On power-up, the configuration of the CANopen extension modules is automatically initialized. The status (variable [3150]) turns to 1.
The CANopen protocol error time-out (variable [3152]) is 10.0s by default.

Variable mapping and inputs/outputs

The CANopen protocol inputs and outputs are accessed by their code:

- Digital inputs: [800]...[831], [1250]...[1281]
- Digital outputs: [4751]...[4782], [5100]...[5131]
- Analog inputs: [1050]...[1065]

SAE J1939

Presentation

J1939 is a CAN protocol used by “electronic” motors which include an Engine Control Unit (ECU), also called Engine Control Module (ECM) or Engine Management System (EMS). This protocol allows to read engine data (measurements, positions, binary values) and send commands (start, stop, speed control…).

The ECU can detect faults and send them to the module: protections can be assigned to these faults (see further).

Note: When the J1939 protocol is in use, the associated CAN bus bit rate is automatically fixed at 250 kbit/s as defined by the J1939-11 standard. This bit rate applies to any other protocol used by the controller on the same CAN bus.

J1939 configuration

J1939 communication

To use J1939 communication:

1. Enter the ***Controller settings*** ⇒ ***Engine/ECU/ECM*** ⇒ ***ECU/ECM*** ⇒ ***ECU/ECM*** page
2. Enable J1939 protocol with parameter [3118]
3. Select your ECU manufacturer listed in parameter [3100]
4. Select ECU type using parameter [3101]
5. Assign the alarms/faults to a protection (see below)
6. Connect the CAN bus of the ECU to the J1939 terminal block (CAN 2) of the module

Automatic address configuration

Changing the *ECU Manufacturer* [3100] and/or the *ECU type* [3101] will automatically set the *ECU ID* [3102] and *COMPACT ID* [3103] variables to the default values for this particular ECU configuration. However you can still manually change these two identifiers afterwards if necessary.

ECU ID auto-detection functionality

This function automatically detects the address of the ECU connected to the J1939 terminal block (CAN 2) of the module. To use this function:

1. Make sure that only one engine ECU and no other J1939 equipment is connected to the **COMPACT** unit
2. Using the front panel of the product or by connecting to the controller from ***i4Gen Suite*** software, access the ***Controller settings*** ⇒ ***Engine/ECU/ECM*** ⇒ ***ECU/ECM*** ⇒ ***ECU/ECM*** page.
3. Press the AUTO DETECT button and wait a few seconds to get the detection results

Speed control frame configuration

Speed frame TSC1 can contain two security mechanisms so the ECU can verify its validity and accept or reject the received speed control frame. According to standard SAE J1939-71, TSC1 frames that do not include these mechanisms should none the less be accepted by the ECU.

- A counter can be included using parameter *TSC1 Message counter* [3123] to make sure the controller constantly updates the frame content.
- A checksum can be included using parameter *TSC1 Message checksum* [3124] so the ECU can check the integrity of the frame content.

ECU manufacturer and type settings

The ECU manufacturer and type determine the following settings:

- Module address on J1939 CAN bus.
- ECU address on J1939 CAN bus.
- Speed control: through J1939 or using analog output or pulses.
- Start/Stop control: through J1939 or using the "crank" and "fuel" digital outputs.
- Oil pressure and coolant temperature are automatically measured through J1939, except if you specify a dedicated sensor in the ***Controller settings*** ⇒ ***Inputs/Outputs*** ⇒ ***Analog inputs*** page.
- J1939 commands from the controller to the ECU can be inhibited by selecting the "Generic" option for the parameter [3100] and the "Without commands" option for the parameter [3101] in the ***Controller settings*** ⇒ ***Engine/ECU/ECM*** ⇒ ***ECU/ECM*** ⇒ ***ECU/ECM*** page.

Note: Note that engine speed measurement method must be selected manually using parameter [2200] in ***Controller settings*** ⇒ ***Engine/ECU/ECM*** ⇒ ***Engine*** ⇒ ***General***. The measurement source can be the magnetic pickup, the alternator or J1939.

Faults

The module can monitor diagnostic messages (DM1) from the ECU. Only relevant diagnostic messages are taken into account and used in the module fault/alarm system. The module interprets the messages for display and protections.

When an alarms/faults reset is performed on the controller ([SHIFT+INFO] button or remote reset), the module sends a reset message (DM3) to the ECU. If the diagnostic message is not sent by the ECU for more than 3s, the corresponding fault/alarm is automatically reset to Off.

The following J1939 "lamp" indicators can be configured to trigger one of the module protections:

J1939 message	Control in *i4Gen Suite* software		Message description (ECU internal threshold)
Malfunction "lamp"	[3110]	*Control on Malfunction Indicator Lamp*	Message in presence of an emission-related trouble
Protection "lamp"	[3111]	*Control on Protection Lamp*	Trouble is most probably not electronic subsystem related. E.g. coolant temperature may exceed acceptable range.
Amber "lamp"	[3112]	*Control on Amber Warning Lamp*	Trouble where the engine need not immediate stop.
Red "lamp"	[3113]	*Control on Red Stop Lamp*	Severe enough trouble for the engine to stop.

The module also displays the last five unmanaged SPN (Suspect Parameter Numbers, i.e. the source of the problem)/FMI (Failure Mode Identifier, i.e. the type of error) combinations that it has received via the diagnostic message (DM1). These SPN/FMIs are backed up in the following registers:

Registers		Description
[664] [665] [666]	*SPN n°1* *J1939 SPN HI 1* *FMI n°1*	Latest SPN/FMI received by the module.
[667] [668] [669]	*SPN n°2* *J1939 SPN HI 2* *FMI n°2*	Second latest SPN/FMI received by the module.
[670] [671] [672]	*SPN n°3* *J1939 SPN HI 3* *FMI n°3*	Third latest SPN/FMI received by the module.
[673] [674] [675]	*SPN n°4* *J1939 SPN HI 4* *FMI n°4*	Fourth latest SPN/FMI received by the module.
[676] [677] [678]	*SPN n°5* *J1939 SPN HI 5* *FMI n°5*	Fifth latest SPN/FMI received by the module.

SPN LO corresponds to LSB (Least significant byte), SPN HI to MSB (Most significant byte)

Note: In any case, a fault/alarm is activated on reception of an unknown SPN/FMI if the parameters *Control on Red Stop Lamp* [3113]/*Control on Red Stop Lamp* [3112] has been set. It is deactivated by Reset.

J1939 Measurements

Next table lists the measuring points whose values are conveyed over J1939 and taken into account by the module. The J1939 standard assigns each of them an SPN (Suspect Parameter Number) and they are grouped in J1939 CAN frames; each frame is identified by a PGN (Parameter Group Number).

Note: For more information on the J1939 protocol and the exact definition of each SPN and PGN, refer to the SAE J1939 standards.

SPN	PGN	Description	Variable
22	FEEF	*Engine Extended Crankcase Blow-by Pressure*	[720]
29	F003	*Accelerator Pedal 2 Position*	[756]
51	FEF2	*Engine Throttle Valve 1 Position 1*	[1178]
52	FEEE	*Engine Intercooler Temperature*	[718]
81	FEF6	*Aftertreatment 1 Diesel Particulate Filter Intake Pressure (use SPN 3609)*	[730]
91	F003	*Accelerator Pedal Position 1*	[682]
92	F003	*Engine Percent Load At Current Speed*	[683]
94	FEEF	*Engine Fuel Delivery Pressure*	[719]
95	FEFC	*Engine Fuel Filter Differential Pressure*	[1181]
97	FEFF	*Water In Fuel Indicator 1*	[740]
98	FEEF	*Engine Oil Level*	[721]
99	FEFC	*Engine Oil Filter Differential Pressure*	[739]
100	FEEF	*Oil pressure*	[680]

SPN	PGN	Description	Variable
101	FEEF	*Engine Crankcase Pressure 1*	[722]
102	FEF6	*Engine Intake Manifold #1 Pressure*	[731]
105	FEF6	*Engine Intake Manifold 1 Temperature*	[732]
106	FEF6	*Engine Intake Air Pressure*	[733]
107	FEF6	*Engine Air Filter 1 Differential Pressure*	[734]
108	FEF5	*Barometric Pressure*	[727]
109	FEEF	*Engine Coolant Pressure 1*	[723]
110	FEEE	*Coolant temperature*	[681]
111	FEEF	*Engine Coolant Level 1*	[724]
112	FEF6	*Engine Coolant Filter Differential Pressure*	[736]
127	FEF8	*Transmission 1 Oil Pressure*	[1180]
156	FEDB	*Engine Fuel 1 Injector Timing Rail 1 Pressure*	[1173]
157	FEDB	*Engine Fuel 1 Injector Metering Rail 1 Pressure*	[706]
158	FEF7	*Key Switch Battery Potential*	[738]
166	FEBE	*Engine Rated Power*	[703]
167	FEF7	*Charging System Potential (Voltage)*	[1179]
168	FEF7	*Battery Potential / Power Input 1*	[737]
171	FEF5	*Ambient Air Temperature*	[728]
172	FEF5	*Engine Intake 1 Air Temperature*	[729]
173	FEF6	*Engine Exhaust Temperature*	[735]
174	FEEE	*Engine Fuel 1 Temperature 1*	[715]
175	FEEE	*Engine Oil Temperature 1*	[716]
176	FEEE	*Engine Turbocharger 1 Oil Temperature*	[717]
182	FEE9	*Engine Trip Fuel*	[711]
183	FEF2	*Engine Fuel Rate*	[725]
184	FEF2	*Engine Instantaneous Fuel Economy*	[726]
188	FEE3	*Engine Speed At Idle, Point 1*	[741]
189	FEBE	*Engine Rated Speed*	[704]
190	F004	*Engine speed*	[679]
247	FEE5	*Engine Total Hours of Operation*	[709]
250	FEE9	*Engine Total Fuel Used*	[713]
441	FE8C	*Auxiliary Temperature 1*	[791]
512	F004	*Driver's Demand Engine - Percent Torque*	[684]
513	F004	*Actual Engine - Percent Torque*	[685]
514	FEDF	*Nominal Friction - Percent Torque*	[707]
515	FEDF	*Engine's Desired Operating Speed*	[708]
899	F004	*Engine Torque Mode*	[757]
970	F001	*Engine Auxiliary Shutdown Switch*	[755]

SPN	PGN	Description	Variable
971	F001	*Engine Derate Switch*	[754]
1013	FEB7	*Maximum speed*	[742]
1039	FEAF	*Trip Fuel (Gaseous)*	[699]
1040	FEAF	*Total Fuel Used (Gaseous)*	[701]
1081	FEE4	*Engine Wait to Start Lamp*	[1174]
1109	FEE4	*Engine Protection System Approaching Shutdown*	[1176]
1110	FEE4	*Engine Protection System has Shutdown Engine*	[1175]
1122	FEA7	*Engine Alternator Bearing 1 Temperature*	[1171]
1123	FEA7	*Engine Alternator Bearing 2 Temperature*	[1172]
1124	FEA7	*Engine Alternator Winding 1 Temperature*	[696]
1125	FEA7	*Engine Alternator Winding 2 Temperature*	[697]
1126	FEA7	*Engine Alternator Winding 3 Temperature*	[698]
1134	FEEE	*Engine Charge Air Cooler Thermostat Opening*	[1177]
1136	FEA4	*Engine ECU Temperature*	[695]
1137	FEA3	*Engine Exhaust Gas Port 1 Temperature*	[1167]
1138	FEA3	*Engine Exhaust Gas Port 2 Temperature*	[1168]
1139	FEA3	*Engine Exhaust Gas Port 3 Temperature*	[1169]
1140	FEA3	*Engine Exhaust Gas Port 4 Temperature*	[1170]
1141	FEA2	*Engine Exhaust Gas Port 5 Temperature*	[1163]
1142	FEA2	*Engine Exhaust Gas Port 6 Temperature*	[1164]
1143	FEA2	*Engine Exhaust Gas Port 7 Temperature*	[1165]
1144	FEA2	*Engine Exhaust Gas Port 8 Temperature*	[1166]
1145	FEA1	*Engine Exhaust Gas Port 9 Temperature*	[1159]
1146	FEA1	*Engine Exhaust Gas Port 10 Temperature*	[1160]
1147	FEA1	*Engine Exhaust Gas Port 11 Temperature*	[1161]
1148	FEA1	*Engine Exhaust Gas Port 12 Temperature*	[1162]
1149	FEA0	*Engine Exhaust Gas Port 13 Temperature*	[1155]
1150	FEA0	*Engine Exhaust Gas Port 14 Temperature*	[1156]
1151	FEA0	*Engine Exhaust Gas Port 15 Temperature*	[1157]
1152	FEA0	*Engine Exhaust Gas Port 16 Temperature*	[1158]
1153	FE9F	*Engine Exhaust Gas Port 17 Temperature*	[1151]
1154	FE9F	*Engine Exhaust Gas Port 18 Temperature*	[1152]
1155	FE9F	*Engine Exhaust Gas Port 19 Temperature*	[1153]
1156	FE9F	*Engine Exhaust Gas Port 20 Temperature*	[1154]
1176	FE99	*Engine Turbocharger 1 Compressor Intake Pressure*	[796]
1177	FE99	*Engine Turbocharger 2 Compressor Intake Pressure*	[1150]
1180	FE98	*Engine Turbocharger 1 Turbine Intake Temperature*	[794]
1181	FE98	*Engine Turbocharger 2 Turbine Intake Temperature*	[795]

SPN	PGN	Description	Variable
1203	FE94	*Engine Auxiliary Coolant Pressure*	[792]
1208	FE92	*Engine Oil Filter Intake Pressure*	[693]
1212	FE94	*Engine Auxiliary Coolant Temperature*	[793]
1218	FECE	*Active Diagnostic Trouble Code Count*	[705]
1242	FE92	*Instantaneous Estimated Brake Power*	[694]
1387	FE8C	*Auxiliary Pressure #1*	[691]
1388	FE8C	*Auxiliary Pressure #2*	[692]
1390	FE8B	*Engine Fuel Valve 1 Intake Absolute Pressure*	[690]
1761	FE56	*Aftertreatment 1 Diesel Exhaust Fluid Tank Volume*	[785]
1800	FE50	*SLI Battery 1 Temperature*	[784]
2432	F004	*Engine Demand - Percent Torque*	[686]
2433	FE07	*Engine Exhaust Manifold Bank 2 Temperature 1*	[688]
2434	FE07	*Engine Exhaust Manifold Bank 1 Temperature 1*	[689]
3031	FE56	*Aftertreatment 1 Diesel Exhaust Fluid Tank Temperature 1*	[786]
3242	FDB4	*Aftertreatment 1 Diesel Particulate Filter Intake Temperature*	[783]
3246	FDB3	*Aftertreatment 1 Diesel Particulate Filter Outlet Temperature*	[782]
3363	FE56	*Aftertreatment 1 Diesel Exhaust Fluid Tank Heater*	[790]
3517	FE56	*Aftertreatment 1 Diesel Exhaust Fluid Tank Level*	[787]
3563	FDD0	*Engine Intake Manifold #1 Absolute Pressure*	[687]
3609	FD8C	*Aftertreatment 1 Diesel Particulate Filter Intake Pressure*	[780]
3644	FD92	*Engine Derate Request*	[781]
3697	FD7C	*Diesel Particulate Filter Lamp Command*	[772]
3698	FD7C	*Exhaust System High Temperature Lamp Command*	[778]
3699	FD7C	*Aftertreatment Diesel Particulate Filter Passive Regeneration Status*	[773]
3700	FD7C	*Aftertreatment Diesel Particulate Filter Active Regeneration Status*	[774]
3701	FD7C	*Aftertreatment Diesel Particulate Filter Status*	[775]
3702	FD7C	*Diesel Particulate Filter Active Regeneration Inhibited Status*	[776]
3703	FD7C	*Diesel Particulate Filter Active Regeneration Inhibited Due to Inhibit Switch*	[777]
3719	FD7B	*Aftertreatment 1 Diesel Particulate Filter Soot Load Percent*	[767]
3720	FD7B	*Aftertreatment 1 Diesel Particulate Filter Ash Load Percent*	[768]
3721	FD7B	*Aftertreatment 1 Diesel Particulate Filter Time Since Last Active Regeneration*	[769]
3750	FD7C	*Aftertreatment 1 Diesel Particulate Filter Conditions Not Met for Active Regeneration*	[779]
3938	F01E	*Generator Governing Bias*	[758]
4360	FD3E	*Aftertreatment 1 SCR Intake Temperature*	[764]
4363	FD3E	*Aftertreatment 1 SCR Outlet Temperature*	[765]
5137	FD40	*Aftertreatment 1 Diesel Exhaust Fluid Tank Heater Command*	[766]

SPN	PGN	Description	Variable
5245	FE56	*Aftertreatment Diesel Exhaust Fluid Tank Low Level Indicator*	[788]
5246	FE56	*Aftertreatment SCR Operator Inducement Severity*	[789]
5466	FD7B	*Aftertreatment 1 Diesel Particulate Filter Soot Load Regeneration Threshold*	[771]
6915	FC4A	*SCR System Cleaning Lamp Command*	[759]
6916	FC4A	*SCR System Cleaning Status*	[760]
6917	FC4A	*SCR System Cleaning Inhibited Status*	[761]
6918	FC4A	*SCR System Cleaning Inhibited Due to Inhibit Switch*	[762]
6934	FC4A	*SCR System Cleaning Forced Status*	[763]

These measurements are displayed in the ***Controller supervision*** ⇒ ***ECU/ECM (i4Gen)*** page. A measurement not sent by the ECU is shown as "...":

Note: To get the measurements through the Modbus/TCP protocol, refer to Modbus TCP/IP *(on page 99)*

Controls

SPN	Description	Details	PGN
898	Requested speed	Engine speed at which the engine is expected to operate if the speed control mode is active.	0
970	Start-Stop	Engine shutdown switch.	F001
2881	Frequency selection	Ability to switch the rated speed. Switched on a state transition while engine speed is 0. 50/60Hz (CM570 and PGI) (e.g. see ECU8 section in the MTU *(on page 130)* chapter).	FDCB

J1939 CUSTOM FRAMES SETTINGS

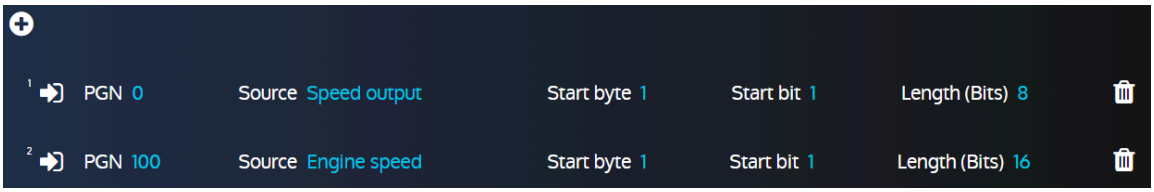
It is possible to set up custom J1939 frames in reception/transmission on the controller.
To configure the J1939 custom frames, please open the ***Controller settings*** ⇒ ***Engine/ECU/ECM*** ⇒ ***ECU/ECM*** ⇒ ***ECU/ECM*** page.
The Receive frame and Transmit frame tabs will be available only if J1939 protocol is enabled.
A maximum of 10 received frames and 10 transmitted frames can be set.

Note:

It is not possible to use custom frames to receive frames from a different id other than the ECU id set in parameter [3102].
It is not possible to use custom frames to transmit frames with a different id other than the controller's id set in parameter [3103].

Global view

Figure 57. J1939 custom frames settings global view



Opening the receive frames page or the transmit frames page will show a preview of the current frame settings or an empty page if no custom frames are defined yet.
Each line matches a single data from a PGN and displays main parameters of the frame settings.
Different actions can be done from the global view:

1. Create a new custom frame by clicking the plus (+) button.
2. Edit an existing custom frame by clicking anywhere on the desired line.
3. Delete an existing custom frame by clicking the bin icon at the right end of the custom frame line.

Receive frames settings (RX)

Creation/Edition

The configuration is done through a form with the following parameters:

Figure 58. J1939 custom receive frames settings

CAN ID

PGN

The PGN of the J1939 data you want to read. It is possible to use both decimal or hexadecimal format. Filling one field will automatically update the other.

Mapping

Destination

The controller's variable in which you want to store the received data.

Offset

The offset you want to apply to the received data value.

Resolution

The resolution (i.e. gain) you want to apply to the received data value.

Note: The value stored in the controller's variable will be equal to ***(Raw value * Resolution) + Offset***.

Data

Start byte

The starting byte of the data in the frame.

Start bit

The starting bit of the data (in the **Start byte**) in the frame.

Length (Bits)

The length in bits of the data.

Example:

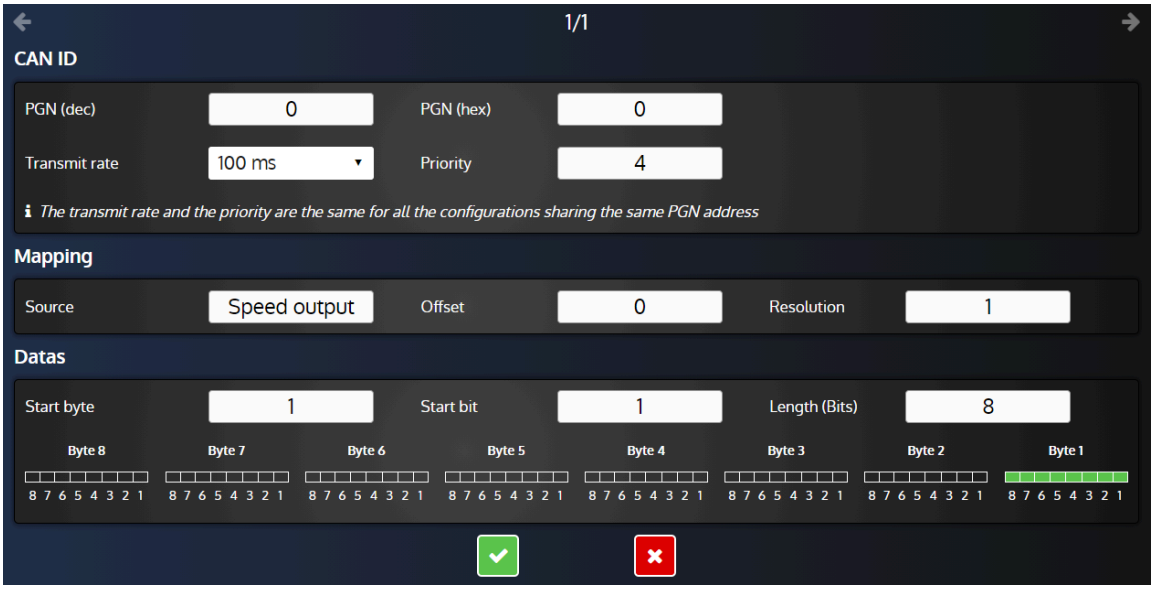
Start byte = 2, Start bit = 1, Length = 8.
The data stored in the controller's variable will come from the 8 bits starting from the 1st bit of the 2nd byte of the CAN frame.

Transmit frames settings (TX)

Creation/Edition

The configuration is done through a form with the following parameters:

J1939 custom transmit frames settings



CAN ID

PGN

The PGN of the J1939 data you want to read. It is possible to use both decimal or hexadecimal format. Filling one field will automatically update the other.

Transmit rate

The frame transmission rate.

Priority

The priority of the frame containing the data according to the J1939 specification.

Note: The configurations sharing the same PGN will share the same transmit rate and priority.

Mapping

Source

The controller's variable whose value will be sent

Offset

The offset to apply to the controller's variable value before sending.

Resolution

The resolution to apply to the controller's variable value before sending.

Note: The transmitted value will be equal to ***(Controller's variable value * Resolution) + Offset***

Data

Start byte

The starting byte of the data in the frame.

Start bit

The starting bit of the data (in the **Start byte**) in the frame.

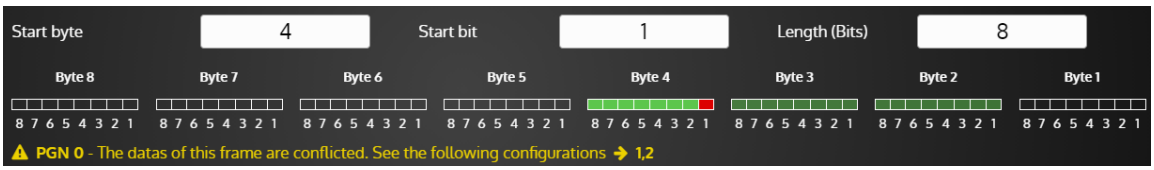
Length (Bits)

The length in bits of the data.

You can check the frame data layout below the data settings thanks to a diagram that will show all available/ used data bytes for a given PGN. This is useful in case you have several configurations sharing the same PGN as it helps to prevent data overlap.

Example:

Figure 59. Example of the data layout in a transmit frame



In the example above, there is at least one other configuration using the same PGN set in the current frame settings. The dark green boxes show the bits used in the other frame settings. The light green ones show the bits used according to the **Start byte**, **Start bit** and **Length (Bits)** parameters from the current frame. The red box indicates that if we try to apply this configuration, it will overlap on one bit of the other frame and prevent us from validating these settings.

J1939 SNIFFER

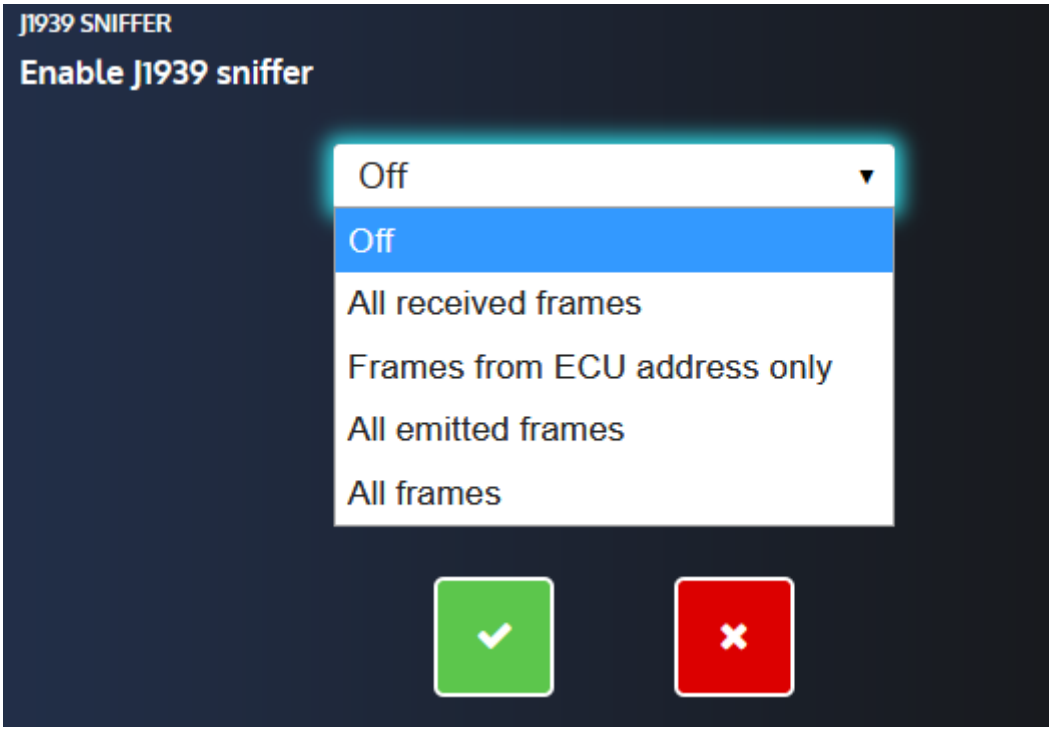
J1939 sniffer is a J1939 CAN frame recorder provided to check frames present on the J1939 network.
The dedicated space allows for the storage of approximately 1000 to 1200 frames that can be retrieved in a text file.
This text file will contain the list of the frames in the form of their 29 bits CAN identifiers 0 to 8 data bytes following a timestamp for each frame.

Setup is done in the ***Controller settings*** ⇒ ***Engine/ECU/ECM*** ⇒ ***ECU/ECM*** ⇒ ***J1939 sniffer*** page.

It is possible to select which frames should be recorded:

- All frames received by the unit.
- Only frames which were sent from the ECU address as set in variable [3101].
- Frames sent by the unit.
- All frames sent/received by the unit.

Figure 60. J1939 sniffer configuration list



If the CAN network is used for J1939 and CANopen communication at the same time, only J1939 frames will be stored by the J1939 sniffer.
Also note that the CAN protocol speed is forced to 250 kbit/s as soon as a J1939 feature (communication of sniffer) is enabled.

An **Erase** button allows you to wipe all J1939 frames that may already be stored in the unit so you can start a fresh new session. This button is disabled if you are not connected to a unit.

To download the recorded frames, go to ***i4Gen*** ⇒ ***File transfer*** page

MTU MDEC

Presentation

MTU MDEC is a complete engine monitoring and control system with a specific MTU MDEC ECU (Engine Control Unit) which can broadcast data values and error codes on a CAN bus.

The ECU can detect faults and send them to the module: protections can be assigned to these faults (see below).

Important: MTU MDEC is proposed as a software option. The option must be available and activated on your controller in order to enable MTU MDEC communication and access dedicated settings and measurements.

When the MTU MDEC protocol is used on the CAN 2 communication port, the associated CAN bus bit rate is automatically fixed at 125 kbit/s

In case any CANopen configuration is enabled, then the CANopen protocol will be switched to the CAN 1 terminal of the controller.
Additional attention must be taken on the CANopen protocol configuration when this protocol is switched on the port CAN 1: see dedicated chapter for more information.

MTU MDEC configuration

MTU MDEC communication

To use MTU MDEC proprietary CAN protocol:

1. Enter the ***Controller settings*** ⇒ ***Engine/ECU/ECM*** ⇒ ***ECU/ECM*** ⇒ ***ECU/ECM*** page
2. Enable MDEC with parameter [3118]:choose the CAN protocol version that fits your MDEC configuration (see MDEC parameter 201.05 below).
3. Assign the alarms/faults to a protection (see below)
4. Connect the CAN bus of the ECU to the CAN bus of the module

Automatic address configuration

Enabling MTU MDEC protocol will automatically set *ECU ID* [3102] and **COMPACT** ID [3103] variables to the default values for this particular ECU configuration. However you can still manually change these two identifiers afterwards if necessary.

ECU ID auto-detection functionality

This function is only available for J1939 protocol. Thus it is disabled for MTU MDEC proprietary protocol.

ECU manufacturer and type settings

The ECU manufacturer and type determine the following settings:

- Module address on engine CAN bus.
- ECU address on engine CAN bus.
- Oil pressure and coolant temperature are automatically measured through the MDEC protocol, except if you specify a dedicated sensor in the ***Controller settings*** ⇒ ***Inputs/Outputs*** ⇒ ***Analog inputs*** page.

Note: Note that the engine speed measurement method must be selected manually using parameter [2200] in the ***Controller settings*** ⇒ ***Engine/ECU/ECM*** ⇒ ***Engine*** ⇒ ***General*** page. The measurement source can be the magnetic pickup, the alternator or MTU MDEC.

Faults

The module can monitor different diagnostic data from the ECU as listed below. The module interprets these datas for display, processing, and protection purposes.

MDEC diagnostic data	Control in *i4Gen Suite* software		Message description
Combined Alarm Yellow (PV 110010)	[3121]	*Control on Combined Alarm Yellow*	Behaviour depends on MDEC ECU configuration
Combined Alarm Red (PV 110014)	[3122]	*Control on Combined Alarm Red*	Behaviour depends on MDEC ECU configuration
Actual Failure Codes (PV 110075)	Display only		Value switches approximately once per second to cycle through the currently active error codes.

MTU MDEC Measurements

Next table lists the measuring points whose values are conveyed over MDEC CAN bus and taken into account by the module. Each measurement is assigned to a MTU MDEC Process Value number (i.e. PV number) to precisely identify the corresponding data. Refer to your MTU MDEC documentation for more information on PV numbers.

MTU MDEC PV	Description	Variable
110002	*Engine speed*	[1202]
110026	*P-Lube Oil*	[1203]
110046	*P-Fuel* **Note:** this PV is not available on the MTU MDEC CAN Module 302	[1204]
110049	*P-Charge Air*	[1205]
110053	*P-Fuel (Common Rail)*	[1206]
110126	*T-Coolant*	[1207]
110131	*T-Charge Air*	[1208]
110137	*T-Coolant Intercooler*	[1209]
110140	*T-Lube Oil*	[1210]
110152	*T-Fuel*	[1211]
110075	*Actual Failure Codes*	[1212]
110010	*Combined Alarm Yellow*	[1213]
110014	*Combined Alarm Red*	[1214]

These measurements are displayed in the ***Controller supervision*** ⇒ ***ECU/ECM (i4Gen)*** page.

Note: To get the measurements through the Modbus/TCP protocol, refer to Modbus TCP/IP *(on page 99)*

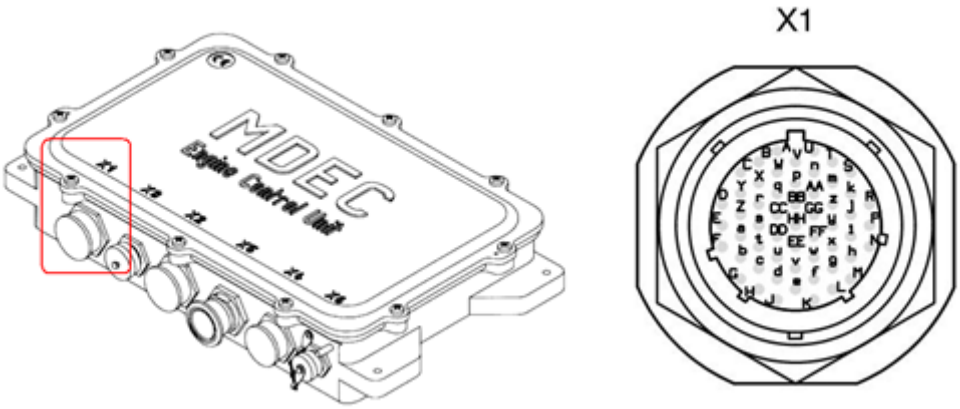
Controls

Standard MTU MDEC does not allow to control the ECU through CAN bus. So all controls are done through dedicated wired signals.

Wiring

The table below details the wiring between the controller and your MTU MDEC unit.

Figure 61. MDEC wiring



Signal name	Controller terminal	MDEC X1 connector	MDEC X1 harness wire number
Power supply 0V	J1 - 1	W	36
CAN Low	J2 - 1 (CAN2 CANL)	F	50
CAN High	J2 - 2 (CAN2 CANH)	G	49
CAN ground	J2 - 4 (CAN2 0V)	E	51
Analog speed output	J2 - 5	AA	8
Analog speed common	J2 - 6	W	36
FUEL	Logic output (Depends on your configuration)	h (signal) and g (ground)	25 (signal) and 26 (ground)
CRANK	Logic output (Depends on your configuration)	N (signal) and M (ground)	43 (signal) and 44 (ground)
50/60Hz	Logic output (Depends on your configuration)	x (signal) and w (ground)	11 (signal) and 12 (ground)
Alarm RESET	Logic output (Depends on your configuration)	R (signal) and P (ground)	41 (signal) and 42 (ground)

Please refer to chapter CAN bus good practices *(on page 125)* for CAN bus wiring requirements.

Recomended configuration

MTU MDEC speed demand supports many possible configurations. For example, a 0.5V to 9.5V input signal may lead to a speed range of 1400...1600rpm or 800...2000rpm. Please double check the MTU MDEC ECU settings.

1. Use MDEC analog input (typically 0.5V...9.5V for an operating range of +100/-100 around 1500rpm for applications operating at 50Hz)
2. Set controller speed output offset to 5V so that the speed output without correction will match the 1500rpm speed demand input of the MDEC (for 50Hz applications).
3. Fine tune the offset to exactly match 1500rpm without controller correction (for 50Hz applications).

Please refer to Speed/Voltage Control *(on page 39)* for more details concerning speed control adjustments.

MTU MDEC configuration

CAN bus configuration of the MTU MDEC ECU must be properly setup in order to communicate with the controller. If necessary, contact your local MTU dealer to check or setup the following MDEC parameters.

MDEC parameter number	MDEC parameter label	MDEC parameter value	Note
200.00	CAN InterfaceConfigParam	898 for CAN PU-Module 302, 303, 304 450 for CAN PU-Module 201	
200.02	CAN ECU Node-ID	2	Must match the controller's parameter *ECU ID* [3102]
201.01	CAN MonitorNodes 1-16	32	This parameter is a bitfield. Bit number 5 (value 32) indicates a third party controller is on the CAN bus.
201.05	CAN PU-Module Type/No	201, 302, 303 or 304	Must match MDEC Module selected in controller parameter [3118]

MODBUS CLIENT

Overview

A Modbus/TCP client is implemented in the product in order to communicate with an external device that provides Modbus communication.
You may send and retrieve data to and from a unit that is connected through Modbus/TCP or through Modbus RTU if you use a Modbus/TCP to RTU gateway between the devices.

Supported Modbus functions

Different Modbus functions may be used to read/write different kind of data in your remote device as listed below:

Function code 01

Read coils

Function code 02

Read discrete inputs

Function code 03

Read holding registers

Function code 04

Read input registers

Function code 05

Write single coil

Function code 06

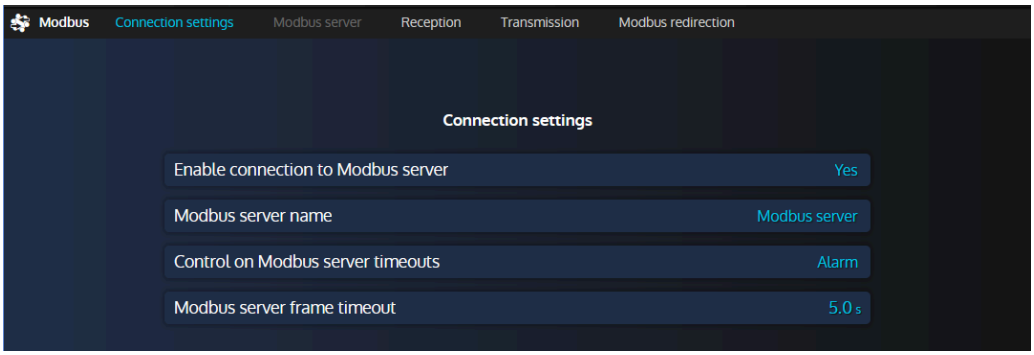
Write single register

Setup

Setup is done in page ***Controller settings*** ⇒ ***Programming*** ⇒ ***Modbus (i4Gen)***. Note that you must be connected to the **COMPACT** unit in order to fully setup the communication parameters, more specifically for the remote Modbus/TCP server IP and communication port.

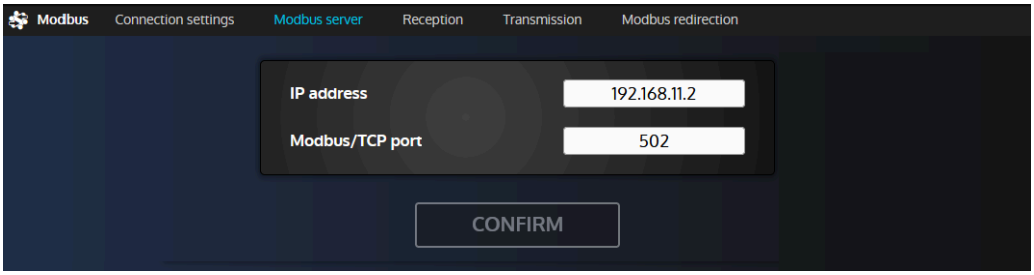
1. Enable communication to a Modbus/TCP server, input a name for the remote unit and optionally setup an alarm/fault in case of communication timeout. The server name will be used as alarm/fault label in case of a communication incident.

Figure 62. Modbus connection settings menu



2. Input the server communication parameters (Ethernet IP address and Modbus port). The standard Modbus/TCP protocol port is 502 but this may vary according to your remote device and desired configuration.

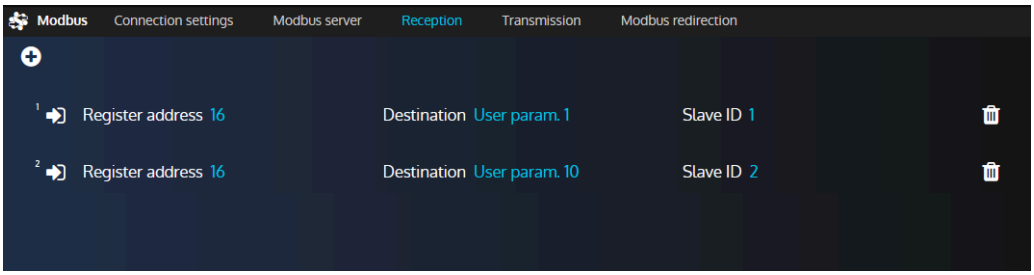
Figure 63. Modbus server settings menu



3. You may now switch to the Reception/Transmission pages in order to setup the registers you want to respectively read and write.
    - Reception: a remote register is read and its computed value is written into an internal variable of the **COMPACT** unit.
    - Transmission: an internal variable is computed and sent into a remote register.

    You may setup up to 10 reception and 10 transmission lines.

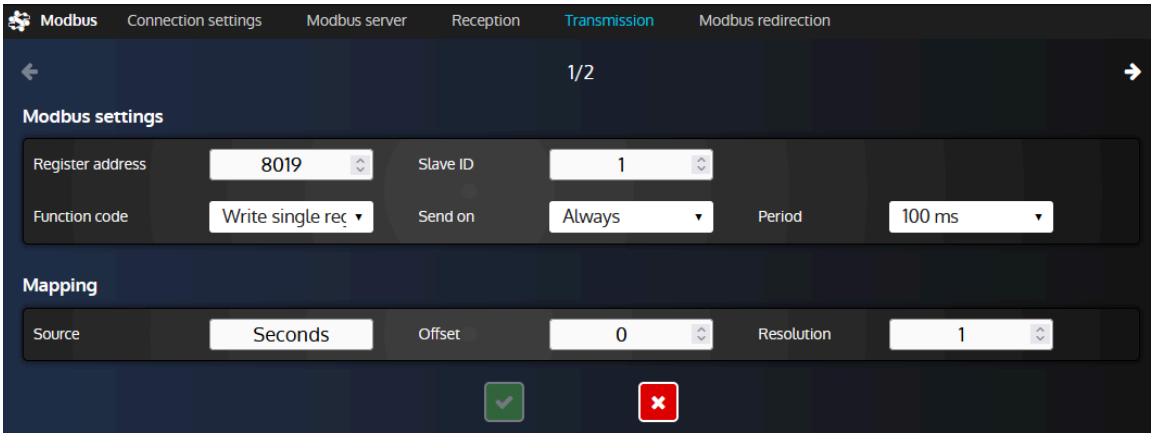
Figure 64. Modbus reception menu



4. Click on the '+' button at the top left corner of the page to add a new reception/transmission line, or click on an existing line in order to modify its setup.

Modbus reception/transmission settings

Figure 65. Modbus transmission menu



Modbus settings

Function code

Modbus function code used to read/write bits, inputs or registers.

Register address

Address of the Modbus register inside the remote Modbus server. Note that register 1 is located at address 0.

Slave ID

This parameter is typically useful if you need to access a Modbus RTU (RS485) device through a Modbus/TCP to RTU gateway. This way, you can access different Modbus RTU slave devices using a single gateway (server).

Sending condition (transmission lines only)

Always will send a value at the selected period. If **Value change** is selected, register will be written only if the source value has changed. Setting this parameter to **Never** disables the transmission without deleting the whole line: it may be useful for example for testing purposes.

Period (transmission lines only)

Choose the transmission period when the sending parameter is set to **Always**. Different values are proposed in order to let you choose between a light communication traffic or responsiveness.

Mapping settings

Destination (reception lines only)

Internal variable of the **COMPACT** controller where the result of a computed read register will be written.

Source (transmission lines only)

Internal variable of the **COMPACT** controller that will be used for computation. The result will be sent into the selected remote register in the Modbus server.

Offset and Resolution

These two parameters allow you to set a calculation rule between Modbus registers and **COMPACT** variables as detailed below. For a reception line, destination variable inside the **COMPACT** controller will get the following value: **Result = (Modbus register value) * Resolution + Offset**. For a transmission line, the value sent to the Modbus server will be: **Register value = (Source value) * Resolution + Offset**

Note: Determining the proper gain when reading values

It is possible to always use the same formula to determine the gain (as long as the values are linear) for a value you're reading: **gain = value expected / value read via Modbus**.
When reading values, do not forget to set the accuracy (and optionally the unit if there is any, for display purpose only) of the user variable in use via the menu ***Controller settings*** ⇒ ***Programming*** ⇒ ***User variables (i4Gen)***

Example:

The controller is set to read the register 123 from another Modbus/TCP device and to store it in the variable "Saved var. 1" [8000]. The value is expected to have a precision of 2 digits so we did set the "Saved var. 1" variable with an accuracy of 0.01. The controller reads 5000.00 but the expected value should be 25.00. Assuming that it is a linear value, we simply use the formula as stated before to determine the gain to apply: 25/5000 = 0.005. Note that if you want to scrap everything after the comma to have the value as an integer number, you can simply change the accuracy of the "Saved var. 1" to 1 (but the gain should remain unchanged).

CAN BUS GOOD PRACTICES

This chapter describes rules to be used to ensure reliable CAN communication. These rules must be applied to all CAN protocol communications, including the **CRE-Link®** protocol and the ECU/remote I/O CAN bus. **CRE TECHNOLOGY** recommends to always use a shielded cable to connect CAN bus.

Cables

⚠ WARNING

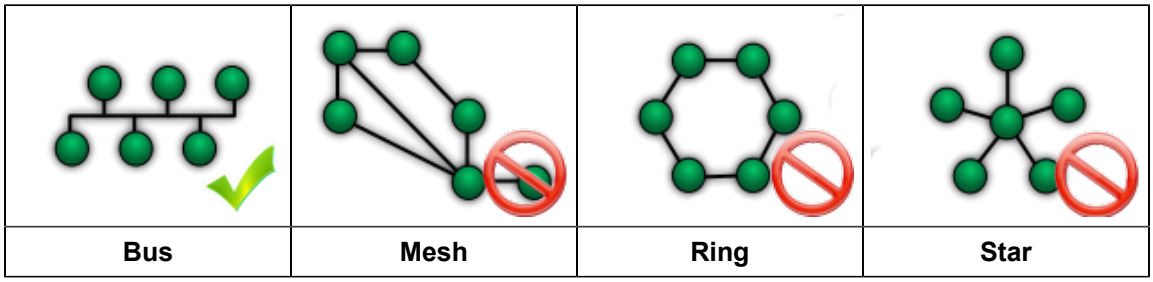
RISK OF EQUIPMENT DAMAGE

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

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

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:

Figure 66. CAN bus accepted wiring topologies



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.

Figure 67. CAN bus wiring example

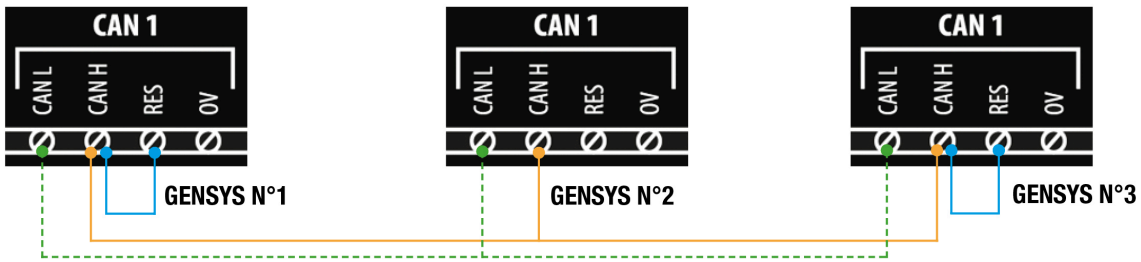
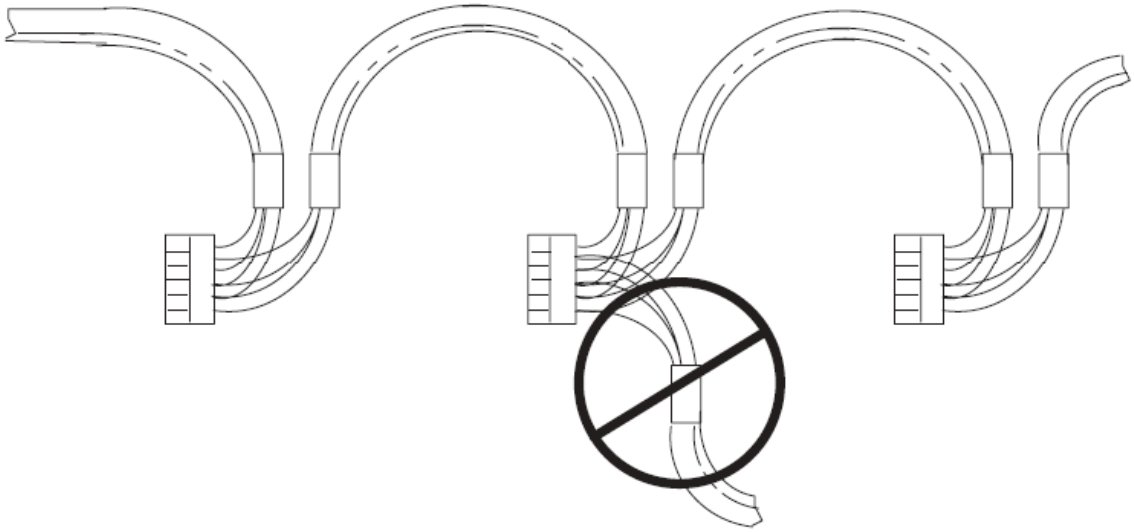


Figure 68. Wrong placement of the termination resistor on the CAN bus



⚠ WARNING

RISK OF EQUIPMENT DAMAGE

Failure to follow this instruction may damage the CAN transmitter/receiver and the controller itself.

Do not, in any cases, connect the "0V" pin to the "-" pin of the power supply.

Note: 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 and 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 (kbit/s)	Maximal length (m)
10	5000
20	2500
50	1000
125	500
250	250
500	100
800	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 (kbit/s)	Note
CAN1	CANopen (if MTU MDEC protocol selected on CAN2)	125	125 kbit/s recommended. Can be changed using parameter [3050].
CAN2	J1939 / MTU MDEC	250 for J1939 125 for MTU MDEC	Switches automatically to the right speed when selecting an ECU protocol with the parameter [3118].
	CANopen (if MTU MDEC protocol not selected)	125 (default)	Fixed to 250 kbit/s if J1939 is selected. Otherwise can be selected between 125/250/500/1000 kbit/s (using ***i4Gen Suite*** software or modification by variable number).

APPENDICES

ECU J1939

Caterpillar

ECU [3101]	Speed	Start/Stop	Speed selection
GENERIC [0]	x	-	-
ADEM A4E2 (C4.4 & C6.6) [1]	x	-	-

Cummins

ECU [3101]	Speed	Start/Stop	Speed selection
GENERIC [0]	x	x	x
QSX15-G8 (CMS570) [1]	x	x	x
CM850 [2]	x	-	x
QSB5 (PGI 1.1) [3]	x	-	x
QSB7 (PGI 1.1) [4]	x	-	x
QSL9 (PGI 1.1) [5]	x	-	x
QSM11 (PGI 1.1) [6]	x	-	x
QSX15 (CMS570) [7]	x	x	x
QSK19 (PGI 1.1) [8]	x	-	x
QSK38 (PGI 1.1) [9]	x	-	x
QSK50 (PGI 1.1) [10]	x	-	x
QSK60 (PGI 1.1) [11]	x	-	x

Detroit Diesel

ECU [3101]	Speed	Start/Stop	Change speed
GENERIC [0]	-	-	-
DDEC III [1]	-	-	-
DDEC IV [2]	-	-	-
DDEC X [3]	-	-	-

Deutz Fahr

ECU [3101]	Speed	Start/Stop	Speed change
GENERIC [0]	x	-	-
EMR [1]	x	-	-
EMR2 [2]	x	-	-
EMR3 [3]	x	-	-

Iveco

ECU [3101]	Speed	Start/Stop	Speed change
GENERIC [0]	x	-	-
NEF (EDC) [1]	x	-	-
CURSOR [2]	x	-	-
CURSOR9 (EDC) [3]	x	-	-
CURSOR11 [4]	x	-	-

John Deere

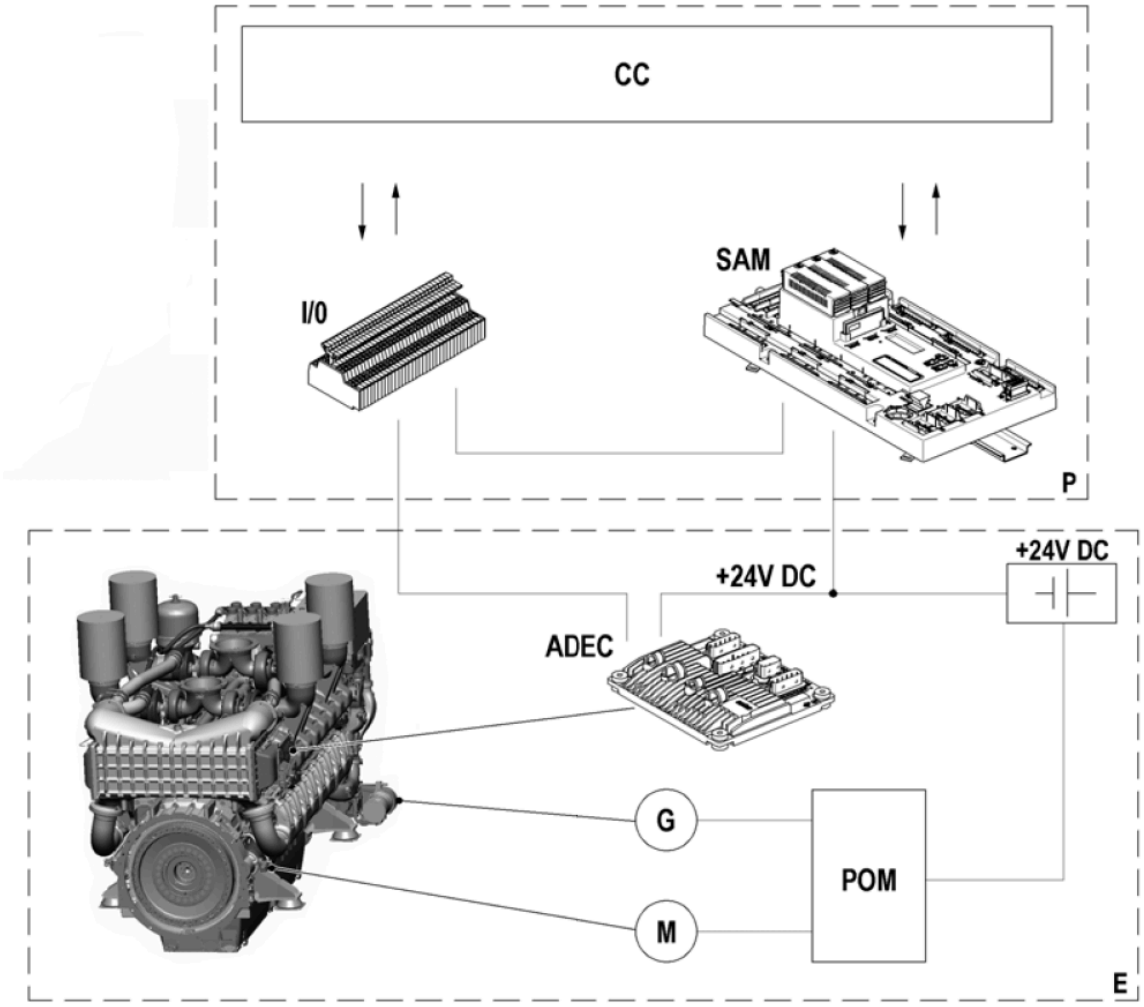
ECU [3101]	Speed	Start/Stop	Speed change
GENERIC [0]	x	-	-
JDEC [1]	x	-	-

MTU

ECU [3101]	Speed	Start/Stop	Speed adjustment
GENERIC [0]	-	x	x
ADEC-2000 [1]	-	x	x
ADEC-4000 [2]	-	x	x
ECU8 + Smart Connect [3]	x	x	x
ECU8 + SAM [4]	-	x	x

ADEC

The SAM (Service and Automation module) is associated with the ADEC 2000 or ADEC 4000. The set is referred to as the ECU7.
Disconnect X13 to turn off the power. Insert the CCB2 card into SAM slot #3.
The ADEC ECU, SAM and the module communicate via 2 CAN buses: a CAN bus between the SAM and the ADEC with a proprietary protocol, a CAN bus between the module and the SAM with the J1939 protocol. The SAM includes a termination resistor.



The ADEC controls, among other things, the engine speed.

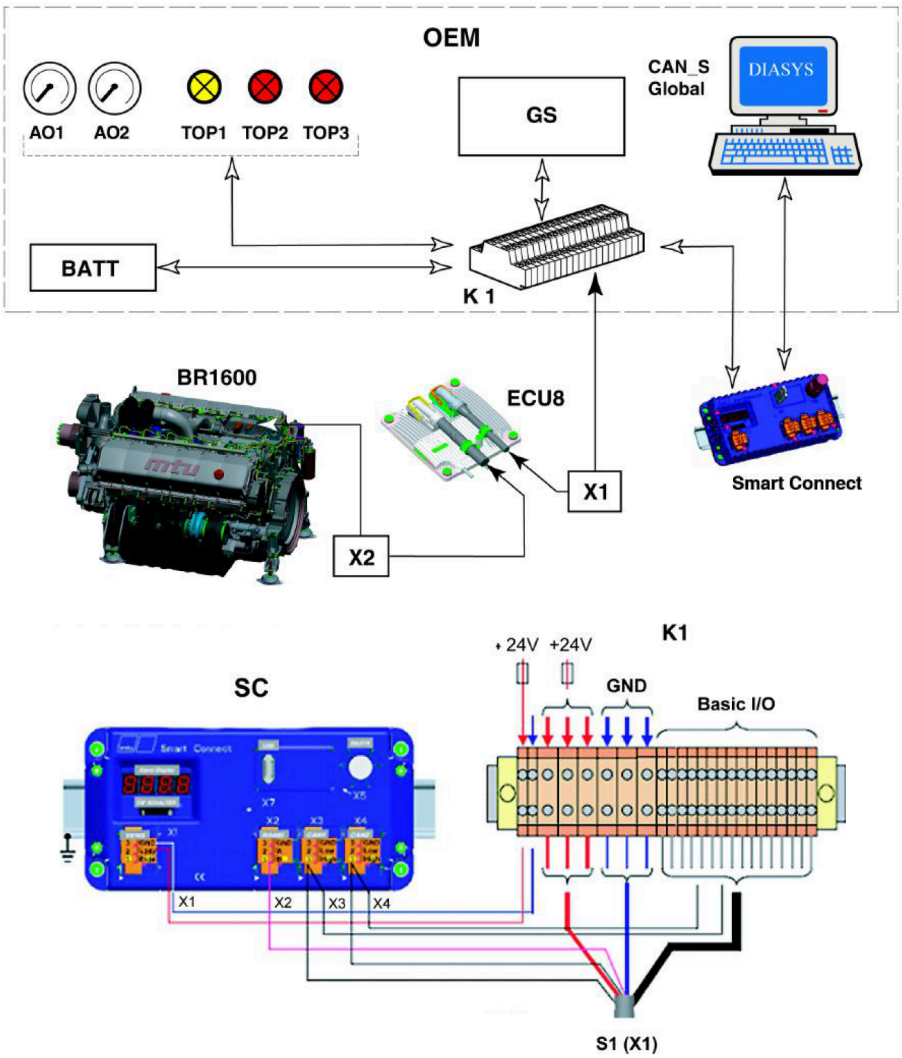
Typical ADEC and SAM connection:

Signal	ADEC X1	Cabinet	SAM X23 connector
CAN High	33	X7-2	2
CAN Low	18	X7-1	1
CAN ground	34	X7-3	3
Speed out +		X2-	
Speed out –		X2-	

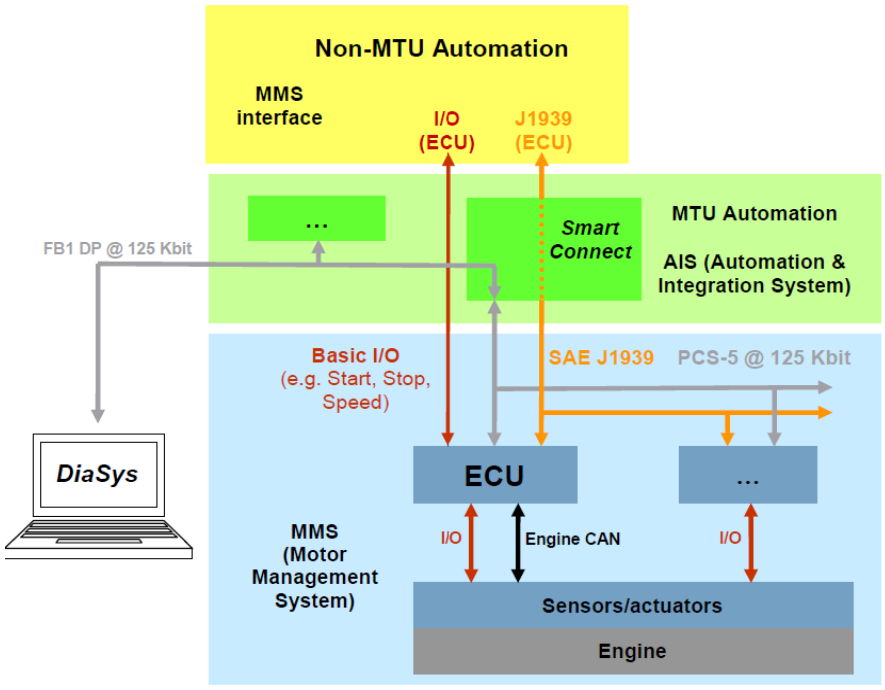
ECU8

Smart Connect is used to:

- Select the origin of the speed control via an 8 position selector
- Set droop frequency and slope



Via the K1 connection box, the ECU8, the Smart Connect and the module are connected: a CAN bus between the Smart Connect and the ECU8 with a proprietary protocol, a CAN bus between the Smart Connect and the module with the J1939 protocol. X4 is the connector supporting the J1939 to connect to the module.



Perkins

ECU [3101]	Speed	Start/Stop	Speed change
GENERIC [0]	x	-	-
1100 (A4E)	x	-	-

Scania

ECU [3101]	Speed	Start/Stop	Speed selection
GENERIC [0]	x	x	-
S6 (DC16-45A) [1]	x	x	-

Volvo Penta

ECU [3101]	Speed	Start/Stop	Speed change
GENERIC [0]	x	-	-
EMS2 [1]	x	x	x (Multi-speed engine)
EDC4 [2]	x	-	-
94xGE [3]	x	x	x
124xGE [4]	x	x	-
1640-2GE [5]	x	x	x
1643GE [6]	x	x	x
D6 [7]	x	x	-
D7 [8]	x	x	-
D13GE-Tier3 [9]	x	x	x

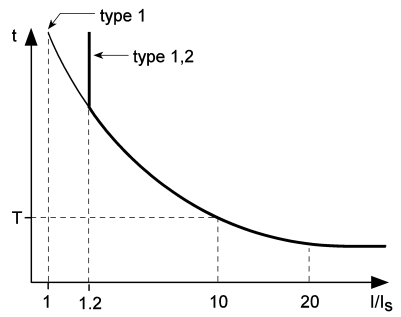
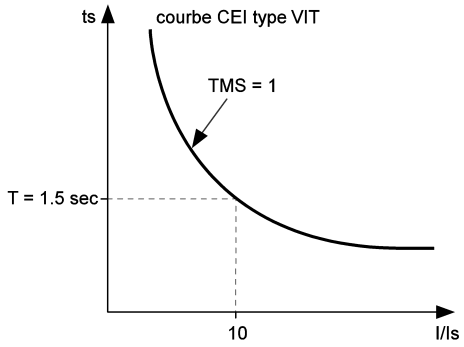
SHORT CIRCUIT PROTECTION

The tripping time depends on the duration an alternator winding can endure an over current.

A IDMT (Inverse Definite Minimum Time) curve is defined by:

- a type (IEEE, IEC, IAC),
- Is: current value for infinite time in type 1 (asymptote value); type 1.2 is not used,
- T: tripping time for I= 10 x Is.

Definition of TMS (Time Multiplier Setting); by default, [2475] = 1:

T is the tripping time for I/Is = 10 (Is= setpoint, aka threshold)	TMS = 1 corresponds to T= 1.5 s at I = 10 x Is
	

Note: In brief, the higher the over-current, the faster the trip.

IEC Curves

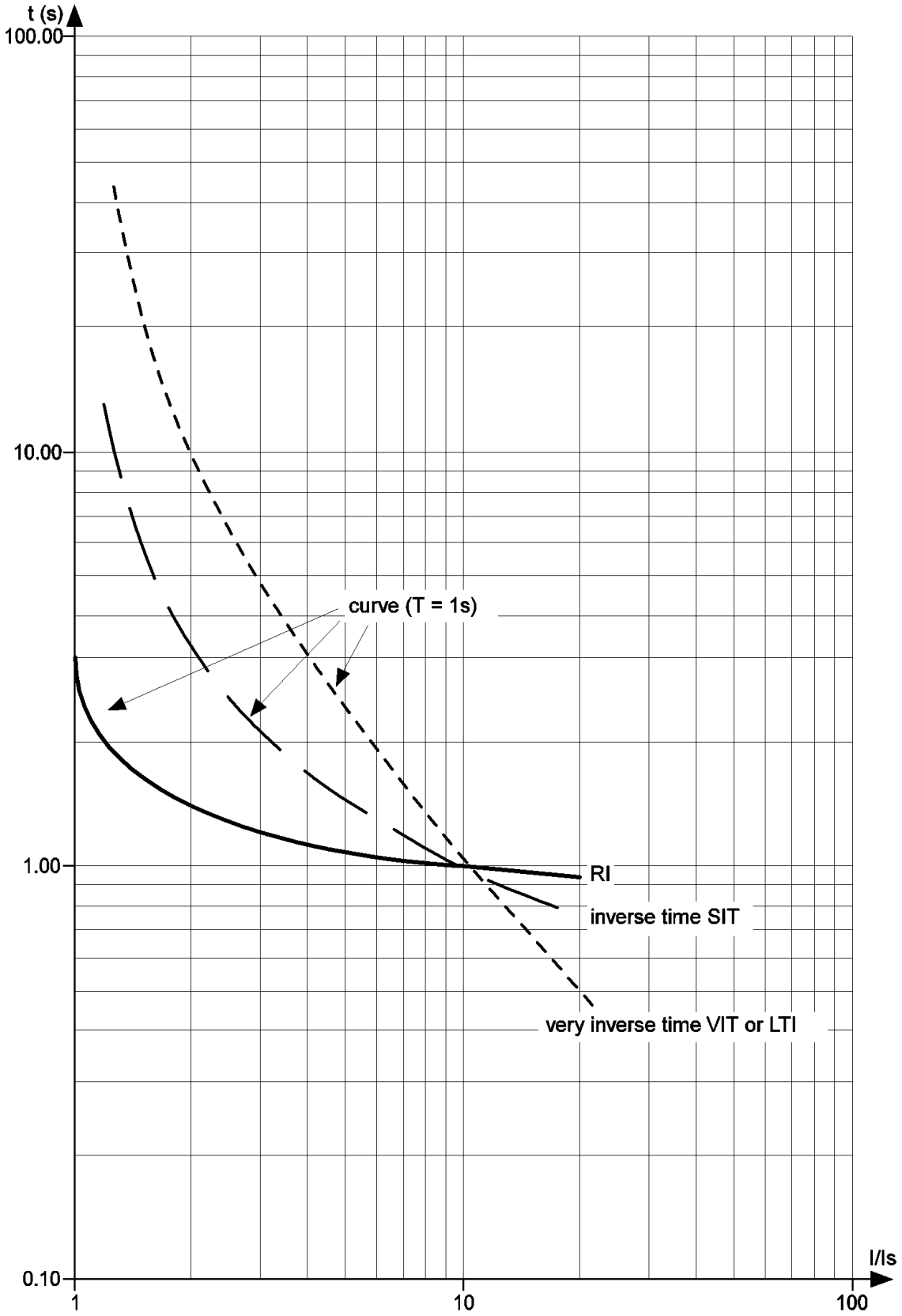
$$t(I) = TMS \times \frac{k}{\left(\frac{I}{Is}\right)^{\alpha} - 1}$$

Characteristics	k	a (defined the type A, B, C)	Selection in *i4Gen Suite* Software	b
(Standard) inverse / A	0.14	0.02	Preset	2.97
Very inverse / B	13.5	1	Preset	1.5
Long time inverse / B	120	1	Custom	13.33
Extremely inverse / C	80	2	Preset	0.808
Ultra inverse	315.2	2.5	Custom	

The time for T curves must be divided by β to get the time for TMS curves.

T curves with t=1 for I/Is=10:

Figure 69. IEC curves graphs



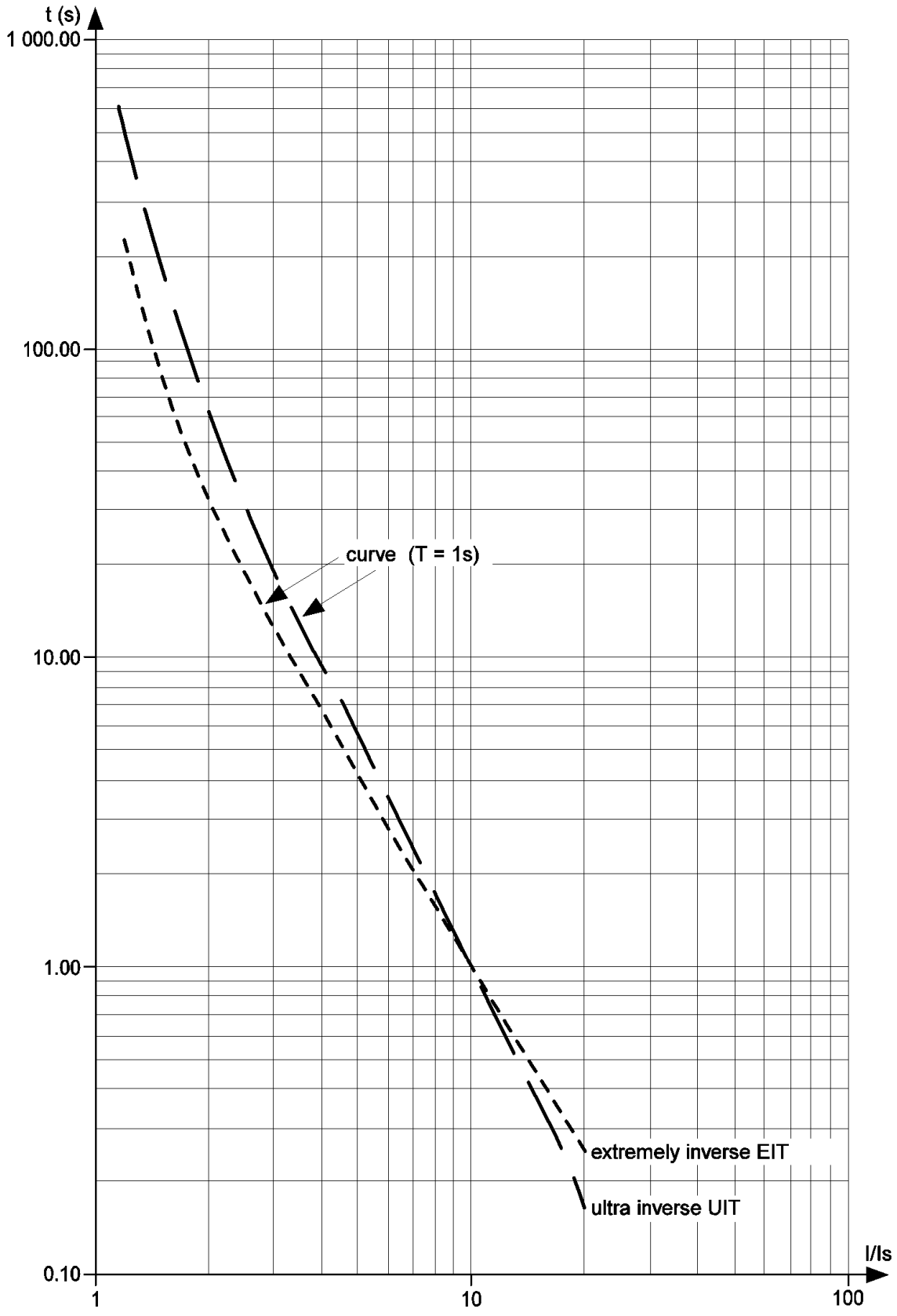

t (s)
1 000.00
100.00
10.00
1.00
0.10
1
10
100
I/Is
curve (T = 1s)
extremely inverse EIT
ultra inverse UIT

Figure 70. IEC curves graphs

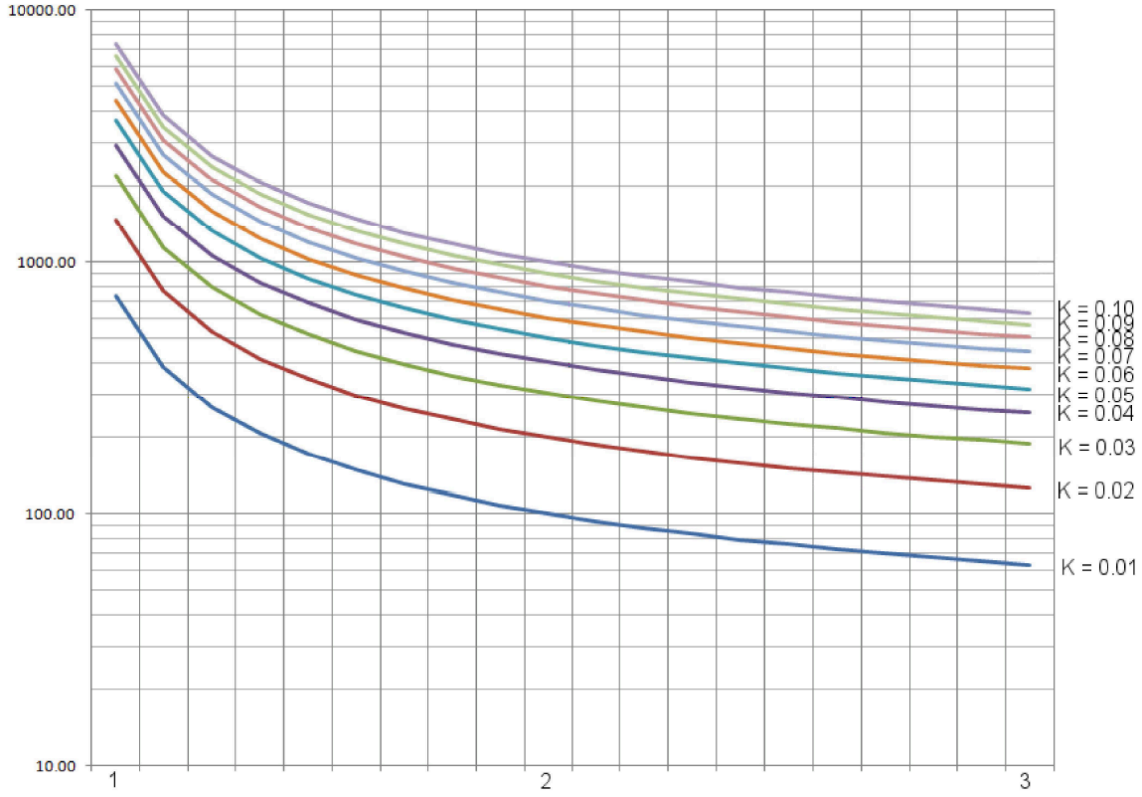
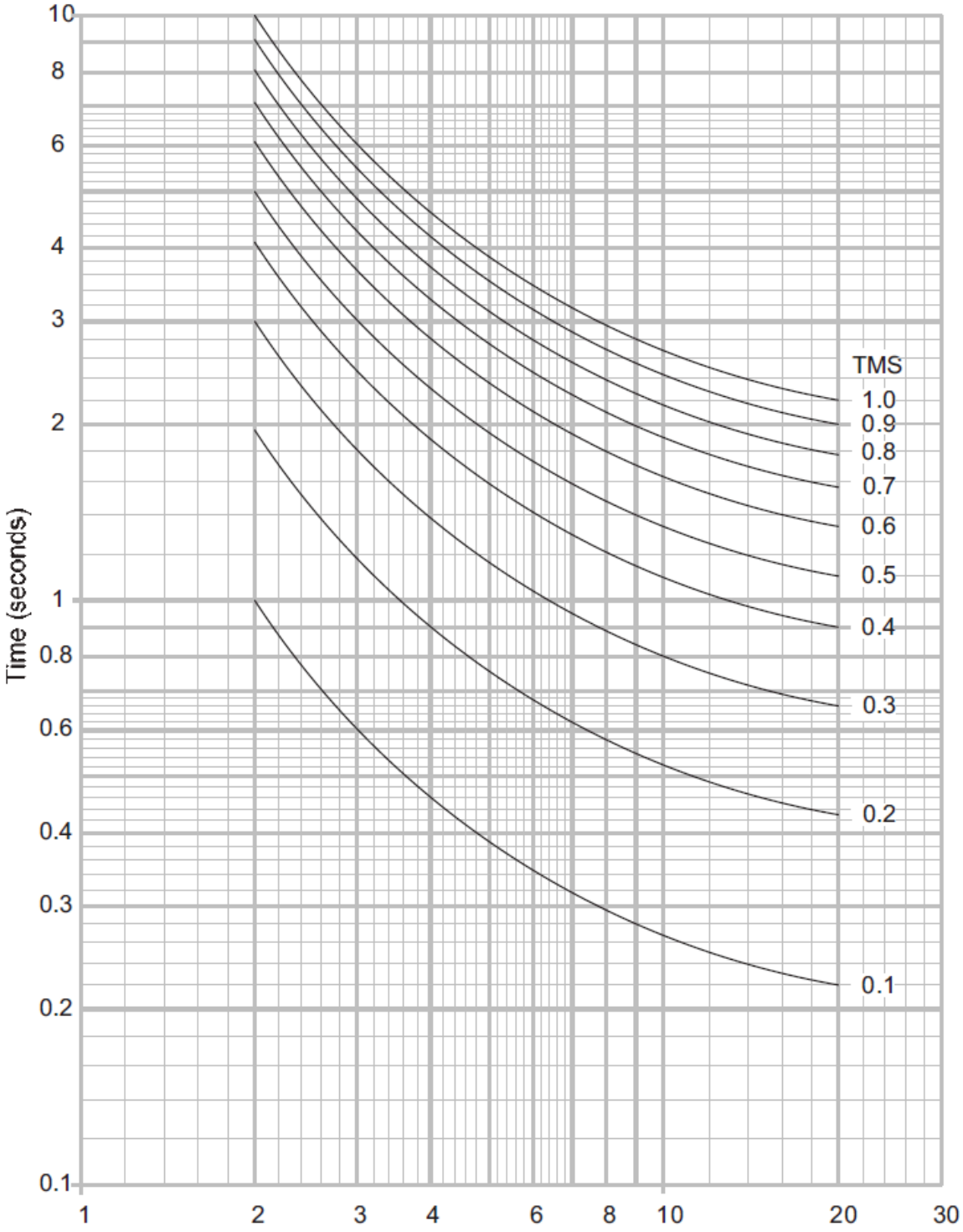


Figure 71. Inverse curves for various value of TMS

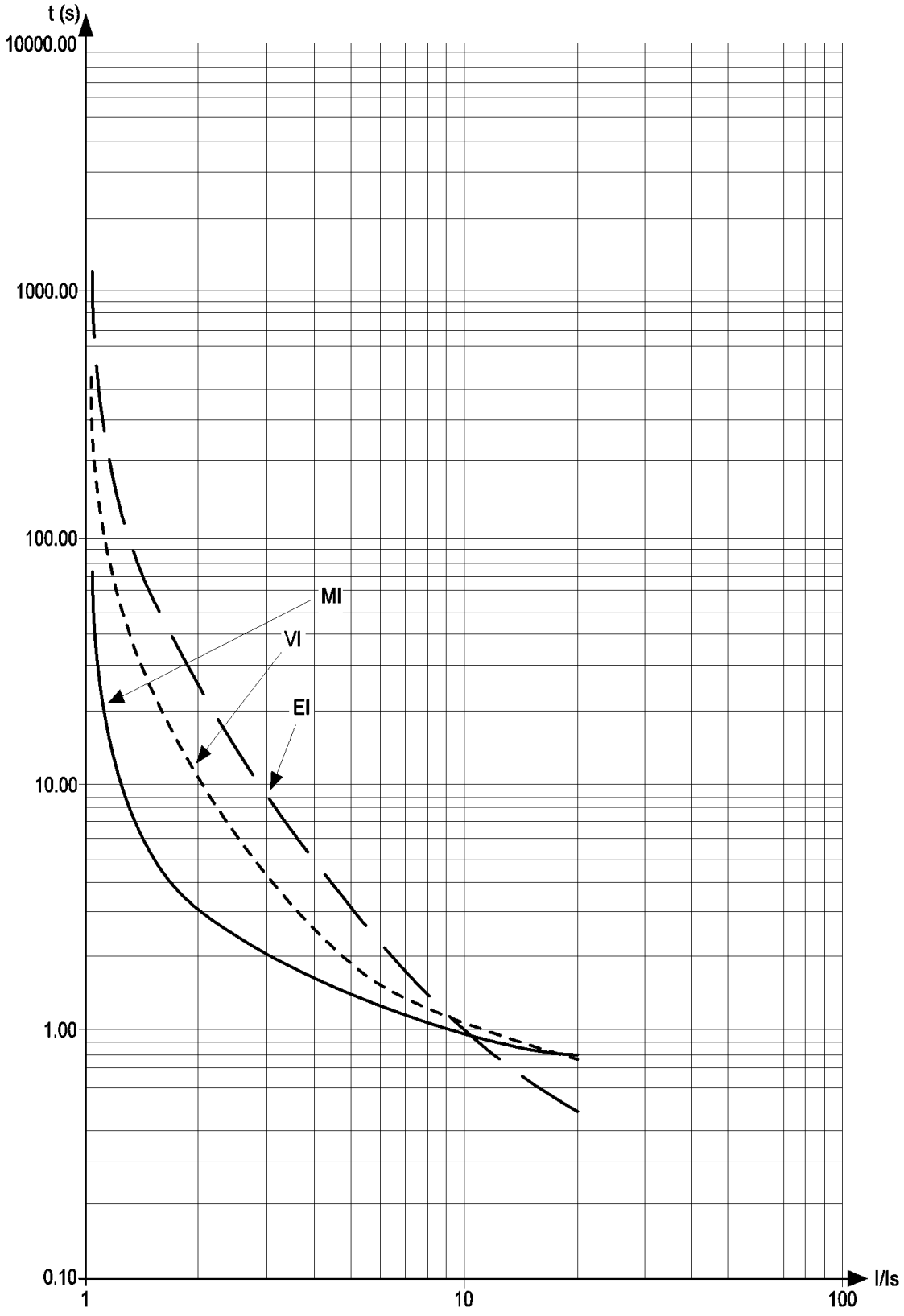


IEEE Curves

$$t(I) = TMS \times \left(\frac{k}{\left(\frac{I}{Is}\right)^{\alpha} - 1} + c \right)$$

Characteristic curve	k	c	a
Moderately inverse	0.515	0.1140	0.02
Very inverse	19.61	0.491	2
Extremely inverse	28.2	0.1217	2

Figure 72. IEEE curves graph

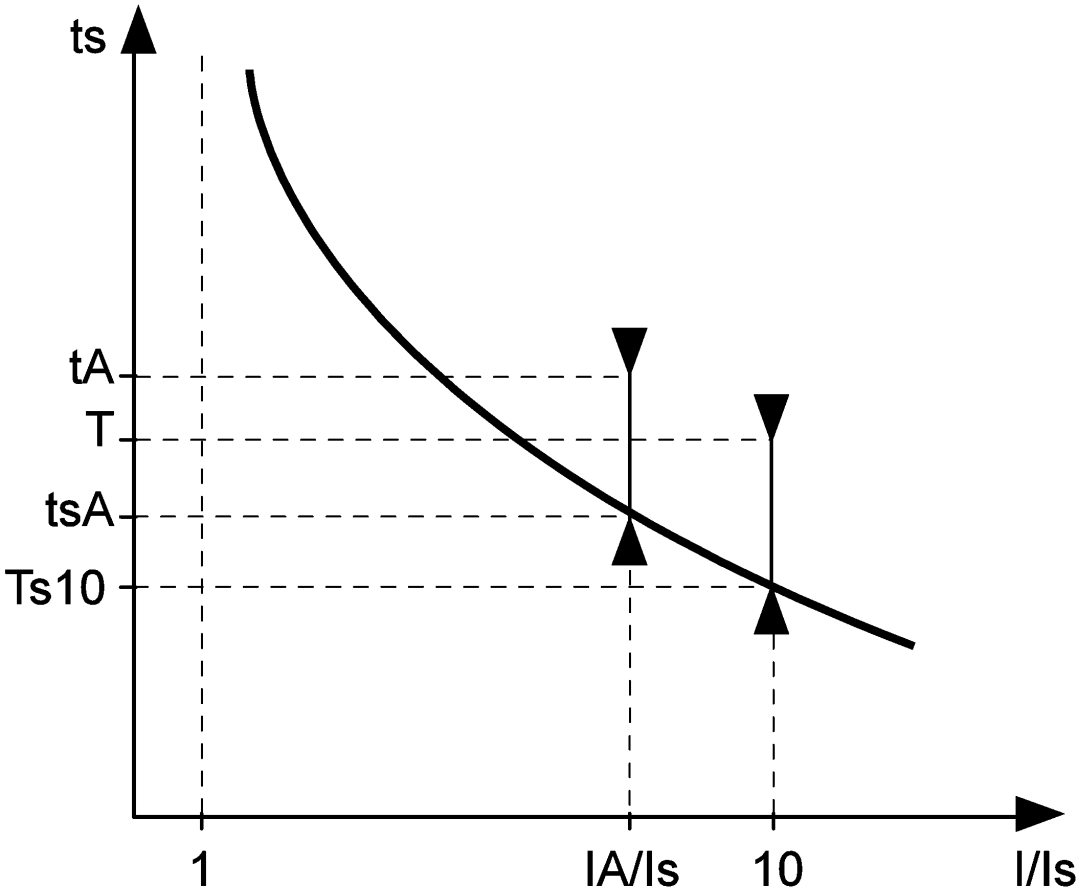


How to derive a curve by parallelism

Say a curve is known. We know tsA (s stands for the start curve) for IA/Is (s stands for setpoint).

Two curves with same k, a and c are parallel: K= tsA/Ts10 = tA/T. This can be used to find tA.

Figure 73. How to find tA by parallelism



In the preceding curves in logarithmic plot, Ts10=1. For a given I/Is (first column of next table), find K in the row. Then ta = K x T.

I/Is	SIT IEC/A	VIT, LTI IEC/B	EIT IEC/C	UIT	RI not av.	IEEE MI IEC/D	IEEE VI IEC/E	IEEE EI IEC/F
1.0	—	—	—	—	3.062	—	—	—
1.1	24.700 (1)	90.000 (1)	471.429 (1)	—	2.534	22.461	136.228	330.606
1.2	12.901	45.000	225.000	545.905	2.216	11.777	65.390	157.946
1.5	5.788	18.000	79.200	179.548	1.736	5.336	23.479	55.791
2.0	3.376	9.000	33.000	67.691	1.427	3.152	10.199	23.421
2.5	2.548	6.000	18.857	35.490	1.290	2.402	6.133	13.512
3.0	2.121	4.500	12.375	21.608	1.212	2.016	4.270	8.970
3.5	1.858	3.600	8.800	14.382	1.161	1.777	3.242	6.465
4.0	1.676	3.000	6.600	10.169	1.126	1.613	2.610	4.924
4.5	1.543	2.571	5.143	7.513	1.101	1.492	2.191	3.903
5.0	1.441	2.250	4.125	5.742	1.081	1.399	1.898	3.190
5.5	1.359	2.000	3.385	4.507	1.065	1.325	1.686	2.671
6.0	1.292	1.800	2.829	3.616	1.053	1.264	1.526	2.281
6.5	1.236	1.636	2.400	2.954	1.042	1.213	1.402	1.981
7.0	1.188	1.500	2.063	2.450	1.033	1.170	1.305	1.744
7.5	1.146	1.385	1.792	2.060	1.026	1.132	1.228	1.555
8.0	1.110	1.286	1.571	1.751	1.019	1.099	1.164	1.400
8.5	1.078	1.200	1.390	1.504	1.013	1.070	1.112	1.273
9.0	1.049	1.125	1.238	1.303	1.008	1.044	1.068	1.166
9.5	1.023	1.059	1.109	1.137	1.004	1.021	1.031	1.077
10.0	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
10.5	0.979	0.947	0.906	0.885	0.996	0.981	0.973	0.934
11.0	0.959	0.900	0.825	0.787	0.993	0.963	0.950	0.877
11.5	0.941	0.857	0.754	0.704	0.990	0.947	0.929	0.828
12.0	0.925	0.818	0.692	0.633	0.988	0.932	0.912	0.784
12.5	0.910	0.783	0.638	0.572	0.985	0.918	0.896	0.746
13.0	0.895	0.750	0.589	0.518	0.983	0.905	0.882	0.712
13.5	0.882	0.720	0.546	0.471	0.981	0.893	0.870	0.682
14.0	0.870	0.692	0.508	0.430	0.979	0.882	0.858	0.655
14.5	0.858	0.667	0.473	0.394	0.977	0.871	0.849	0.631
15.0	0.847	0.643	0.442	0.362	0.976	0.861	0.840	0.609
15.5	0.836	0.621	0.414	0.334	0.974	0.852	0.831	0.589
16.0	0.827	0.600	0.388	0.308	0.973	0.843	0.824	0.571
16.5	0.817	0.581	0.365	0.285	0.971	0.834	0.817	0.555
17.0	0.808	0.563	0.344	0.265	0.970	0.826	0.811	0.540
17.5	0.800	0.545	0.324	0.246	0.969	0.819	0.806	0.527
18.0	0.792	0.529	0.307	0.229	0.968	0.812	0.801	0.514
18.5	0.784	0.514	0.290	0.214	0.967	0.805	0.796	0.503
19.0	0.777	0.500	0.275	0.200	0.966	0.798	0.792	0.492
19.5	0.770	0.486	0.261	0.188	0.965	0.792	0.788	0.482
20.0	0.763	0.474	0.248	0.176	0.964	0.786	0.784	0.473

(1) Means only valid for IEC curves

ENTER A CODE

A code can be used to change a controller type into another (for example, a ***GENSYS COMPACT PRIME*** can be transformed into a ***HYBRID COMPACT***) or to add an option to your controller (i.e. MTU MDEC compatibility). Please contact **CRE TECHNOLOGY** for further information on how to obtain a code.

Note: When entering a code, it is preferable that no other devices than ***i4Gen Suite*** is connected to the controller.

1. To enter a code, go to the ***Controller settings*** ⇒ ***System*** ⇒ ***Code (i4Gen)*** page.
2. Click the "Confirm" button to send the code to the controller. A success message will show and the controller will restart.

You can now reconnect to the controller:

- If the code entered was to add an option, see the list of active options in the About page.
- If the code entered was to change the controller type, start a firmware update with the appropriated firmware version from the ***Controller settings*** ⇒ ***System*** ⇒ ***Update (i4Gen)*** page.

TROUBLESHOOTING

To get a history of alarms-faults, stop the Generator, connect to ***i4Gen*** ⇒ ***File transfer*** and click on the **Save** button beside **History - Alarms/Faults/Events/Logger**.

To restore factory settings from ***i4Gen Suite*** software, navigate to the ***Controller settings*** ⇒ ***System*** ⇒ ***Reset factory settings (i4Gen)*** page, and click on the **Reset** button.

Alarm/Fault messages

Fault "Oil pressure" on start

Check the related connections.

Check the related settings: mainly, delays and directions of digital/analog inputs.

The engine starts but runs above/below nominal speed.

Check the wiring.

Check the fuel level.

Check the speed output.

No J1939 communication

Check that the ECU is powered.

Check that the configuration correspond to the engine/ECU.

Check that the wiring is correct.

Check the supply order between the module and the ECU.

Check that the ECU and its settings are consistent with the J1939 standard.

Note: Some ECU do not provide information if the engine is stopped. Try starting the engine.

"Oil Pressure fault" on digital input is not displayed

Check configuration of digital input

Check controller status displayed (state "Gen ready" must be active, and timer *Delay before activation of the protections* [2004] (adjustable in ***Controller settings*** ⇒ ***General*** ⇒ ***Timers*** menu) must be elapsed before to activate oil pressure fault monitoring

Message "Isolated product"

Check the related connections, including the one of internal resistor (Connect the "RES" terminal and the "CAN H" terminal).

Check the related settings: Quantity 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 COMPACT 1B***/***BTB COMPACT*** products. One of them is not supplied or disconnected.

Message "Missing HYBRID"

Check the ***HYBRID COMPACT*** products. One of them is not supplied or disconnected.

Message "Missing BAT"

Check the ***BAT 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.

Message "Breaker" fault

Check the type of breaker against the selection in ***Controller settings*** ⇒ ***Inputs/Outputs*** ⇒ ***Digital/relays outputs***.

Stop the other generators.

Make sure the digital input set with the function "*Generator breaker feedback*" is connected.

Start the generators in **MAN** mode (or just press 

). Make sure the breaker LED turns on (green); otherwise, increase the "breaker feedback" time-out [2304] (default value 5.0s).

Cannot connect with PC

Consider deactivating the firewall and adding an Anti-virus exception.

Check the network wiring, see Network *(on page 97)*

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 Generator 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 parameters 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 level 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. Update your module to the latest version or get 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 at the tenth 5.00

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 warnings indicate that the 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 ….

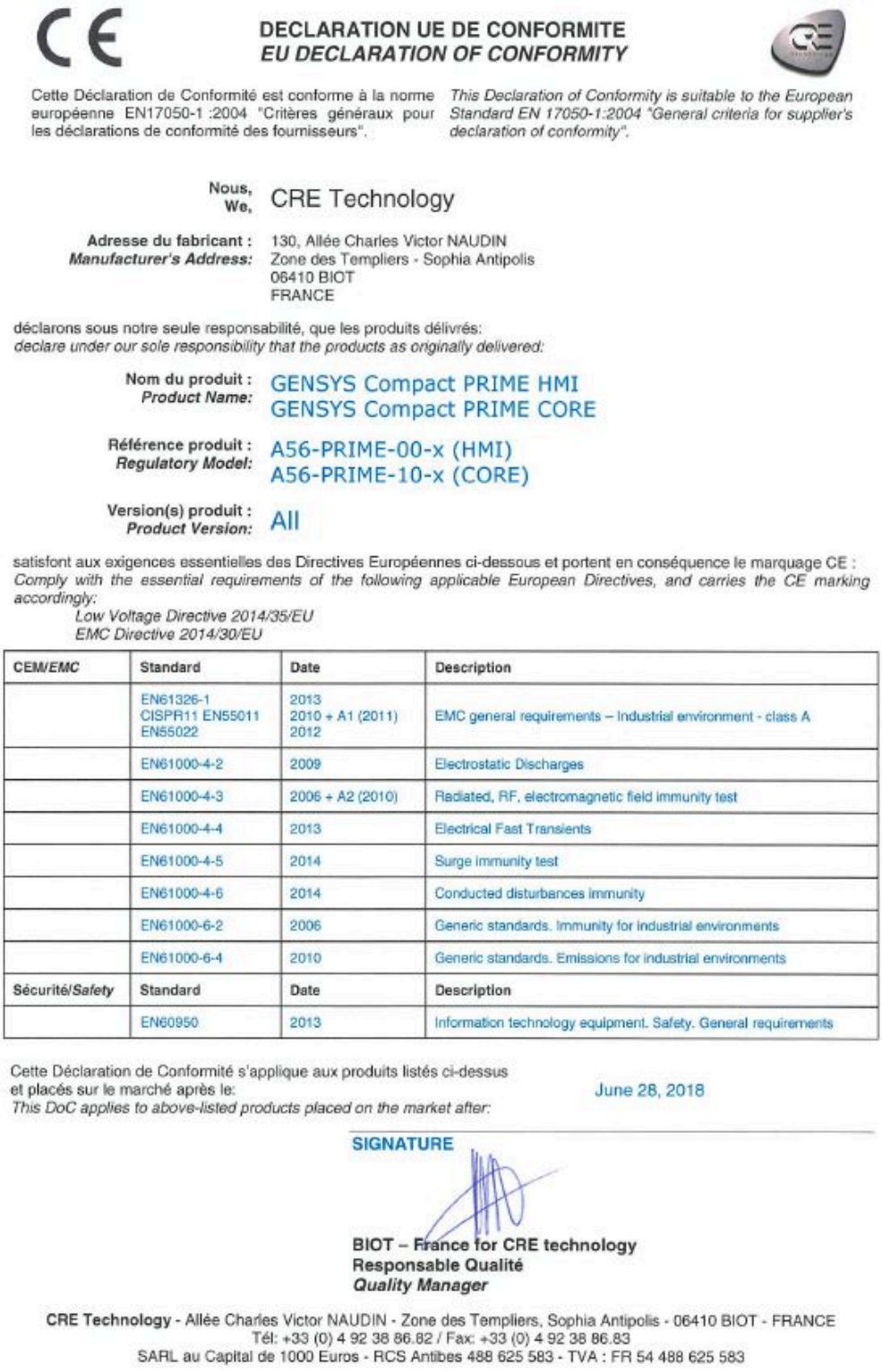
These warnings indicate that no value has been filled inside the configuration file for a unit/parameter/text or label. The values will stay unchanged.

WARNING 011: Variable …. does not exist.

The parameter does not exist. Check compatibility of the version/type of the module and the configuration file.

CERTIFICATIONS

Figure 74. 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:* GENSYS Compact PRIME HMI
GENSYS Compact PRIME CORE

Référence produit : *Regulatory Model:* A56-PRIME-00-x (HMI)
A56-PRIME-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

CRE Technology - Allée Charles Victor NAUDIN - Zone des Templiers, Sophia Antipolis - 06410 BIOT - FRANCE
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SARL au Capital de 1000 Euros - RCS Antibes 488 625 583 - TVA : FR 54 488 625 583

Certifications are available for download as PDF files at www.cretechnology.com in the download area.

SOFTWARE VARIABLES

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TABLE OF CONTENTS

DYNAMIC

SPEED CONTROL

Variable	Speed governor amplitude [2205]
Unit	V
Init value	10.00
Min value	0.00
Max value	10.00
Description	This parameter determines the amplitude of the speed output. Speed output voltage = Speed output offset + (Speed correction * Speed output amplitude). Ex: If the speed output offset is 5V and the amplitude is 2.5V, the speed output may vary between a minimum correction of 2.5V (5V + 2.5V) and a maximum correction of 7.5V (5V - 2.5V). On a 50Hz application, this parameter must be set to obtain a minimum correction of 47.5Hz and a maximum correction of 52.5Hz. On a 60Hz application, this parameter should be set to obtain a minimum correction of 57.5Hz and a maximum correction of 62.5Hz. In manual mode: - Use the shift + up arrow combination in the speed control page to increase the speed correction. - Use the shift + down arrow in the speed control page to decrease the speed correction.

Variable	Speed governor offset [2206]
Unit	V
Init value	0.00
Min value	-10.00
Max value	10.00
Description	This parameter determines the speed output offset. Speed output voltage = Speed output offset + (Speed correction * Speed output amplitude). Ex: If the speed output offset is 5V and the amplitude is 2.5V, the speed output may vary between a minimum correction of 2.5V (5V + 2.5V) and a maximum correction of 7.5V (5V - 2.5V). On a 50Hz application, this parameter should be set to 50Hz when there is no correction. On a 60Hz application, this parameter should be set to 60Hz when there is no correction. In manual mode: - Use the shift + up arrow combination in the speed control page to increase the speed correction. - Use the shift + down arrow in the speed control page to decrease the speed correction.

Variable	Pulse frequency dead band [3650]
Unit	%
Init value	1.00
Min value	0.00
Max value	100.00
Description	This setpoint adjusts the Dead Band in case of speed control by pulses. This dead band in % determinated the area around nominal frequency with no actions regarding +/- pulses output. If nominal frequency 50Hz, dead band 1 %. No pulse output between 49,5Hz to 50,5Hz

Variable	Frequency pulse divider [3652]
Unit	-
Init value	5
Min value	0
Max value	100
Description	This setpoint adjusts the "pulse divider" in case of speed control by pulses. This pulse divider is able to change the response time of speed control by pulses. If you increase the value of pulse divider, you will decrease the time of pulse active.

Variable	Droop (frequency) [2204]
Unit	%
Init value	2
Min value	0
Max value	20
Description	Droop (frequency). The steeper the slope, the more the frequency will drop on an increase in kW A slope that is too shallow, on the other hand, will give an imprecise distribution.

Variable	Speed output inversion [2212]
Unit	-
Init value	0
List	0: No 1: Yes
Description	Activate this parameter if the frequency increases when the speed correction decreases and if the frequency decreases when the speed correction increases. This parameter makes it possible to operate the control without reversing the "Speed common" and "Speed output" terminals.

AVR CONTROL

Variable	AVR Amplitude [2251]
Unit	V
Init value	10.00
Min value	0.00
Max value	10.00
Description	This parameter determines the amplitude of the voltage output. Voltage output = Voltage output offset + (Voltage correction * Voltage output amplitude). Ex : If the voltage output offset is 5V and the amplitude is 2.5V, the voltage output can vary between a minimum correction of 2.5V (5V + 2.5V) and a maximum correction of 7.5V (5V - 2.5V). On a 400V application, this parameter must be set to obtain a minimum correction of 370V and a maximum correction of 430V. In manual mode: - Use the shift + up arrow combination in the AVR control page to increase the voltage correction. - Use the combination shift + down arrow in the AVR control page to decrease the voltage correction.

Variable	AVR Offset [2252]
Unit	V
Init value	0.00
Min value	-10.00
Max value	10.00
Description	This parameter determines the offset of the voltage output. Voltage output = Voltage output offset + (Voltage correction * Voltage output amplitude). Ex : If the voltage output offset is 5V and the amplitude is 2.5V, the voltage output can vary between a minimum correction of 2.5V (5V + 2.5V) and a maximum correction of 7.5V (5V - 2.5V). On a 400V application, this parameter must be set to obtain 400V when there is no correction. In manual mode: - Use the shift + up arrow combination in the AVR control page to increase the voltage correction. - Use the combination shift + down arrow in the AVR control page to decrease the voltage correction.

Variable	Pulse voltage dead band [3651]
Unit	%
Init value	1.00
Min value	0.00
Max value	100.00
Description	This setpoint adjusts the Dead Band in case of voltage control by pulses. This dead band in % determinated the area around nominal voltage, with no actions regarding +/- pulses output. If nominal voltage 400Vac, dead band 1 %. No pulse output between 396Vac to 404Vac.

Variable	Voltage pulse divider [3653]
Unit	-
Init value	5
Min value	0
Max value	100
Description	This setpoint adjusts the "pulse divider" in case of voltage control by pulses. This pulse divider is able to change the response time of voltage control by pulses. If you increase the value of pulse divider, you will decrease the time of pulse active.

Variable	Droop (voltage) [2250]
Unit	%
Init value	2
Min value	0
Max value	20
Description	Droop (voltage). The steeper the slope, the more the voltage will drop on an increase in kVAR. A slope that is too shallow, on the other hand, will give an imprecise distribution.

Variable	AVR signal output inversion [2254]
Unit	-
Init value	0
List	0: No 1: Yes
Description	Activate this parameter if the voltage increases when the voltage correction decreases and if the voltage decreases when the voltage correction increases. This parameter allows the regulation to be operated without reversing the "AVR common" and "AVR output" terminals.

SYNCHRONIZATION PID

Phase

Variable	Phase Global Gain [2904]
Unit	-
Init value	10
Min value	0
Max value	100
Description	This parameter multiplies the 3 components of the regulation (P, I and D). In most cases it is recommended to leave the default values of P, I and D and to change only this parameter. If the system seems too slow, increase this parameter. If on the contrary the system is unstable due to a too strong correction, decrease this parameter. Phase regulation is active during synchronization if the frequency of the generator(s) is close to the frequency setpoint (value to be reached for coupling). When the generator frequency is too far from the frequency setpoint, the phase regulation is not active, only the frequency regulation is. Therefore, to correctly adjust the phase regulation, it is necessary to have a frequency on the generator close to the frequency setpoint, by modifying the offset for example, or by having correctly adjusted the frequency regulation beforehand.

Variable	Phase Proportional [2905]
Unit	-
Init value	30
Min value	0
Max value	100
Description	This parameter should only be changed if the system has not been correctly regulated by changing the Gain alone. In this case, refer to the chapter "Control Loop PID" in the technical documentation of your product for a step-by-step method of adjustment. As a general rule : - G must remain fixed, neither too low nor too high, it multiplies the 3 other components - Set P, I and D to 0 - Increase P until you have a system that corrects quickly enough, without major instabilities. In most cases, an error persists between the measurement and the setpoint (value to be reached). - Increase I to correct this persistent error over time. - Increase D to reduce the oscillations, if they exist. Phase regulation is active during synchronization if the frequency of the generator(s) is close to the frequency setpoint (value to be reached for coupling). When the generator frequency is too far from the frequency setpoint, the phase regulation is not active, only the frequency regulation is. Therefore, to correctly adjust the phase regulation, it is necessary to have a frequency on the generator close to the frequency setpoint, by modifying the offset for example, or by having correctly adjusted the frequency regulation beforehand.

Variable	Phase Integral [2906]
Unit	-
Init value	10
Min value	0
Max value	100
Description	This parameter should only be changed if the system has not been correctly regulated by changing the Gain alone. In this case, refer to the chapter "Control Loop PID" in the technical documentation of your product for a step-by-step method of adjustment. As a general rule : - G must remain fixed, neither too low nor too high, it multiplies the 3 other components - Set P, I and D to 0 - Increase P until you have a system that corrects quickly enough, without major instabilities. In most cases, an error persists between the measurement and the setpoint (value to be reached). - Increase I to correct this persistent error over time. - Increase D to reduce the oscillations, if they exist. Phase regulation is active during synchronization if the frequency of the generator(s) is close to the frequency setpoint (value to be reached for coupling). When the generator frequency is too far from the frequency setpoint, the phase regulation is not active, only the frequency regulation is. Therefore, to correctly adjust the phase regulation, it is necessary to have a frequency on the generator close to the frequency setpoint, by modifying the offset for example, or by having correctly adjusted the frequency regulation beforehand.

Variable	Phase Derivate [2907]
Unit	-
Init value	0
Min value	0
Max value	100
Description	This parameter should only be changed if the system has not been correctly regulated by changing the Gain alone. In this case, refer to the chapter "Control Loop PID" in the technical documentation of your product for a step-by-step method of adjustment. As a general rule : - G must remain fixed, neither too low nor too high, it multiplies the 3 other components - Set P, I and D to 0 - Increase P until you have a system that corrects quickly enough, without major instabilities. In most cases, an error persists between the measurement and the setpoint (value to be reached). - Increase I to correct this persistent error over time. - Increase D to reduce the oscillations, if they exist. Phase regulation is active during synchronization if the frequency of the generator(s) is close to the frequency setpoint (value to be reached for coupling). When the generator frequency is too far from the frequency setpoint, the phase regulation is not active, only the frequency regulation is. Therefore, to correctly adjust the phase regulation, it is necessary to have a frequency on the generator close to the frequency setpoint, by modifying the offset for example, or by having correctly adjusted the frequency regulation beforehand.

Frequency

Variable	Frequency Global Gain [2900]
Unit	-
Init value	10
Min value	0
Max value	100
Description	This parameter multiplies the 3 components of the regulation (P, I and D). In most cases it is recommended to leave the default values of P, I and D and to change only this parameter. If the system seems too slow, increase this parameter. If on the contrary the system is unstable due to a too strong correction, decrease this parameter. The frequency regulation is active during the synchronization if the frequency of the generator(s) is very far from the setpoint (value to be reached for coupling). When the frequency is close to the setpoint, the frequency regulation is not active, only the phase regulation is. Therefore, to correctly adjust the frequency regulation, it is necessary to move the frequency away from the setpoint, for example by changing the offset, or by manually changing the speed correction.

Variable	Frequency Proportional [2901]
Unit	-
Init value	7
Min value	0
Max value	100
Description	This parameter should only be changed if the system has not been correctly regulated by changing the Gain alone. In this case, refer to the chapter "Control Loop PID" in the technical documentation of your product for a step-by-step method of adjustment. As a general rule : - G must remain fixed, neither too low nor too high, it multiplies the 3 other components - Set P, I and D to 0 - Increase P until you have a system that corrects quickly enough, without major instabilities. In most cases, an error persists between the measurement and the setpoint (value to be reached). - Increase I to correct this persistent error over time. - Increase D to reduce the oscillations, if they exist. The frequency regulation is active during the synchronization if the frequency of the generator(s) is very far from the setpoint (value to be reached for coupling). When the frequency is close to the setpoint, the frequency regulation is not active, only the phase regulation is. Therefore, to correctly adjust the frequency regulation, it is necessary to move the frequency away from the setpoint, for example by changing the offset, or by manually changing the speed correction.

Variable	Frequency Integral [2902]
Unit	-
Init value	10
Min value	0
Max value	100
Description	This parameter should only be changed if the system has not been correctly regulated by changing the Gain alone. In this case, refer to the chapter "Control Loop PID" in the technical documentation of your product for a step-by-step method of adjustment. As a general rule : - G must remain fixed, neither too low nor too high, it multiplies the 3 other components - Set P, I and D to 0 - Increase P until you have a system that corrects quickly enough, without major instabilities. In most cases, an error persists between the measurement and the setpoint (value to be reached). - Increase I to correct this persistent error over time. - Increase D to reduce the oscillations, if they exist. The frequency regulation is active during the synchronization if the frequency of the generator(s) is very far from the setpoint (value to be reached for coupling). When the frequency is close to the setpoint, the frequency regulation is not active, only the phase regulation is. Therefore, to correctly adjust the frequency regulation, it is necessary to move the frequency away from the setpoint, for example by changing the offset, or by manually changing the speed correction.

Variable	Frequency Derivate [2903]
Unit	-
Init value	0
Min value	0
Max value	100
Description	This parameter should only be changed if the system has not been correctly regulated by changing the Gain alone. In this case, refer to the chapter "Control Loop PID" in the technical documentation of your product for a step-by-step method of adjustment. As a general rule : - G must remain fixed, neither too low nor too high, it multiplies the 3 other components - Set P, I and D to 0 - Increase P until you have a system that corrects quickly enough, without major instabilities. In most cases, an error persists between the measurement and the setpoint (value to be reached). - Increase I to correct this persistent error over time. - Increase D to reduce the oscillations, if they exist. The frequency regulation is active during the synchronization if the frequency of the generator(s) is very far from the setpoint (value to be reached for coupling). When the frequency is close to the setpoint, the frequency regulation is not active, only the phase regulation is. Therefore, to correctly adjust the frequency regulation, it is necessary to move the frequency away from the setpoint, for example by changing the offset, or by manually changing the speed correction.

Voltage

Variable	Voltage Global Gain [2950]
Unit	-
Init value	10
Min value	0
Max value	100
Description	This parameter multiplies the 3 components of the regulation (P, I and D). In most cases it is recommended to leave the default values of P, I and D and to change only this parameter. If the system seems too slow, increase this parameter. If on the contrary the system is unstable due to a too strong correction, decrease this parameter. The voltage regulation is active during the whole synchronization phase of the generator(s). To correctly adjust the voltage regulation, it is necessary to move the voltage away from the setpoint, for example by changing the offset, or by manually changing the voltage correction.

Variable	Voltage Proportional [2951]
Unit	-
Init value	20
Min value	0
Max value	100
Description	This parameter should only be changed if the system has not been correctly regulated by changing the Gain alone. In this case, refer to the chapter "Control Loop PID" in the technical documentation of your product for a step-by-step method of adjustment. As a general rule : - G must remain fixed, neither too low nor too high, it multiplies the 3 other components - Set P, I and D to 0 - Increase P until you have a system that corrects quickly enough, without major instabilities. In most cases, an error persists between the measurement and the setpoint (value to be reached). - Increase I to correct this persistent error over time. - Increase D to reduce the oscillations, if they exist. The voltage regulation is active during the whole synchronization phase of the generator(s). To correctly adjust the voltage regulation, it is necessary to move the voltage away from the setpoint, for example by changing the offset, or by manually changing the voltage correction.

Variable	Voltage Integral [2952]
Unit	-
Init value	15
Min value	0
Max value	100
Description	This parameter should only be changed if the system has not been correctly regulated by changing the Gain alone. In this case, refer to the chapter "Control Loop PID" in the technical documentation of your product for a step-by-step method of adjustment. As a general rule : - G must remain fixed, neither too low nor too high, it multiplies the 3 other components - Set P, I and D to 0 - Increase P until you have a system that corrects quickly enough, without major instabilities. In most cases, an error persists between the measurement and the setpoint (value to be reached). - Increase I to correct this persistent error over time. - Increase D to reduce the oscillations, if they exist. The voltage regulation is active during the whole synchronization phase of the generator(s). To correctly adjust the voltage regulation, it is necessary to move the voltage away from the setpoint, for example by changing the offset, or by manually changing the voltage correction.

Variable	Voltage Derivate [2953]
Unit	-
Init value	0
Min value	0
Max value	100
Description	This parameter should only be changed if the system has not been correctly regulated by changing the Gain alone. In this case, refer to the chapter "Control Loop PID" in the technical documentation of your product for a step-by-step method of adjustment. As a general rule : - G must remain fixed, neither too low nor too high, it multiplies the 3 other components - Set P, I and D to 0 - Increase P until you have a system that corrects quickly enough, without major instabilities. In most cases, an error persists between the measurement and the setpoint (value to be reached). - Increase I to correct this persistent error over time. - Increase D to reduce the oscillations, if they exist. The voltage regulation is active during the whole synchronization phase of the generator(s). To correctly adjust the voltage regulation, it is necessary to move the voltage away from the setpoint, for example by changing the offset, or by manually changing the voltage correction.

ISOCHRONOUS LOAD SHARING PID

Active power / Frequency

Variable	kW/Freq Gain [2908]
Unit	-
Init value	10
Min value	0
Max value	100
Description	This parameter multiplies the 3 components of the regulation (P, I and D). In most cases it is recommended to leave the default values of P, I and D and to change only this parameter. If the system seems too slow, increase this parameter. If on the contrary the system is unstable due to a too strong correction, decrease this parameter. The kW regulation is active as soon as the genset(s) are paralleled to another source. The parameters of this regulation ensure simultaneously: - kW regulation in all conditions (load ramp, unload ramp, stabilization phase). - Frequency regulation when the generator(s) are paralleled to another source. Not to be confused with the regulation dedicated to the frequency which only ensures the synchronization before coupling.

Variable	kW/Freq Proportional [2909]
Unit	-
Init value	50
Min value	0
Max value	100
Description	This parameter should only be changed if the system has not been correctly regulated by changing the Gain alone. In this case, refer to the chapter "Control Loop PID" in the technical documentation of your product for a step-by-step method of adjustment. As a general rule : - G must remain fixed, neither too low nor too high, it multiplies the 3 other components - Set P, I and D to 0 - Increase P until you have a system that corrects quickly enough, without major instabilities. In most cases, an error persists between the measurement and the setpoint (value to be reached). - Increase I to correct this persistent error over time. - Increase D to reduce the oscillations, if they exist. The kW regulation is active as soon as the genset(s) are paralleled to another source. The parameters of this regulation ensure simultaneously: - kW regulation in all conditions (load ramp, unload ramp, stabilization phase). - Frequency regulation when the generator(s) are paralleled to another source. Not to be confused with the regulation dedicated to the frequency which only ensures the synchronization before coupling.

Variable	kW/Freq Integral [2910]
Unit	-
Init value	10
Min value	0
Max value	100
Description	This parameter should only be changed if the system has not been correctly regulated by changing the Gain alone. In this case, refer to the chapter "Control Loop PID" in the technical documentation of your product for a step-by-step method of adjustment. As a general rule : - G must remain fixed, neither too low nor too high, it multiplies the 3 other components - Set P, I and D to 0 - Increase P until you have a system that corrects quickly enough, without major instabilities. In most cases, an error persists between the measurement and the setpoint (value to be reached). - Increase I to correct this persistent error over time. - Increase D to reduce the oscillations, if they exist. The kW regulation is active as soon as the genset(s) are paralleled to another source. The parameters of this regulation ensure simultaneously: - kW regulation in all conditions (load ramp, unload ramp, stabilization phase). - Frequency regulation when the generator(s) are paralleled to another source. Not to be confused with the regulation dedicated to the frequency which only ensures the synchronization before coupling.

Variable	kW/Freq Derivative [2911]
Unit	-
Init value	0
Min value	0
Max value	100
Description	This parameter should only be changed if the system has not been correctly regulated by changing the Gain alone. In this case, refer to the chapter "Control Loop PID" in the technical documentation of your product for a step-by-step method of adjustment. As a general rule : - G must remain fixed, neither too low nor too high, it multiplies the 3 other components - Set P, I and D to 0 - Increase P until you have a system that corrects quickly enough, without major instabilities. In most cases, an error persists between the measurement and the setpoint (value to be reached). - Increase I to correct this persistent error over time. - Increase D to reduce the oscillations, if they exist. The kW regulation is active as soon as the genset(s) are paralleled to another source. The parameters of this regulation ensure simultaneously: - kW regulation in all conditions (load ramp, unload ramp, stabilization phase). - Frequency regulation when the generator(s) are paralleled to another source. Not to be confused with the regulation dedicated to the frequency which only ensures the synchronization before coupling.

Variable	Frequency centering [2914]
Unit	-
Init value	10
Min value	0
Max value	100
Description	The kW regulation affects both kW and frequency simultaneously when the genset(s) are paralleled to another source. This parameter allows you to give more or less importance to each in the regulation. The higher the value of this parameter, the more the frequency will be corrected at the disadvantage of the kW. Conversely, the lower the value of this parameter, the more the KW will be corrected at the disadvantage of the frequency. In most cases, it is recommended not to change the default value.

Reactive power / Voltage

Variable	kVAR/Voltage Gain [2954]
Unit	-
Init value	10
Min value	0
Max value	100
Description	This parameter multiplies the 3 components of the regulation (P, I and D). In most cases it is recommended to leave the default values of P, I and D and to change only this parameter. If the system seems too slow, increase this parameter. If on the contrary the system is unstable due to a too strong correction, decrease this parameter. The kVAR regulation is active as soon as the genset(s) are paralleled to another source. The parameters of this regulation ensure simultaneously: - kVAR regulation in all conditions (load ramp, unload ramp, stabilization phase). - Voltage regulation when the genset(s) are paralleled to another source. Not to be confused with the dedicated voltage regulation which only ensures the synchronization before coupling.

Variable	kVAR/Voltage Proportional [2955]
Unit	-
Init value	50
Min value	0
Max value	100
Description	This parameter should only be changed if the system has not been correctly regulated by changing the Gain alone. In this case, refer to the chapter "Control Loop PID" in the technical documentation of your product for a step-by-step method of adjustment. As a general rule : - G must remain fixed, neither too low nor too high, it multiplies the 3 other components - Set P, I and D to 0 - Increase P until you have a system that corrects quickly enough, without major instabilities. In most cases, an error persists between the measurement and the setpoint (value to be reached). - Increase I to correct this persistent error over time. - Increase D to reduce the oscillations, if they exist. The kVAR regulation is active as soon as the genset(s) are paralleled to another source. The parameters of this regulation ensure simultaneously: - kVAR regulation in all conditions (load ramp, unload ramp, stabilization phase). - Voltage regulation when the genset(s) are paralleled to another source. Not to be confused with the dedicated voltage regulation which only ensures the synchronization before coupling.

Variable	kVAR/Voltage Integral [2956]
Unit	-
Init value	10
Min value	0
Max value	100
Description	This parameter should only be changed if the system has not been correctly regulated by changing the Gain alone. In this case, refer to the chapter "Control Loop PID" in the technical documentation of your product for a step-by-step method of adjustment. As a general rule : - G must remain fixed, neither too low nor too high, it multiplies the 3 other components - Set P, I and D to 0 - Increase P until you have a system that corrects quickly enough, without major instabilities. In most cases, an error persists between the measurement and the setpoint (value to be reached). - Increase I to correct this persistent error over time. - Increase D to reduce the oscillations, if they exist. The kVAR regulation is active as soon as the genset(s) are paralleled to another source. The parameters of this regulation ensure simultaneously: - kVAR regulation in all conditions (load ramp, unload ramp, stabilization phase). - Voltage regulation when the genset(s) are paralleled to another source. Not to be confused with the dedicated voltage regulation which only ensures the synchronization before coupling.

Variable	kVAR/Voltage Derivate [2957]
Unit	-
Init value	0
Min value	0
Max value	100
Description	This parameter should only be changed if the system has not been correctly regulated by changing the Gain alone. In this case, refer to the chapter "Control Loop PID" in the technical documentation of your product for a step-by-step method of adjustment. As a general rule : - G must remain fixed, neither too low nor too high, it multiplies the 3 other components - Set P, I and D to 0 - Increase P until you have a system that corrects quickly enough, without major instabilities. In most cases, an error persists between the measurement and the setpoint (value to be reached). - Increase I to correct this persistent error over time. - Increase D to reduce the oscillations, if they exist. The kVAR regulation is active as soon as the genset(s) are paralleled to another source. The parameters of this regulation ensure simultaneously: - kVAR regulation in all conditions (load ramp, unload ramp, stabilization phase). - Voltage regulation when the genset(s) are paralleled to another source. Not to be confused with the dedicated voltage regulation which only ensures the synchronization before coupling.

Variable	Voltage centering [2958]
Unit	-
Init value	10
Min value	0
Max value	100
Description	The kVAR regulation simultaneously affects the kVAR and the voltage when the genset(s) are paralleled to another source. This parameter allows you to give more or less importance to each in the regulation. The higher the value of this parameter, the more the voltage will be corrected at the disadvantage of the kVARs. Conversely, the lower the value of this parameter, the more the KVARs will be corrected at the disadvantage of the voltage. In most cases, it is recommended not to change the default value.

GENERAL

APPLICATION

General

Variable	My number [2001]
Unit	-
Init value	1
Min value	1
Max value	32
Description	This parameter is used to define the product identifier for communication between products. It must be unique for each controller 'type': - Number GENSYS COMPACT from first to last (32 maximum) - Number MASTER COMPACT, MASTER COMPACT 1B and BTB COMPACT from first to last (32 maximum) - Number HYBRID COMPACT from first to last (32 maximum) - Number BAT COMPACT from first to last (max. 32)

Variable	Number of GENSYS COMPACT PRIME [2000]
Unit	-
Init value	2
Min value	0
Max value	32
Description	Number of GENSYS COMPACT PRIME on the power plant. This parameter is used for the CAN communication between products.

Variable	Number of MASTER COMPACT/BTB COMPACT [2017]
Unit	-
Init value	0
Min value	0
Max value	32
Description	Number of MASTER COMPACT / MASTER COMPACT 1B / BTB (combined) on the power plant. This parameter is used for the CAN communication between products.

Variable	Number of HYBRID COMPACT [2025]
Unit	-
Init value	0
Min value	0
Max value	32
Description	Number of HYBRID COMPACT on the power plant. This parameter is used for the CAN communication between products.

Variable	Number of BAT COMPACT [2030]
Unit	-
Init value	0
Min value	0
Max value	1
Description	Number of BAT COMPACT on the power plant. This parameter is used for the CAN communication between products.

Variable	Connection type [2003]
Unit	-
Init value	2
List	0: Monophase 1: Biphase 180° 2: Triphase 120° (3 or 4 wires) 3: Triphase L1-N-L2 4: Triphase L2-N-L3 5: Triphase L3-N-L1
Description	This parameter is used to select the voltage system that will be applied to all the voltage sources managed by the product. 6 values can be selected: - Single phase: Connection of one active phase and one neutral. Connect the voltages on terminals L1-N. Connect the currents on I1-IN. - Two phase 180°: Connection of 2 active phases (and an optional neutral). Connect the voltages to terminals L1-L3 (and optional N). Connect the currents to I1-I3-IN. If the neutral is not connected to the voltage terminal block, the product will calculate a virtual neutral by itself. - Three-phase 120°: Connection of 3 active phases (and an optional neutral). Connect the voltages on terminals L1-L2-L3 (and optional N). Connect the currents to I1-I2-I3-IN. If the neutral is not connected to the voltage terminal block, the product will calculate a virtual neutral by itself. - Three-phase L1-N-L2: Connection of 3 active phases and a neutral. High leg on L3, neutral between L1 and L2. The neutral must be connected. - Three-phase L2-N-L3: Connection of 3 active phases and a neutral. High leg on L1, neutral between L2 and L3. The neutral must be connected. - Three-phase L3-N-L1: Connection of 3 active phases and a neutral. High leg on L2, neutral between L3 and L1. The neutral must be connected.

Mode

Variable	Power on mode [2012]
Unit	-
Init value	0
List	0: Manual 1: Test 2: Auto
Description	This parameter is used to select the mode of the product when the power supply is applied. 3 values can be used : - Manual : The product will switch-on on Manual mode - Test : The product will switch-on on Test mode - Auto : The product will switch-on on Auto mode

Variable	Test mode operation [2014]
Unit	-
Init value	0
List	0: On load 1: Off load 2: On load with timer
Description	This parameter is used to select the actions for test mode on the product. 3 values can be used : - On load : The generator(s) start(s) and the breaker(s) close(s) to take the load. - Off load : The generator(s) start(s) but the breaker does not close. - On load with timer :The generator start, run without load during a configurable timer, and the breaker closes.

Variable	Limited time test mode [2015]
Unit	-
Init value	0
List	0: No 1: Yes
Description	This parameter is used to activate an operation delay in test mode. During this timer, the test mode is activated. At the end of this timer, the product will be forced on auto mode and the generator will stop if there is no active remote start.

Variable	Test mode duration [2016]
Unit	s
Init value	600
Min value	0
Max value	65535
Description	This parameter allows you to set the time for which the product will remain in test mode if the limited time test mode has been activated.

Synchronization & Load Sharing only

Variable	Synchronization & Load sharing only [2024]
Unit	-
Init value	0
List	0: No 1: Yes
Description	This parameter determines if the product should process only synchronization and kW/kVAR management. 2 values can be selected: - No: Standard operation of the product with management of the faults when the feedback of the circuit breakers is not in conformity with the orders of the product, management of the engine. - Yes: Circuit-breaker faults are not managed, which leaves more flexibility in sequences when circuit-breaker close/open commands are given by a PLC. The engine sequence is not managed. The product will start the synchronization sequence if voltage and frequency are between 95% and 105% of nominal and a digital input configured as 'Remote start on load' is activated. The kW management function is activated as soon as a digital input configured as 'Generator breaker feedback' is activated. In this operating mode, the product can only be used in automatic mode.

TIMERS

Start sequence

Variable	Pre-start timer (Glow plugs & Auxiliaries) [3456]
Unit	s
Init value	0.0
Min value	0.0
Max value	999.9
Description	This timer determines how long the Pre-Start output will remain active. This output can be used to activate the glow plugs or any auxiliary functions of Pre-Start (water preheating, pre-lubrication, etc.).

Variable	Engine preheat timer (Idle or Nominal speed) [3467]
Unit	s
Init value	0.0
Min value	0.0
Max value	999.9
Description	Engine preheat timer without load. During the entire engine preheat time, the engine can run at nominal speed or at idle: See page Engine / Start/Stop.

Variable	Speed stabilization timer [3469]
Unit	s
Init value	3.0
Min value	0.0
Max value	999.9
Description	Time during which the speed must remain stable between 95 and 105% of nominal before continuing the engine sequence. By default, the speed must remain stable for 3s between 95 and 105% of nominal. Not to be confused with the maximum time (available in the protection pages) at the end of which the product will stop the engine if the speed has not stabilized.

Variable	Voltage stabilization timer [2056]
Unit	s
Init value	3.0
Min value	0.0
Max value	999.9
Description	Time during which the voltage must remain stable between 95 and 105% of nominal before continuing the engine sequence. By default, the voltage must remain stable for 3s between 95 and 105% of nominal. Not to be confused with the maximum time (available in the protection pages) at the end of which the product will stop the engine if the voltage has not stabilized.

Variable	Delay before activation of the protections [2004]
Unit	s
Init value	10.0
Min value	0.0
Max value	999.9
Description	Waiting time before activating the protections once the engine is ready. By default, the time delay is 10s, i.e. the protections will be activated 10 seconds after the stabilization in voltage of the generator which is the last phase of the engine sequence.

Variable	Off load timer (Only for start with timer) [3478]
Unit	s
Init value	1800.0
Min value	0.0
Max value	6553.5
Description	This delay is used during a start on load with delay, either by activating a digital input configured as "Start on load with delay" in auto mode, or by using the test mode by having configured the product to do a "Start on load with delay" test. It corresponds to the waiting time between the end of the engine sequence and the closure of the generator breaker.

Stop sequence

Variable	Cooling timer (Idle or Nominal speed) [3470]
Unit	s
Init value	10.0
Min value	0.0
Max value	999.9
Description	Time delay for the engine to cool down after the stop request. While the engine is cooling down, the engine can run at nominal speed or at idle: See page Engine / Start/Stop.

Variable	Energize to stop hold timer [3472]
Unit	s
Init value	0.0
Min value	0.0
Max value	999.9
Description	Holding time of the energize to stop output after the speed measurement has reached zero.

Gas

Variable	Time before ignition [3480]
Unit	s
Init value	2.0
Min value	0.0
Max value	999.9
Description	Time during which the starter is active without ignition

Variable	Ignition time on start [3481]
Unit	s
Init value	2.0
Min value	0.0
Max value	999.9
Description	Ignition activation time at engine start

Variable	Ignition time on stop [3482]
Unit	s
Init value	4.0
Min value	0.0
Max value	999.9
Description	Ignition activation time at engine stop

Ramp timer

Variable	Load ramp timer [2853]
Unit	s
Init value	30.0
Min value	0.0
Max value	1600.0
Description	This setpoint adjusts the load ramp timer, for load sharing or mains paralleling mode. In case of a battery it adjusts the discharge ramp timer. 100 % of this timer corresponds to transfer 100% of generator/power plant/battery 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
Init value	30.0
Min value	0.0
Max value	1600.0
Description	This setpoint adjusts the unload ramp timer, for load sharing or mains paralleling mode. In case of a battery it adjusts the charge ramp timer. 100 % of this timer corresponds to transfer 100% of generator/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.

Static paralleling

Variable	Waiting for deexcitation timer [2051]
Unit	s
Init value	30.0
Min value	0.0
Max value	999.9
Description	In the case of operation in static paralleling, if the generator circuit breaker has just opened, and the automatic control system wants to put the generator back on the busbar, either because the generator was in the stop phase and the production request has been reactivated, or because the automated system has opened the circuit breaker and is trying to close it again following the tripping of a protection configured as an electrical fault, then, if there is no voltage on the busbar, the automated system will try to de-energize the alternator for the time configured in this time delay in order to restart a static paralleling sequence. If the alternator fails to de-energize, the automated system will apply the standard sequence, without static paralleling.

Others

Variable	Horn timer [2478]
Unit	s
Init value	1.0
Min value	0.0
Max value	6553.5
Description	Duration of activation of the horn which is activated each time an alarm or fault occurs on the product. The value 0 means that the horn will sound until the alarms/ faults on the product are manually acknowledged.

CAN

CAN 1

Variable	CAN 1 baud rate [3050]
Unit	-
Init value	125
List	125: 125 kBit/s 250: 250 kBit/s 500: 500 kBit/s 1000: 1000 kBit/s
Description	CAN bus speed 1: - Used for communication between products with the proprietary CRE protocol (Only for communicating products). - Used for the connection of inputs/outputs with the CANopen protocol when the MTU MDEC protocol is activated on CAN 2 (Only for products with engine control). Higher speed results in a reduction of the maximum bus distance.

Variable	Starting on loss of communication with BAT COMPACT [2046]
Unit	-
Init value	0
List	0: No 1: Yes
Description	This parameter only affects the product in applications with one or more BAT COMPACT. It determines the behaviour of the product when the BAT COMPACT no longer sends a frame on the CAN bus (power failure or other problems). For applications with BTB COMPACT the product will only act according to this parameter if the BAT COMPACT is within the same segment.

Variable	Starting on loss of communication with MASTER COMPACT [2019]
Unit	-
Init value	0
List	0: No 1: Yes
Description	This parameter only affects the product in applications with one or more MASTER COMPACT / MASTER COMPACT 1B. It determines the behaviour of the product when the MASTER COMPACT / MASTER COMPACT 1B no longer sends a frame on the CAN bus (power failure or other problems). For applications with BTB COMPACT, the product will only act according to this parameter if the MASTER COMPACT / MASTER COMPACT 1B that no longer sends a frame is in the same segment.

Variable	Inhibition remote start from CAN [2018]
Unit	-
Init value	0
List	0: No 1: Yes
Description	Allows a unit to ignore a remote start request coming from another product connected via CAN

CAN 2

Variable	CAN 2 baud rate [3051]
Unit	-
Init value	125
List	125: 125 kBit/s 250: 250 kBit/s 500: 500 kBit/s 1000: 1000 kBit/s
Description	CAN bus speed 2: - Used for connecting inputs/outputs with the CANopen protocol (Except when using the MDEC protocol, in which case the CANopen inputs/outputs must be connected to CAN 1). If the J1939 protocol is disabled, this parameter determines the communication speed of the CAN 2 bus. - Used for the communication between the product and the ECU with the J1939 protocol (Only for products with engine control). When the J1939 protocol is enabled, the CAN 2 bus speed is forced to 250kb/s. This parameter will not impact the bus speed. - Used for the communication between the product and the ECU with the MDEC protocol (Only for products with engine control). When the MDEC protocol is enabled, the CAN 2 bus speed is forced to 125kb/s. This parameter will not impact the bus speed. A higher speed results in a reduction of the maximum bus distance.

Segment

Variable	Segment number [2020]
Unit	-
Init value	1
Min value	1
Max value	33
Description	Segment number of the unit

EVENTS

Variable	Record power up [8300]
Unit	-
Init value	1
List	0: No 1: Yes
Description	Records controller power up event

Variable	Record engine status (Start/Stop) [8301]
Unit	-
Init value	1
List	0: No 1: Yes
Description	Records engine start and stop events

Variable	Record circuit breaker status (Open/Closed) [8303]
Unit	-
Init value	1
List	0: No 1: Yes
Description	Records breaker closing and opening events

Variable	Record operating mode [8304]
Unit	-
Init value	1
List	0: No 1: Yes
Description	Records controller mode switching events (automatic, test, manual)

METERS

Variable	Generator KWh [79]
Unit	kWh
Init value	0
Min value	0
Max value	4294967295
Description	Generator kWH (lower bytes)

Variable	Generator KVARh [81]
Unit	kVARh
Init value	0
Min value	0
Max value	4294967295
Description	Generator kVARH (lower bytes)

Variable	Number of hours generator running [83]
Unit	h
Init value	0
Min value	0
Max value	4294967295
Description	Generator run hours (lower bytes)

Variable	Number of generator starts [78]
Unit	-
Init value	0
Min value	0
Max value	65535
Description	Number of starts (only information)

Variable	Number of hours in override mode [96]
Unit	h
Init value	0
Min value	0
Max value	4294967295
Description	Running hours in override mode (lower bytes)

Variable	Generator Auxiliary Hours Run [93]
Unit	h
Init value	0
Min value	0
Max value	4294967295
Description	Generator auxiliary run hours (lower bytes)

ELECTRICAL

GENERATOR

General

Variable	Nominal active power [2105]
Unit	kW
Init value	300
Min value	1
Max value	32500
Description	This parameter is used to set the nominal active power (kW). All the protections based on the active power and the control loops are calculated as a percentage of this value.

Variable	Nominal reactive power [2106]
Unit	kVAR
Init value	220
Min value	1
Max value	32500
Description	This parameter is used to set the nominal reactive power (kVAR). All the protections based on the reactive power and the control loops are calculated as a percentage of this value.

Variable	Nominal voltage [2102]
Unit	V
Init value	400
Min value	0
Max value	65535
Description	This parameter is used to set the nominal voltage: - Three-phase and two-phase: Enter a phase-to-phase voltage. - Single-phase: Enter a phase-to-neutral voltage. All the protections based on the voltage as well as the control loops are calculated as a percentage of this value. For low voltage (400VAC, 440VAC, 480VAC, etc...) or high voltage (20.000VAC, 33.000VAC, etc...) applications, this variable must be adjusted.

Variable	PT ratio [2100]
Unit	-
Init value	1.00
Min value	0.00
Max value	655.35
Description	This parameter allows you to set the ratio between the voltage present on the busbar and the voltage connected to the module. Example: Busbar voltage 20.000Vac / Voltage connected to the module 100 Vac: PT ratio value = 20.000/100 = 200. This PT ratio can be calculated or is indicated on the measuring transformers.

Variable	CT ratio [2101]
Unit	-
Init value	200.0
Min value	0.0
Max value	6553.5
Description	This parameter is used to set the ratio between the current on the busbar and the current connected to the module. Example: Busbar current 1000A / Current connected to the module 5A: CT ratio value = 1000/5 = 200. This CT ratio can be calculated or is indicated on the measuring current transformers.

Variable	Low kW active power threshold [2866]
Unit	%
Init value	5.0
Min value	0.0
Max value	100.0
Description	This parameter allows you to define the minimum active power that the automatic system will impose on the generator. For example, this is the power that will be taken just after the circuit breaker is closed, before the load ramp. It is also the value at which the automatic system will open the circuit breaker during an unload ramp. This low limit protects against the risk of reverse power. It is recommended to set a low limit between 5 and 10% of the nominal active power.

Control

Variable	Regulation type [2013]
Unit	-
Init value	0
List	0: Normal 1: Base load/Base PF 2: Forced droop Hz/V 3: Forced droop Hz only
Description	kW regulation used when paralleling between several gensets (0 = load sharing according to nominal power / 1 = Generator will follow a fix setpoint / 2 = Droop). Running in fixed setpoint or droop will inhibit load dependent start/stop options.

Variable	Base load Generator(s) kW setpoint [2107]
Unit	kW
Init value	100
Min value	0
Max value	32500
Description	This parameter is used to set the active power setpoint of the generator/power plant when the product is configured in base load mode.

Variable	Power factor setpoint (inductive) [2253]
Unit	-
Init value	0.80
Min value	0.00
Max value	1.00
Description	This parameter is used to set the generator/power plant cos(φ) set point that will be applied when paralleling to the mains. The imposed cos(φ) is an inductive cos(φ).

Static paralleling

Variable	Static paralleling [2050]
Unit	-
Init value	0
List	0: No 1: Yes
Description	This parameter is used to enable static paralleling. 2 values can be selected: - No: Standard operation 1/ Generator starts with its excitation. 2/ Breaker closes with or without synchronization depending of the voltage on the busbar. - Yes: Static paralleling is activated 1/ Breaker(s) close(s). 2/ Generator(s) start(s) without excitation. 3/ Excitation is activated (on all generators at the same time in case of a power-plant).

BUS

Variable	Nominal voltage [2152]
Unit	V
Init value	400
Min value	0
Max value	65535
Description	This parameter is used to set the nominal voltage: - Three-phase and two-phase: Enter a phase-to-phase voltage. - Single-phase: Enter a phase-to-neutral voltage. All the protections based on the voltage are calculated as a percentage of this value. For low voltage (400VAC, 440VAC, 480VAC, etc...) or high voltage (20.000VAC, 33.000VAC, etc...) applications, this variable must be adjusted.

Variable	PT ratio [2150]
Unit	-
Init value	1.00
Min value	0.00
Max value	655.35
Description	This parameter allows you to set the ratio between the voltage present on the bus-bar and the voltage connected to the module. Example: Busbar voltage 20.000Vac / Voltage connected to the module 100 Vac: PT ratio value = 20.000/100 = 200. This PT ratio can be calculated or is indicated on the measuring transformers.

SYNCHRONISATION CHECK

Variable	Voltage acceptance [2800]
Unit	%
Init value	5.0
Min value	0.0
Max value	12.0
Description	Maximum voltage difference (in % of the nominal value) between the voltages on either side of the circuit breaker to allow closing.

Variable	Frequency acceptance [2801]
Unit	Hz
Init value	0.10
Min value	0.00
Max value	0.20
Description	Maximum frequency difference between the voltages on either side of the circuit breaker to allow closing.

Variable	Phase Angle acceptance [2802]
Unit	°
Init value	10
Min value	0
Max value	30
Description	Maximum phase difference between the voltages on either side of the circuit breaker to allow closing.

Variable	Fail to synchronize timer [2803]
Unit	s
Init value	120.0
Min value	0.0
Max value	999.9
Description	Time after which the product will activate an alarm if it remains in synchronization without ever being able to give the closing command. Activation of this alarm means that the synchronization control loops are incorrectly set.

Variable	Action on fail to synchronize [2804]
Unit	-
Init value	3
List	0: Unused 3: Alarm 4: Fault (soft shutdown) 6: Fault (soft shutdown) + Help
Description	Action performed on protection's trigger. Actions' description is available in the technical documentation.

Variable	Phase offset [2812]
Unit	°
Init value	0
Min value	-180
Max value	180
Description	Phase offset for synch. check relay (Ex: Dyn11)

POWER MANAGEMENT

Generators Start/Stop

Load dependent start/stop

Variable	Load dependent start/stop mode [2879]
Unit	-
Init value	0
List	0: Unused 1: Start/stop load levels 2: Reserve power (%) 3: Reserve power (kW)
Description	This parameter activates the start/stop function according to load variations. 4 choices are possible: - Not used: The function is not activated. - Start/stop thresholds: Generators are started/stopped according to 2 thresholds (a start threshold, a stop threshold), set as a percentage. These thresholds are compared with the actual active power, given as a percentage of nominal. This is the product history mode. - Reserve power (%): Generators are started/stopped according to 2 thresholds (a start threshold, a stop threshold), set as a percentage. The start threshold is compared with the available reserve power, given as a percentage of the nominal value of the generators and batteries producing on the bus. The stop threshold is compared with the reserve power available after a generator has stopped, given as a percentage of the nominal value of the generators and batteries producing on the bus. - Reserve power (kW): Generators are started/stopped according to 2 thresholds (a start threshold, a stop threshold), set in kW. The start threshold is compared with the available reserve power, given in kW. The stop threshold is compared with the reserve power that will be available after a generator has stopped, given in kW. See technical documentation for more information.

Variable	kW threshold to start a generator [2854]
Unit	%
Init value	80.0
Min value	0.0
Max value	200.0
Description	This parameter determines the active power threshold (expressed as a % of the nominal value of the generators present on the bus) above which a generator will start in 'Start/Stop load levels' mode.

Variable	Reserve power (%) threshold to start a generator [2880]
Unit	%
Init value	40.0
Min value	0.0
Max value	100.0
Description	This parameter determines the reserve power threshold (expressed as a % of the nominal value of the generators and batteries present on the bus) below which a generator will start in 'Reserve power (%)' mode.

Variable	Reserve power (kW) threshold to start a generator [2881]
Unit	kW
Init value	100
Min value	0
Max value	32500
Description	This parameter determines the reserve power threshold (expressed in kW) below which a generator will start in 'Reserve power (kW)' mode.

Variable	Start timer [2855]
Unit	s
Init value	10.0
Min value	0.0
Max value	6553.5
Description	This parameter is used to determine the time during which the start condition must be met in order to start generator(s).

Variable	kW threshold to stop a generator [2857]
Unit	%
Init value	20.0
Min value	0.0
Max value	200.0
Description	This parameter determines the active power threshold (expressed as a % of the nominal value of the generators present on the bus) below which a generator will stop in 'Start/Stop load levels' mode.

Variable	Reserve power (%) threshold to stop a generator [2887]
Unit	%
Init value	60.0
Min value	0.0
Max value	100.0
Description	This parameter is used to determine the reserve power threshold (expressed as a % of the nominal value of the generators and batteries present on the bus) above which a generator will stop in 'Reserve power (%)' mode. Please note that the stop threshold is compared to the reserve power that will be available after the generator has stopped (and not to the value of the reserve power at the moment when the automated system orders the generator to stop). The aim is to always have an available reserve power greater than the value entered in this parameter. Consequently, the value set for generator stop must be very close to the value set for generator start. The only purpose of the difference between the 2 thresholds is to create a hysteresis to prevent unwanted starts/stops in the event of load variations around the reserve power threshold.

Variable	Reserve power (kW) threshold to stop a generator [2888]
Unit	kW
Init value	150
Min value	0
Max value	32500
Description	This parameter is used to determine the reserve power threshold (expressed as kW) above which a generator will stop in 'Reserve power (kW)' mode. Please note that the stop threshold is compared to the reserve power that will be available after the generator has stopped (and not to the value of the reserve power at the moment when the automated system orders the generator to stop). The aim is to always have an available reserve power greater than the value entered in this parameter. Consequently, the value set for generator stop must be very close to the value set for generator start. The only purpose of the difference between the 2 thresholds is to create a hysteresis to prevent unwanted starts/stops in the event of load variations around the reserve power threshold.

Variable	Stop timer [2858]
Unit	s
Init value	10.0
Min value	0.0
Max value	6553.5
Description	This parameter is used to determine the time during which the stop condition must be met in order to stop generator(s).

Renewable energy production dependant start/stop

Variable	Enable renewable energy production dependant start/stop [2883]
Unit	-
Init value	0
List	0: No 1: Yes
Description	This parameter activates the start/stop of generators according to the active power produced by renewable energies. As the active power generated by photovoltaic panels and wind turbines is susceptible to significant and rapid drops, it may be necessary to ensure a reserve power that is proportional to the active power produced by renewable energies. This function is not a substitute for start/stop of generators based on a fixed reserve power, but should be used as a complement. Example: If no energy is produced by renewable energies, this function will ensure a reserve of X (threshold to be defined) multiplied by 0 (current active power). This value being equal to 0, this function will ensure a reserve of 0kW in this precise case. It may therefore be necessary to use the standard power reserve function as a complement to ensure a reserve in the event of load impact.

Variable	Start : Reserve < Renewable energy current power multiplied by [2884]
Unit	%
Init value	40.0
Min value	0.0
Max value	100.0
Description	This parameter is used to determine the proportion of active power produced by renewable energies for which a reserve power must be provided by batteries and/or generators. This is the start threshold. It must be slightly different from the stop threshold to ensure hysteresis. Ex: If the value of the parameter is 40%, and renewable energies produce 100kW at a given time t, then, a generator will start if the reserve power provided by the batteries and/or generators falls below 40%*100kW = 40kW.

Variable	Start timer [2885]
Unit	s
Init value	10.0
Min value	0.0
Max value	6553.5
Description	This parameter is used to determine the time during which the start condition must be met in order to start generator(s).

Variable	Stop : Reserve > Renewable energy current power multiplied by [2889]
Unit	%
Init value	60.0
Min value	0.0
Max value	100.0
Description	This parameter is used to determine the proportion of active power produced by renewable energies for which a reserve power must be provided by batteries and/or generators. This is the stop threshold. It must be slightly different from the start threshold to ensure hysteresis. Ex: If the parameter value is 60%, and renewable energies produce 100kW at a given time t, then, a generator will stop if the reserve power provided by the batteries and/or generators remains above 60kW (60%*100kW) after the generator has stopped.

Variable	Stop timer [2886]
Unit	s
Init value	10.0
Min value	0.0
Max value	6553.5
Description	This parameter is used to determine the time during which the stop condition must be met in order to stop generator(s).

Hours dependent start/stop

Variable	Enable hours dependant start/stop [2882]
Unit	-
Init value	0
List	0: Unused 1: Running hours 2: Auxiliary hours
Description	This parameter activates hours dependant start/stop to balance running hours. 3 choices are possible: - Not used: The function is not activated. - Running hours: The generators are started/stopped in order to have a maximum difference between the generator with the least operating hours and the one with the most operating hours, corresponding to the value set in parameter 2865 'Hours'. - Auxiliary hours: Same as 'Running hours' mode, but based on auxiliary hours counters which may differ from the running hours counters. Note: To alternate between 2 generators every 16 hours, set a difference of 8 hours.

Variable	Hour [2865]
Unit	h
Init value	8
Min value	0
Max value	1000
Description	This parameter is used to determine the maximum difference that the automated system must maintain between the generator with the lowest number of running hours and the generator with the highest number of running hours.

Start/Stop priority

Variable	Generators start type on powered bus [2892]
Unit	-
Init value	0
List	0: Start all generators 1: Start one by one
Description	When using a generator start/stop function and if no generators are on the bus but there is an other source on the bus, you can either decide to start all the generators at the same time or start them one by one.

Variable	Generators start type on deadbus [2894]
Unit	-
Init value	0
List	0: Start all generators 1: Start one by one
Description	When using a generator start/stop function and if no source is on the bus you can either decide to start all the generators at the same time or start them one by one.

Variable	Start/Stop priority criteria [2850]
Unit	-
Init value	1
List	1: By generator number 2: By running hours 3: By custom configuration 5: By auxiliary hours
Description	This parameter determines which generator will be started or stopped when one of the start/stop conditions is met. 4 choices are possible: - By generator number: In this case, the automated system starts the generator with the lowest number. It stops the generator with the highest number. - By running hours: In this case, the automated system starts the generator with the lowest number of running hours. It stops the generator with the most running hours. - By custom number: Same as 'By generator number', but based on custom numbers. - By auxiliary hours: Same as 'By running hours' but based on auxiliary hours.

Variable	Custom number [2863]
Unit	-
Init value	1
Min value	1
Max value	32
Description	This parameter is used to define the custom number that the automated system will consider for this generator during a start/stop with the criteria 'Custom number'.

Load shedding

Variable	Opening load on under frequency [3702]
Unit	-
Init value	0
List	0: Disabled 1: Enable
Description	Enables/Disables underfrequency monitoring for non-essential load shedding

Variable	Under frequency threshold 1 [3700]
Unit	%
Init value	96.0
Min value	0.0
Max value	100.0
Description	First underfrequency level

Variable	Under frequency threshold 2 [3701]
Unit	%
Init value	90.0
Min value	0.0
Max value	100.0
Description	Second underfrequency level (must be lower than level 1)

Variable	Opening of the load on maximum kW [3705]
Unit	-
Init value	0
List	0: Disabled 1: Enable
Description	Enables/Disables overload monitoring for non-essential load shedding

Variable	Maximum kW threshold 1 [3703]
Unit	%
Init value	95.0
Min value	0.0
Max value	200.0
Description	First overload level

Variable	Maximum KW threshold 2 [3704]
Unit	%
Init value	100.0
Min value	0.0
Max value	200.0
Description	Second overload level (must be higher than level 1)

Variable	Timer for threshold 1 [3706]
Unit	s
Init value	6.0
Min value	0.0
Max value	999.9
Description	Delay before first level activation (kW and Hz)

Variable	Timer for threshold 2 [3707]
Unit	s
Init value	2.0
Min value	0.0
Max value	999.9
Description	Delay before activation of the second level (kW and Hz). Must be lower than level 1.

Variable	Minimum delay between 2 openings [2861]
Unit	s
Init value	5.0
Min value	0.0
Max value	999.9
Description	Minimum time between two load shedding requests

Variable	Action after last opening [2862]
Unit	-
Init value	0
List	0: Unused 3: Alarm 4: Fault (soft shutdown) 6: Fault (soft shutdown) + Help
Description	Action performed on protection's trigger. Actions' description is available in the technical documentation.

ENGINE/ECU/ECM

ENGINE

General

Variable	Engine type [3477]
Unit	-
Init value	0
List	0: Diesel 1: Gas
Description	This parameter allows you to define the engine type of the generator. 2 choices are available: - Diesel: Management of the fuel activation and starter(s), management of the pre-heating, stabilization, cooling phases, etc... - Gas: Management of the ignition in addition to the other elements common to diesel engines.

Variable	Type of engine speed measurement [2200]
Unit	-
Init value	1
List	0: Pick-up 1: Alternator 2: J1939/MTU MDEC
Description	This parameter allows you to determine the way in which the automatic system will get the speed measurement. 3 choices are available: - Pick-up : In this case the speed measurement is deduced from the frequency of the pick-up signal. An incorrect speed value may be due to a wrong setting of the number of teeth. - Alternator : In this case the speed measurement is deduced from the frequency measured on the alternator voltages. An incorrect speed value may be due to an incorrect setting of the number of pairs of poles. - J1939/MTU MDEC : In this case the speed measurement is read in J1939 or via the MDEC protocol. An incorrect speed value may be due to a wrong wiring (CAN2) or a wrong address configured for the ECU identifier.

Variable	Number of teeth for pick-up [2201]
Unit	-
Init value	100
Min value	1
Max value	65535
Description	This parameter sets the number of teeth for the pick-up that determines the speed value when measured from the pick-up input. A wrong value for the number of teeth will result in a wrong value for the speed.

Variable	Number of pole pairs [2202]
Unit	-
Init value	2
Min value	0
Max value	50
Description	This parameter sets the number of pole pairs of the alternator, which is used to determine the value of the speed when it is measured from the frequency of the alternator. A wrong value of the number of pole pairs will result in a wrong value of the speed.

Variable	Nominal speed [2207]
Unit	rpm
Init value	1500
Min value	0
Max value	10000
Description	This parameter determines the speed at which the engine runs at steady state. A wrong value of this parameter can cause the speed and frequency protections to trip, the engine to stop during start-up sequences, and a wrong centering of the frequency. Set 1500 rpm for a 50Hz application and 1800 rpm for a 60Hz application.

Variable	Idle speed [3468]
Unit	rpm
Init value	700
Min value	0
Max value	10000
Description	This parameter allows you to define the idle speed that will be applied during the preheating phase and/or the cooling phase (depending on the configuration made). When the engine speed is controlled from the speed output of the module, a digital output configured as Idle speed must be wired on the speed control to apply the idle speed. In the case of speed control in J1939, the product will automatically apply the idle speed in the speed frame TSC1.

Variable	Hide engine measurement [2032]
Unit	-
Init value	0
List	0: No 1: Yes
Description	This parameter determines if the product should hide the engine measurements. - No: Engine measurements will be displayed - Yes: Engine measurements will not be displayed

Variable	Cooling fan activation threshold [3475]
Unit	°C
Init value	40.0
Min value	-3276.8
Max value	3276.7
Description	This parameter allows to define the temperature of the coolant above which the fan will be activated. A digital output of the module must be configured as Cooling fan.

Start/Stop

Start sequence

Variable	Engine speed during preheating [3479]
Unit	-
Init value	0
List	0: Nominal speed 1: Idle speed
Description	This parameter determines the speed at which the engine should run during the preheating phase.

Variable	External start sequence [3452]
Unit	-
Init value	0
List	0: Disabled 1: Enable
Description	This parameter allows to determine if the module must manage the engine sequence or if another device manages it. 2 values can be configured: - Disabled: The management of the start sequence externally is disabled. The module manages the entire engine sequence. - Enabled: The engine sequence is managed by another device. In this case, when a remote start is activated in Auto mode or when the start button is pressed in manual mode, the module gives a start command (via a digital output) to the module responsible for the engine sequence and waits for a configurable delay before going to fault if the engine has not started.

Variable	External module start failure timer [3453]
Unit	s
Init value	60.0
Min value	0.0
Max value	999.9
Description	This parameter, which takes effect when the external start sequence is activated, allows you to set the time after which the product activates a fault if the engine has not started.

Stop sequence

Variable	Engine speed during cooling [3476]
Unit	-
Init value	0
List	0: Nominal speed 1: Idle speed
Description	This parameter determines the speed at which the engine should run during the cooling phase.

Starter

Variable	Number of attempts per starter [3461]
Unit	-
Init value	3
Min value	0
Max value	15
Description	This parameter determines the number of start attempts made on each starter before stopping the sequence with a fault display.

Variable	Delay between each start [3458]
Unit	s
Init value	5.0
Min value	0.0
Max value	999.9
Description	This parameter allows you to determine the waiting time between start attempts (i.e. activation of the starters).

Variable	Minimum holding time of the starter [3466]
Unit	s
Init value	2.0
Min value	0.0
Max value	999.9
Description	This parameter determines the minimum activation time of the starter. The starter will remain active for this time even if the speed reaches the threshold set in the parameter Crank drop out faster.

Variable	Maximum holding time of the starter [3457]
Unit	s
Init value	5.0
Min value	0.0
Max value	999.9
Description	This parameter allows to determine the maximum activation time of the starter. If the speed has not reached the value configured in the parameter Crank drop out after this time, the starter will deactivate and the module will make further start attempts according to the configuration made.

Variable	Activation order of starters [3459]
Unit	-
Init value	0
List	0: Alternative 1: Consecutive
Description	This parameter determines the order in which the starters will activate if there are multiple starters configured. 2 choices are possible: - Alternative : The automated system activates the starters one after the other and repeats with the first. - Consecutive : Each starter executes several trials consecutively before handing over to the next starter.

Variable	First starter [3460]
Unit	-
Init value	1
Min value	1
Max value	3
Description	This parameter determines the first starter that the module will activate if there are several starters configured.

Variable	Stop threshold of the first starter [3462]
Unit	rpm
Init value	400
Min value	0
Max value	10000
Description	This parameter determines the speed threshold at which starter #1 will cut out (unless the threshold is reached faster than the minimum holding time of the starter, in which case the automated system will respect the minimum holding time).

Variable	Stop threshold of the second starter [3463]
Unit	rpm
Init value	400
Min value	0
Max value	10000
Description	This parameter determines the speed threshold at which starter #2 will cut out (unless the threshold is reached faster than the minimum holding time of the starter, in which case the automated system will respect the minimum holding time).

Variable	Stop threshold of the third starter [3464]
Unit	rpm
Init value	400
Min value	0
Max value	10000
Description	This parameter determines the speed threshold at which starter #3 will cut out (unless the threshold is reached faster than the minimum holding time of the starter, in which case the automated system will respect the minimum holding time).

ECU/ECM

ECU/ECM

ECU/ECM settings

Variable	Enable communication protocol [3118]
Unit	-
Init value	0
List	0: No 1: J1939 2: MTU MDEC CAN module 201, 303 and 304 3: MTU MDEC CAN module 302
Description	This parameter enables the J1939 communication protocol or the MTU MDEC communication protocol (MTU MDEC can only be selected if the option has been enabled and the controller is connected.). When the J1939 protocol is activated, the CAN 2 bus speed is forced to 250kb/s. The parameter which allows the CAN 2 speed to be set no longer has any effect. When the MDEC protocol is activated, the speed of the CAN 2 bus is forced to 125kb/s. The parameter which allows the CAN 2 speed to be set no longer has any effect.

Variable	ECU Manufacturer [3100]
Unit	-
Init value	5
List	1: Scania 2: Volvo 3: Perkins 4: Iveco 5: Generic 6: Cummins 7: John Deere 8: Caterpillar 9: Deutz 10: MTU 11: Detroit diesel
Description	This parameter allows you to choose the manufacturer of your ECU/Engine. If the manufacturer of your ECU/Engine is not present in the list, set the parameter to Generic.

Variable	Units of measurement [3117]
Unit	-
Init value	0
List	0: Bar, °C, L/h 1: PSI, °F, G/h
Description	This parameter allows you to set the J1939 system of units of measurement.

Variable	ECU ID [3102]
Unit	-
Init value	0
Min value	0
Max value	255
Description	This parameter allows to define the CAN identifier of the ECU. A wrong value configured on this parameter results in an impossibility of reading and displaying the measurements transmitted by the ECU.

Variable	COMPACT ID [3103]
Unit	-
Init value	234
Min value	0
Max value	255
Description	This parameter allows to define the CAN identifier of the module. A wrong value set on this parameter results in the impossibility to send commands to the ECU (i.e. to control the engine speed, the engine start and stop, etc.).

Speed frame (TSC1)

Variable	TSC1 Message counter [3123]
Unit	-
Init value	0
List	0: No 1: Yes
Description	This parameter is used to integrate the message counter into the TSC1 speed frame.

Variable	TSC1 Message checksum [3124]
Unit	-
Init value	0
List	0: No 1: Yes
Description	This parameter is used to integrate the message checksum into the TSC1 speed frame.

J1939 sniffer

Variable	Enable J1939 sniffer [3119]
Unit	-
Init value	0
List	0: Off 1: All received frames 2: Frames from ECU address only 3: All emited frames 4: All frames
Description	This parameter enables the J1939 frame sniffer. 5 choices are possible: - Off : No frame is recorded - All received frames : Only the frames received by the module are recorded. - Frames of the ECU address only : Only the frames whose identifier is the one indicated in the ECU ID parameter are recorded. - All transmitted frames: Only the frames transmitted by the module are recorded. - All the frames : All the frames are recorded, those sent by the module, those received by the module. The recording starts as soon as the selection is different from Off. Switch the parameter to Off to stop recording.

INPUTS/OUTPUTS

DIGITAL INPUTS

Digital inputs

Input 1 (Customisable) [250]

Variable	Function configured on DI 1 [2700]
Unit	-
Init value	4501
Min value	0
Max value	10299
Description	Digital Input 1 associated function (Default value: Generator breaker feedback)

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

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

Variable	Timer ON Digital Input 1 [2709]
Unit	s
Init value	0.0
Min value	0.0
Max value	6553.5
Description	Digital Input 1 activation timer

Variable	Timer OFF Digital Input 1 [2718]
Unit	s
Init value	0.0
Min value	0.0
Max value	6553.5
Description	Digital Input 1 desactivation timer

Input 2 (Customisable) [251]

Variable	Function configured on DI 2 [2701]
Unit	-
Init value	4502
Min value	0
Max value	10299
Description	Digital Input 2 associated function (Default value: Remote start)

Variable	Polarity NO/NC on DI 2 [2737]
Unit	-
Init value	0
Min value	0
Max value	1
Description	Direction of Digital Input 2 (0=Normaly Open/1=Normaly Close)

Variable	Validity on digital input 2 [2728]
Unit	-
Init value	1
Min value	0
Max value	3
Description	Digital Input 2 activation validity (0=Never/1=Always/2=Post Starting/3= rpm & Volt Stabilized)

Variable	Timer ON Digital Input 2 [2710]
Unit	s
Init value	0.0
Min value	0.0
Max value	6553.5
Description	Digital Input 2 activation timer

Variable	Timer OFF Digital Input 2 [2719]
Unit	s
Init value	0.0
Min value	0.0
Max value	6553.5
Description	Digital Input 2 desactivation timer

Input 3 (Customisable) [252]

Variable	Function configured on DI 3 [2702]
Unit	-
Init value	4505
Min value	0
Max value	10299
Description	Digital Input 3 associated function (Default value: Emergency stop)

Variable	Polarity NO/NC on DI 3 [2738]
Unit	-
Init value	1
Min value	0
Max value	1
Description	Direction of Digital Input 3 (0=Normaly Open/1=Normaly Close)

Variable	Validity on digital input 3 [2729]
Unit	-
Init value	1
Min value	0
Max value	3
Description	Digital Input 3 activation validity (0=Never/1=Always/2=Post Starting/3= rpm & Volt Stabilized)

Variable	Timer ON Digital Input 3 [2711]
Unit	s
Init value	0.0
Min value	0.0
Max value	6553.5
Description	Digital Input 3 activation timer

Variable	Timer OFF Digital Input 3 [2720]
Unit	s
Init value	0.0
Min value	0.0
Max value	6553.5
Description	Digital Input 3 desactivation timer

Input 4 (Customisable) [253]

Variable	Function configured on DI 4 [2703]
Unit	-
Init value	0
Min value	0
Max value	10299
Description	Digital Input 4 associated function (Default value: Mains breaker feedback on COMPACT MAINS)

Variable	Polarity NO/NC on DI 4 [2739]
Unit	-
Init value	0
Min value	0
Max value	1
Description	Direction of Digital Input 4 (0=Normaly Open/1=Normaly Close)

Variable	Validity on digital input 4 [2730]
Unit	-
Init value	1
Min value	0
Max value	3
Description	Digital Input 4 activation validity (0=Never/1=Always/2=Post Starting/3= rpm & Volt Stabilized)

Variable	Timer ON Digital Input 4 [2712]
Unit	s
Init value	0.0
Min value	0.0
Max value	6553.5
Description	Digital Input 4 activation timer

Variable	Timer OFF Digital Input 4 [2721]
Unit	s
Init value	0.0
Min value	0.0
Max value	6553.5
Description	Digital Input 4 desactivation timer

Input 5 (Customisable) [254]

Variable	Function configured on DI 5 [2704]
Unit	-
Init value	0
Min value	0
Max value	10299
Description	Digital Input 5 associated function

Variable	Polarity NO/NC on DI 5 [2740]
Unit	-
Init value	0
Min value	0
Max value	1
Description	Direction of Digital Input 5 (0=Normaly Open/1=Normaly Close)

Variable	Validity on digital input 5 [2731]
Unit	-
Init value	1
Min value	0
Max value	3
Description	Digital Input 5 activation validity (0=Never/1=Always/2=Post Starting/3= rpm & Volt Stabilized)

Variable	Timer ON Digital Input 5 [2713]
Unit	s
Init value	0.0
Min value	0.0
Max value	6553.5
Description	Digital Input 5 activation timer

Variable	Timer OFF Digital Input 5 [2722]
Unit	s
Init value	0.0
Min value	0.0
Max value	6553.5
Description	Digital Input 5 desactivation timer

Input 6 (Customisable) [255]

Variable	Function configured on DI 6 [2705]
Unit	-
Init value	0
Min value	0
Max value	10299
Description	Digital Input 6 associated function

Variable	Polarity NO/NC on DI 6 [2741]
Unit	-
Init value	0
Min value	0
Max value	1
Description	Direction of Digital Input 6 (0=Normaly Open/1=Normaly Close)

Variable	Validity on digital input 6 [2732]
Unit	-
Init value	1
Min value	0
Max value	3
Description	Digital Input 6 activation validity (0=Never/1=Always/2=Post Starting/3= rpm & Volt Stabilized)

Variable	Timer ON Digital Input 6 [2714]
Unit	s
Init value	0.0
Min value	0.0
Max value	6553.5
Description	Digital Input 6 activation timer

Variable	Timer OFF Digital Input 6 [2723]
Unit	s
Init value	0.0
Min value	0.0
Max value	6553.5
Description	Digital Input 6 desactivation timer

Input 7 (Customisable) [256]

Variable	Function configured on DI 7 [2706]
Unit	-
Init value	0
Min value	0
Max value	10299
Description	Digital Input 7 associated function

Variable	Polarity NO/NC on DI 7 [2742]
Unit	-
Init value	0
Min value	0
Max value	1
Description	Direction of Digital Input 7 (0=Normaly Open/1=Normaly Close)

Variable	Validity on digital input 7 [2733]
Unit	-
Init value	1
Min value	0
Max value	3
Description	Digital Input 7 activation validity (0=Never/1=Always/2=Post Starting/3= rpm & Volt Stabilized)

Variable	Timer ON Digital Input 7 [2715]
Unit	s
Init value	0.0
Min value	0.0
Max value	6553.5
Description	Digital Input 7 activation timer

Variable	Timer OFF Digital Input 7 [2724]
Unit	s
Init value	0.0
Min value	0.0
Max value	6553.5
Description	Digital Input 7 desactivation timer

Input 8 (Customisable) [257]

Variable	Function configured on DI 8 [2707]
Unit	-
Init value	0
Min value	0
Max value	10299
Description	Digital Input 8 associated function

Variable	Polarity NO/NC on DI 8 [2743]
Unit	-
Init value	0
Min value	0
Max value	1
Description	Direction of Digital Input 8 (0=Normaly Open/1=Normaly Close)

Variable	Validity on digital input 8 [2734]
Unit	-
Init value	1
Min value	0
Max value	3
Description	Digital Input 8 activation validity (0=Never/1=Always/2=Post Starting/3= rpm & Volt Stabilized)

Variable	Timer ON Digital Input 8 [2716]
Unit	s
Init value	0.0
Min value	0.0
Max value	6553.5
Description	Digital Input 8 activation timer

Variable	Timer OFF Digital Input 8 [2725]
Unit	s
Init value	0.0
Min value	0.0
Max value	6553.5
Description	Digital Input 8 desactivation timer

Input 9 (Customisable) [258]

Variable	Function configured on DI 9 [2708]
Unit	-
Init value	0
Min value	0
Max value	10299
Description	Digital Input 9 associated function

Variable	Polarity NO/NC on DI 9 [2744]
Unit	-
Init value	0
Min value	0
Max value	1
Description	Direction of Digital Input 9 (0=Normaly Open/1=Normaly Close)

Variable	Validity on digital input 9 [2735]
Unit	-
Init value	1
Min value	0
Max value	3
Description	Digital Input 9 activation validity (0=Never/1=Always/2=Post Starting/3= rpm & Volt Stabilized)

Variable	Timer ON Digital Input 9 [2717]
Unit	s
Init value	0.0
Min value	0.0
Max value	6553.5
Description	Digital Input 9 activation timer

Variable	Timer OFF Digital Input 9 [2726]
Unit	s
Init value	0.0
Min value	0.0
Max value	6553.5
Description	Digital Input 9 desactivation timer

Hysteresis on digital input

Hysteresis on digital input 1

Variable	Hysteresis 1 enable for digital input [2769]
Unit	-
Init value	0
List	0: No 1: Yes
Description	This parameter enables the first hysteresis function on logic threshold to be activated. To do this: - Configure a digital input as 'Hysteresis low threshold DI1' and wire the hysteresis low threshold logic signal to this input. - Configure a digital input as 'Hysteresis high threshold DI1' and wire the hysteresis high threshold logic signal to this input. - Configure a digital output as 'Hysteresis output activation on DI1' and wire this output to the hysteresis control - Select the direction of activation/deactivation of the control

Variable	Timer ON hysteresis 1 [2777]
Unit	s
Init value	0.0
Min value	0.0
Max value	999.9
Description	This parameter allows to set the time between the moment when the activation threshold is reached and the moment when the command is activated.

Variable	Direction hysteresis 1 [2785]
Unit	-
Init value	0
List	0: Set on low threshold, reset on high threshold 1: Set on high threshold, reset on low threshold
Description	This parameter allows to set the direction in which the hysteresis should work. 2 choices are possible: - Activate the command when the low threshold is active and deactivate it when the high threshold is active - Activate the command when the high threshold is active and deactivate it when the low threshold is active

Hysteresis on digital input 2

Variable	Hysteresis 2 enable for digital input [2770]
Unit	-
Init value	0
List	0: No 1: Yes
Description	This parameter enables the second hysteresis function on logic threshold to be activated. To do this: - Configure a digital input as 'Hysteresis low threshold DI2' and wire the hysteresis low threshold logic signal to this input. - Configure a digital input as 'Hysteresis high threshold DI2' and wire the hysteresis high threshold logic signal to this input. - Configure a digital output as 'Hysteresis output activation on DI2' and wire this output to the hysteresis control - Select the direction of activation/deactivation of the control

Variable	Timer ON hysteresis 2 [2778]
Unit	s
Init value	0.0
Min value	0.0
Max value	999.9
Description	This parameter allows to set the time between the moment when the activation threshold is reached and the moment when the command is activated.

Variable	Direction hysteresis 2 [2786]
Unit	-
Init value	0
List	0: Set on low threshold, reset on high threshold 1: Set on high threshold, reset on low threshold
Description	This parameter allows to set the direction in which the hysteresis should work. 2 choices are possible: - Activate the command when the low threshold is active and deactivate it when the high threshold is active - Activate the command when the high threshold is active and deactivate it when the low threshold is active

Hysteresis on digital input 3

Variable	Hysteresis 3 enable for digital input [2771]
Unit	-
Init value	0
List	0: No 1: Yes
Description	This parameter enables the third hysteresis function on logic threshold to be activated. To do this: - Configure a digital input as 'Hysteresis low threshold DI3' and wire the hysteresis low threshold logic signal to this input. - Configure a digital input as 'Hysteresis high threshold DI3' and wire the hysteresis high threshold logic signal to this input. - Configure a digital output as 'Hysteresis output activation on DI3' and wire this output to the hysteresis control - Select the direction of activation/deactivation of the control

Variable	Timer ON hysteresis 3 [2779]
Unit	s
Init value	0.0
Min value	0.0
Max value	999.9
Description	This parameter allows to set the time between the moment when the activation threshold is reached and the moment when the command is activated.

Variable	Direction hysteresis 3 [2787]
Unit	-
Init value	0
List	0: Set on low threshold, reset on high threshold 1: Set on high threshold, reset on low threshold
Description	This parameter allows to set the direction in which the hysteresis should work. 2 choices are possible: - Activate the command when the low threshold is active and deactivate it when the high threshold is active - Activate the command when the high threshold is active and deactivate it when the low threshold is active

Hysteresis on digital input 4

Variable	Hysteresis 4 enable for digital input [2772]
Unit	-
Init value	0
List	0: No 1: Yes
Description	This parameter enables the fourth hysteresis function on logic threshold to be activated. To do this: - Configure a digital input as 'Hysteresis low threshold DI4' and wire the hysteresis low threshold logic signal to this input. - Configure a digital input as 'Hysteresis high threshold DI4' and wire the hysteresis high threshold logic signal to this input. - Configure a digital output as 'Hysteresis output activation on DI4' and wire this output to the hysteresis control - Select the direction of activation/deactivation of the control

Variable	Timer ON hysteresis 4 [2780]
Unit	s
Init value	0.0
Min value	0.0
Max value	999.9
Description	This parameter allows to set the time between the moment when the activation threshold is reached and the moment when the command is activated.

Variable	Direction hysteresis 4 [2788]
Unit	-
Init value	0
List	0: Set on low threshold, reset on high threshold 1: Set on high threshold, reset on low threshold
Description	This parameter allows to set the direction in which the hysteresis should work. 2 choices are possible: - Activate the command when the low threshold is active and deactivate it when the high threshold is active - Activate the command when the high threshold is active and deactivate it when the low threshold is active

Hysteresis on digital input 5

Variable	Hysteresis 5 enable for digital input [2773]
Unit	-
Init value	0
List	0: No 1: Yes
Description	This parameter enables the fifth hysteresis function on logic threshold to be activated. To do this: - Configure a digital input as 'Hysteresis low threshold DI5' and wire the hysteresis low threshold logic signal to this input. - Configure a digital input as 'Hysteresis high threshold DI5' and wire the hysteresis high threshold logic signal to this input. - Configure a digital output as 'Hysteresis output activation on DI5' and wire this output to the hysteresis control - Select the direction of activation/deactivation of the control

Variable	Timer ON hysteresis 5 [2781]
Unit	s
Init value	0.0
Min value	0.0
Max value	999.9
Description	This parameter allows to set the time between the moment when the activation threshold is reached and the moment when the command is activated.

Variable	Direction hysteresis 5 [2789]
Unit	-
Init value	0
List	0: Set on low threshold, reset on high threshold 1: Set on high threshold, reset on low threshold
Description	This parameter allows to set the direction in which the hysteresis should work. 2 choices are possible: - Activate the command when the low threshold is active and deactivate it when the high threshold is active - Activate the command when the high threshold is active and deactivate it when the low threshold is active

Hysteresis on digital input 6

Variable	Hysteresis 6 enable for digital input [2774]
Unit	-
Init value	0
List	0: No 1: Yes
Description	This parameter enables the sixth hysteresis function on logic threshold to be activated. To do this: - Configure a digital input as 'Hysteresis low threshold DI6' and wire the hysteresis low threshold logic signal to this input. - Configure a digital input as 'Hysteresis high threshold DI6' and wire the hysteresis high threshold logic signal to this input. - Configure a digital output as 'Hysteresis output activation on DI6' and wire this output to the hysteresis control - Select the direction of activation/deactivation of the control

Variable	Timer ON hysteresis 6 [2782]
Unit	s
Init value	0.0
Min value	0.0
Max value	999.9
Description	This parameter allows to set the time between the moment when the activation threshold is reached and the moment when the command is activated.

Variable	Direction hysteresis 6 [2790]
Unit	-
Init value	0
List	0: Set on low threshold, reset on high threshold 1: Set on high threshold, reset on low threshold
Description	This parameter allows to set the direction in which the hysteresis should work. 2 choices are possible: - Activate the command when the low threshold is active and deactivate it when the high threshold is active - Activate the command when the high threshold is active and deactivate it when the low threshold is active

Hysteresis on digital input 7

Variable	Hysteresis 7 enable for digital input [2775]
Unit	-
Init value	0
List	0: No 1: Yes
Description	This parameter enables the seventh hysteresis function on logic threshold to be activated. To do this: - Configure a digital input as 'Hysteresis low threshold DI7' and wire the hysteresis low threshold logic signal to this input. - Configure a digital input as 'Hysteresis high threshold DI7' and wire the hysteresis high threshold logic signal to this input. - Configure a digital output as 'Hysteresis output activation on DI7' and wire this output to the hysteresis control - Select the direction of activation/deactivation of the control

Variable	Timer ON hysteresis 7 [2783]
Unit	s
Init value	0.0
Min value	0.0
Max value	999.9
Description	This parameter allows to set the time between the moment when the activation threshold is reached and the moment when the command is activated.

Variable	Direction hysteresis 7 [2791]
Unit	-
Init value	0
List	0: Set on low threshold, reset on high threshold 1: Set on high threshold, reset on low threshold
Description	This parameter allows to set the direction in which the hysteresis should work. 2 choices are possible: - Activate the command when the low threshold is active and deactivate it when the high threshold is active - Activate the command when the high threshold is active and deactivate it when the low threshold is active

Hysteresis on digital input 8

Variable	Hysteresis 8 enable for digital input [2776]
Unit	-
Init value	0
List	0: No 1: Yes
Description	This parameter enables the eighth hysteresis function on logic threshold to be activated. To do this: - Configure a digital input as 'Hysteresis low threshold DI8' and wire the hysteresis low threshold logic signal to this input. - Configure a digital input as 'Hysteresis high threshold DI8' and wire the hysteresis high threshold logic signal to this input. - Configure a digital output as 'Hysteresis output activation on DI8' and wire this output to the hysteresis control - Select the direction of activation/deactivation of the control

Variable	Timer ON hysteresis 8 [2784]
Unit	s
Init value	0.0
Min value	0.0
Max value	999.9
Description	This parameter allows to set the time between the moment when the activation threshold is reached and the moment when the command is activated.

Variable	Direction hysteresis 8 [2792]
Unit	-
Init value	0
List	0: Set on low threshold, reset on high threshold 1: Set on high threshold, reset on low threshold
Description	This parameter allows to set the direction in which the hysteresis should work. 2 choices are possible: - Activate the command when the low threshold is active and deactivate it when the high threshold is active - Activate the command when the high threshold is active and deactivate it when the low threshold is active

DIGITAL/RELAYS OUTPUTS

Digital outputs

Output 1 (Customisable) [4350]

Variable	Function configured DO 1 [2745]
Unit	-
Init value	4652
Min value	0
Max value	10299
Description	Output 1 Associated function

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

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

Variable	Activation delay DO 01 [2793]
Unit	s
Init value	0.0
Min value	0.0
Max value	6553.5
Description	Delay before physical activation of logic output 1

Output 2 (Customisable) [4351]

Variable	Function configured DO 2 [2746]
Unit	-
Init value	4655
Min value	0
Max value	10299
Description	Output 2 Associated function

Variable	Polarity NE/ND DO 2 [2752]
Unit	-
Init value	0
Min value	0
Max value	1
Description	Polarity (0=Normaly De-energized / 1=Normaly Energized) Digital output 2

Variable	Pulse length DO 2 [2762]
Unit	s
Init value	0.0
Min value	0.0
Max value	6553.5
Description	Digital ouput 2 pulse timer (0 = no pulse, continous activation)

Variable	Activation delay DO 02 [2794]
Unit	s
Init value	0.0
Min value	0.0
Max value	6553.5
Description	Delay before physical activation of logic output 2

Output 3 (Customisable) [4352]

Variable	Function configured DO 3 [2747]
Unit	-
Init value	0
Min value	0
Max value	10299
Description	Output 3 Associated function

Variable	Polarity NE/ND DO 3 [2753]
Unit	-
Init value	0
Min value	0
Max value	1
Description	Polarity (0=Normaly De-energized / 1=Normaly Energized) Digital output 3

Variable	Pulse length DO 3 [2763]
Unit	s
Init value	0.0
Min value	0.0
Max value	6553.5
Description	Digital ouput 3 pulse timer (0 = no pulse, continous activation)

Variable	Activation delay DO 03 [2795]
Unit	s
Init value	0.0
Min value	0.0
Max value	6553.5
Description	Delay before physical activation of logic output 3

Output 4 (Customisable) [4353]

Variable	Function configured DO 4 [2748]
Unit	-
Init value	0
Min value	0
Max value	10299
Description	Output 4 Associated function

Variable	Polarity NE/ND DO 4 [2754]
Unit	-
Init value	0
Min value	0
Max value	1
Description	Polarity (0=Normaly De-energized / 1=Normaly Energized) Digital output 4

Variable	Pulse length DO 4 [2764]
Unit	s
Init value	0.0
Min value	0.0
Max value	6553.5
Description	Digital ouput 4 pulse timer (0 = no pulse, continous activation)

Variable	Activation delay DO 04 [2796]
Unit	s
Init value	0.0
Min value	0.0
Max value	6553.5
Description	Delay before physical activation of logic output 4

Output 5 (Customisable) [4354]

Variable	Function configured DO 5 [2749]
Unit	-
Init value	0
Min value	0
Max value	10299
Description	Output 5 Associated function

Variable	Polarity NE/ND DO 5 [2755]
Unit	-
Init value	0
Min value	0
Max value	1
Description	Polarity (0=Normaly De-energized / 1=Normaly Energized) Digital output 5

Variable	Pulse length DO 5 [2765]
Unit	s
Init value	0.0
Min value	0.0
Max value	6553.5
Description	Digital ouput 5 pulse timer (0 = no pulse, continous activation)

Variable	Activation delay DO 05 [2797]
Unit	s
Init value	0.0
Min value	0.0
Max value	6553.5
Description	Delay before physical activation of logic output 5

Output 6 (Customisable) [4355]

Variable	Function configured DO 6 [2750]
Unit	-
Init value	0
Min value	0
Max value	10299
Description	Output 6 Associated function

Variable	Polarity NE/ND DO 6 [2756]
Unit	-
Init value	0
Min value	0
Max value	1
Description	Polarity (0=Normaly De-energized / 1=Normaly Energized) Digital output 6

Variable	Pulse length DO 6 [2766]
Unit	s
Init value	0.0
Min value	0.0
Max value	6553.5
Description	Digital ouput 6 pulse timer (0 = no pulse, continous activation)

Variable	Activation delay DO 06 [2798]
Unit	s
Init value	0.0
Min value	0.0
Max value	6553.5
Description	Delay before physical activation of logic output 6

Relay outputs

Relay 1 (Customisable) [4356]

Variable	Output function Relay 1 [2757]
Unit	-
Init value	4677
Min value	0
Max value	10299
Description	Relay 1 Associated function

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

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

Variable	Activation delay relay 1 [8250]
Unit	s
Init value	0.0
Min value	0.0
Max value	6553.5
Description	Delay before physical activation of relay 1

Relay 2 (Customisable) [4357]

Variable	Output function Relay 2 [2758]
Unit	-
Init value	4675
Min value	0
Max value	10299
Description	Relay 2 Associated function

Variable	Direction NO/NC Relay 2 [2760]
Unit	-
Init value	0
Min value	0
Max value	1
Description	Relay 2 Direction (0=Normaly Open / 1=Normaly Closed)

Variable	Pulse length R 2 [2768]
Unit	s
Init value	0.0
Min value	0.0
Max value	6553.5
Description	Relay ouput 2 pulse timer (0 = no pulse, continous activation)

Variable	Activation delay relay 2 [8251]
Unit	s
Init value	0.0
Min value	0.0
Max value	6553.5
Description	Delay before physical activation of relay 2

BREAKER

General

Variable	Delay before new attempt [2806]
Unit	s
Init value	30.0
Min value	0.0
Max value	999.9
Description	Delay before another attempt for an electrical fault. When an electrical fault is detected, the module opens its breaker and waits for an amount of time specified in this variable to attempt to close it again.

Variable	Fail to open/close breaker timer [2304]
Unit	s
Init value	5.0
Min value	0.1
Max value	10.0
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.

Variable	Unexpected close/open breaker timer [2317]
Unit	s
Init value	1.0
Min value	0.0
Max value	10.0
Description	Timer before taking into account an unexpected change of a breaker feedback input state.

Generator breaker

Attempts number

Variable	Number of closing attempts [2807]
Unit	-
Init value	3
Min value	0
Max value	15
Description	Number of attempts for an electrical fault. When an electrical fault is detected, the module automatically tries to close its breaker to see if the fault has disapeared. If it isn't the case the module will try again until it has reached the number set in this variable

Control

Variable	Generator circuit breaker control type [2300]
Unit	-
Init value	4
List	0: Open Contact - Close Pulse 1: Open Contact - Close Contact 2: Open MNcoil - Close Pulse 3: Open MNcoil - Close Contact 4: Open Pulse - Close Pulse 5: Open Pulse - Close Contact
Description	Control type of the relay for the genset circuit breaker of the genset (pulse, hold, coil...)

Pulse

Variable	Generator breaker control pulse length [2301]
Unit	s
Init value	2.5
Min value	0.1
Max value	10.0
Description	Generator circuit breaker pulse length

Variable	Undervoltage coil deenergized time [2302]
Unit	s
Init value	1.0
Min value	0.1
Max value	10.0
Description	Time during which the coil is no longer energized after a request to open the circuit breaker.

Variable	Undervoltage coil security timer [2303]
Unit	s
Init value	2.0
Min value	0.1
Max value	10.0
Description	Minimum safety time between the moment the coil has been reenergized and the next request to close the circuit breaker.

CANOPEN

Digital inputs

CANopen DI 1 (Customisable) [800]

Variable	CANopenFuncI1 [3200]
Unit	-
Init value	0
Min value	0
Max value	10299
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)

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

Variable	Validity on CANopen digital input 1 [3264]
Unit	-
Init value	1
Min value	0
Max value	3
Description	Activation validity (0=Never/1=Always/2=Post Starting/3= rpm & Volt Stabilized)

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

CANopen DI 2 (Customisable) [801]

Variable	CANopenFuncI2 [3201]
Unit	-
Init value	0
Min value	0
Max value	10299
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)

Variable	CANopenDir I2 [3297]
Unit	-
Init value	0
Min value	0
Max value	1
Description	Direction of logic input Normally open or Normally closed

Variable	Validity on CANopen digital input 2 [3265]
Unit	-
Init value	1
Min value	0
Max value	3
Description	Activation validity (0=Never/1=Always/2=Post Starting/3= rpm & Volt Stabilized)

Variable	CANopenTM I2 [3233]
Unit	s
Init value	0.0
Min value	0.0
Max value	6553.5
Description	Function execution delay, user can add execution delay after logic input status change

CANopen DI 3 (Customisable) [802]

Variable	CANopenFuncI3 [3202]
Unit	-
Init value	0
Min value	0
Max value	10299
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)

Variable	CANopenDir I3 [3298]
Unit	-
Init value	0
Min value	0
Max value	1
Description	Direction of logic input Normally open or Normally closed

Variable	Validity on CANopen digital input 3 [3266]
Unit	-
Init value	1
Min value	0
Max value	3
Description	Activation validity (0=Never/1=Always/2=Post Starting/3= rpm & Volt Stabilized)

Variable	CANopenTM I3 [3234]
Unit	s
Init value	0.0
Min value	0.0
Max value	6553.5
Description	Function execution delay, user can add execution delay after logic input status change

CANopen DI 4 (Customisable) [803]

Variable	CANopenFuncI4 [3203]
Unit	-
Init value	0
Min value	0
Max value	10299
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)

Variable	CANopenDir I4 [3299]
Unit	-
Init value	0
Min value	0
Max value	1
Description	Direction of logic input Normally open or Normally closed

Variable	Validity on CANopen digital input 4 [3267]
Unit	-
Init value	1
Min value	0
Max value	3
Description	Activation validity (0=Never/1=Always/2=Post Starting/3= rpm & Volt Stabilized)

Variable	CANopenTM I4 [3235]
Unit	s
Init value	0.0
Min value	0.0
Max value	6553.5
Description	Function execution delay, user can add execution delay after logic input status change

CANopen DI 5 (Customisable) [804]

Variable	CANopenFuncI5 [3204]
Unit	-
Init value	0
Min value	0
Max value	10299
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)

Variable	CANopenDir I5 [3300]
Unit	-
Init value	0
Min value	0
Max value	1
Description	Direction of logic input Normally open or Normally closed

Variable	Validity on CANopen digital input 5 [3268]
Unit	-
Init value	1
Min value	0
Max value	3
Description	Activation validity (0=Never/1=Always/2=Post Starting/3= rpm & Volt Stabilized)

Variable	CANopenTM I5 [3236]
Unit	s
Init value	0.0
Min value	0.0
Max value	6553.5
Description	Function execution delay, user can add execution delay after logic input status change

CANopen DI 6 (Customisable) [805]

Variable	CANopenFuncI6 [3205]
Unit	-
Init value	0
Min value	0
Max value	10299
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)

Variable	CANopenDir I6 [3301]
Unit	-
Init value	0
Min value	0
Max value	1
Description	Direction of logic input Normally open or Normally closed

Variable	Validity on CANopen digital input 6 [3269]
Unit	-
Init value	1
Min value	0
Max value	3
Description	Activation validity (0=Never/1=Always/2=Post Starting/3= rpm & Volt Stabilized)

Variable	CANopenTM I6 [3237]
Unit	s
Init value	0.0
Min value	0.0
Max value	6553.5
Description	Function execution delay, user can add execution delay after logic input status change

CANopen DI 7 (Customisable) [806]

Variable	CANopenFuncI7 [3206]
Unit	-
Init value	0
Min value	0
Max value	10299
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)

Variable	CANopenDir I7 [3302]
Unit	-
Init value	0
Min value	0
Max value	1
Description	Direction of logic input Normally open or Normally closed

Variable	Validity on CANopen digital input 7 [3270]
Unit	-
Init value	1
Min value	0
Max value	3
Description	Activation validity (0=Never/1=Always/2=Post Starting/3= rpm & Volt Stabilized)

Variable	CANopenTM I7 [3238]
Unit	s
Init value	0.0
Min value	0.0
Max value	6553.5
Description	Function execution delay, user can add execution delay after logic input status change

CANopen DI 8 (Customisable) [807]

Variable	CANopenFuncI8 [3207]
Unit	-
Init value	0
Min value	0
Max value	10299
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)

Variable	CANopenDir I8 [3303]
Unit	-
Init value	0
Min value	0
Max value	1
Description	Direction of logic input Normally open or Normally closed

Variable	Validity on CANopen digital input 8 [3271]
Unit	-
Init value	1
Min value	0
Max value	3
Description	Activation validity (0=Never/1=Always/2=Post Starting/3= rpm & Volt Stabilized)

Variable	CANopenTM I8 [3239]
Unit	s
Init value	0.0
Min value	0.0
Max value	6553.5
Description	Function execution delay, user can add execution delay after logic input status change

CANopen DI 9 (Customisable) [808]

Variable	CANopenFuncI9 [3208]
Unit	-
Init value	0
Min value	0
Max value	10299
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)

Variable	CANopenDir I9 [3304]
Unit	-
Init value	0
Min value	0
Max value	1
Description	Direction of logic input Normally open or Normally closed

Variable	Validity on CANopen digital input 9 [3272]
Unit	-
Init value	1
Min value	0
Max value	3
Description	Activation validity (0=Never/1=Always/2=Post Starting/3= rpm & Volt Stabilized)

Variable	CANopenTM I9 [3240]
Unit	s
Init value	0.0
Min value	0.0
Max value	6553.5
Description	Function execution delay, user can add execution delay after logic input status change

CANopen DI 10 (Customisable) [809]

Variable	CANopenFuncI10 [3209]
Unit	-
Init value	0
Min value	0
Max value	10299
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)

Variable	CANopenDir I10 [3305]
Unit	-
Init value	0
Min value	0
Max value	1
Description	Direction of logic input Normally open or Normally closed

Variable	Validity on CANopen digital input 10 [3273]
Unit	-
Init value	1
Min value	0
Max value	3
Description	Activation validity (0=Never/1=Always/2=Post Starting/3= rpm & Volt Stabilized)

Variable	CANopenTM I10 [3241]
Unit	s
Init value	0.0
Min value	0.0
Max value	6553.5
Description	Function execution delay, user can add execution delay after logic input status change

CANopen DI 11 (Customisable) [810]

Variable	CANopenFuncI11 [3210]
Unit	-
Init value	0
Min value	0
Max value	10299
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)

Variable	CANopenDir I11 [3306]
Unit	-
Init value	0
Min value	0
Max value	1
Description	Direction of logic input Normally open or Normally closed

Variable	Validity on CANopen digital input 11 [3274]
Unit	-
Init value	1
Min value	0
Max value	3
Description	Activation validity (0=Never/1=Always/2=Post Starting/3= rpm & Volt Stabilized)

Variable	CANopenTM I11 [3242]
Unit	s
Init value	0.0
Min value	0.0
Max value	6553.5
Description	Function execution delay, user can add execution delay after logic input status change

CANopen DI 12 (Customisable) [811]

Variable	CANopenFuncI12 [3211]
Unit	-
Init value	0
Min value	0
Max value	10299
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)

Variable	CANopenDir I12 [3307]
Unit	-
Init value	0
Min value	0
Max value	1
Description	Direction of logic input Normally open or Normally closed

Variable	Validity on CANopen digital input 12 [3275]
Unit	-
Init value	1
Min value	0
Max value	3
Description	Activation validity (0=Never/1=Always/2=Post Starting/3= rpm & Volt Stabilized)

Variable	CANopenTM I12 [3243]
Unit	s
Init value	0.0
Min value	0.0
Max value	6553.5
Description	Function execution delay, user can add execution delay after logic input status change

CANopen DI 13 (Customisable) [812]

Variable	CANopenFuncI13 [3212]
Unit	-
Init value	0
Min value	0
Max value	10299
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)

Variable	CANopenDir I13 [3308]
Unit	-
Init value	0
Min value	0
Max value	1
Description	Direction of logic input Normally open or Normally closed

Variable	Validity on CANopen digital input 13 [3276]
Unit	-
Init value	1
Min value	0
Max value	3
Description	Activation validity (0=Never/1=Always/2=Post Starting/3= rpm & Volt Stabilized)

Variable	CANopenTM I13 [3244]
Unit	s
Init value	0.0
Min value	0.0
Max value	6553.5
Description	Function execution delay, user can add execution delay after logic input status change

CANopen DI 14 (Customisable) [813]

Variable	CANopenFuncI14 [3213]
Unit	-
Init value	0
Min value	0
Max value	10299
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)

Variable	CANopenDir I14 [3309]
Unit	-
Init value	0
Min value	0
Max value	1
Description	Direction of logic input Normally open or Normally closed

Variable	Validity on CANopen digital input 14 [3277]
Unit	-
Init value	1
Min value	0
Max value	3
Description	Activation validity (0=Never/1=Always/2=Post Starting/3= rpm & Volt Stabilized)

Variable	CANopenTM I14 [3245]
Unit	s
Init value	0.0
Min value	0.0
Max value	6553.5
Description	Function execution delay, user can add execution delay after logic input status change

CANopen DI 15 (Customisable) [814]

Variable	CANopenFuncI15 [3214]
Unit	-
Init value	0
Min value	0
Max value	10299
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)

Variable	CANopenDir I15 [3310]
Unit	-
Init value	0
Min value	0
Max value	1
Description	Direction of logic input Normally open or Normally closed

Variable	Validity on CANopen digital input 15 [3278]
Unit	-
Init value	1
Min value	0
Max value	3
Description	Activation validity (0=Never/1=Always/2=Post Starting/3= rpm & Volt Stabilized)

Variable	CANopenTM I15 [3246]
Unit	s
Init value	0.0
Min value	0.0
Max value	6553.5
Description	Function execution delay, user can add execution delay after logic input status change

CANopen DI 16 (Customisable) [815]

Variable	CANopenFuncI16 [3215]
Unit	-
Init value	0
Min value	0
Max value	10299
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)

Variable	CANopenDir I16 [3311]
Unit	-
Init value	0
Min value	0
Max value	1
Description	Direction of logic input Normally open or Normally closed

Variable	Validity on CANopen digital input 16 [3279]
Unit	-
Init value	1
Min value	0
Max value	3
Description	Activation validity (0=Never/1=Always/2=Post Starting/3= rpm & Volt Stabilized)

Variable	CANopenTM I16 [3247]
Unit	s
Init value	0.0
Min value	0.0
Max value	6553.5
Description	Function execution delay, user can add execution delay after logic input status change

CANopen DI 17 (Customisable) [816]

Variable	CANopenFuncI17 [3216]
Unit	-
Init value	0
Min value	0
Max value	10299
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)

Variable	CANopenDir I17 [3312]
Unit	-
Init value	0
Min value	0
Max value	1
Description	Direction of logic input Normally open or Normally closed

Variable	Validity on CANopen digital input 17 [3280]
Unit	-
Init value	1
Min value	0
Max value	3
Description	Activation validity (0=Never/1=Always/2=Post Starting/3= rpm & Volt Stabilized)

Variable	CANopenTM I17 [3248]
Unit	s
Init value	0.0
Min value	0.0
Max value	6553.5
Description	Function execution delay, user can add execution delay after logic input status change

CANopen DI 18 (Customisable) [817]

Variable	CANopenFuncI18 [3217]
Unit	-
Init value	0
Min value	0
Max value	10299
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)

Variable	CANopenDir I18 [3313]
Unit	-
Init value	0
Min value	0
Max value	1
Description	Direction of logic input Normally open or Normally closed

Variable	Validity on CANopen digital input 18 [3281]
Unit	-
Init value	1
Min value	0
Max value	3
Description	Activation validity (0=Never/1=Always/2=Post Starting/3= rpm & Volt Stabilized)

Variable	CANopenTM I18 [3249]
Unit	s
Init value	0.0
Min value	0.0
Max value	6553.5
Description	Function execution delay, user can add execution delay after logic input status change

CANopen DI 19 (Customisable) [818]

Variable	CANopenFuncI19 [3218]
Unit	-
Init value	0
Min value	0
Max value	10299
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)

Variable	CANopenDir I19 [3314]
Unit	-
Init value	0
Min value	0
Max value	1
Description	Direction of logic input Normally open or Normally closed

Variable	Validity on CANopen digital input 19 [3282]
Unit	-
Init value	1
Min value	0
Max value	3
Description	Activation validity (0=Never/1=Always/2=Post Starting/3= rpm & Volt Stabilized)

Variable	CANopenTM I19 [3250]
Unit	s
Init value	0.0
Min value	0.0
Max value	6553.5
Description	Function execution delay, user can add execution delay after logic input status change

CANopen DI 20 (Customisable) [819]

Variable	CANopenFuncI20 [3219]
Unit	-
Init value	0
Min value	0
Max value	10299
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)

Variable	CANopenDir I20 [3315]
Unit	-
Init value	0
Min value	0
Max value	1
Description	Direction of logic input Normally open or Normally closed

Variable	Validity on CANopen digital input 20 [3283]
Unit	-
Init value	1
Min value	0
Max value	3
Description	Activation validity (0=Never/1=Always/2=Post Starting/3= rpm & Volt Stabilized)

Variable	CANopenTM I20 [3251]
Unit	s
Init value	0.0
Min value	0.0
Max value	6553.5
Description	Function execution delay, user can add execution delay after logic input status change

CANopen DI 21 (Customisable) [820]

Variable	CANopenFuncI21 [3220]
Unit	-
Init value	0
Min value	0
Max value	10299
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)

Variable	CANopenDir I21 [3316]
Unit	-
Init value	0
Min value	0
Max value	1
Description	Direction of logic input Normally open or Normally closed

Variable	Validity on CANopen digital input 21 [3284]
Unit	-
Init value	1
Min value	0
Max value	3
Description	Activation validity (0=Never/1=Always/2=Post Starting/3= rpm & Volt Stabilized)

Variable	CANopenTM I21 [3252]
Unit	s
Init value	0.0
Min value	0.0
Max value	6553.5
Description	Function execution delay, user can add execution delay after logic input status change

CANopen DI 22 (Customisable) [821]

Variable	CANopenFuncI22 [3221]
Unit	-
Init value	0
Min value	0
Max value	10299
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)

Variable	CANopenDir I22 [3317]
Unit	-
Init value	0
Min value	0
Max value	1
Description	Direction of logic input Normally open or Normally closed

Variable	Validity on CANopen digital input 22 [3285]
Unit	-
Init value	1
Min value	0
Max value	3
Description	Activation validity (0=Never/1=Always/2=Post Starting/3= rpm & Volt Stabilized)

Variable	CANopenTM I22 [3253]
Unit	s
Init value	0.0
Min value	0.0
Max value	6553.5
Description	Function execution delay, user can add execution delay after logic input status change

CANopen DI 23 (Customisable) [822]

Variable	CANopenFuncI23 [3222]
Unit	-
Init value	0
Min value	0
Max value	10299
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)

Variable	CANopenDir I23 [3318]
Unit	-
Init value	0
Min value	0
Max value	1
Description	Direction of logic input Normally open or Normally closed

Variable	Validity on CANopen digital input 23 [3286]
Unit	-
Init value	1
Min value	0
Max value	3
Description	Activation validity (0=Never/1=Always/2=Post Starting/3= rpm & Volt Stabilized)

Variable	CANopenTM I23 [3254]
Unit	s
Init value	0.0
Min value	0.0
Max value	6553.5
Description	Function execution delay, user can add execution delay after logic input status change

CANopen DI 24 (Customisable) [823]

Variable	CANopenFuncI24 [3223]
Unit	-
Init value	0
Min value	0
Max value	10299
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)

Variable	CANopenDir I24 [3319]
Unit	-
Init value	0
Min value	0
Max value	1
Description	Direction of logic input Normally open or Normally closed

Variable	Validity on CANopen digital input 24 [3287]
Unit	-
Init value	1
Min value	0
Max value	3
Description	Activation validity (0=Never/1=Always/2=Post Starting/3= rpm & Volt Stabilized)

Variable	CANopenTM I24 [3255]
Unit	s
Init value	0.0
Min value	0.0
Max value	6553.5
Description	Function execution delay, user can add execution delay after logic input status change

CANopen DI 25 (Customisable) [824]

Variable	CANopenFuncI25 [3224]
Unit	-
Init value	0
Min value	0
Max value	10299
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)

Variable	CANopenDir I25 [3320]
Unit	-
Init value	0
Min value	0
Max value	1
Description	Direction of logic input Normally open or Normally closed

Variable	Validity on CANopen digital input 25 [3288]
Unit	-
Init value	1
Min value	0
Max value	3
Description	Activation validity (0=Never/1=Always/2=Post Starting/3= rpm & Volt Stabilized)

Variable	CANopenTM I25 [3256]
Unit	s
Init value	0.0
Min value	0.0
Max value	6553.5
Description	Function execution delay, user can add execution delay after logic input status change

CANopen DI 26 (Customisable) [825]

Variable	CANopenFuncI26 [3225]
Unit	-
Init value	0
Min value	0
Max value	10299
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)

Variable	CANopenDir I26 [3321]
Unit	-
Init value	0
Min value	0
Max value	1
Description	Direction of logic input Normally open or Normally closed

Variable	Validity on CANopen digital input 26 [3289]
Unit	-
Init value	1
Min value	0
Max value	3
Description	Activation validity (0=Never/1=Always/2=Post Starting/3= rpm & Volt Stabilized)

Variable	CANopenTM I26 [3257]
Unit	s
Init value	0.0
Min value	0.0
Max value	6553.5
Description	Function execution delay, user can add execution delay after logic input status change

CANopen DI 27 (Customisable) [826]

Variable	CANopenFuncI27 [3226]
Unit	-
Init value	0
Min value	0
Max value	10299
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)

Variable	CANopenDir I27 [3322]
Unit	-
Init value	0
Min value	0
Max value	1
Description	Direction of logic input Normally open or Normally closed

Variable	Validity on CANopen digital input 27 [3290]
Unit	-
Init value	1
Min value	0
Max value	3
Description	Activation validity (0=Never/1=Always/2=Post Starting/3= rpm & Volt Stabilized)

Variable	CANopenTM I27 [3258]
Unit	s
Init value	0.0
Min value	0.0
Max value	6553.5
Description	Function execution delay, user can add execution delay after logic input status change

CANopen DI 28 (Customisable) [827]

Variable	CANopenFuncI28 [3227]
Unit	-
Init value	0
Min value	0
Max value	10299
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)

Variable	CANopenDir I28 [3323]
Unit	-
Init value	0
Min value	0
Max value	1
Description	Direction of logic input Normally open or Normally closed

Variable	Validity on CANopen digital input 28 [3291]
Unit	-
Init value	1
Min value	0
Max value	3
Description	Activation validity (0=Never/1=Always/2=Post Starting/3= rpm & Volt Stabilized)

Variable	CANopenTM I28 [3259]
Unit	s
Init value	0.0
Min value	0.0
Max value	6553.5
Description	Function execution delay, user can add execution delay after logic input status change

CANopen DI 29 (Customisable) [828]

Variable	CANopenFuncI29 [3228]
Unit	-
Init value	0
Min value	0
Max value	10299
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)

Variable	CANopenDir I29 [3324]
Unit	-
Init value	0
Min value	0
Max value	1
Description	Direction of logic input Normally open or Normally closed

Variable	Validity on CANopen digital input 29 [3292]
Unit	-
Init value	1
Min value	0
Max value	3
Description	Activation validity (0=Never/1=Always/2=Post Starting/3= rpm & Volt Stabilized)

Variable	CANopenTM I29 [3260]
Unit	s
Init value	0.0
Min value	0.0
Max value	6553.5
Description	Function execution delay, user can add execution delay after logic input status change

CANopen DI 30 (Customisable) [829]

Variable	CANopenFuncI30 [3229]
Unit	-
Init value	0
Min value	0
Max value	10299
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)

Variable	CANopenDir I30 [3325]
Unit	-
Init value	0
Min value	0
Max value	1
Description	Direction of logic input Normally open or Normally closed

Variable	Validity on CANopen digital input 30 [3293]
Unit	-
Init value	1
Min value	0
Max value	3
Description	Activation validity (0=Never/1=Always/2=Post Starting/3= rpm & Volt Stabilized)

Variable	CANopenTM I30 [3261]
Unit	s
Init value	0.0
Min value	0.0
Max value	6553.5
Description	Function execution delay, user can add execution delay after logic input status change

CANopen DI 31 (Customisable) [830]

Variable	CANopenFuncI31 [3230]
Unit	-
Init value	0
Min value	0
Max value	10299
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)

Variable	CANopenDir I31 [3326]
Unit	-
Init value	0
Min value	0
Max value	1
Description	Direction of logic input Normally open or Normally closed

Variable	Validity on CANopen digital input 31 [3294]
Unit	-
Init value	1
Min value	0
Max value	3
Description	Activation validity (0=Never/1=Always/2=Post Starting/3= rpm & Volt Stabilized)

Variable	CANopenTM I31 [3262]
Unit	s
Init value	0.0
Min value	0.0
Max value	6553.5
Description	Function execution delay, user can add execution delay after logic input status change

CANopen DI 32 (Customisable) [831]

Variable	CANopenFuncI32 [3231]
Unit	-
Init value	0
Min value	0
Max value	10299
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)

Variable	CANopenDir I32 [3327]
Unit	-
Init value	0
Min value	0
Max value	1
Description	Direction of logic input Normally open or Normally closed

Variable	Validity on CANopen digital input 32 [3295]
Unit	-
Init value	1
Min value	0
Max value	3
Description	Activation validity (0=Never/1=Always/2=Post Starting/3= rpm & Volt Stabilized)

Variable	CANopenTM I32 [3263]
Unit	s
Init value	0.0
Min value	0.0
Max value	6553.5
Description	Function execution delay, user can add execution delay after logic input status change

CANopen DI 33 (Customisable) [1250]

Variable	CANopenFuncI33 [8550]
Unit	-
Init value	0
Min value	0
Max value	10299
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)

Variable	CANopenDir I33 [8646]
Unit	-
Init value	0
Min value	0
Max value	1
Description	Direction of logic input Normally open or Normally closed

Variable	Validity on CANopen digital input 33 [8614]
Unit	-
Init value	1
Min value	0
Max value	3
Description	Activation validity (0=Never/1=Always/2=Post Starting/3= rpm & Volt Stabilized)

Variable	CANopenTM I33 [8582]
Unit	s
Init value	0.0
Min value	0.0
Max value	6553.5
Description	Function execution delay, user can add execution delay after logic input status change

CANopen DI 34 (Customisable) [1251]

Variable	CANopenFuncI34 [8551]
Unit	-
Init value	0
Min value	0
Max value	10299
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)

Variable	CANopenDir I34 [8647]
Unit	-
Init value	0
Min value	0
Max value	1
Description	Direction of logic input Normally open or Normally closed

Variable	Validity on CANopen digital input 34 [8615]
Unit	-
Init value	1
Min value	0
Max value	3
Description	Activation validity (0=Never/1=Always/2=Post Starting/3= rpm & Volt Stabilized)

Variable	CANopenTM I34 [8583]
Unit	s
Init value	0.0
Min value	0.0
Max value	6553.5
Description	Function execution delay, user can add execution delay after logic input status change

CANopen DI 35 (Customisable) [1252]

Variable	CANopenFuncI35 [8552]
Unit	-
Init value	0
Min value	0
Max value	10299
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)

Variable	CANopenDir I35 [8648]
Unit	-
Init value	0
Min value	0
Max value	1
Description	Direction of logic input Normally open or Normally closed

Variable	Validity on CANopen digital input 35 [8616]
Unit	-
Init value	1
Min value	0
Max value	3
Description	Activation validity (0=Never/1=Always/2=Post Starting/3= rpm & Volt Stabilized)

Variable	CANopenTM I35 [8584]
Unit	s
Init value	0.0
Min value	0.0
Max value	6553.5
Description	Function execution delay, user can add execution delay after logic input status change

CANopen DI 36 (Customisable) [1253]

Variable	CANopenFuncI36 [8553]
Unit	-
Init value	0
Min value	0
Max value	10299
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)

Variable	CANopenDir I36 [8649]
Unit	-
Init value	0
Min value	0
Max value	1
Description	Direction of logic input Normally open or Normally closed

Variable	Validity on CANopen digital input 36 [8617]
Unit	-
Init value	1
Min value	0
Max value	3
Description	Activation validity (0=Never/1=Always/2=Post Starting/3= rpm & Volt Stabilized)

Variable	CANopenTM I36 [8585]
Unit	s
Init value	0.0
Min value	0.0
Max value	6553.5
Description	Function execution delay, user can add execution delay after logic input status change

CANopen DI 37 (Customisable) [1254]

Variable	CANopenFuncI37 [8554]
Unit	-
Init value	0
Min value	0
Max value	10299
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)

Variable	CANopenDir I37 [8650]
Unit	-
Init value	0
Min value	0
Max value	1
Description	Direction of logic input Normally open or Normally closed

Variable	Validity on CANopen digital input 37 [8618]
Unit	-
Init value	1
Min value	0
Max value	3
Description	Activation validity (0=Never/1=Always/2=Post Starting/3= rpm & Volt Stabilized)

Variable	CANopenTM I37 [8586]
Unit	s
Init value	0.0
Min value	0.0
Max value	6553.5
Description	Function execution delay, user can add execution delay after logic input status change

CANopen DI 38 (Customisable) [1255]

Variable	CANopenFuncI38 [8555]
Unit	-
Init value	0
Min value	0
Max value	10299
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)

Variable	CANopenDir I38 [8651]
Unit	-
Init value	0
Min value	0
Max value	1
Description	Direction of logic input Normally open or Normally closed

Variable	Validity on CANopen digital input 38 [8619]
Unit	-
Init value	1
Min value	0
Max value	3
Description	Activation validity (0=Never/1=Always/2=Post Starting/3= rpm & Volt Stabilized)

Variable	CANopenTM I38 [8587]
Unit	s
Init value	0.0
Min value	0.0
Max value	6553.5
Description	Function execution delay, user can add execution delay after logic input status change

CANopen DI 39 (Customisable) [1256]

Variable	CANopenFuncI39 [8556]
Unit	-
Init value	0
Min value	0
Max value	10299
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)

Variable	CANopenDir I39 [8652]
Unit	-
Init value	0
Min value	0
Max value	1
Description	Direction of logic input Normally open or Normally closed

Variable	Validity on CANopen digital input 39 [8620]
Unit	-
Init value	1
Min value	0
Max value	3
Description	Activation validity (0=Never/1=Always/2=Post Starting/3= rpm & Volt Stabilized)

Variable	CANopenTM I39 [8588]
Unit	s
Init value	0.0
Min value	0.0
Max value	6553.5
Description	Function execution delay, user can add execution delay after logic input status change

CANopen DI 40 (Customisable) [1257]

Variable	CANopenFuncI40 [8557]
Unit	-
Init value	0
Min value	0
Max value	10299
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)

Variable	CANopenDir I40 [8653]
Unit	-
Init value	0
Min value	0
Max value	1
Description	Direction of logic input Normally open or Normally closed

Variable	Validity on CANopen digital input 40 [8621]
Unit	-
Init value	1
Min value	0
Max value	3
Description	Activation validity (0=Never/1=Always/2=Post Starting/3= rpm & Volt Stabilized)

Variable	CANopenTM I40 [8589]
Unit	s
Init value	0.0
Min value	0.0
Max value	6553.5
Description	Function execution delay, user can add execution delay after logic input status change

CANopen DI 41 (Customisable) [1258]

Variable	CANopenFuncI41 [8558]
Unit	-
Init value	0
Min value	0
Max value	10299
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)

Variable	CANopenDir I41 [8654]
Unit	-
Init value	0
Min value	0
Max value	1
Description	Direction of logic input Normally open or Normally closed

Variable	Validity on CANopen digital input 41 [8622]
Unit	-
Init value	1
Min value	0
Max value	3
Description	Activation validity (0=Never/1=Always/2=Post Starting/3= rpm & Volt Stabilized)

Variable	CANopenTM I41 [8590]
Unit	s
Init value	0.0
Min value	0.0
Max value	6553.5
Description	Function execution delay, user can add execution delay after logic input status change

CANopen DI 42 (Customisable) [1259]

Variable	CANopenFuncI42 [8559]
Unit	-
Init value	0
Min value	0
Max value	10299
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)

Variable	CANopenDir I42 [8655]
Unit	-
Init value	0
Min value	0
Max value	1
Description	Direction of logic input Normally open or Normally closed

Variable	Validity on CANopen digital input 42 [8623]
Unit	-
Init value	1
Min value	0
Max value	3
Description	Activation validity (0=Never/1=Always/2=Post Starting/3= rpm & Volt Stabilized)

Variable	CANopenTM I42 [8591]
Unit	s
Init value	0.0
Min value	0.0
Max value	6553.5
Description	Function execution delay, user can add execution delay after logic input status change

CANopen DI 43 (Customisable) [1260]

Variable	CANopenFuncI43 [8560]
Unit	-
Init value	0
Min value	0
Max value	10299
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)

Variable	CANopenDir I43 [8656]
Unit	-
Init value	0
Min value	0
Max value	1
Description	Direction of logic input Normally open or Normally closed

Variable	Validity on CANopen digital input 43 [8624]
Unit	-
Init value	1
Min value	0
Max value	3
Description	Activation validity (0=Never/1=Always/2=Post Starting/3= rpm & Volt Stabilized)

Variable	CANopenTM I43 [8592]
Unit	s
Init value	0.0
Min value	0.0
Max value	6553.5
Description	Function execution delay, user can add execution delay after logic input status change

CANopen DI 44 (Customisable) [1261]

Variable	CANopenFuncI44 [8561]
Unit	-
Init value	0
Min value	0
Max value	10299
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)

Variable	CANopenDir I44 [8657]
Unit	-
Init value	0
Min value	0
Max value	1
Description	Direction of logic input Normally open or Normally closed

Variable	Validity on CANopen digital input 44 [8625]
Unit	-
Init value	1
Min value	0
Max value	3
Description	Activation validity (0=Never/1=Always/2=Post Starting/3= rpm & Volt Stabilized)

Variable	CANopenTM I44 [8593]
Unit	s
Init value	0.0
Min value	0.0
Max value	6553.5
Description	Function execution delay, user can add execution delay after logic input status change

CANopen DI 45 (Customisable) [1262]

Variable	CANopenFuncI45 [8562]
Unit	-
Init value	0
Min value	0
Max value	10299
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)

Variable	CANopenDir I45 [8658]
Unit	-
Init value	0
Min value	0
Max value	1
Description	Direction of logic input Normally open or Normally closed

Variable	Validity on CANopen digital input 45 [8626]
Unit	-
Init value	1
Min value	0
Max value	3
Description	Activation validity (0=Never/1=Always/2=Post Starting/3= rpm & Volt Stabilized)

Variable	CANopenTM I45 [8594]
Unit	s
Init value	0.0
Min value	0.0
Max value	6553.5
Description	Function execution delay, user can add execution delay after logic input status change

CANopen DI 46 (Customisable) [1263]

Variable	CANopenFuncI46 [8563]
Unit	-
Init value	0
Min value	0
Max value	10299
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)

Variable	CANopenDir I46 [8659]
Unit	-
Init value	0
Min value	0
Max value	1
Description	Direction of logic input Normally open or Normally closed

Variable	Validity on CANopen digital input 46 [8627]
Unit	-
Init value	1
Min value	0
Max value	3
Description	Activation validity (0=Never/1=Always/2=Post Starting/3= rpm & Volt Stabilized)

Variable	CANopenTM I46 [8595]
Unit	s
Init value	0.0
Min value	0.0
Max value	6553.5
Description	Function execution delay, user can add execution delay after logic input status change

CANopen DI 47 (Customisable) [1264]

Variable	CANopenFuncI47 [8564]
Unit	-
Init value	0
Min value	0
Max value	10299
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)

Variable	CANopenDir I47 [8660]
Unit	-
Init value	0
Min value	0
Max value	1
Description	Direction of logic input Normally open or Normally closed

Variable	Validity on CANopen digital input 47 [8628]
Unit	-
Init value	1
Min value	0
Max value	3
Description	Activation validity (0=Never/1=Always/2=Post Starting/3= rpm & Volt Stabilized)

Variable	CANopenTM I47 [8596]
Unit	s
Init value	0.0
Min value	0.0
Max value	6553.5
Description	Function execution delay, user can add execution delay after logic input status change

CANopen DI 48 (Customisable) [1265]

Variable	CANopenFuncI48 [8565]
Unit	-
Init value	0
Min value	0
Max value	10299
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)

Variable	CANopenDir I48 [8661]
Unit	-
Init value	0
Min value	0
Max value	1
Description	Direction of logic input Normally open or Normally closed

Variable	Validity on CANopen digital input 48 [8629]
Unit	-
Init value	1
Min value	0
Max value	3
Description	Activation validity (0=Never/1=Always/2=Post Starting/3= rpm & Volt Stabilized)

Variable	CANopenTM I48 [8597]
Unit	s
Init value	0.0
Min value	0.0
Max value	6553.5
Description	Function execution delay, user can add execution delay after logic input status change

CANopen DI 49 (Customisable) [1266]

Variable	CANopenFuncI49 [8566]
Unit	-
Init value	0
Min value	0
Max value	10299
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)

Variable	CANopenDir I49 [8662]
Unit	-
Init value	0
Min value	0
Max value	1
Description	Direction of logic input Normally open or Normally closed

Variable	Validity on CANopen digital input 49 [8630]
Unit	-
Init value	1
Min value	0
Max value	3
Description	Activation validity (0=Never/1=Always/2=Post Starting/3= rpm & Volt Stabilized)

Variable	CANopenTM I49 [8598]
Unit	s
Init value	0.0
Min value	0.0
Max value	6553.5
Description	Function execution delay, user can add execution delay after logic input status change

CANopen DI 50 (Customisable) [1267]

Variable	CANopenFuncI50 [8567]
Unit	-
Init value	0
Min value	0
Max value	10299
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)

Variable	CANopenDir I50 [8663]
Unit	-
Init value	0
Min value	0
Max value	1
Description	Direction of logic input Normally open or Normally closed

Variable	Validity on CANopen digital input 50 [8631]
Unit	-
Init value	1
Min value	0
Max value	3
Description	Activation validity (0=Never/1=Always/2=Post Starting/3= rpm & Volt Stabilized)

Variable	CANopenTM I50 [8599]
Unit	s
Init value	0.0
Min value	0.0
Max value	6553.5
Description	Function execution delay, user can add execution delay after logic input status change

CANopen DI 51 (Customisable) [1268]

Variable	CANopenFuncI51 [8568]
Unit	-
Init value	0
Min value	0
Max value	10299
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)

Variable	CANopenDir I51 [8664]
Unit	-
Init value	0
Min value	0
Max value	1
Description	Direction of logic input Normally open or Normally closed

Variable	Validity on CANopen digital input 51 [8632]
Unit	-
Init value	1
Min value	0
Max value	3
Description	Activation validity (0=Never/1=Always/2=Post Starting/3= rpm & Volt Stabilized)

Variable	CANopenTM I51 [8600]
Unit	s
Init value	0.0
Min value	0.0
Max value	6553.5
Description	Function execution delay, user can add execution delay after logic input status change

CANopen DI 52 (Customisable) [1269]

Variable	CANopenFuncI52 [8569]
Unit	-
Init value	0
Min value	0
Max value	10299
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)

Variable	CANopenDir I52 [8665]
Unit	-
Init value	0
Min value	0
Max value	1
Description	Direction of logic input Normally open or Normally closed

Variable	Validity on CANopen digital input 52 [8633]
Unit	-
Init value	1
Min value	0
Max value	3
Description	Activation validity (0=Never/1=Always/2=Post Starting/3= rpm & Volt Stabilized)

Variable	CANopenTM I52 [8601]
Unit	s
Init value	0.0
Min value	0.0
Max value	6553.5
Description	Function execution delay, user can add execution delay after logic input status change

CANopen DI 53 (Customisable) [1270]

Variable	CANopenFuncI53 [8570]
Unit	-
Init value	0
Min value	0
Max value	10299
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)

Variable	CANopenDir I53 [8666]
Unit	-
Init value	0
Min value	0
Max value	1
Description	Direction of logic input Normally open or Normally closed

Variable	Validity on CANopen digital input 53 [8634]
Unit	-
Init value	1
Min value	0
Max value	3
Description	Activation validity (0=Never/1=Always/2=Post Starting/3= rpm & Volt Stabilized)

Variable	CANopenTM I53 [8602]
Unit	s
Init value	0.0
Min value	0.0
Max value	6553.5
Description	Function execution delay, user can add execution delay after logic input status change

CANopen DI 54 (Customisable) [1271]

Variable	CANopenFuncI54 [8571]
Unit	-
Init value	0
Min value	0
Max value	10299
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)

Variable	CANopenDir I54 [8667]
Unit	-
Init value	0
Min value	0
Max value	1
Description	Direction of logic input Normally open or Normally closed

Variable	Validity on CANopen digital input 54 [8635]
Unit	-
Init value	1
Min value	0
Max value	3
Description	Activation validity (0=Never/1=Always/2=Post Starting/3= rpm & Volt Stabilized)

Variable	CANopenTM I54 [8603]
Unit	s
Init value	0.0
Min value	0.0
Max value	6553.5
Description	Function execution delay, user can add execution delay after logic input status change

CANopen DI 55 (Customisable) [1272]

Variable	CANopenFuncI55 [8572]
Unit	-
Init value	0
Min value	0
Max value	10299
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)

Variable	CANopenDir I55 [8668]
Unit	-
Init value	0
Min value	0
Max value	1
Description	Direction of logic input Normally open or Normally closed

Variable	Validity on CANopen digital input 55 [8636]
Unit	-
Init value	1
Min value	0
Max value	3
Description	Activation validity (0=Never/1=Always/2=Post Starting/3= rpm & Volt Stabilized)

Variable	CANopenTM I55 [8604]
Unit	s
Init value	0.0
Min value	0.0
Max value	6553.5
Description	Function execution delay, user can add execution delay after logic input status change

CANopen DI 56 (Customisable) [1273]

Variable	CANopenFuncI56 [8573]
Unit	-
Init value	0
Min value	0
Max value	10299
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)

Variable	CANopenDir I56 [8669]
Unit	-
Init value	0
Min value	0
Max value	1
Description	Direction of logic input Normally open or Normally closed

Variable	Validity on CANopen digital input 56 [8637]
Unit	-
Init value	1
Min value	0
Max value	3
Description	Activation validity (0=Never/1=Always/2=Post Starting/3= rpm & Volt Stabilized)

Variable	CANopenTM I56 [8605]
Unit	s
Init value	0.0
Min value	0.0
Max value	6553.5
Description	Function execution delay, user can add execution delay after logic input status change

CANopen DI 57 (Customisable) [1274]

Variable	CANopenFuncI57 [8574]
Unit	-
Init value	0
Min value	0
Max value	10299
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)

Variable	CANopenDir I57 [8670]
Unit	-
Init value	0
Min value	0
Max value	1
Description	Direction of logic input Normally open or Normally closed

Variable	Validity on CANopen digital input 57 [8638]
Unit	-
Init value	1
Min value	0
Max value	3
Description	Activation validity (0=Never/1=Always/2=Post Starting/3= rpm & Volt Stabilized)

Variable	CANopenTM I57 [8606]
Unit	s
Init value	0.0
Min value	0.0
Max value	6553.5
Description	Function execution delay, user can add execution delay after logic input status change

CANopen DI 58 (Customisable) [1275]

Variable	CANopenFuncI58 [8575]
Unit	-
Init value	0
Min value	0
Max value	10299
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)

Variable	CANopenDir I58 [8671]
Unit	-
Init value	0
Min value	0
Max value	1
Description	Direction of logic input Normally open or Normally closed

Variable	Validity on CANopen digital input 58 [8639]
Unit	-
Init value	1
Min value	0
Max value	3
Description	Activation validity (0=Never/1=Always/2=Post Starting/3= rpm & Volt Stabilized)

Variable	CANopenTM I58 [8607]
Unit	s
Init value	0.0
Min value	0.0
Max value	6553.5
Description	Function execution delay, user can add execution delay after logic input status change

CANopen DI 59 (Customisable) [1276]

Variable	CANopenFuncI59 [8576]
Unit	-
Init value	0
Min value	0
Max value	10299
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)

Variable	CANopenDir I59 [8672]
Unit	-
Init value	0
Min value	0
Max value	1
Description	Direction of logic input Normally open or Normally closed

Variable	Validity on CANopen digital input 59 [8640]
Unit	-
Init value	1
Min value	0
Max value	3
Description	Activation validity (0=Never/1=Always/2=Post Starting/3= rpm & Volt Stabilized)

Variable	CANopenTM I59 [8608]
Unit	s
Init value	0.0
Min value	0.0
Max value	6553.5
Description	Function execution delay, user can add execution delay after logic input status change

CANopen DI 60 (Customisable) [1277]

Variable	CANopenFuncI60 [8577]
Unit	-
Init value	0
Min value	0
Max value	10299
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)

Variable	CANopenDir I60 [8673]
Unit	-
Init value	0
Min value	0
Max value	1
Description	Direction of logic input Normally open or Normally closed

Variable	Validity on CANopen digital input 60 [8641]
Unit	-
Init value	1
Min value	0
Max value	3
Description	Activation validity (0=Never/1=Always/2=Post Starting/3= rpm & Volt Stabilized)

Variable	CANopenTM I60 [8609]
Unit	s
Init value	0.0
Min value	0.0
Max value	6553.5
Description	Function execution delay, user can add execution delay after logic input status change

CANopen DI 61 (Customisable) [1278]

Variable	CANopenFuncI61 [8578]
Unit	-
Init value	0
Min value	0
Max value	10299
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)

Variable	CANopenDir I61 [8674]
Unit	-
Init value	0
Min value	0
Max value	1
Description	Direction of logic input Normally open or Normally closed

Variable	Validity on CANopen digital input 61 [8642]
Unit	-
Init value	1
Min value	0
Max value	3
Description	Activation validity (0=Never/1=Always/2=Post Starting/3= rpm & Volt Stabilized)

Variable	CANopenTM I61 [8610]
Unit	s
Init value	0.0
Min value	0.0
Max value	6553.5
Description	Function execution delay, user can add execution delay after logic input status change

CANopen DI 62 (Customisable) [1279]

Variable	CANopenFuncI62 [8579]
Unit	-
Init value	0
Min value	0
Max value	10299
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)

Variable	CANopenDir I62 [8675]
Unit	-
Init value	0
Min value	0
Max value	1
Description	Direction of logic input Normally open or Normally closed

Variable	Validity on CANopen digital input 62 [8643]
Unit	-
Init value	1
Min value	0
Max value	3
Description	Activation validity (0=Never/1=Always/2=Post Starting/3= rpm & Volt Stabilized)

Variable	CANopenTM I62 [8611]
Unit	s
Init value	0.0
Min value	0.0
Max value	6553.5
Description	Function execution delay, user can add execution delay after logic input status change

CANopen DI 63 (Customisable) [1280]

Variable	CANopenFuncI63 [8580]
Unit	-
Init value	0
Min value	0
Max value	10299
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)

Variable	CANopenDir I63 [8676]
Unit	-
Init value	0
Min value	0
Max value	1
Description	Direction of logic input Normally open or Normally closed

Variable	Validity on CANopen digital input 63 [8644]
Unit	-
Init value	1
Min value	0
Max value	3
Description	Activation validity (0=Never/1=Always/2=Post Starting/3= rpm & Volt Stabilized)

Variable	CANopenTM I63 [8612]
Unit	s
Init value	0.0
Min value	0.0
Max value	6553.5
Description	Function execution delay, user can add execution delay after logic input status change

CANopen DI 64 (Customisable) [1281]

Variable	CANopenFuncI64 [8581]
Unit	-
Init value	0
Min value	0
Max value	10299
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)

Variable	CANopenDir I64 [8677]
Unit	-
Init value	0
Min value	0
Max value	1
Description	Direction of logic input Normally open or Normally closed

Variable	Validity on CANopen digital input 64 [8645]
Unit	-
Init value	1
Min value	0
Max value	3
Description	Activation validity (0=Never/1=Always/2=Post Starting/3= rpm & Volt Stabilized)

Variable	CANopenTM I64 [8613]
Unit	s
Init value	0.0
Min value	0.0
Max value	6553.5
Description	Function execution delay, user can add execution delay after logic input status change

Digital outputs

CANopen DO 1 (Customisable) [4751]

Variable	CANopenFuncO1 [3350]
Unit	-
Init value	0
Min value	0
Max value	10299
Description	Status change of the open or closed logic output, depending on the selected function

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

CANopen DO 2 (Customisable) [4752]

Variable	CANopenFuncO2 [3351]
Unit	-
Init value	0
Min value	0
Max value	10299
Description	Status change of the open or closed logic output, depending on the selected function

Variable	CANopenModeO2 [3383]
Unit	-
Init value	0
Min value	0
Max value	1
Description	selection of the direction of the logic output, normally energized or de-energized

CANopen DO 3 (Customisable) [4753]

Variable	CANopenFuncO3 [3352]
Unit	-
Init value	0
Min value	0
Max value	10299
Description	Status change of the open or closed logic output, depending on the selected function

Variable	CANopenModeO3 [3384]
Unit	-
Init value	0
Min value	0
Max value	1
Description	selection of the direction of the logic output, normally energized or de-energized

CANopen DO 4 (Customisable) [4754]

Variable	CANopenFuncO4 [3353]
Unit	-
Init value	0
Min value	0
Max value	10299
Description	Status change of the open or closed logic output, depending on the selected function

Variable	CANopenModeO4 [3385]
Unit	-
Init value	0
Min value	0
Max value	1
Description	selection of the direction of the logic output, normally energized or de-energized

CANopen DO 5 (Customisable) [4755]

Variable	CANopenFuncO5 [3354]
Unit	-
Init value	0
Min value	0
Max value	10299
Description	Status change of the open or closed logic output, depending on the selected function

Variable	CANopenModeO5 [3386]
Unit	-
Init value	0
Min value	0
Max value	1
Description	selection of the direction of the logic output, normally energized or de-energized

CANopen DO 6 (Customisable) [4756]

Variable	CANopenFuncO6 [3355]
Unit	-
Init value	0
Min value	0
Max value	10299
Description	Status change of the open or closed logic output, depending on the selected function

Variable	CANopenModeO6 [3387]
Unit	-
Init value	0
Min value	0
Max value	1
Description	selection of the direction of the logic output, normally energized or de-energized

CANopen DO 7 (Customisable) [4757]

Variable	CANopenFuncO7 [3356]
Unit	-
Init value	0
Min value	0
Max value	10299
Description	Status change of the open or closed logic output, depending on the selected function

Variable	CANopenModeO7 [3388]
Unit	-
Init value	0
Min value	0
Max value	1
Description	selection of the direction of the logic output, normally energized or de-energized

CANopen DO 8 (Customisable) [4758]

Variable	CANopenFuncO8 [3357]
Unit	-
Init value	0
Min value	0
Max value	10299
Description	Status change of the open or closed logic output, depending on the selected function

Variable	CANopenModeO8 [3389]
Unit	-
Init value	0
Min value	0
Max value	1
Description	selection of the direction of the logic output, normally energized or de-energized

CANopen DO 9 (Customisable) [4759]

Variable	CANopenFuncO9 [3358]
Unit	-
Init value	0
Min value	0
Max value	10299
Description	Status change of the open or closed logic output, depending on the selected function

Variable	CANopenModeO9 [3390]
Unit	-
Init value	0
Min value	0
Max value	1
Description	selection of the direction of the logic output, normally energized or de-energized

CANopen DO 10 (Customisable) [4760]

Variable	CANopenFuncO10 [3359]
Unit	-
Init value	0
Min value	0
Max value	10299
Description	Status change of the open or closed logic output, depending on the selected function

Variable	CANopenModeO10 [3391]
Unit	-
Init value	0
Min value	0
Max value	1
Description	selection of the direction of the logic output, normally energized or de-energized

CANopen DO 11 (Customisable) [4761]

Variable	CANopenFuncO11 [3360]
Unit	-
Init value	0
Min value	0
Max value	10299
Description	Status change of the open or closed logic output, depending on the selected function

Variable	CANopenModeO11 [3392]
Unit	-
Init value	0
Min value	0
Max value	1
Description	selection of the direction of the logic output, normally energized or de-energized

CANopen DO 12 (Customisable) [4762]

Variable	CANopenFuncO12 [3361]
Unit	-
Init value	0
Min value	0
Max value	10299
Description	Status change of the open or closed logic output, depending on the selected function

Variable	CANopenModeO12 [3393]
Unit	-
Init value	0
Min value	0
Max value	1
Description	selection of the direction of the logic output, normally energized or de-energized

CANopen DO 13 (Customisable) [4763]

Variable	CANopenFuncO13 [3362]
Unit	-
Init value	0
Min value	0
Max value	10299
Description	Status change of the open or closed logic output, depending on the selected function

Variable	CANopenModeO13 [3394]
Unit	-
Init value	0
Min value	0
Max value	1
Description	selection of the direction of the logic output, normally energized or de-energized

CANopen DO 14 (Customisable) [4764]

Variable	CANopenFuncO14 [3363]
Unit	-
Init value	0
Min value	0
Max value	10299
Description	Status change of the open or closed logic output, depending on the selected function

Variable	CANopenModeO14 [3395]
Unit	-
Init value	0
Min value	0
Max value	1
Description	selection of the direction of the logic output, normally energized or de-energized

CANopen DO 15 (Customisable) [4765]

Variable	CANopenFuncO15 [3364]
Unit	-
Init value	0
Min value	0
Max value	10299
Description	Status change of the open or closed logic output, depending on the selected function

Variable	CANopenModeO15 [3396]
Unit	-
Init value	0
Min value	0
Max value	1
Description	selection of the direction of the logic output, normally energized or de-energized

CANopen DO 16 (Customisable) [4766]

Variable	CANopenFuncO16 [3365]
Unit	-
Init value	0
Min value	0
Max value	10299
Description	Status change of the open or closed logic output, depending on the selected function

Variable	CANopenModeO16 [3397]
Unit	-
Init value	0
Min value	0
Max value	1
Description	selection of the direction of the logic output, normally energized or de-energized

CANopen DO 17 (Customisable) [4767]

Variable	CANopenFuncO17 [3366]
Unit	-
Init value	0
Min value	0
Max value	10299
Description	Status change of the open or closed logic output, depending on the selected function

Variable	CANopenModeO17 [3398]
Unit	-
Init value	0
Min value	0
Max value	1
Description	selection of the direction of the logic output, normally energized or de-energized

CANopen DO 18 (Customisable) [4768]

Variable	CANopenFuncO18 [3367]
Unit	-
Init value	0
Min value	0
Max value	10299
Description	Status change of the open or closed logic output, depending on the selected function

Variable	CANopenModeO18 [3399]
Unit	-
Init value	0
Min value	0
Max value	1
Description	selection of the direction of the logic output, normally energized or de-energized

CANopen DO 19 (Customisable) [4769]

Variable	CANopenFuncO19 [3368]
Unit	-
Init value	0
Min value	0
Max value	10299
Description	Status change of the open or closed logic output, depending on the selected function

Variable	CANopenModeO19 [3400]
Unit	-
Init value	0
Min value	0
Max value	1
Description	selection of the direction of the logic output, normally energized or de-energized

CANopen DO 20 (Customisable) [4770]

Variable	CANopenFuncO20 [3369]
Unit	-
Init value	0
Min value	0
Max value	10299
Description	Status change of the open or closed logic output, depending on the selected function

Variable	CANopenModeO20 [3401]
Unit	-
Init value	0
Min value	0
Max value	1
Description	selection of the direction of the logic output, normally energized or de-energized

CANopen DO 21 (Customisable) [4771]

Variable	CANopenFuncO21 [3370]
Unit	-
Init value	0
Min value	0
Max value	10299
Description	Status change of the open or closed logic output, depending on the selected function

Variable	CANopenModeO21 [3402]
Unit	-
Init value	0
Min value	0
Max value	1
Description	selection of the direction of the logic output, normally energized or de-energized

CANopen DO 22 (Customisable) [4772]

Variable	CANopenFuncO22 [3371]
Unit	-
Init value	0
Min value	0
Max value	10299
Description	Status change of the open or closed logic output, depending on the selected function

Variable	CANopenModeO22 [3403]
Unit	-
Init value	0
Min value	0
Max value	1
Description	selection of the direction of the logic output, normally energized or de-energized

CANopen DO 23 (Customisable) [4773]

Variable	CANopenFuncO23 [3372]
Unit	-
Init value	0
Min value	0
Max value	10299
Description	Status change of the open or closed logic output, depending on the selected function

Variable	CANopenModeO23 [3404]
Unit	-
Init value	0
Min value	0
Max value	1
Description	selection of the direction of the logic output, normally energized or de-energized

CANopen DO 24 (Customisable) [4774]

Variable	CANopenFuncO24 [3373]
Unit	-
Init value	0
Min value	0
Max value	10299
Description	Status change of the open or closed logic output, depending on the selected function

Variable	CANopenModeO24 [3405]
Unit	-
Init value	0
Min value	0
Max value	1
Description	selection of the direction of the logic output, normally energized or de-energized

CANopen DO 25 (Customisable) [4775]

Variable	CANopenFuncO25 [3374]
Unit	-
Init value	0
Min value	0
Max value	10299
Description	Status change of the open or closed logic output, depending on the selected function

Variable	CANopenModeO25 [3406]
Unit	-
Init value	0
Min value	0
Max value	1
Description	selection of the direction of the logic output, normally energized or de-energized

CANopen DO 26 (Customisable) [4776]

Variable	CANopenFuncO26 [3375]
Unit	-
Init value	0
Min value	0
Max value	10299
Description	Status change of the open or closed logic output, depending on the selected function

Variable	CANopenModeO26 [3407]
Unit	-
Init value	0
Min value	0
Max value	1
Description	selection of the direction of the logic output, normally energized or de-energized

CANopen DO 27 (Customisable) [4777]

Variable	CANopenFuncO27 [3376]
Unit	-
Init value	0
Min value	0
Max value	10299
Description	Status change of the open or closed logic output, depending on the selected function

Variable	CANopenModeO27 [3408]
Unit	-
Init value	0
Min value	0
Max value	1
Description	selection of the direction of the logic output, normally energized or de-energized

CANopen DO 28 (Customisable) [4778]

Variable	CANopenFuncO28 [3377]
Unit	-
Init value	0
Min value	0
Max value	10299
Description	Status change of the open or closed logic output, depending on the selected function

Variable	CANopenModeO28 [3409]
Unit	-
Init value	0
Min value	0
Max value	1
Description	selection of the direction of the logic output, normally energized or de-energized

CANopen DO 29 (Customisable) [4779]

Variable	CANopenFuncO29 [3378]
Unit	-
Init value	0
Min value	0
Max value	10299
Description	Status change of the open or closed logic output, depending on the selected function

Variable	CANopenModeO29 [3410]
Unit	-
Init value	0
Min value	0
Max value	1
Description	selection of the direction of the logic output, normally energized or de-energized

CANopen DO 30 (Customisable) [4780]

Variable	CANopenFuncO30 [3379]
Unit	-
Init value	0
Min value	0
Max value	10299
Description	Status change of the open or closed logic output, depending on the selected function

Variable	CANopenModeO30 [3411]
Unit	-
Init value	0
Min value	0
Max value	1
Description	selection of the direction of the logic output, normally energized or de-energized

CANopen DO 31 (Customisable) [4781]

Variable	CANopenFuncO31 [3380]
Unit	-
Init value	0
Min value	0
Max value	10299
Description	Status change of the open or closed logic output, depending on the selected function

Variable	CANopenModeO31 [3412]
Unit	-
Init value	0
Min value	0
Max value	1
Description	selection of the direction of the logic output, normally energized or de-energized

CANopen DO 32 (Customisable) [4782]

Variable	CANopenFuncO32 [3381]
Unit	-
Init value	0
Min value	0
Max value	10299
Description	Status change of the open or closed logic output, depending on the selected function

Variable	CANopenModeO32 [3413]
Unit	-
Init value	0
Min value	0
Max value	1
Description	selection of the direction of the logic output, normally energized or de-energized

CANopen DO 33 (Customisable) [5100]

Variable	CANopenFuncO33 [8700]
Unit	-
Init value	0
Min value	0
Max value	10299
Description	Status change of the open or closed logic output, depending on the selected function

Variable	CANopenModeO33 [8732]
Unit	-
Init value	0
Min value	0
Max value	1
Description	selection of the direction of the logic output, normally energized or de-energized

CANopen DO 34 (Customisable) [5101]

Variable	CANopenFuncO34 [8701]
Unit	-
Init value	0
Min value	0
Max value	10299
Description	Status change of the open or closed logic output, depending on the selected function

Variable	CANopenModeO34 [8733]
Unit	-
Init value	0
Min value	0
Max value	1
Description	selection of the direction of the logic output, normally energized or de-energized

CANopen DO 35 (Customisable) [5102]

Variable	CANopenFuncO35 [8702]
Unit	-
Init value	0
Min value	0
Max value	10299
Description	Status change of the open or closed logic output, depending on the selected function

Variable	CANopenModeO35 [8734]
Unit	-
Init value	0
Min value	0
Max value	1
Description	selection of the direction of the logic output, normally energized or de-energized

CANopen DO 36 (Customisable) [5103]

Variable	CANopenFuncO36 [8703]
Unit	-
Init value	0
Min value	0
Max value	10299
Description	Status change of the open or closed logic output, depending on the selected function

Variable	CANopenModeO36 [8735]
Unit	-
Init value	0
Min value	0
Max value	1
Description	selection of the direction of the logic output, normally energized or de-energized

CANopen DO 37 (Customisable) [5104]

Variable	CANopenFuncO37 [8704]
Unit	-
Init value	0
Min value	0
Max value	10299
Description	Status change of the open or closed logic output, depending on the selected function

Variable	CANopenModeO37 [8736]
Unit	-
Init value	0
Min value	0
Max value	1
Description	selection of the direction of the logic output, normally energized or de-energized

CANopen DO 38 (Customisable) [5105]

Variable	CANopenFuncO38 [8705]
Unit	-
Init value	0
Min value	0
Max value	10299
Description	Status change of the open or closed logic output, depending on the selected function

Variable	CANopenModeO38 [8737]
Unit	-
Init value	0
Min value	0
Max value	1
Description	selection of the direction of the logic output, normally energized or de-energized

CANopen DO 39 (Customisable) [5106]

Variable	CANopenFuncO39 [8706]
Unit	-
Init value	0
Min value	0
Max value	10299
Description	Status change of the open or closed logic output, depending on the selected function

Variable	CANopenModeO39 [8738]
Unit	-
Init value	0
Min value	0
Max value	1
Description	selection of the direction of the logic output, normally energized or de-energized

CANopen DO 40 (Customisable) [5107]

Variable	CANopenFuncO40 [8707]
Unit	-
Init value	0
Min value	0
Max value	10299
Description	Status change of the open or closed logic output, depending on the selected function

Variable	CANopenModeO40 [8739]
Unit	-
Init value	0
Min value	0
Max value	1
Description	selection of the direction of the logic output, normally energized or de-energized

CANopen DO 41 (Customisable) [5108]

Variable	CANopenFuncO41 [8708]
Unit	-
Init value	0
Min value	0
Max value	10299
Description	Status change of the open or closed logic output, depending on the selected function

Variable	CANopenModeO41 [8740]
Unit	-
Init value	0
Min value	0
Max value	1
Description	selection of the direction of the logic output, normally energized or de-energized

CANopen DO 42 (Customisable) [5109]

Variable	CANopenFuncO42 [8709]
Unit	-
Init value	0
Min value	0
Max value	10299
Description	Status change of the open or closed logic output, depending on the selected function

Variable	CANopenModeO42 [8741]
Unit	-
Init value	0
Min value	0
Max value	1
Description	selection of the direction of the logic output, normally energized or de-energized

CANopen DO 43 (Customisable) [5110]

Variable	CANopenFuncO43 [8710]
Unit	-
Init value	0
Min value	0
Max value	10299
Description	Status change of the open or closed logic output, depending on the selected function

Variable	CANopenModeO43 [8742]
Unit	-
Init value	0
Min value	0
Max value	1
Description	selection of the direction of the logic output, normally energized or de-energized

CANopen DO 44 (Customisable) [5111]

Variable	CANopenFuncO44 [8711]
Unit	-
Init value	0
Min value	0
Max value	10299
Description	Status change of the open or closed logic output, depending on the selected function

Variable	CANopenModeO44 [8743]
Unit	-
Init value	0
Min value	0
Max value	1
Description	selection of the direction of the logic output, normally energized or de-energized

CANopen DO 45 (Customisable) [5112]

Variable	CANopenFuncO45 [8712]
Unit	-
Init value	0
Min value	0
Max value	10299
Description	Status change of the open or closed logic output, depending on the selected function

Variable	CANopenModeO45 [8744]
Unit	-
Init value	0
Min value	0
Max value	1
Description	selection of the direction of the logic output, normally energized or de-energized

CANopen DO 46 (Customisable) [5113]

Variable	CANopenFuncO46 [8713]
Unit	-
Init value	0
Min value	0
Max value	10299
Description	Status change of the open or closed logic output, depending on the selected function

Variable	CANopenModeO46 [8745]
Unit	-
Init value	0
Min value	0
Max value	1
Description	selection of the direction of the logic output, normally energized or de-energized

CANopen DO 47 (Customisable) [5114]

Variable	CANopenFuncO47 [8714]
Unit	-
Init value	0
Min value	0
Max value	10299
Description	Status change of the open or closed logic output, depending on the selected function

Variable	CANopenModeO47 [8746]
Unit	-
Init value	0
Min value	0
Max value	1
Description	selection of the direction of the logic output, normally energized or de-energized

CANopen DO 48 (Customisable) [5115]

Variable	CANopenFuncO48 [8715]
Unit	-
Init value	0
Min value	0
Max value	10299
Description	Status change of the open or closed logic output, depending on the selected function

Variable	CANopenModeO48 [8747]
Unit	-
Init value	0
Min value	0
Max value	1
Description	selection of the direction of the logic output, normally energized or de-energized

CANopen DO 49 (Customisable) [5116]

Variable	CANopenFuncO49 [8716]
Unit	-
Init value	0
Min value	0
Max value	10299
Description	Status change of the open or closed logic output, depending on the selected function

Variable	CANopenModeO49 [8748]
Unit	-
Init value	0
Min value	0
Max value	1
Description	selection of the direction of the logic output, normally energized or de-energized

CANopen DO 50 (Customisable) [5117]

Variable	CANopenFuncO50 [8717]
Unit	-
Init value	0
Min value	0
Max value	10299
Description	Status change of the open or closed logic output, depending on the selected function

Variable	CANopenModeO50 [8749]
Unit	-
Init value	0
Min value	0
Max value	1
Description	selection of the direction of the logic output, normally energized or de-energized

CANopen DO 51 (Customisable) [5118]

Variable	CANopenFuncO51 [8718]
Unit	-
Init value	0
Min value	0
Max value	10299
Description	Status change of the open or closed logic output, depending on the selected function

Variable	CANopenModeO51 [8750]
Unit	-
Init value	0
Min value	0
Max value	1
Description	selection of the direction of the logic output, normally energized or de-energized

CANopen DO 52 (Customisable) [5119]

Variable	CANopenFuncO52 [8719]
Unit	-
Init value	0
Min value	0
Max value	10299
Description	Status change of the open or closed logic output, depending on the selected function

Variable	CANopenModeO52 [8751]
Unit	-
Init value	0
Min value	0
Max value	1
Description	selection of the direction of the logic output, normally energized or de-energized

CANopen DO 53 (Customisable) [5120]

Variable	CANopenFuncO53 [8720]
Unit	-
Init value	0
Min value	0
Max value	10299
Description	Status change of the open or closed logic output, depending on the selected function

Variable	CANopenModeO53 [8752]
Unit	-
Init value	0
Min value	0
Max value	1
Description	selection of the direction of the logic output, normally energized or de-energized

CANopen DO 54 (Customisable) [5121]

Variable	CANopenFuncO54 [8721]
Unit	-
Init value	0
Min value	0
Max value	10299
Description	Status change of the open or closed logic output, depending on the selected function

Variable	CANopenModeO54 [8753]
Unit	-
Init value	0
Min value	0
Max value	1
Description	selection of the direction of the logic output, normally energized or de-energized

CANopen DO 55 (Customisable) [5122]

Variable	CANopenFuncO55 [8722]
Unit	-
Init value	0
Min value	0
Max value	10299
Description	Status change of the open or closed logic output, depending on the selected function

Variable	CANopenModeO55 [8754]
Unit	-
Init value	0
Min value	0
Max value	1
Description	selection of the direction of the logic output, normally energized or de-energized

CANopen DO 56 (Customisable) [5123]

Variable	CANopenFuncO56 [8723]
Unit	-
Init value	0
Min value	0
Max value	10299
Description	Status change of the open or closed logic output, depending on the selected function

Variable	CANopenModeO56 [8755]
Unit	-
Init value	0
Min value	0
Max value	1
Description	selection of the direction of the logic output, normally energized or de-energized

CANopen DO 57 (Customisable) [5124]

Variable	CANopenFuncO57 [8724]
Unit	-
Init value	0
Min value	0
Max value	10299
Description	Status change of the open or closed logic output, depending on the selected function

Variable	CANopenModeO57 [8756]
Unit	-
Init value	0
Min value	0
Max value	1
Description	selection of the direction of the logic output, normally energized or de-energized

CANopen DO 58 (Customisable) [5125]

Variable	CANopenFuncO58 [8725]
Unit	-
Init value	0
Min value	0
Max value	10299
Description	Status change of the open or closed logic output, depending on the selected function

Variable	CANopenModeO58 [8757]
Unit	-
Init value	0
Min value	0
Max value	1
Description	selection of the direction of the logic output, normally energized or de-energized

CANopen DO 59 (Customisable) [5126]

Variable	CANopenFuncO59 [8726]
Unit	-
Init value	0
Min value	0
Max value	10299
Description	Status change of the open or closed logic output, depending on the selected function

Variable	CANopenModeO59 [8758]
Unit	-
Init value	0
Min value	0
Max value	1
Description	selection of the direction of the logic output, normally energized or de-energized

CANopen DO 60 (Customisable) [5127]

Variable	CANopenFuncO60 [8727]
Unit	-
Init value	0
Min value	0
Max value	10299
Description	Status change of the open or closed logic output, depending on the selected function

Variable	CANopenModeO60 [8759]
Unit	-
Init value	0
Min value	0
Max value	1
Description	selection of the direction of the logic output, normally energized or de-energized

CANopen DO 61 (Customisable) [5128]

Variable	CANopenFuncO61 [8728]
Unit	-
Init value	0
Min value	0
Max value	10299
Description	Status change of the open or closed logic output, depending on the selected function

Variable	CANopenModeO61 [8760]
Unit	-
Init value	0
Min value	0
Max value	1
Description	selection of the direction of the logic output, normally energized or de-energized

CANopen DO 62 (Customisable) [5129]

Variable	CANopenFuncO62 [8729]
Unit	-
Init value	0
Min value	0
Max value	10299
Description	Status change of the open or closed logic output, depending on the selected function

Variable	CANopenModeO62 [8761]
Unit	-
Init value	0
Min value	0
Max value	1
Description	selection of the direction of the logic output, normally energized or de-energized

CANopen DO 63 (Customisable) [5130]

Variable	CANopenFuncO63 [8730]
Unit	-
Init value	0
Min value	0
Max value	10299
Description	Status change of the open or closed logic output, depending on the selected function

Variable	CANopenModeO63 [8762]
Unit	-
Init value	0
Min value	0
Max value	1
Description	selection of the direction of the logic output, normally energized or de-energized

CANopen DO 64 (Customisable) [5131]

Variable	CANopenFuncO64 [8731]
Unit	-
Init value	0
Min value	0
Max value	10299
Description	Status change of the open or closed logic output, depending on the selected function

Variable	CANopenModeO64 [8763]
Unit	-
Init value	0
Min value	0
Max value	1
Description	selection of the direction of the logic output, normally energized or de-energized

Analog inputs

Analog inputs 1

Variable	CANopen AI 1 (Customisable) [1050]
Unit	-
Init value	0
Min value	-32768
Max value	32767
Description	CANopen analog input 1

Variable	CANopen Gain AI 01 [8351]
Unit	-
Init value	1.000
Min value	0.000
Max value	10.000
Description	Gain for CANopen analog input 1 value

Variable	CANopen Offset AI 01 [8350]
Unit	-
Init value	0
Min value	-32768
Max value	32767
Description	Offset for CANopen analog input 1 value

Analog inputs 2

Variable	CANopen AI 2 (Customisable) [1051]
Unit	-
Init value	0
Min value	-32768
Max value	32767
Description	CANopen analog input 2

Variable	CANopen Gain AI 02 [8353]
Unit	-
Init value	1.000
Min value	0.000
Max value	10.000
Description	Gain for CANopen analog input 2 value

Variable	CANopen Offset AI 02 [8352]
Unit	-
Init value	0
Min value	-32768
Max value	32767
Description	Offset for CANopen analog input 2 value

Analog inputs 3

Variable	CANopen AI 3 (Customisable) [1052]
Unit	-
Init value	0
Min value	-32768
Max value	32767
Description	CANopen analog input 3

Variable	CANopen Gain AI 03 [8355]
Unit	-
Init value	1.000
Min value	0.000
Max value	10.000
Description	Gain for CANopen analog input 3 value

Variable	CANopen Offset AI 03 [8354]
Unit	-
Init value	0
Min value	-32768
Max value	32767
Description	Offset for CANopen analog input 3 value

Analog inputs 4

Variable	CANopen AI 4 (Customisable) [1053]
Unit	-
Init value	0
Min value	-32768
Max value	32767
Description	CANopen analog input 4

Variable	CANopen Gain AI 04 [8357]
Unit	-
Init value	1.000
Min value	0.000
Max value	10.000
Description	Gain for CANopen analog input 4 value

Variable	CANopen Offset AI 04 [8356]
Unit	-
Init value	0
Min value	-32768
Max value	32767
Description	Offset for CANopen analog input 4 value

Analog inputs 5

Variable	CANopen AI 5 (Customisable) [1054]
Unit	-
Init value	0
Min value	-32768
Max value	32767
Description	CANopen analog input 5

Variable	CANopen Gain AI 05 [8359]
Unit	-
Init value	1.000
Min value	0.000
Max value	10.000
Description	Gain for CANopen analog input 5 value

Variable	CANopen Offset AI 05 [8358]
Unit	-
Init value	0
Min value	-32768
Max value	32767
Description	Offset for CANopen analog input 5 value

Analog inputs 6

Variable	CANopen AI 6 (Customisable) [1055]
Unit	-
Init value	0
Min value	-32768
Max value	32767
Description	CANopen analog input 6

Variable	CANopen Gain AI 06 [8361]
Unit	-
Init value	1.000
Min value	0.000
Max value	10.000
Description	Gain for CANopen analog input 6 value

Variable	CANopen Offset AI 06 [8360]
Unit	-
Init value	0
Min value	-32768
Max value	32767
Description	Offset for CANopen analog input 6 value

Analog inputs 7

Variable	CANopen AI 7 (Customisable) [1056]
Unit	-
Init value	0
Min value	-32768
Max value	32767
Description	CANopen analog input 7

Variable	CANopen Gain AI 07 [8363]
Unit	-
Init value	1.000
Min value	0.000
Max value	10.000
Description	Gain for CANopen analog input 7 value

Variable	CANopen Offset AI 07 [8362]
Unit	-
Init value	0
Min value	-32768
Max value	32767
Description	Offset for CANopen analog input 7 value

Analog inputs 8

Variable	CANopen AI 8 (Customisable) [1057]
Unit	-
Init value	0
Min value	-32768
Max value	32767
Description	CANopen analog input 8

Variable	CANopen Gain AI 08 [8365]
Unit	-
Init value	1.000
Min value	0.000
Max value	10.000
Description	Gain for CANopen analog input 8 value

Variable	CANopen Offset AI 08 [8364]
Unit	-
Init value	0
Min value	-32768
Max value	32767
Description	Offset for CANopen analog input 8 value

Analog inputs 9

Variable	CANopen AI 9 (Customisable) [1058]
Unit	-
Init value	0
Min value	-32768
Max value	32767
Description	CANopen analog input 9

Variable	CANopen Gain AI 09 [8367]
Unit	-
Init value	1.000
Min value	0.000
Max value	10.000
Description	Gain for CANopen analog input 9 value

Variable	CANopen Offset AI 09 [8366]
Unit	-
Init value	0
Min value	-32768
Max value	32767
Description	Offset for CANopen analog input 9 value

Analog inputs 10

Variable	CANopen AI 10 (Customisable) [1059]
Unit	-
Init value	0
Min value	-32768
Max value	32767
Description	CANopen analog input 10

Variable	CANopen Gain AI 10 [8369]
Unit	-
Init value	1.000
Min value	0.000
Max value	10.000
Description	Gain for CANopen analog input 10 value

Variable	CANopen Offset AI 10 [8368]
Unit	-
Init value	0
Min value	-32768
Max value	32767
Description	Offset for CANopen analog input 10 value

Analog inputs 11

Variable	CANopen AI 11 (Customisable) [1060]
Unit	-
Init value	0
Min value	-32768
Max value	32767
Description	CANopen analog input 11

Variable	CANopen Gain AI 11 [8371]
Unit	-
Init value	1.000
Min value	0.000
Max value	10.000
Description	Gain for CANopen analog input 11 value

Variable	CANopen Offset AI 11 [8370]
Unit	-
Init value	0
Min value	-32768
Max value	32767
Description	Offset for CANopen analog input 11 value

Analog inputs 12

Variable	CANopen AI 12 (Customisable) [1061]
Unit	-
Init value	0
Min value	-32768
Max value	32767
Description	CANopen analog input 12

Variable	CANopen Gain AI 12 [8373]
Unit	-
Init value	1.000
Min value	0.000
Max value	10.000
Description	Gain for CANopen analog input 12 value

Variable	CANopen Offset AI 12 [8372]
Unit	-
Init value	0
Min value	-32768
Max value	32767
Description	Offset for CANopen analog input 12 value

Analog inputs 13

Variable	CANopen AI 13 (Customisable) [1062]
Unit	-
Init value	0
Min value	-32768
Max value	32767
Description	CANopen analog input 13

Variable	CANopen Gain AI 13 [8375]
Unit	-
Init value	1.000
Min value	0.000
Max value	10.000
Description	Gain for CANopen analog input 13 value

Variable	CANopen Offset AI 13 [8374]
Unit	-
Init value	0
Min value	-32768
Max value	32767
Description	Offset for CANopen analog input 13 value

Analog inputs 14

Variable	CANopen AI 14 (Customisable) [1063]
Unit	-
Init value	0
Min value	-32768
Max value	32767
Description	CANopen analog input 14

Variable	CANopen Gain AI 14 [8377]
Unit	-
Init value	1.000
Min value	0.000
Max value	10.000
Description	Gain for CANopen analog input 14 value

Variable	CANopen Offset AI 14 [8376]
Unit	-
Init value	0
Min value	-32768
Max value	32767
Description	Offset for CANopen analog input 14 value

Analog inputs 15

Variable	CANopen AI 15 (Customisable) [1064]
Unit	-
Init value	0
Min value	-32768
Max value	32767
Description	CANopen analog input 15

Variable	CANopen Gain AI 15 [8379]
Unit	-
Init value	1.000
Min value	0.000
Max value	10.000
Description	Gain for CANopen analog input 15 value

Variable	CANopen Offset AI 15 [8378]
Unit	-
Init value	0
Min value	-32768
Max value	32767
Description	Offset for CANopen analog input 15 value

Analog inputs 16

Variable	CANopen AI 16 (Customisable) [1065]
Unit	-
Init value	0
Min value	-32768
Max value	32767
Description	CANopen analog input 16

Variable	CANopen Gain AI 16 [8381]
Unit	-
Init value	1.000
Min value	0.000
Max value	10.000
Description	Gain for CANopen analog input 16 value

Variable	CANopen Offset AI 16 [8380]
Unit	-
Init value	0
Min value	-32768
Max value	32767
Description	Offset for CANopen analog input 16 value

PROTECTIONS

GENERATOR PROTECTIONS

Over/under frequency

Over frequency

Variable	Over frequency threshold [2400]
Unit	%
Init value	105.0
Min value	0.0
Max value	200.0
Description	Threshold to be exceeded to trigger the associated control for this protection.

Variable	Over frequency timer [2401]
Unit	s
Init value	30.0
Min value	0.0
Max value	999.9
Description	Timer defining how long the value should exceed the treshold before triggering the control associated to this protection.

Variable	Over frequency control [2402]
Unit	-
Init value	4
List	0: Unused 1: Generator electrical fault 3: Alarm 4: Fault (soft shutdown) 5: Security (hard shutdown) 6: Fault (soft shutdown) + Help 7: Generator electrical fault + Help
Description	Action performed on protection's trigger. Actions' description is available in the technical documentation.

Under frequency

Variable	Under frequency threshold [2403]
Unit	%
Init value	90.0
Min value	0.0
Max value	200.0
Description	Threshold to be exceeded to trigger the associated control for this protection.

Variable	Under frequency timer [2404]
Unit	s
Init value	10.0
Min value	0.0
Max value	999.9
Description	Timer defining how long the value should exceed the treshold before triggering the control associated to this protection.

Variable	Under frequency control [2405]
Unit	-
Init value	4
List	0: Unused 1: Generator electrical fault 3: Alarm 4: Fault (soft shutdown) 5: Security (hard shutdown) 6: Fault (soft shutdown) + Help 7: Generator electrical fault + Help
Description	Action performed on protection's trigger. Actions' description is available in the technical documentation.

Over frequency 2

Variable	Over frequency threshold 2 [2436]
Unit	%
Init value	110.0
Min value	0.0
Max value	200.0
Description	Threshold to be exceeded to trigger the associated control for this protection.

Variable	Over frequency timer 2 [2437]
Unit	s
Init value	10.0
Min value	0.0
Max value	999.9
Description	Timer defining how long the value should exceed the treshold before triggering the control associated to this protection.

Variable	Over frequency control 2 [2438]
Unit	-
Init value	0
List	0: Unused 1: Generator electrical fault 3: Alarm 4: Fault (soft shutdown) 5: Security (hard shutdown) 6: Fault (soft shutdown) + Help 7: Generator electrical fault + Help
Description	Action performed on protection's trigger. Actions' description is available in the technical documentation.

Under frequency 2

Variable	Under frequency threshold 2 [2439]
Unit	%
Init value	90.0
Min value	0.0
Max value	200.0
Description	Threshold to be exceeded to trigger the associated control for this protection.

Variable	Under frequency timer 2 [2440]
Unit	s
Init value	10.0
Min value	0.0
Max value	999.9
Description	Timer defining how long the value should exceed the treshold before triggering the control associated to this protection.

Variable	Under frequency control 2 [2441]
Unit	-
Init value	0
List	0: Unused 1: Generator electrical fault 3: Alarm 4: Fault (soft shutdown) 5: Security (hard shutdown) 6: Fault (soft shutdown) + Help 7: Generator electrical fault + Help
Description	Action performed on protection's trigger. Actions' description is available in the technical documentation.

Over/under voltage

Over voltage

Variable	Over voltage threshold [2406]
Unit	%
Init value	110.0
Min value	0.0
Max value	200.0
Description	Threshold to be exceeded to trigger the associated control for this protection.

Variable	Over voltage timer [2407]
Unit	s
Init value	10.0
Min value	0.0
Max value	999.9
Description	Timer defining how long the value should exceed the treshold before triggering the control associated to this protection.

Variable	Over voltage control [2408]
Unit	-
Init value	4
List	0: Unused 1: Generator electrical fault 3: Alarm 4: Fault (soft shutdown) 5: Security (hard shutdown) 6: Fault (soft shutdown) + Help 7: Generator electrical fault + Help
Description	Action performed on protection's trigger. Actions' description is available in the technical documentation.

Under voltage

Variable	Under voltage threshold [2409]
Unit	%
Init value	90.0
Min value	0.0
Max value	200.0
Description	Threshold to be exceeded to trigger the associated control for this protection.

Variable	Under voltage timer [2410]
Unit	s
Init value	20.0
Min value	0.0
Max value	999.9
Description	Timer defining how long the value should exceed the treshold before triggering the control associated to this protection.

Variable	Under voltage control [2411]
Unit	-
Init value	4
List	0: Unused 1: Generator electrical fault 3: Alarm 4: Fault (soft shutdown) 5: Security (hard shutdown) 6: Fault (soft shutdown) + Help 7: Generator electrical fault + Help
Description	Action performed on protection's trigger. Actions' description is available in the technical documentation.

Over voltage 2

Variable	Over voltage threshold 2 [2442]
Unit	%
Init value	110.0
Min value	0.0
Max value	200.0
Description	Threshold to be exceeded to trigger the associated control for this protection.

Variable	Over voltage timer 2 [2443]
Unit	s
Init value	10.0
Min value	0.0
Max value	999.9
Description	Timer defining how long the value should exceed the treshold before triggering the control associated to this protection.

Variable	Over voltage control 2 [2444]
Unit	-
Init value	0
List	0: Unused 1: Generator electrical fault 3: Alarm 4: Fault (soft shutdown) 5: Security (hard shutdown) 6: Fault (soft shutdown) + Help 7: Generator electrical fault + Help
Description	Action performed on protection's trigger. Actions' description is available in the technical documentation.

Under voltage 2

Variable	Under voltage threshold 2 [2445]
Unit	%
Init value	90.0
Min value	0.0
Max value	200.0
Description	Threshold to be exceeded to trigger the associated control for this protection.

Variable	Under voltage timer 2 [2446]
Unit	s
Init value	20.0
Min value	0.0
Max value	999.9
Description	Timer defining how long the value should exceed the treshold before triggering the control associated to this protection.

Variable	Under voltage control 2 [2447]
Unit	-
Init value	0
List	0: Unused 1: Generator electrical fault 3: Alarm 4: Fault (soft shutdown) 5: Security (hard shutdown) 6: Fault (soft shutdown) + Help 7: Generator electrical fault + Help
Description	Action performed on protection's trigger. Actions' description is available in the technical documentation.

Over current/neutral

Over current

Variable	Over current threshold [2430]
Unit	A
Init value	500
Min value	0
Max value	65535
Description	Threshold to be exceeded to trigger the associated control for this protection.

Variable	Over current timer [2431]
Unit	s
Init value	3.0
Min value	0.0
Max value	999.9
Description	Timer defining how long the value should exceed the treshold before triggering the control associated to this protection.

Variable	Over current control [2432]
Unit	-
Init value	0
List	0: Unused 1: Generator electrical fault 3: Alarm 4: Fault (soft shutdown) 5: Security (hard shutdown) 6: Fault (soft shutdown) + Help 7: Generator electrical fault + Help
Description	Action performed on protection's trigger. Actions' description is available in the technical documentation.

Neutral current

Variable	Neutral current threshold [2433]
Unit	A
Init value	300
Min value	0
Max value	65535
Description	Threshold to be exceeded to trigger the associated control for this protection.

Variable	Neutral current timer [2434]
Unit	s
Init value	120.0
Min value	0.0
Max value	999.9
Description	Timer defining how long the value should exceed the treshold before triggering the control associated to this protection.

Variable	Neutral current control [2435]
Unit	-
Init value	0
List	0: Unused 1: Generator electrical fault 3: Alarm 4: Fault (soft shutdown) 5: Security (hard shutdown) 6: Fault (soft shutdown) + Help 7: Generator electrical fault + Help
Description	Action performed on protection's trigger. Actions' description is available in the technical documentation.

Over current 2

Variable	Over current threshold 2 [2466]
Unit	A
Init value	500
Min value	0
Max value	65535
Description	Threshold to be exceeded to trigger the associated control for this protection.

Variable	Over current timer 2 [2467]
Unit	s
Init value	3.0
Min value	0.0
Max value	999.9
Description	Timer defining how long the value should exceed the treshold before triggering the control associated to this protection.

Variable	Over current control 2 [2468]
Unit	-
Init value	0
List	0: Unused 1: Generator electrical fault 3: Alarm 4: Fault (soft shutdown) 5: Security (hard shutdown) 6: Fault (soft shutdown) + Help 7: Generator electrical fault + Help
Description	Action performed on protection's trigger. Actions' description is available in the technical documentation.

Neutral current 2

Variable	Neutral current threshold 2 [2469]
Unit	A
Init value	300
Min value	0
Max value	65535
Description	Threshold to be exceeded to trigger the associated control for this protection.

Variable	Neutral current timer 2 [2470]
Unit	s
Init value	120.0
Min value	0.0
Max value	999.9
Description	Timer defining how long the value should exceed the treshold before triggering the control associated to this protection.

Variable	Neutral current control 2 [2471]
Unit	-
Init value	0
List	0: Unused 1: Generator electrical fault 3: Alarm 4: Fault (soft shutdown) 5: Security (hard shutdown) 6: Fault (soft shutdown) + Help 7: Generator electrical fault + Help
Description	Action performed on protection's trigger. Actions' description is available in the technical documentation.

Reverse kW/kVAR

Reverse kW

Variable	Reverse kW threshold [2418]
Unit	%
Init value	10.0
Min value	0.1
Max value	200.0
Description	Threshold to be exceeded to trigger the associated control for this protection.

Variable	Reverse kW timer [2419]
Unit	s
Init value	10.0
Min value	0.0
Max value	999.9
Description	Timer defining how long the value should exceed the treshold before triggering the control associated to this protection.

Variable	Reverse kW control [2420]
Unit	-
Init value	1
List	0: Unused 1: Generator electrical fault 3: Alarm 4: Fault (soft shutdown) 5: Security (hard shutdown) 6: Fault (soft shutdown) + Help 7: Generator electrical fault + Help
Description	Action performed on protection's trigger. Actions' description is available in the technical documentation.

Reverse kVAR

Variable	Reverse kVAR threshold [2427]
Unit	%
Init value	20.0
Min value	0.1
Max value	200.0
Description	Threshold to be exceeded to trigger the associated control for this protection.

Variable	Reverse kVAR timer [2428]
Unit	s
Init value	20.0
Min value	0.0
Max value	999.9
Description	Timer defining how long the value should exceed the treshold before triggering the control associated to this protection.

Variable	Reverse kVAR control [2429]
Unit	-
Init value	1
List	0: Unused 1: Generator electrical fault 3: Alarm 4: Fault (soft shutdown) 5: Security (hard shutdown) 6: Fault (soft shutdown) + Help 7: Generator electrical fault + Help
Description	Action performed on protection's trigger. Actions' description is available in the technical documentation.

Reverse kW 2

Variable	Reverse kW threshold 2 [2454]
Unit	%
Init value	10.0
Min value	0.1
Max value	200.0
Description	Threshold to be exceeded to trigger the associated control for this protection.

Variable	Reverse kW timer 2 [2455]
Unit	s
Init value	20.0
Min value	0.0
Max value	999.9
Description	Timer defining how long the value should exceed the treshold before triggering the control associated to this protection.

Variable	Reverse kW control 2 [2456]
Unit	-
Init value	0
List	0: Unused 1: Generator electrical fault 3: Alarm 4: Fault (soft shutdown) 5: Security (hard shutdown) 6: Fault (soft shutdown) + Help 7: Generator electrical fault + Help
Description	Action performed on protection's trigger. Actions' description is available in the technical documentation.

Reverse kVAR 2

Variable	Reverse kVAR threshold 2 [2463]
Unit	%
Init value	10.0
Min value	0.1
Max value	200.0
Description	Threshold to be exceeded to trigger the associated control for this protection.

Variable	Reverse kVAR timer 2 [2464]
Unit	s
Init value	20.0
Min value	0.0
Max value	999.9
Description	Timer defining how long the value should exceed the treshold before triggering the control associated to this protection.

Variable	Reverse kVAR control 2 [2465]
Unit	-
Init value	0
List	0: Unused 1: Generator electrical fault 3: Alarm 4: Fault (soft shutdown) 5: Security (hard shutdown) 6: Fault (soft shutdown) + Help 7: Generator electrical fault + Help
Description	Action performed on protection's trigger. Actions' description is available in the technical documentation.

Maximum/Minimum kW

Maximum kW

Variable	Maximum kW threshold [2415]
Unit	%
Init value	110.0
Min value	0.0
Max value	200.0
Description	Threshold to be exceeded to trigger the associated control for this protection.

Variable	Maximum kW timer [2416]
Unit	s
Init value	60.0
Min value	0.0
Max value	999.9
Description	Timer defining how long the value should exceed the treshold before triggering the control associated to this protection.

Variable	Maximum kW control [2417]
Unit	-
Init value	4
List	0: Unused 1: Generator electrical fault 3: Alarm 4: Fault (soft shutdown) 5: Security (hard shutdown) 6: Fault (soft shutdown) + Help 7: Generator electrical fault + Help
Description	Action performed on protection's trigger. Actions' description is available in the technical documentation.

Minimum kW

Variable	Minimum kW threshold [2412]
Unit	%
Init value	10.0
Min value	0.0
Max value	200.0
Description	Threshold to be exceeded to trigger the associated control for this protection.

Variable	Minimum kW timer [2413]
Unit	s
Init value	120.0
Min value	0.0
Max value	999.9
Description	Timer defining how long the value should exceed the treshold before triggering the control associated to this protection.

Variable	Minimum kW control [2414]
Unit	-
Init value	0
List	0: Unused 1: Generator electrical fault 3: Alarm 4: Fault (soft shutdown) 5: Security (hard shutdown) 6: Fault (soft shutdown) + Help 7: Generator electrical fault + Help
Description	Action performed on protection's trigger. Actions' description is available in the technical documentation.

Maximum kW 2

Variable	Maximum kW threshold 2 [2451]
Unit	%
Init value	110.0
Min value	0.0
Max value	200.0
Description	Threshold to be exceeded to trigger the associated control for this protection.

Variable	Maximum kW timer 2 [2452]
Unit	s
Init value	60.0
Min value	0.0
Max value	999.9
Description	Timer defining how long the value should exceed the treshold before triggering the control associated to this protection.

Variable	Maximum kW control 2 [2453]
Unit	-
Init value	0
List	0: Unused 1: Generator electrical fault 3: Alarm 4: Fault (soft shutdown) 5: Security (hard shutdown) 6: Fault (soft shutdown) + Help 7: Generator electrical fault + Help
Description	Action performed on protection's trigger. Actions' description is available in the technical documentation.

Minimum kW 2

Variable	Minimum kW threshold 2 [2448]
Unit	%
Init value	10.0
Min value	0.0
Max value	200.0
Description	Threshold to be exceeded to trigger the associated control for this protection.

Variable	Minimum kW timer 2 [2449]
Unit	s
Init value	120.0
Min value	0.0
Max value	999.9
Description	Timer defining how long the value should exceed the treshold before triggering the control associated to this protection.

Variable	Minimum kW control 2 [2450]
Unit	-
Init value	0
List	0: Unused 1: Generator electrical fault 3: Alarm 4: Fault (soft shutdown) 5: Security (hard shutdown) 6: Fault (soft shutdown) + Help 7: Generator electrical fault + Help
Description	Action performed on protection's trigger. Actions' description is available in the technical documentation.

Maxi kVAR/Mini kVAR

Maximum kVAR

Variable	Maximum kVAR threshold [2424]
Unit	%
Init value	110.0
Min value	0.0
Max value	200.0
Description	Threshold to be exceeded to trigger the associated control for this protection.

Variable	Maximum kVAR timer [2425]
Unit	s
Init value	30.0
Min value	0.0
Max value	999.9
Description	Timer defining how long the value should exceed the treshold before triggering the control associated to this protection.

Variable	Maximum kVAR control [2426]
Unit	-
Init value	4
List	0: Unused 1: Generator electrical fault 3: Alarm 4: Fault (soft shutdown) 5: Security (hard shutdown) 6: Fault (soft shutdown) + Help 7: Generator electrical fault + Help
Description	Action performed on protection's trigger. Actions' description is available in the technical documentation.

Minimum kVar

Variable	Minimum kVAR threshold [2421]
Unit	%
Init value	10.0
Min value	0.0
Max value	200.0
Description	Threshold to be exceeded to trigger the associated control for this protection.

Variable	Minimum kVAR timer [2422]
Unit	s
Init value	120.0
Min value	0.0
Max value	999.9
Description	Timer defining how long the value should exceed the treshold before triggering the control associated to this protection.

Variable	Minimum kVAR control [2423]
Unit	-
Init value	0
List	0: Unused 1: Generator electrical fault 3: Alarm 4: Fault (soft shutdown) 5: Security (hard shutdown) 6: Fault (soft shutdown) + Help 7: Generator electrical fault + Help
Description	Action performed on protection's trigger. Actions' description is available in the technical documentation.

Maximum kVAR 2

Variable	Maximum kVAR threshold 2 [2460]
Unit	%
Init value	110.0
Min value	0.0
Max value	200.0
Description	Threshold to be exceeded to trigger the associated control for this protection.

Variable	Maximum kVAR timer 2 [2461]
Unit	s
Init value	30.0
Min value	0.0
Max value	999.9
Description	Timer defining how long the value should exceed the treshold before triggering the control associated to this protection.

Variable	Maximum kVAR control 2 [2462]
Unit	-
Init value	0
List	0: Unused 1: Generator electrical fault 3: Alarm 4: Fault (soft shutdown) 5: Security (hard shutdown) 6: Fault (soft shutdown) + Help 7: Generator electrical fault + Help
Description	Action performed on protection's trigger. Actions' description is available in the technical documentation.

Minimum kVar 2

Variable	Minimum kVAR threshold 2 [2457]
Unit	%
Init value	10.0
Min value	0.0
Max value	200.0
Description	Threshold to be exceeded to trigger the associated control for this protection.

Variable	Minimum kVAR timer 2 [2458]
Unit	s
Init value	120.0
Min value	0.0
Max value	999.9
Description	Timer defining how long the value should exceed the treshold before triggering the control associated to this protection.

Variable	Minimum kVAR control 2 [2459]
Unit	-
Init value	0
List	0: Unused 1: Generator electrical fault 3: Alarm 4: Fault (soft shutdown) 5: Security (hard shutdown) 6: Fault (soft shutdown) + Help 7: Generator electrical fault + Help
Description	Action performed on protection's trigger. Actions' description is available in the technical documentation.

Uneven load sharing

Uneven kW

Variable	Threshold uneven kW [3708]
Unit	%
Init value	10.0
Min value	0.0
Max value	100.0
Description	Threshold to be exceeded to trigger the associated control for this protection.

Variable	Timer uneven kW [3709]
Unit	s
Init value	30.0
Min value	0.0
Max value	999.9
Description	Timer defining how long the value should exceed the treshold before triggering the control associated to this protection.

Variable	Control uneven kW [3710]
Unit	-
Init value	0
List	0: Unused 1: Generator electrical fault 3: Alarm 4: Fault (soft shutdown) 5: Security (hard shutdown) 6: Fault (soft shutdown) + Help 7: Generator electrical fault + Help
Description	Action performed on protection's trigger. Actions' description is available in the technical documentation.

Uneven kVAR

Variable	Threshold uneven kVAR [3711]
Unit	%
Init value	10.0
Min value	0.0
Max value	100.0
Description	Threshold to be exceeded to trigger the associated control for this protection.

Variable	Timer uneven kVAR [3712]
Unit	s
Init value	30.0
Min value	0.0
Max value	999.9
Description	Timer defining how long the value should exceed the treshold before triggering the control associated to this protection.

Variable	Control uneven kVAR [3713]
Unit	-
Init value	0
List	0: Unused 1: Generator electrical fault 3: Alarm 4: Fault (soft shutdown) 5: Security (hard shutdown) 6: Fault (soft shutdown) + Help 7: Generator electrical fault + Help
Description	Action performed on protection's trigger. Actions' description is available in the technical documentation.

Voltage/Current unbalance

Voltage unbalance

Variable	Voltage unbalance threshold [2486]
Unit	%
Init value	5.0
Min value	0.0
Max value	200.0
Description	Threshold to be exceeded to trigger the associated control for this protection.

Variable	Voltage unbalance timer [2487]
Unit	s
Init value	3.0
Min value	0.0
Max value	999.9
Description	Timer defining how long the value should exceed the treshold before triggering the control associated to this protection.

Variable	Voltage unbalance control [2488]
Unit	-
Init value	0
List	0: Unused 1: Generator electrical fault 3: Alarm 4: Fault (soft shutdown) 5: Security (hard shutdown) 6: Fault (soft shutdown) + Help 7: Generator electrical fault + Help
Description	Action performed on protection's trigger. Actions' description is available in the technical documentation.

Current unbalance

Variable	Current unbalance threshold [2492]
Unit	%
Init value	40.0
Min value	0.0
Max value	200.0
Description	Threshold to be exceeded to trigger the associated control for this protection.

Variable	Current unbalance timer [2493]
Unit	s
Init value	3.0
Min value	0.0
Max value	999.9
Description	Timer defining how long the value should exceed the treshold before triggering the control associated to this protection.

Variable	Current unbalance control [2494]
Unit	-
Init value	0
List	0: Unused 1: Generator electrical fault 3: Alarm 4: Fault (soft shutdown) 5: Security (hard shutdown) 6: Fault (soft shutdown) + Help 7: Generator electrical fault + Help
Description	Action performed on protection's trigger. Actions' description is available in the technical documentation.

Voltage unbalance 2

Variable	Voltage unbalance threshold 2 [2489]
Unit	%
Init value	10.0
Min value	0.0
Max value	200.0
Description	Threshold to be exceeded to trigger the associated control for this protection.

Variable	Voltage unbalance timer 2 [2490]
Unit	s
Init value	3.0
Min value	0.0
Max value	999.9
Description	Timer defining how long the value should exceed the treshold before triggering the control associated to this protection.

Variable	Voltage unbalance control 2 [2491]
Unit	-
Init value	0
List	0: Unused 1: Generator electrical fault 3: Alarm 4: Fault (soft shutdown) 5: Security (hard shutdown) 6: Fault (soft shutdown) + Help 7: Generator electrical fault + Help
Description	Action performed on protection's trigger. Actions' description is available in the technical documentation.

Current unbalance 2

Variable	Current unbalance threshold 2 [2495]
Unit	%
Init value	60.0
Min value	0.0
Max value	200.0
Description	Threshold to be exceeded to trigger the associated control for this protection.

Variable	Current unbalance timer 2 [2496]
Unit	s
Init value	3.0
Min value	0.0
Max value	999.9
Description	Timer defining how long the value should exceed the treshold before triggering the control associated to this protection.

Variable	Current unbalance control 2 [2497]
Unit	-
Init value	0
List	0: Unused 1: Generator electrical fault 3: Alarm 4: Fault (soft shutdown) 5: Security (hard shutdown) 6: Fault (soft shutdown) + Help 7: Generator electrical fault + Help
Description	Action performed on protection's trigger. Actions' description is available in the technical documentation.

Short circuit

Variable	Generator Short Circuit Control [2477]
Unit	-
Init value	0
List	0: Unused 1: Generator electrical fault 3: Alarm 4: Fault (soft shutdown) 5: Security (hard shutdown) 6: Fault (soft shutdown) + Help 7: Generator electrical fault + Help
Description	Action performed on protection's trigger. Actions' description is available in the technical documentation.

Variable	Single phase nominal current [2103]
Unit	A
Init value	250
Min value	0
Max value	65535
Description	Nominal Current

Variable	Curve type [2498]
Unit	-
Init value	0
List	0: IEC Inverse 1: IEC Very Inverse 2: IEC Extremely Inverse 3: IEEE Moderately Inverse 4: IEEE Very Inverse 5: IEEE Extremely Inverse 6: Custom
Description	Different standard short circuit protection curves can be chosen: - 0: IEC Inverse - 1: IEC Very Inverse - 2: IEC Extremely Inverse - 3: IEEE Moderately Inverse - 4: IEEE Very Inverse - 5: IEEE Extremely Inverse - 6: Custom Note: The short circuit protection parameters can only be modified if 'Custom' is selected.

Variable	Short Circuit K constant characteristic [2472]
Unit	s
Init value	0.14
Min value	0.00
Max value	655.35
Description	Generator Current Short Circuit Protection : K constant characteristic

Variable	Short Circuit C constant characteristic [2473]
Unit	s
Init value	0.000
Min value	0.000
Max value	65.535
Description	Generator Current Short Circuit Protection : C constant characteristic

Variable	Short Circuit Alpha constant characteristic [2474]
Unit	-
Init value	0.02
Min value	0.00
Max value	655.35
Description	Generator Current Short Circuit Protection : Alpha constant characteristic

Variable	Short Circuit Is constant [2476]
Unit	%
Init value	110
Min value	0
Max value	1000
Description	Generator Current Short Circuit Protection : IS constant characteristic

Variable	Short Circuit TMS (Time Multiplier Setting) [2475]
Unit	-
Init value	1.0
Min value	0.1
Max value	1.0
Description	Generator Current Short Circuit Protection : TMS (Time Multiplier Setting) constant characteristic

Earth fault

Earth fault ratio

Variable	Earth Current CT ratio [2485]
Unit	-
Init value	1.0
Min value	0.1
Max value	3250.0
Description	Earth Current Transformers Ratio. CT must be connected to J5 for earth fault measurement.

Earth fault

Variable	Earth fault threshold [2479]
Unit	A
Init value	1.0
Min value	0.0
Max value	6553.5
Description	Threshold to be exceeded to trigger the associated control for this protection.

Variable	Earth fault timer [2480]
Unit	s
Init value	1.0
Min value	0.0
Max value	10.0
Description	Timer defining how long the value should exceed the treshold before triggering the control associated to this protection.

Variable	Earth fault control [2481]
Unit	-
Init value	0
List	0: Unused 1: Generator electrical fault 3: Alarm 4: Fault (soft shutdown) 5: Security (hard shutdown) 6: Fault (soft shutdown) + Help 7: Generator electrical fault + Help
Description	Action performed on protection's trigger. Actions' description is available in the technical documentation.

Earth fault 2

Variable	Earth fault threshold 2 [2482]
Unit	A
Init value	2.0
Min value	0.0
Max value	6553.5
Description	Threshold to be exceeded to trigger the associated control for this protection.

Variable	Earth fault timer 2 [2483]
Unit	s
Init value	0.5
Min value	0.0
Max value	10.0
Description	Timer defining how long the value should exceed the treshold before triggering the control associated to this protection.

Variable	Earth fault control 2 [2484]
Unit	-
Init value	0
List	0: Unused 1: Generator electrical fault 3: Alarm 4: Fault (soft shutdown) 5: Security (hard shutdown) 6: Fault (soft shutdown) + Help 7: Generator electrical fault + Help
Description	Action performed on protection's trigger. Actions' description is available in the technical documentation.

Rotophase

Variable	Rotophase protection control [8501]
Unit	-
Init value	0
List	0: Unused 1: Generator electrical fault 3: Alarm 4: Fault (soft shutdown) 5: Security (hard shutdown) 6: Fault (soft shutdown) + Help 7: Generator electrical fault + Help
Description	Action performed on protection's trigger. Actions' description is available in the technical documentation.

Variable	Rotophase activation direction (0 = Indirect, 1 = Direct) [8500]
Unit	-
Init value	1
List	0: Indirect 1: Direct
Description	This setpoint define wich direction of rotophase will activate rotophase protection. If the setpoint is on direct then the action of variables 8500 will activate if voltage phases are plugged on a direct direction. If the setpoint is on indirect then the action of variables 8500 will activate if voltage phases are plugged on an indirect direction.

BUS PROTECTIONS

Over/under frequency

Over frequency

Variable	Over frequency threshold [2500]
Unit	%
Init value	110.0
Min value	0.0
Max value	200.0
Description	Threshold to be exceeded to trigger the associated control for this protection.

Variable	Over frequency timer [2501]
Unit	s
Init value	10.0
Min value	0.0
Max value	999.9
Description	Timer defining how long the value should exceed the treshold before triggering the control associated to this protection.

Variable	Over frequency control [2502]
Unit	-
Init value	0
List	0: Unused 1: Generator electrical fault 3: Alarm 4: Fault (soft shutdown) 5: Security (hard shutdown) 6: Fault (soft shutdown) + Help 7: Generator electrical fault + Help
Description	Action performed on protection's trigger. Actions' description is available in the technical documentation.

Under frequency

Variable	Under frequency threshold [2503]
Unit	%
Init value	90.0
Min value	0.0
Max value	200.0
Description	Threshold to be exceeded to trigger the associated control for this protection.

Variable	Under frequency timer [2504]
Unit	s
Init value	10.0
Min value	0.0
Max value	999.9
Description	Timer defining how long the value should exceed the treshold before triggering the control associated to this protection.

Variable	Under frequency control [2505]
Unit	-
Init value	0
List	0: Unused 1: Generator electrical fault 3: Alarm 4: Fault (soft shutdown) 5: Security (hard shutdown) 6: Fault (soft shutdown) + Help 7: Generator electrical fault + Help
Description	Action performed on protection's trigger. Actions' description is available in the technical documentation.

Over frequency 2

Variable	Over frequency threshold 2 [2530]
Unit	%
Init value	110.0
Min value	0.0
Max value	200.0
Description	Threshold to be exceeded to trigger the associated control for this protection.

Variable	Over frequency timer 2 [2531]
Unit	s
Init value	10.0
Min value	0.0
Max value	999.9
Description	Timer defining how long the value should exceed the treshold before triggering the control associated to this protection.

Variable	Over frequency control 2 [2532]
Unit	-
Init value	0
List	0: Unused 1: Generator electrical fault 3: Alarm 4: Fault (soft shutdown) 5: Security (hard shutdown) 6: Fault (soft shutdown) + Help 7: Generator electrical fault + Help
Description	Action performed on protection's trigger. Actions' description is available in the technical documentation.

Under frequency 2

Variable	Under frequency threshold 2 [2533]
Unit	%
Init value	90.0
Min value	0.0
Max value	200.0
Description	Threshold to be exceeded to trigger the associated control for this protection.

Variable	Under frequency timer 2 [2534]
Unit	s
Init value	10.0
Min value	0.0
Max value	999.9
Description	Timer defining how long the value should exceed the treshold before triggering the control associated to this protection.

Variable	Under frequency control 2 [2535]
Unit	-
Init value	0
List	0: Unused 1: Generator electrical fault 3: Alarm 4: Fault (soft shutdown) 5: Security (hard shutdown) 6: Fault (soft shutdown) + Help 7: Generator electrical fault + Help
Description	Action performed on protection's trigger. Actions' description is available in the technical documentation.

Over/under voltage

Over voltage

Variable	Over voltage threshold [2506]
Unit	%
Init value	110.0
Min value	0.0
Max value	200.0
Description	Threshold to be exceeded to trigger the associated control for this protection.

Variable	Over voltage timer [2507]
Unit	s
Init value	10.0
Min value	0.0
Max value	999.9
Description	Timer defining how long the value should exceed the treshold before triggering the control associated to this protection.

Variable	Over voltage control [2508]
Unit	-
Init value	0
List	0: Unused 1: Generator electrical fault 3: Alarm 4: Fault (soft shutdown) 5: Security (hard shutdown) 6: Fault (soft shutdown) + Help 7: Generator electrical fault + Help
Description	Action performed on protection's trigger. Actions' description is available in the technical documentation.

Under voltage

Variable	Under voltage threshold [2509]
Unit	%
Init value	90.0
Min value	0.0
Max value	200.0
Description	Threshold to be exceeded to trigger the associated control for this protection.

Variable	Under voltage timer [2510]
Unit	s
Init value	20.0
Min value	0.0
Max value	999.9
Description	Timer defining how long the value should exceed the treshold before triggering the control associated to this protection.

Variable	Under voltage control [2511]
Unit	-
Init value	0
List	0: Unused 1: Generator electrical fault 3: Alarm 4: Fault (soft shutdown) 5: Security (hard shutdown) 6: Fault (soft shutdown) + Help 7: Generator electrical fault + Help
Description	Action performed on protection's trigger. Actions' description is available in the technical documentation.

Over voltage 2

Variable	Over voltage threshold 2 [2536]
Unit	%
Init value	110.0
Min value	0.0
Max value	200.0
Description	Threshold to be exceeded to trigger the associated control for this protection.

Variable	Over voltage timer 2 [2537]
Unit	s
Init value	10.0
Min value	0.0
Max value	999.9
Description	Timer defining how long the value should exceed the treshold before triggering the control associated to this protection.

Variable	Over voltage control 2 [2538]
Unit	-
Init value	0
List	0: Unused 1: Generator electrical fault 3: Alarm 4: Fault (soft shutdown) 5: Security (hard shutdown) 6: Fault (soft shutdown) + Help 7: Generator electrical fault + Help
Description	Action performed on protection's trigger. Actions' description is available in the technical documentation.

Under voltage 2

Variable	Under voltage threshold 2 [2539]
Unit	%
Init value	90.0
Min value	0.0
Max value	200.0
Description	Threshold to be exceeded to trigger the associated control for this protection.

Variable	Under voltage timer 2 [2540]
Unit	s
Init value	20.0
Min value	0.0
Max value	999.9
Description	Timer defining how long the value should exceed the treshold before triggering the control associated to this protection.

Variable	Under voltage control 2 [2541]
Unit	-
Init value	0
List	0: Unused 1: Generator electrical fault 3: Alarm 4: Fault (soft shutdown) 5: Security (hard shutdown) 6: Fault (soft shutdown) + Help 7: Generator electrical fault + Help
Description	Action performed on protection's trigger. Actions' description is available in the technical documentation.

Voltage unbalance

Voltage unbalance

Variable	Voltage unbalance threshold [2565]
Unit	%
Init value	5.0
Min value	0.0
Max value	200.0
Description	Threshold to be exceeded to trigger the associated control for this protection.

Variable	Voltage unbalance timer [2566]
Unit	s
Init value	3.0
Min value	0.0
Max value	999.9
Description	Timer defining how long the value should exceed the treshold before triggering the control associated to this protection.

Variable	Voltage unbalance control [2567]
Unit	-
Init value	0
List	0: Unused 1: Generator electrical fault 3: Alarm 4: Fault (soft shutdown) 9: Mains electrical fault
Description	Action performed on protection's trigger. Actions' description is available in the technical documentation.

Voltage unbalance 2

Variable	Voltage unbalance threshold 2 [2568]
Unit	%
Init value	10.0
Min value	0.0
Max value	200.0
Description	Threshold to be exceeded to trigger the associated control for this protection.

Variable	Voltage unbalance timer 2 [2569]
Unit	s
Init value	3.0
Min value	0.0
Max value	999.9
Description	Timer defining how long the value should exceed the treshold before triggering the control associated to this protection.

Variable	Voltage unbalance control 2 [2570]
Unit	-
Init value	0
List	0: Unused 1: Generator electrical fault 3: Alarm 4: Fault (soft shutdown) 9: Mains electrical fault
Description	Action performed on protection's trigger. Actions' description is available in the technical documentation.

Rotophase

Variable	Rotophase protection control [2585]
Unit	-
Init value	0
List	0: Unused 1: Generator electrical fault 3: Alarm 4: Fault (soft shutdown) 9: Mains electrical fault
Description	Action performed on protection's trigger. Actions' description is available in the technical documentation.

Variable	Rotophase activation direction (0 = Indirect, 1 = Direct) [2584]
Unit	-
Init value	1
List	0: Indirect 1: Direct
Description	This setpoint define wich direction of rotophase will activate rotophase protection If the setpoint is on direct then the action of variables 2584 will activate if voltage phases are plugged on a direct direction. If the setpoint is on indirect then the action of variables 2584 will activate if voltage phases are plugged on an indirect direction.

Measure error

Variable	Bus Bar measure error inhibition [2571]
Unit	-
Init value	0
List	0: No 1: Yes
Description	Enable/Disable "Bus bars measure error" Alarm : This alarm is active when any genset of the power plant is operating, circuit breaker closed, and there is no voltage on Bus Bar measurement

ENGINE PROTECTIONS

Speed

Over speed

Variable	Over speed threshold [2350]
Unit	%
Init value	110.0
Min value	0.0
Max value	200.0
Description	Threshold to be exceeded to trigger the associated control for this protection.

Variable	Over speed timer [2351]
Unit	s
Init value	2.0
Min value	0.0
Max value	999.9
Description	Timer defining how long the value should exceed the treshold before triggering the control associated to this protection.

Variable	Over speed control [2352]
Unit	-
Init value	5
List	0: Unused 3: Alarm 4: Fault (soft shutdown) 5: Security (hard shutdown) 6: Fault (soft shutdown) + Help
Description	Action performed on protection's trigger. Actions' description is available in the technical documentation.

Under speed

Variable	Under speed threshold [2353]
Unit	%
Init value	90.0
Min value	0.0
Max value	200.0
Description	Threshold to be exceeded to trigger the associated control for this protection.

Variable	Under speed timer [2354]
Unit	s
Init value	20.0
Min value	0.0
Max value	999.9
Description	Timer defining how long the value should exceed the treshold before triggering the control associated to this protection.

Variable	Under speed control [2355]
Unit	-
Init value	4
List	0: Unused 3: Alarm 4: Fault (soft shutdown) 5: Security (hard shutdown) 6: Fault (soft shutdown) + Help
Description	Action performed on protection's trigger. Actions' description is available in the technical documentation.

Over speed 2

Variable	Over speed threshold 2 [2368]
Unit	%
Init value	115.0
Min value	0.0
Max value	200.0
Description	Threshold to be exceeded to trigger the associated control for this protection.

Variable	Over speed timer 2 [2369]
Unit	s
Init value	2.0
Min value	0.0
Max value	999.9
Description	Timer defining how long the value should exceed the treshold before triggering the control associated to this protection.

Variable	Over speed control 2 [2370]
Unit	-
Init value	0
List	0: Unused 3: Alarm 4: Fault (soft shutdown) 5: Security (hard shutdown) 6: Fault (soft shutdown) + Help
Description	Action performed on protection's trigger. Actions' description is available in the technical documentation.

Under speed 2

Variable	Under speed threshold 2 [2371]
Unit	%
Init value	85.0
Min value	0.0
Max value	200.0
Description	Threshold to be exceeded to trigger the associated control for this protection.

Variable	Under speed timer 2 [2372]
Unit	s
Init value	20.0
Min value	0.0
Max value	999.9
Description	Timer defining how long the value should exceed the treshold before triggering the control associated to this protection.

Variable	Under speed control 2 [2373]
Unit	-
Init value	0
List	0: Unused 3: Alarm 4: Fault (soft shutdown) 5: Security (hard shutdown) 6: Fault (soft shutdown) + Help
Description	Action performed on protection's trigger. Actions' description is available in the technical documentation.

Oil pressure

Minimum oil pressure

Variable	Oil pressure threshold [2362]
Unit	bar
Init value	3.0
Min value	0.0
Max value	6553.5
Description	Threshold to be exceeded to trigger the associated control for this protection.

Variable	Oil pressure timer [2363]
Unit	s
Init value	10.0
Min value	0.0
Max value	999.9
Description	Timer defining how long the value should exceed the treshold before triggering the control associated to this protection.

Variable	Oil pressure control [2364]
Unit	-
Init value	0
List	0: Unused 3: Alarm 4: Fault (soft shutdown) 5: Security (hard shutdown) 6: Fault (soft shutdown) + Help
Description	Action performed on protection's trigger. Actions' description is available in the technical documentation.

Minimum oil pressure 2

Variable	Oil pressure threshold 2 [2380]
Unit	bar
Init value	2.0
Min value	0.0
Max value	6553.5
Description	Threshold to be exceeded to trigger the associated control for this protection.

Variable	Oil pressure timer 2 [2381]
Unit	s
Init value	5.0
Min value	0.0
Max value	999.9
Description	Timer defining how long the value should exceed the treshold before triggering the control associated to this protection.

Variable	Oil pressure control 2 [2382]
Unit	-
Init value	0
List	0: Unused 3: Alarm 4: Fault (soft shutdown) 5: Security (hard shutdown) 6: Fault (soft shutdown) + Help
Description	Action performed on protection's trigger. Actions' description is available in the technical documentation.

Water temperature

Maximum water temperature

Variable	Water temperature threshold [2365]
Unit	°C
Init value	110.0
Min value	-3276.8
Max value	3276.7
Description	Threshold to be exceeded to trigger the associated control for this protection.

Variable	Water temperature timer [2366]
Unit	s
Init value	30.0
Min value	0.0
Max value	999.9
Description	Timer defining how long the value should exceed the treshold before triggering the control associated to this protection.

Variable	Water temperature control [2367]
Unit	-
Init value	0
List	0: Unused 3: Alarm 4: Fault (soft shutdown) 5: Security (hard shutdown) 6: Fault (soft shutdown) + Help
Description	Action performed on protection's trigger. Actions' description is available in the technical documentation.

Maximum water temperature 2

Variable	Water temperature threshold 2 [2383]
Unit	°C
Init value	120.0
Min value	-3276.8
Max value	3276.7
Description	Threshold to be exceeded to trigger the associated control for this protection.

Variable	Water temperature timer 2 [2384]
Unit	s
Init value	10.0
Min value	0.0
Max value	999.9
Description	Timer defining how long the value should exceed the treshold before triggering the control associated to this protection.

Variable	Water temperature control 2 [2385]
Unit	-
Init value	0
List	0: Unused 3: Alarm 4: Fault (soft shutdown) 5: Security (hard shutdown) 6: Fault (soft shutdown) + Help
Description	Action performed on protection's trigger. Actions' description is available in the technical documentation.

Start sequence

Out of speed range

Variable	Out of speed range timer [2393]
Unit	s
Init value	60.0
Min value	0.0
Max value	999.9
Description	Timer defining how long the value should exceed the treshold before triggering the control associated to this protection.

Variable	Out of speed range control [2394]
Unit	-
Init value	4
List	0: Unused 3: Alarm 4: Fault (soft shutdown) 5: Security (hard shutdown) 6: Fault (soft shutdown) + Help
Description	Action performed on protection's trigger. Actions' description is available in the technical documentation.

Out of voltage range

Variable	Out of voltage range timer [2395]
Unit	s
Init value	60.0
Min value	0.0
Max value	999.9
Description	Timer defining how long the value should exceed the treshold before triggering the control associated to this protection.

Variable	Out of voltage range control [2396]
Unit	-
Init value	4
List	0: Unused 3: Alarm 4: Fault (soft shutdown) 5: Security (hard shutdown) 6: Fault (soft shutdown) + Help
Description	Action performed on protection's trigger. Actions' description is available in the technical documentation.

Stop sequence

Variable	Fail to stop engine [3471]
Unit	s
Init value	20.0
Min value	0.0
Max value	999.9
Description	Fail to stop engine timer

Variable	Unexpected stop timer [2203]
Unit	s
Init value	5.0
Min value	0.0
Max value	6553.5
Description	If the module measures a zero speed and no stop request has been made, the module displays a fault after this delay.

ECU/ECM

Lamp error

Variable	Control on Malfunction Indicator Lamp [3110]
Unit	-
Init value	0
List	0: Unused 3: Alarm 4: Fault (soft shutdown) 5: Security (hard shutdown) 6: Fault (soft shutdown) + Help
Description	Action performed on protection's trigger. Actions' description is available in the technical documentation.

Variable	Control on Protection Lamp [3111]
Unit	-
Init value	0
List	0: Unused 3: Alarm 4: Fault (soft shutdown) 5: Security (hard shutdown) 6: Fault (soft shutdown) + Help
Description	Action performed on protection's trigger. Actions' description is available in the technical documentation.

Variable	Control on Amber Warning Lamp [3112]
Unit	-
Init value	0
List	0: Unused 3: Alarm 4: Fault (soft shutdown) 5: Security (hard shutdown) 6: Fault (soft shutdown) + Help
Description	Action performed on protection's trigger. Actions' description is available in the technical documentation.

Variable	Control on Red Stop Lamp [3113]
Unit	-
Init value	0
List	0: Unused 3: Alarm 4: Fault (soft shutdown) 5: Security (hard shutdown) 6: Fault (soft shutdown) + Help
Description	Action performed on protection's trigger. Actions' description is available in the technical documentation.

Variable	Control on Combined Alarm Yellow [3121]
Unit	-
Init value	0
List	0: Unused 3: Alarm 4: Fault (soft shutdown) 5: Security (hard shutdown) 6: Fault (soft shutdown) + Help
Description	Action performed on protection's trigger. Actions' description is available in the technical documentation.

Variable	Control on Combined Alarm Red [3122]
Unit	-
Init value	0
List	0: Unused 3: Alarm 4: Fault (soft shutdown) 5: Security (hard shutdown) 6: Fault (soft shutdown) + Help
Description	Action performed on protection's trigger. Actions' description is available in the technical documentation.

Communication error

Variable	Control on ECU error [3058]
Unit	-
Init value	3
List	0: Unused 3: Alarm 4: Fault (soft shutdown) 6: Fault (soft shutdown) + Help
Description	Action performed on protection's trigger. Actions' description is available in the technical documentation.

Variable	Timer before ECU error [3116]
Unit	s
Init value	10.0
Min value	0.0
Max value	6553.5
Description	Timer before triggering the CAN error related to the communication between the controller and the ECU/ECM.

OTHER PROTECTIONS

Analog inputs

Analog input 1

Variable	Analog input 1 threshold [2600]
Unit	bar
Init value	0.0
Min value	-3276.8
Max value	3276.7
Description	Threshold to be exceeded to trigger the associated control for this protection.

Variable	Analog input 1 timer [2601]
Unit	s
Init value	0.0
Min value	0.0
Max value	999.9
Description	Threshold to be exceeded to trigger the associated control for this protection.

Variable	Analog input 1 control [2602]
Unit	-
Init value	0
List	0: Unused 1: Generator electrical fault 3: Alarm 4: Fault (soft shutdown) 5: Security (hard shutdown) 6: Fault (soft shutdown) + Help 7: Generator electrical fault + Help
Description	Action performed on protection's trigger. Actions' description is available in the technical documentation.

Variable	Analog input 1 threshold 2 [2603]
Unit	bar
Init value	0.0
Min value	-3276.8
Max value	3276.7
Description	Threshold to be exceeded to trigger the associated control for this protection.

Variable	Analog input 1 timer 2 [2604]
Unit	s
Init value	0.0
Min value	0.0
Max value	999.9
Description	Threshold to be exceeded to trigger the associated control for this protection.

Variable	Analog input 1 control 2 [2605]
Unit	-
Init value	0
List	0: Unused 1: Generator electrical fault 3: Alarm 4: Fault (soft shutdown) 5: Security (hard shutdown) 6: Fault (soft shutdown) + Help 7: Generator electrical fault + Help
Description	Action performed on protection's trigger. Actions' description is available in the technical documentation.

Variable	Direction analog input 1 protection [2606]
Unit	-
Init value	0
List	0: Minimum 1: Maximum
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

Variable	Analog input 2 threshold [2608]
Unit	°C
Init value	0.0
Min value	-3276.8
Max value	3276.7
Description	Threshold to be exceeded to trigger the associated control for this protection.

Variable	Analog input 2 timer [2609]
Unit	s
Init value	0.0
Min value	0.0
Max value	999.9
Description	Threshold to be exceeded to trigger the associated control for this protection.

Variable	Analog input 2 control [2610]
Unit	-
Init value	0
List	0: Unused 1: Generator electrical fault 3: Alarm 4: Fault (soft shutdown) 5: Security (hard shutdown) 6: Fault (soft shutdown) + Help 7: Generator electrical fault + Help
Description	Action performed on protection's trigger. Actions' description is available in the technical documentation.

Variable	Analog input 2 threshold 2 [2611]
Unit	°C
Init value	0.0
Min value	-3276.8
Max value	3276.7
Description	Threshold to be exceeded to trigger the associated control for this protection.

Variable	Analog input 2 timer 2 [2612]
Unit	s
Init value	0.0
Min value	0.0
Max value	999.9
Description	Threshold to be exceeded to trigger the associated control for this protection.

Variable	Analog input 2 control 2 [2613]
Unit	-
Init value	0
List	0: Unused 1: Generator electrical fault 3: Alarm 4: Fault (soft shutdown) 5: Security (hard shutdown) 6: Fault (soft shutdown) + Help 7: Generator electrical fault + Help
Description	Action performed on protection's trigger. Actions' description is available in the technical documentation.

Variable	Direction analog input 2 protection [2614]
Unit	-
Init value	0
List	0: Minimum 1: Maximum
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

Variable	Analog input 3 threshold [2616]
Unit	-
Init value	0
Min value	-32768
Max value	32767
Description	Threshold to be exceeded to trigger the associated control for this protection.

Variable	Analog input 3 timer [2617]
Unit	s
Init value	0.0
Min value	0.0
Max value	999.9
Description	Threshold to be exceeded to trigger the associated control for this protection.

Variable	Analog input 3 control [2618]
Unit	-
Init value	0
List	0: Unused 1: Generator electrical fault 3: Alarm 4: Fault (soft shutdown) 5: Security (hard shutdown) 6: Fault (soft shutdown) + Help 7: Generator electrical fault + Help
Description	Action performed on protection's trigger. Actions' description is available in the technical documentation.

Variable	Analog input 3 threshold 2 [2619]
Unit	-
Init value	0
Min value	-32768
Max value	32767
Description	Threshold to be exceeded to trigger the associated control for this protection.

Variable	Analog input 3 timer 2 [2620]
Unit	s
Init value	0.0
Min value	0.0
Max value	999.9
Description	Threshold to be exceeded to trigger the associated control for this protection.

Variable	Analog input 3 control 2 [2621]
Unit	-
Init value	0
List	0: Unused 1: Generator electrical fault 3: Alarm 4: Fault (soft shutdown) 5: Security (hard shutdown) 6: Fault (soft shutdown) + Help 7: Generator electrical fault + Help
Description	Action performed on protection's trigger. Actions' description is available in the technical documentation.

Variable	Direction analog input 3 protection [2622]
Unit	-
Init value	0
List	0: Minimum 1: Maximum
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.

Outputs

Max/Min speed output

Variable	Timer Min Max Speed output [2389]
Unit	s
Init value	10.0
Min value	0.0
Max value	999.9
Description	Timer defining how long the value should exceed the treshold before triggering the control associated to this protection.

Variable	Control Min Max Speed output [2390]
Unit	-
Init value	0
List	0: Unused 3: Alarm
Description	Action performed on protection's trigger. Actions' description is available in the technical documentation.

Max/Min AVR output

Variable	Timer Min Max AVR output [2391]
Unit	s
Init value	10.0
Min value	0.0
Max value	999.9
Description	Timer defining how long the value should exceed the treshold before triggering the control associated to this protection.

Variable	Control Min Max AVR output [2392]
Unit	-
Init value	0
List	0: Unused 3: Alarm
Description	Action performed on protection's trigger. Actions' description is available in the technical documentation.

Battery

Maximum battery voltage

Variable	Max. voltage battery threshold [2359]
Unit	V
Init value	30.0
Min value	0.0
Max value	35.0
Description	Threshold to be exceeded to trigger the associated control for this protection.

Variable	Max. voltage battery timer [2360]
Unit	s
Init value	10.0
Min value	0.0
Max value	999.9
Description	Timer defining how long the value should exceed the treshold before triggering the control associated to this protection.

Variable	Max. voltage battery control [2361]
Unit	-
Init value	0
List	0: Unused 3: Alarm
Description	Action performed on protection's trigger. Actions' description is available in the technical documentation.

Minimum battery voltage

Variable	Min. voltage battery threshold [2356]
Unit	V
Init value	18.0
Min value	0.0
Max value	35.0
Description	Threshold to be exceeded to trigger the associated control for this protection.

Variable	Min. voltage battery timer [2357]
Unit	s
Init value	60.0
Min value	0.0
Max value	999.9
Description	Timer defining how long the value should exceed the treshold before triggering the control associated to this protection.

Variable	Min. voltage battery control [2358]
Unit	-
Init value	0
List	0: Unused 3: Alarm
Description	Action performed on protection's trigger. Actions' description is available in the technical documentation.

Maximum battery voltage 2

Variable	Max. voltage battery threshold 2 [2377]
Unit	V
Init value	32.0
Min value	0.0
Max value	35.0
Description	Threshold to be exceeded to trigger the associated control for this protection.

Variable	Max. voltage battery timer 2 [2378]
Unit	s
Init value	5.0
Min value	0.0
Max value	999.9
Description	Timer defining how long the value should exceed the treshold before triggering the control associated to this protection.

Variable	Max. voltage battery control 2 [2379]
Unit	-
Init value	0
List	0: Unused 3: Alarm
Description	Action performed on protection's trigger. Actions' description is available in the technical documentation.

Minimum battery voltage 2

Variable	Min. voltage battery threshold 2 [2374]
Unit	V
Init value	15.0
Min value	0.0
Max value	35.0
Description	Threshold to be exceeded to trigger the associated control for this protection.

Variable	Min. voltage battery timer 2 [2375]
Unit	s
Init value	10.0
Min value	0.0
Max value	999.9
Description	Timer defining how long the value should exceed the treshold before triggering the control associated to this protection.

Variable	Min. voltage battery control 2 [2376]
Unit	-
Init value	0
List	0: Unused 3: Alarm
Description	Action performed on protection's trigger. Actions' description is available in the technical documentation.

Boost battery

Variable	Control boost battery [2388]
Unit	-
Init value	0
List	0: No 1: Yes
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 boost battery [2386]
Unit	V
Init value	20.0
Min value	0.0
Max value	35.0
Description	Threshold to be exceeded to trigger the associated control for this protection.

Variable	High threshold boost battery [2387]
Unit	V
Init value	28.0
Min value	0.0
Max value	35.0
Description	Threshold to be exceeded to trigger the associated control for this protection.

CAN 1

Variable	Control on controllers communication fault [3052]
Unit	-
Init value	8
List	0: Unused 3: Alarm 4: Fault (soft shutdown) 8: Droop Hz/V + Alarm 10: Droop Hz only + Alarm
Description	Action performed on protection's trigger. Actions' description is available in the technical documentation.

Variable	Control on missing GENSYS COMPACT PRIME on CAN bus [3054]
Unit	-
Init value	3
List	0: Unused 3: Alarm 4: Fault (soft shutdown) 8: Droop Hz/V + Alarm
Description	Action performed on protection's trigger. Actions' description is available in the technical documentation.

Variable	Control on missing MASTER COMPACT/BTB COMPACT on CAN bus [3057]
Unit	-
Init value	8
List	0: Unused 3: Alarm 4: Fault (soft shutdown) 8: Droop Hz/V + Alarm
Description	Action performed on protection's trigger. Actions' description is available in the technical documentation.

Variable	Control on missing HYBRID COMPACT on CAN bus [3060]
Unit	-
Init value	3
List	0: Unused 3: Alarm 4: Fault (soft shutdown) 8: Droop Hz/V + Alarm 10: Droop Hz only + Alarm
Description	Action performed on protection's trigger. Actions' description is available in the technical documentation.

Variable	Control on missing BAT COMPACT on CAN bus [3061]
Unit	-
Init value	3
List	0: Unused 3: Alarm 4: Fault (soft shutdown) 8: Droop Hz/V + Alarm 10: Droop Hz only + Alarm
Description	Action performed on protection's trigger. Actions' description is available in the technical documentation.

CANopen

Variable	Control on CANopen error [3059]
Unit	-
Init value	3
List	0: Unused 3: Alarm 4: Fault (soft shutdown) 6: Fault (soft shutdown) + Help
Description	Action performed on protection's trigger. Actions' description is available in the technical documentation.

Variable	CANopen error timer [3152]
Unit	s
Init value	10.0
Min value	0.0
Max value	6553.5
Description	CANopen error timer

Mismatch rotophase

Variable	Mismatch rotophases protection control [2397]
Unit	-
Init value	0
List	0: Unused 1: Generator electrical fault 3: Alarm 4: Fault (soft shutdown) 5: Security (hard shutdown) 6: Fault (soft shutdown) + Help 7: Generator electrical fault + Help
Description	Action performed on protection's trigger. Actions' description is available in the technical documentation.

PROGRAMMING

HYSTERESIS

Hysteresis 1

Variable	Enable Hysteresis 1 [2657]
Unit	-
Init value	0
List	0: No 1: Yes
Description	Enable hysteresis on analog input 1 with thresholds E2660 (Low Level) & E2663 (High Level)

Variable	Low level threshold [2660]
Unit	bar
Init value	0.0
Min value	-3276.8
Max value	3276.7
Description	Low level threshold for digital output activation on hysteresis 1

Variable	Timer on low level threshold [2666]
Unit	s
Init value	3.0
Min value	0.0
Max value	999.9
Description	Timer before set/reset digital output on hysteresis low threshold 1

Variable	High level threshold [2663]
Unit	bar
Init value	0.0
Min value	-3276.8
Max value	3276.7
Description	High level threshold for digital output activation on hysteresis 1

Variable	Timer on high level threshold [2669]
Unit	s
Init value	3.0
Min value	0.0
Max value	999.9
Description	Timer before set/reset digital output on hysteresis high threshold 1

Variable	Hysteresis Direction 1 [2672]
Unit	-
Init value	0
List	0: Set on low threshold, reset on high threshold 1: Set on high threshold, reset on low threshold
Description	Hysteresis 1 Direction (0 : Set on low thresh. - Reset on high thresh. / 1 : Set on high thresh. - Reset on low thresh)

Hysteresis 2

Variable	Enable Hysteresis 2 [2658]
Unit	-
Init value	0
List	0: No 1: Yes
Description	Enable hysteresis on analog input 2 with thresholds E2661 (Low Level) & E2664 (High Level)

Variable	Low level threshold [2661]
Unit	°C
Init value	0.0
Min value	-3276.8
Max value	3276.7
Description	Low level threshold for digital output activation on hysteresis 2

Variable	Timer on low level threshold [2667]
Unit	s
Init value	3.0
Min value	0.0
Max value	999.9
Description	Timer before set/reset digital output on hysteresis low threshold 2

Variable	High level threshold [2664]
Unit	°C
Init value	0.0
Min value	-3276.8
Max value	3276.7
Description	High level threshold for digital output activation on hysteresis 2

Variable	Timer on high level threshold [2670]
Unit	s
Init value	3.0
Min value	0.0
Max value	999.9
Description	Timer before set/reset digital output on hysteresis high threshold 2

Variable	Hysteresis Direction 2 [2673]
Unit	-
Init value	0
List	0: Set on low threshold, reset on high threshold 1: Set on high threshold, reset on low threshold
Description	Hysteresis 2 Direction (0 : Set on low thresh. - Reset on high thresh. / 1 : Set on high thresh. - Reset on low thresh)

Hysteresis 3

Variable	Enable Hysteresis 3 [2659]
Unit	-
Init value	0
List	0: No 1: Yes
Description	Enable hysteresis on analog input 3 with thresholds E2662 (Low Level) & E2665 (High Level)

Variable	Low level threshold [2662]
Unit	-
Init value	0
Min value	-32768
Max value	32767
Description	Low level threshold for digital output activation on hysteresis 3

Variable	Timer on low level threshold [2668]
Unit	s
Init value	3.0
Min value	0.0
Max value	999.9
Description	Timer before set/reset digital output on hysteresis low threshold 3

Variable	High level threshold [2665]
Unit	-
Init value	0
Min value	-32768
Max value	32767
Description	High level threshold for digital output activation on hysteresis 3

Variable	Timer on high level threshold [2671]
Unit	s
Init value	3.0
Min value	0.0
Max value	999.9
Description	Timer before set/reset digital output on hysteresis high threshold 3

Variable	Hysteresis Direction 3 [2674]
Unit	-
Init value	0
List	0: Set on low threshold, reset on high threshold 1: Set on high threshold, reset on low threshold
Description	Hysteresis 3 Direction (0 : Set on low thresh. - Reset on high thresh. / 1 : Set on high thresh. - Reset on low thresh)

MODBUS

Connection settings

Variable	Enable connection to Modbus server [3031]
Unit	-
Init value	0
List	0: No 1: Yes
Description	Enable connection to a Modbus server for custom read/write requests

Variable	Control on Modbus server timeouts [3030]
Unit	-
Init value	3
List	0: Unused 3: Alarm 4: Fault (soft shutdown) 6: Fault (soft shutdown) + Help
Description	Control on TCP connection loss or frame timeout with Modbus server

Variable	Modbus server frame timeout [3032]
Unit	s
Init value	5.0
Min value	0.0
Max value	6553.5
Description	Timeout in ms for no response to a frame emitted from the Modbus server

Modbus rights

Variable	Write date/time [3015.0]
Description	-

Variable	Write engine meters [3015.1]
Description	-

Variable	Write input functions [3015.3]
Description	-

Variable	Reading via Modbus TCP [3015.8]
Description	-

Variable	Writing via Modbus TCP [3015.9]
Description	-

LOGGER

Activation

Variable	Activation [3610]
Unit	-
Init value	0
List	0: Off 1: Always ON 2: Post starting 3: Stabilized
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.

Variables 1-5

Log 1

Variable	Variable 1 to log [3600]
Unit	-
Init value	0
Min value	0
Max value	10299
Description	Logger of the variable to archive

Variable	Log variable 1 on [3622]
Unit	-
Init value	0
List	0: Value change 1: Interval
Description	A variable can be logged in two different ways: - Interval: The variable will be logged at specific intervals, defined by the user ([3612]) - Value change: The variable will be logged each time the value of the variable has been changed

Variable	Logging period variable 1 [3612]
Unit	s
Init value	1
Min value	1
Max value	9999
Description	Time in second of interval between each archiving

Log 2

Variable	Variable 2 to log [3601]
Unit	-
Init value	0
Min value	0
Max value	10299
Description	Logger of the variable to archive

Variable	Log variable 2 on [3623]
Unit	-
Init value	0
List	0: Value change 1: Interval
Description	A variable can be logged in two different ways: - Interval: The variable will be logged at a periodic interval, defined by the user ([3613]) - Value change: The variable will be logged each time the value of the variable has been changed

Variable	Logging period variable 2 [3613]
Unit	s
Init value	1
Min value	1
Max value	9999
Description	Time in second of interval between each archiving

Log 3

Variable	Variable 3 to log [3602]
Unit	-
Init value	0
Min value	0
Max value	10299
Description	Logger of the variable to archive

Variable	Log variable 3 on [3624]
Unit	-
Init value	0
List	0: Value change 1: Interval
Description	A variable can be logged in two different ways: - Interval: The variable will be logged at a periodic interval, defined by the user ([3614]) - Value change: The variable will be logged each time the value of the variable has been changed

Variable	Logging period variable 3 [3614]
Unit	s
Init value	1
Min value	1
Max value	9999
Description	Time in second of interval between each archiving

Log 4

Variable	Variable 4 to log [3603]
Unit	-
Init value	0
Min value	0
Max value	10299
Description	Logger of the variable to archive

Variable	Log variable 4 on [3625]
Unit	-
Init value	0
List	0: Value change 1: Interval
Description	A variable can be logged in two different ways: - Interval: The variable will be logged at a periodic interval, defined by the user ([3615]) - Value change: The variable will be logged each time the value of the variable has been changed

Variable	Logging period variable 4 [3615]
Unit	s
Init value	1
Min value	1
Max value	9999
Description	Time in second of interval between each archiving

Log 5

Variable	Variable 5 to log [3604]
Unit	-
Init value	0
Min value	0
Max value	10299
Description	Logger of the variable to archive

Variable	Log variable 5 on [3626]
Unit	-
Init value	0
List	0: Value change 1: Interval
Description	A variable can be logged in two different ways: - Interval: The variable will be logged at a periodic interval, defined by the user ([3616]) - Value change: The variable will be logged each time the value of the variable has been changed

Variable	Logging period variable 5 [3616]
Unit	s
Init value	1
Min value	1
Max value	9999
Description	Time in second of interval between each archiving

Variables 6-10

Log 6

Variable	Variable 6 to log [3605]
Unit	-
Init value	0
Min value	0
Max value	10299
Description	Logger of the variable to archive

Variable	Log variable 6 on [3627]
Unit	-
Init value	0
List	0: Value change 1: Interval
Description	A variable can be logged in two different ways: - Interval: The variable will be logged at a periodic interval, defined by the user ([3617]) - Value change: The variable will be logged each time the value of the variable has been changed

Variable	Logging period variable 6 [3617]
Unit	s
Init value	1
Min value	1
Max value	9999
Description	Time in second of interval between each archiving

Log 7

Variable	Variable 7 to log [3606]
Unit	-
Init value	0
Min value	0
Max value	10299
Description	Logger of the variable to archive

Variable	Log variable 7 on [3628]
Unit	-
Init value	0
List	0: Value change 1: Interval
Description	A variable can be logged in two different ways: - Interval: The variable will be logged at a periodic interval, defined by the user ([3618]) - Value change: The variable will be logged each time the value of the variable has been changed

Variable	Logging period variable 7 [3618]
Unit	s
Init value	1
Min value	1
Max value	9999
Description	Time in second of interval between each archiving

Log 8

Variable	Variable 8 to log [3607]
Unit	-
Init value	0
Min value	0
Max value	10299
Description	Logger of the variable to archive

Variable	Log variable 8 on [3629]
Unit	-
Init value	0
List	0: Value change 1: Interval
Description	A variable can be logged in two different ways: - Interval: The variable will be logged at a periodic interval, defined by the user ([3619]) - Value change: The variable will be logged each time the value of the variable has been changed

Variable	Logging period variable 8 [3619]
Unit	s
Init value	1
Min value	1
Max value	9999
Description	Time in second of interval between each archiving

Log 9

Variable	Variable 9 to log [3608]
Unit	-
Init value	0
Min value	0
Max value	10299
Description	Logger of the variable to archive

Variable	Log variable 9 on [3630]
Unit	-
Init value	0
List	0: Value change 1: Interval
Description	A variable can be logged in two different ways: - Interval: The variable will be logged at a periodic interval, defined by the user ([3620]) - Value change: The variable will be logged each time the value of the variable has been changed

Variable	Logging period variable 9 [3620]
Unit	s
Init value	1
Min value	1
Max value	9999
Description	Time in second of interval between each archiving

Log 10

Variable	Variable 10 to log [3609]
Unit	-
Init value	0
Min value	0
Max value	10299
Description	Logger of the variable to archive

Variable	Log variable 10 on [3631]
Unit	-
Init value	0
List	0: Value change 1: Interval
Description	A variable can be logged in two different ways: - Interval: The variable will be logged at a periodic interval, defined by the user ([3621]) - Value change: The variable will be logged each time the value of the variable has been changed

Variable	Logging period variable 10 [3621]
Unit	s
Init value	1
Min value	1
Max value	9999
Description	Time in second of interval between each archiving

SYSTEM

LCD DISPLAY

Screen saving

Variable	Screensaver timeout [3551]
Unit	min
Init value	5
Min value	0
Max value	120
Description	Timeout Screen saver (0=infini)

Backlight

Variable	Backlight timeout [3552]
Unit	min
Init value	5
Min value	0
Max value	120
Description	Timeout Backlight (0=infini)

Variable	LCD screen backlight [3555]
Unit	%
Init value	100
Min value	0
Max value	100
Description	LCD backlight intensity

Variable	LCD screen contrast [3554]
Unit	%
Init value	50
Min value	0
Max value	100
Description	LCD contrast intensity

DATE/TIME

Variable	Day of the week [10]
Unit	-
Init value	0
Min value	0
Max value	6
Description	Day of the week (RTC)

Variable	Day [11]
Unit	days
Init value	0
Min value	1
Max value	31
Description	Day (RTC)

Variable	Month [12]
Unit	-
Init value	0
Min value	1
Max value	12
Description	Month (RTC)

Variable	Year [13]
Unit	-
Init value	0
Min value	0
Max value	99
Description	Year (RTC)

Variable	Hours [14]
Unit	h
Init value	0
Min value	0
Max value	23
Description	Hours (RTC)

Variable	Minutes [15]
Unit	min
Init value	0
Min value	0
Max value	59
Description	Minutes (RTC)

BUTTONS INHIBITION

Variable	Auto button inhibition [8102.14]
Description	Allows to disable (1) or enable (0) the button

Variable	Test button inhibition [8102.13]
Description	Allows to disable (1) or enable (0) the button

Variable	Man button inhibition [8102.12]
Description	Allows to disable (1) or enable (0) the button

Variable	Start button inhibition [8102.11]
Description	Allows to disable (1) or enable (0) the button

Variable	Stop button inhibition [8102.10]
Description	Allows to disable (1) or enable (0) the button

Variable	Gen breaker button inhibition [8102.9]
Description	Allows to disable (1) or enable (0) the button

Variable	Fault/Alarm/info button inhibition [8102.7]
Description	Allows to disable (1) or enable (0) the button

Variable	Esc button inhibition [8102.6]
Description	Allows to disable (1) or enable (0) the button

Variable	Enter button inhibition [8102.5]
Description	Allows to disable (1) or enable (0) the button

Variable	Up arrow button inhibition [8102.4]
Description	Allows to disable (1) or enable (0) the button

Variable	Left arrow button inhibition [8102.3]
Description	Allows to disable (1) or enable (0) the button

Variable	Down arrow button inhibition [8102.2]
Description	Allows to disable (1) or enable (0) the button

Variable	Right arrow button inhibition [8102.1]
Description	Allows to disable (1) or enable (0) the button

Variable	Shift button inhibition [8102.0]
Description	Allows to disable (1) or enable (0) the button

LIST OF INPUTS

GENERATOR

Variable	Generator breaker feedback [4501]
Description	Breaker position feedback, when active the breaker is considered closed.

Variable	Remote start on load [4502]
Description	Activation will start generator in automatic mode and close the generator breaker on load. If Load dependant start stop is used this input must remain active all the time to allow load dependent start stop to manage start/stop sequences.

Variable	Generator ready [4523]
Description	To be used only if the external start sequence is activated, and to indicate to the automated system when motor speed stability must be checked. If this function is not used during an external start sequence, the generator switches to speed stabilization check as soon as speed exceeds 95% of nominal. If this function is used during an external start sequence, the generator switches to speed stabilization check as soon as this input is activated. If the input is declared and missing while the generator is on load, a critical fault will be triggered. If the input is declared and missing while the generator is starting, a start fault will be triggered after the corresponding time delay.

Variable	Start inhibition [4524]
Description	Prevents engine from starting, input will block start sequence only if active before starting demand.

Variable	Override (NFE37312) [4610]
Description	Override mode: will disable all configured protections of the controller except : Over-speed, Emergency stop and short-circuit. Other fault will be displayed as alarm dedicated override running hours counter will be incremented in override mode.

Variable	Remote start off load [4611]
Description	Activation will start generator(s) in automatic mode and keep breaker open: used for off load tests.

Variable	Remote start with timer [4612]
Description	Activation starts the generator(s) in automatic mode and waits for an adjustable delay until the generator(s) are ready before closing the circuit breaker. Used to extend the start sequence and preheat the generator(s) at nominal frequency.

ENGINE

Variable	Preglow request [4534]
Description	Manual prestart auxiliary request, will activate the output 'Pre-start (Glow plugs & Auxiliaries)' when in manual mode

INPUTS/OUTPUTS

Variable	Digital output 1 forced [4630]
Description	Activating this input will force activation of digital ouput 1.

Variable	Digital output 2 forced [4631]
Description	Activating this input will force activation of digital ouput 2.

Variable	Digital output 3 forced [4632]
Description	Activating this input will force activation of digital ouput 3.

Variable	Digital output 4 forced [4633]
Description	Activating this input will force activation of digital ouput 4.

Variable	Digital output 5 forced [4634]
Description	Activating this input will force activation of digital ouput 5.

Variable	Digital output 6 forced [4635]
Description	Activating this input will force activation of digital ouput 6.

Variable	Relay 1 forced [4950]
Description	Activating this input will force activation of relay ouput 1.

Variable	Relay 2 forced [4951]
Description	Activating this input will force activation of relay ouput 2.

POWER PLANT

Variable	External non essential trip request [4537]
Description	External activation of the load shedding protection outputs.Use only if load shedding is enable.

Variable	Priority generator [4538]
Description	Use only when Load Dependent Start Stop is configured. This function will force the generator to start if it was waiting to stop in automatic mode. The generator will be on load as long as the input is active, and will inhibit automatic stop depending on load.

Variable	Unload generator if load-dependent start-stop rules OK [4543]
Description	Use only when Load Dependent Start Stop is configured. If this function is enabled, when the automated system decides to stop a generator, that generator will be stopped first.

Variable	Start all generators [4640]
Description	CAN bus broadcasted remote start. Activating this input will send a remote start on load command to all other generators of the same segment number.

ENGINE PROTECTIONS

Variable	Oil pressure fault [4503]
Description	External oil pressure switch. Immediate shut down protection. Function is normally closed as standard and disable when engine is stopped.

Variable	Coolant temperature fault [4504]
Description	External coolant temperature switch. Protection is stopping engine after cooling down timer.

ALARMS/FAULTS

Variable	Emergency stop [4505]
Description	Emergency stop activation: Will immediately stop the generator(s) and force circuit breaker open.

Variable	Generator fault request (Trip) [4507]
Description	External electrical fault : Activation opens the circuit-breaker and keeps it open. After an adjustable delay (circuit-breaker menu/Delay before new attempt), a new attempt will be performed to close the circuit-breaker. The maximum number of attempts can be set in breaker settings (number of closing attempts). If the fault is still present after the last attempt, the circuit-breaker will open and the system will stop on fault.

Variable	Remote hard shut down [4525]
Description	Immediate stop of the generator, activated from external device.

Variable	Remote soft shut down [4526]
Description	Immediate opening of generator circuit breaker and stop of generators after cooling down, activated by external command.

Variable	Remote alarm [4527]
Description	Alarm only - non critical event activated by external device - Orange led is displayed an event logged.

Variable	Remote Fault + Help [4528]
Description	Use only when Load Dependent Start Stop is configured. 'Remote Fault + Help' will request an additionnal available genset to be paralleled before to trigger the 'Generator electrical fault' protection, in order to provide enough power after protection is tripped.

Variable	Remote soft shutdown + help [4529]
Description	Use only when Load Dependent Start Stop is configured. 'Remote soft shut down + Help' will request an additionnal genset to be paralleled before to trigger the 'Soft Shut Down' protection, in order to provide enough power after protection is tripped.

ALTERNATIVE SELECTIONS

Variable	Alternative selection 1 [4594]
Description	Available variable to toggle a parameter between 2 values. See Alternative selection function.

Variable	Alternative selection 2 [4595]
Description	Available variable to toggle a parameter between 2 values. See Alternative selection function.

Variable	Alternative selection 3 [4596]
Description	Available variable to toggle a parameter between 2 values. See Alternative selection function.

Variable	Alternative selection 4 [4597]
Description	Available variable to toggle a parameter between 2 values. See Alternative selection function.

Variable	Alternative selection 5 [4598]
Description	Available variable to toggle a parameter between 2 values. See Alternative selection function.

Variable	Alternative selection 6 [4599]
Description	Available variable to toggle a parameter between 2 values. See Alternative selection function.

Variable	Alternative selection 7 [4600]
Description	Available variable to toggle a parameter between 2 values. See Alternative selection function.

Variable	Alternative selection 8 [4601]
Description	Available variable to toggle a parameter between 2 values. See Alternative selection function.

Variable	Alternative selection 9 [4602]
Description	Available variable to toggle a parameter between 2 values. See Alternative selection function.

Variable	Alternative selection 10 [4603]
Description	Available variable to toggle a parameter between 2 values. See Alternative selection function.

Variable	Alternative selection 11 [4604]
Description	Available variable to toggle a parameter between 2 values. See Alternative selection function.

Variable	Alternative selection 12 [4605]
Description	Available variable to toggle a parameter between 2 values. See Alternative selection function.

Variable	Alternative selection 13 [4606]
Description	Available variable to toggle a parameter between 2 values. See Alternative selection function.

Variable	Alternative selection 14 [4607]
Description	14th available variable to switch a parameter between 2 values

Variable	Alternative selection 15 [4608]
Description	15th available variable to switch a parameter between 2 values

Variable	Alternative selection 16 [4609]
Description	16th available variable to switch a parameter between 2 values

HYSTERESIS

Variable	Hysteresis low threshold DI1 [4614]
Description	Activate to trigger the corresponding hysteresis low threshold.

Variable	Hysteresis low threshold DI2 [4615]
Description	Activate to trigger the corresponding hysteresis low threshold.

Variable	Hysteresis low threshold DI3 [4616]
Description	Activate to trigger the corresponding hysteresis low threshold.

Variable	Hysteresis low threshold DI4 [4617]
Description	Activate to trigger the corresponding hysteresis low threshold.

Variable	Hysteresis low threshold DI5 [4618]
Description	Activate to trigger the corresponding hysteresis low threshold.

Variable	Hysteresis low threshold DI6 [4619]
Description	Activate to trigger the corresponding hysteresis low threshold.

Variable	Hysteresis low threshold DI7 [4620]
Description	Activate to trigger the corresponding hysteresis low threshold.

Variable	Hysteresis low threshold DI8 [4621]
Description	Activate to trigger the corresponding hysteresis low threshold.

Variable	Hysteresis high threshold DI1 [4622]
Description	Activate to trigger the corresponding hysteresis high threshold.

Variable	Hysteresis high threshold DI2 [4623]
Description	Activate to trigger the corresponding hysteresis high threshold.

Variable	Hysteresis high threshold DI3 [4624]
Description	Activate to trigger the corresponding hysteresis high threshold.

Variable	Hysteresis high threshold DI4 [4625]
Description	Activate to trigger the corresponding hysteresis high threshold.

Variable	Hysteresis high threshold DI5 [4626]
Description	Activate to trigger the corresponding hysteresis high threshold.

Variable	Hysteresis high threshold DI6 [4627]
Description	Activate to trigger the corresponding hysteresis high threshold.

Variable	Hysteresis high threshold DI7 [4628]
Description	Activate to trigger the corresponding hysteresis high threshold.

Variable	Hysteresis high threshold DI8 [4629]
Description	Activate to trigger the corresponding hysteresis high threshold.

REMOTE BUTTONS

Variable	Remote faults reset [4506]
Description	External reset. Aknowledgement of alarm/fault present in display pages (same action as shift+I reset).

Variable	Manual start request [4509]
Description	Manual start command (alternative to front panel push button). Active in manual mode only.

Variable	Manual stop request [4510]
Description	Manual stop command (alternative to front panel push button). Active in manual mode only.

Variable	Manual mode request [4511]
Description	Force controller in manual mode, same effect as MAN button.

Variable	Manual mode inhibition [4512]
Description	Prevent controller to go in manual mode (Remotely or front panel).

Variable	Auto mode request [4513]
Description	Force controller in auto mode, same effect as AUTO button.

Variable	Increase speed in manual mode [4514]
Description	Remote frequency increase request in manual mode with circuit breaker open (alternative to front panel button).

Variable	Decrease speed in manual mode [4515]
Description	Remote frequency decrease request in manual mode with circuit breaker open (alternative to front panel button)

Variable	Increase voltage in manual mode [4516]
Description	Remote voltage increase request in manual mode with circuit breaker open (alternative to front panel button)

Variable	Decrease voltage in manual mode [4517]
Description	Remote voltage decrease request in manual mode with circuit breaker open (alternative to front panel button)

Variable	Generator breaker opening in manual mode [4518]
Description	Remote manual opening of generator breaker in manual mode (alternative to front button). Active in manual mode only.

Variable	Generator breaker closing in manual mode [4520]
Description	Remote manual close of generator breaker in manual mode (alternative to front button). Active in manual mode only.

Variable	Stop horn [4530]
Description	External horn stop request. Used when Horn output is configured.

Variable	Led test [4580]
Description	Activates all LEDs of the module in order to check that the LEDs work

Variable	Test mode request [4590]
Description	Force controller in test mode, same effect as TEST button.

LIST OF OUTPUTS

COMMANDS

Variable	Starter n°1 [4652]
Description	Starter n°1 - cranking output.

Variable	Starter n°2 [4653]
Description	Starter n°2 - cranking output.

Variable	Starter n°3 [4654]
Description	Starter n°3 - cranking output.

Variable	Fuel / Gas [4655]
Description	Fuel output - Output is activated at start up and shut down to stop the engine. Also used as logical remote start command on local engine controllers such as Diesel Control Unit or ECU, when 'external start sequence' function is enable.

Variable	Horn [4663]
Description	External horn or warning light. Activated whenever a fault/alarm triggers. The output is disable on acknowledgment or reset. Horn timer is adjustable in timer menu (0s = permanent activation).

Variable	Energize to stop [4674]
Description	Output is energized to stop the engine fuel, activation remains from shutdown request untill engine is completely stopped (0rpm), an additionnal timer can be adjusted in timer menu.

Variable	Generator breaker close [4675]
Description	Command to close the breaker. Output signal (pulse or continue) will depend on configuration in Breaker settings.

Variable	Generator breaker open [4677]
Description	Command to open the breaker. Output signal (pulse or continue) will depend on configuration in Breaker settings.

Variable	Excitation command [4680]
Description	Used for static paralleling: energizes the AVR excitation relay after startup of synchronized generator if nominal speed is reached, excitation will be disabled at stop or on protections.

Variable	Pre-start (Glow plugs & Auxiliaries) [4685]
Description	This output is used to activate the glow plugs or any auxiliary functions before starting (water preheating, pre-lubrication, etc.) output is active at start command for a defines timer (adjustable in timer menu) and release before cranking.

Variable	Smoke limit / Position limiting [4686]
Description	Smoke limit / Position limiting. Output will be activated from cranking to speed stabilisation. dedicated to activate a smoke limiter function on engine.

Variable	Damper [4687]
Description	Damping flap, activated during stop sequence untill reset in case of a fault resulting in a shut down.

Variable	Cooling fan [4688]
Description	Cooling fan output, activated if the water temperature is above the Cooling fan activation threshold parameter (Configuration/engine menu)

Variable	1st non essential trip [4689]
Description	In case Load Shedding function is used: Load 1 to be shed in first

Variable	2nd non essential trip [4690]
Description	In case Load Shedding function is used: Load 2 to be shed after load 1

Variable	3rd non essential trip [4691]
Description	In case Load Shedding function is used: Load 3 to be shed after load 2

Variable	4th non essential trip [4692]
Description	In case Load Shedding function is used: Load 4 to be shed after load 3

Variable	5th non essential trip [4693]
Description	In case Load Shedding function is used: Load 5 to be shed after load 4

Variable	Increase speed by pulse [4699]
Description	Speed regulator requiring +/- contacts. In manual mode, the output is activated when you press the "top arrow" key or with an "Increase speed in manual mode"

Variable	Decrease speed by pulse [4700]
Description	Speed regulator requiring +/- contacts. In manual mode, the output is activated when you press the "bottom arrow" key or with an "Decrease speed in manual mode"

Variable	Increase voltage by pulse [4701]
Description	Voltage regulator requiring +/- contacts. In manual mode, the output is activated when you press the "top arrow" key or with an "Increase voltage in manual mode"

Variable	Decrease voltage by pulse [4702]
Description	Voltage regulator requiring +/- contacts. In manual mode, the output is activated when you press the "bottom arrow" key or with an "Decrease voltage in manual mode"

Variable	Idle speed [4704]
Description	Idle request on speed governor activated during 'Engine preheat timer' and optionally on cooling down if configured. Must be connect to idle speed input of speed regulation.

Variable	Ignition [4707]
Description	Ignition (Gas sequence). Output activated before starting sequence.

Variable	Battery boost DO [4709]
Description	Battery boost digital output. Activated with'Boost battery' function (configuration/protection).

Variable	Faults reset [4737]
Description	Active when a Fault RESET is requested on controller.

GENERATOR

Variable	Fail to close generator breaker [4154]
Description	Fault report: The automated system tried to close the circuit breaker without success

Variable	Fail to open generator breaker [4155]
Description	Fault report: The automated system tried to open the circuit breaker without success

Variable	Generator breaker open suddenly [4156]
Description	Fault report: The circuit breaker has opened without any request for opening from the automated system

Variable	Generator breaker close suddenly [4170]
Description	Fault report: The circuit breaker has closed without any request for closing from the automated system

Variable	Fail to stabilize speed [4477]
Description	Fault report: The speed is not stable, it is not maintained between 95% and 105% of the nominal speed

Variable	Fail to stabilize voltage [4478]
Description	Fault report: The voltage is not stable, it is not maintained between 95% and 105% of the nominal voltage

Variable	Generator breaker state [4650]
Description	Status report: Gives the state desired by the automated system for the circuit breaker (0: opening / 1: closing). Not to be confused with the closing command, whose behaviour depends on the configuration (Contact, Impulse, etc).

Variable	Generator ready [4670]
Description	Status report: Active when start sequence is succesful and generator at its nominal frequency and voltage. The variable remains active until the engine is requested to stopped.

Variable	Generator ready and breaker closed [4672]
Description	Status report: Active if generator(s) are producing

Variable	Generator stop [4673]
Description	Status report: Activated if generator is stopped (speed <10rpm)

BUS

Variable	Dead bus bar [124]
Description	There is no voltage on the common bus bar

ENGINE

Variable	Unexpected stop [4451]
Description	Fault report: The engine has stopped without a stop request from the automated system

Variable	Fail to stop engine [4472]
Description	Fault report: The automated system tried to stop the engine without success

Variable	Fail to start engine [4475]
Description	Fault report: The automated system tried to start the engine without success

CAN BUS ECU/ECM

Variable	Protection Lamp [658]
Description	Protection Lamp status (PGN : 65226 / SPN: 987)

Variable	Amber Warning Lamp [659]
Description	Amber Warning Lamp status (PGN : 65226 / SPN: 624)

Variable	Red Stop Lamp [660]
Description	Red Stop Lamp status (PGN : 65226 / SPN: 623)

Variable	Malfunction Indicator Lamp [661]
Description	Malfunction Indicator Lamp status (PGN : 65226 / SPN: 1213)

Variable	MDEC module is alive [1200]
Description	MTU MDEC module is alive (NMT messages seen on dedicated CAN bus)

Variable	MDEC module communication error [1201]
Description	MTU MDEC module communication error (No NMT message on dedicated CAN bus)

Variable	Combined Alarm Yellow [1213]
Description	Combined Alarm Yellow - From MTU MDEC module

Variable	Combined Alarm Red [1214]
Description	Combined Alarm Red - From MTU MDEC module

INPUTS/OUTPUTS

Variable	Input 1 (Customisable) [250]
Description	Digital input n°1 of the product. Select a normally open polarity if the input is connected to 0V when the input should be considered active. Select a normally closed polarity if the input is connected to 0V when the input must be considered inactive. The validity indicates when the digital input should be taken into account. The T ON delay allows you to add a delay between the moment when the digital input is physically activated and the moment when the product considers it active for the automated system. The T OFF time delay allows you to add a delay between the moment when the digital input is physically disabled and the moment when the product considers it inactive for the automated system.

Variable	Input 2 (Customisable) [251]
Description	Digital input n°2 of the product. Select a normally open polarity if the input is connected to 0V when the input should be considered active. Select a normally closed polarity if the input is connected to 0V when the input must be considered inactive. The validity indicates when the digital input should be taken into account. The T ON delay allows you to add a delay between the moment when the digital input is physically activated and the moment when the product considers it active for the automated system. The T OFF time delay allows you to add a delay between the moment when the digital input is physically disabled and the moment when the product considers it inactive for the automated system.

Variable	Input 3 (Customisable) [252]
Description	Digital input n°3 of the product. Select a normally open polarity if the input is connected to 0V when the input should be considered active. Select a normally closed polarity if the input is connected to 0V when the input must be considered inactive. The validity indicates when the digital input should be taken into account. The T ON delay allows you to add a delay between the moment when the digital input is physically activated and the moment when the product considers it active for the automated system. The T OFF time delay allows you to add a delay between the moment when the digital input is physically disabled and the moment when the product considers it inactive for the automated system.

Variable	Input 4 (Customisable) [253]
Description	Digital input n°4 of the product. Select a normally open polarity if the input is connected to 0V when the input should be considered active. Select a normally closed polarity if the input is connected to 0V when the input must be considered inactive. The validity indicates when the digital input should be taken into account. The T ON delay allows you to add a delay between the moment when the digital input is physically activated and the moment when the product considers it active for the automated system. The T OFF time delay allows you to add a delay between the moment when the digital input is physically disabled and the moment when the product considers it inactive for the automated system.

Variable	Input 5 (Customisable) [254]
Description	Digital input n°5 of the product. Select a normally open polarity if the input is connected to 0V when the input should be considered active. Select a normally closed polarity if the input is connected to 0V when the input must be considered inactive. The validity indicates when the digital input should be taken into account. The T ON delay allows you to add a delay between the moment when the digital input is physically activated and the moment when the product considers it active for the automated system. The T OFF time delay allows you to add a delay between the moment when the digital input is physically disabled and the moment when the product considers it inactive for the automated system.

Variable	Input 6 (Customisable) [255]
Description	Digital input n°6 of the product. Select a normally open polarity if the input is connected to 0V when the input should be considered active. Select a normally closed polarity if the input is connected to 0V when the input must be considered inactive. The validity indicates when the digital input should be taken into account. The T ON delay allows you to add a delay between the moment when the digital input is physically activated and the moment when the product considers it active for the automated system. The T OFF time delay allows you to add a delay between the moment when the digital input is physically disabled and the moment when the product considers it inactive for the automated system.

Variable	Input 7 (Customisable) [256]
Description	Digital input n°7 of the product. Select a normally open polarity if the input is connected to 0V when the input should be considered active. Select a normally closed polarity if the input is connected to 0V when the input must be considered inactive. The validity indicates when the digital input should be taken into account. The T ON delay allows you to add a delay between the moment when the digital input is physically activated and the moment when the product considers it active for the automated system. The T OFF time delay allows you to add a delay between the moment when the digital input is physically disabled and the moment when the product considers it inactive for the automated system.

Variable	Input 8 (Customisable) [257]
Description	Digital input n°8 of the product. Select a normally open polarity if the input is connected to 0V when the input should be considered active. Select a normally closed polarity if the input is connected to 0V when the input must be considered inactive. The validity indicates when the digital input should be taken into account. The T ON delay allows you to add a delay between the moment when the digital input is physically activated and the moment when the product considers it active for the automated system. The T OFF time delay allows you to add a delay between the moment when the digital input is physically disabled and the moment when the product considers it inactive for the automated system.

Variable	Input 9 (Customisable) [258]
Description	Digital input n°9 of the product. Select a normally open polarity if the input is connected to 0V when the input should be considered active. Select a normally closed polarity if the input is connected to 0V when the input must be considered inactive. The validity indicates when the digital input should be taken into account. The T ON delay allows you to add a delay between the moment when the digital input is physically activated and the moment when the product considers it active for the automated system. The T OFF time delay allows you to add a delay between the moment when the digital input is physically disabled and the moment when the product considers it inactive for the automated system.

Variable	Analog 1 (Customisable) [259]
Description	Digital input 10 (Analog1 set as Digital input)

Variable	Analog 2 (Customisable) [260]
Description	Digital input 11 (Analog2 set as Digital input)

Variable	Analog 3 (Customisable) [261]
Description	Digital input 12 (Analog3 set as Digital input)

Variable	Physical status of digital input 1 [953.0]
Description	Physical state of the digital input (without application of polarity, validity and time delays)

Variable	Physical status of digital input 2 [953.1]
Description	Physical state of the digital input (without application of polarity, validity and time delays)

Variable	Physical status of digital input 3 [953.2]
Description	Physical state of the digital input (without application of polarity, validity and time delays)

Variable	Physical status of digital input 4 [953.3]
Description	Physical state of the digital input (without application of polarity, validity and time delays)

Variable	Physical status of digital input 5 [953.4]
Description	Physical state of the digital input (without application of polarity, validity and time delays)

Variable	Physical status of digital input 6 [953.5]
Description	Physical state of the digital input (without application of polarity, validity and time delays)

Variable	Physical status of digital input 7 [953.6]
Description	Physical state of the digital input (without application of polarity, validity and time delays)

Variable	Physical status of digital input 8 [953.7]
Description	Physical state of the digital input (without application of polarity, validity and time delays)

Variable	Physical status of digital input 9 [953.8]
Description	Physical state of the digital input (without application of polarity, validity and time delays)

Variable	Output 1 (Customisable) [4350]
Description	Real time displayed status of Digital Output 1

Variable	Output 2 (Customisable) [4351]
Description	Real time displayed status of Digital Output 2

Variable	Output 3 (Customisable) [4352]
Description	Real time displayed status of Digital Output 3

Variable	Output 4 (Customisable) [4353]
Description	Real time displayed status of Digital Output 4

Variable	Output 5 (Customisable) [4354]
Description	Real time displayed status of Digital Output 5

Variable	Output 6 (Customisable) [4355]
Description	Real time displayed status of Digital Output 6

Variable	Relay 1 (Customisable) [4356]
Description	Real time displayed status of Relay Output 1

Variable	Relay 2 (Customisable) [4357]
Description	Real time displayed status of Relay Output 2

I/O CAN BUS EXPANSION

Variable	CANopen DI 1 (Customisable) [800]
Description	CANopen digital Input 1

Variable	CANopen DI 2 (Customisable) [801]
Description	CANopen digital Input 2

Variable	CANopen DI 3 (Customisable) [802]
Description	CANopen digital Input 3

Variable	CANopen DI 4 (Customisable) [803]
Description	CANopen digital Input 4

Variable	CANopen DI 5 (Customisable) [804]
Description	CANopen digital Input 5

Variable	CANopen DI 6 (Customisable) [805]
Description	CANopen digital Input 6

Variable	CANopen DI 7 (Customisable) [806]
Description	CANopen digital Input 7

Variable	CANopen DI 8 (Customisable) [807]
Description	CANopen digital Input 8

Variable	CANopen DI 9 (Customisable) [808]
Description	CANopen digital Input 9

Variable	CANopen DI 10 (Customisable) [809]
Description	CANopen digital Input 10

Variable	CANopen DI 11 (Customisable) [810]
Description	CANopen digital Input 11

Variable	CANopen DI 12 (Customisable) [811]
Description	CANopen digital Input 12

Variable	CANopen DI 13 (Customisable) [812]
Description	CANopen digital Input 13

Variable	CANopen DI 14 (Customisable) [813]
Description	CANopen digital Input 14

Variable	CANopen DI 15 (Customisable) [814]
Description	CANopen digital Input 15

Variable	CANopen DI 16 (Customisable) [815]
Description	CANopen digital Input 16

Variable	CANopen DI 17 (Customisable) [816]
Description	CANopen digital Input 17

Variable	CANopen DI 18 (Customisable) [817]
Description	CANopen digital Input 18

Variable	CANopen DI 19 (Customisable) [818]
Description	CANopen digital Input 19

Variable	CANopen DI 20 (Customisable) [819]
Description	CANopen digital Input 20

Variable	CANopen DI 21 (Customisable) [820]
Description	CANopen digital Input 21

Variable	CANopen DI 22 (Customisable) [821]
Description	CANopen digital Input 22

Variable	CANopen DI 23 (Customisable) [822]
Description	CANopen digital Input 23

Variable	CANopen DI 24 (Customisable) [823]
Description	CANopen digital Input 24

Variable	CANopen DI 25 (Customisable) [824]
Description	CANopen digital Input 25

Variable	CANopen DI 26 (Customisable) [825]
Description	CANopen digital Input 26

Variable	CANopen DI 27 (Customisable) [826]
Description	CANopen digital Input 27

Variable	CANopen DI 28 (Customisable) [827]
Description	CANopen digital Input 28

Variable	CANopen DI 29 (Customisable) [828]
Description	CANopen digital Input 29

Variable	CANopen DI 30 (Customisable) [829]
Description	CANopen digital Input 30

Variable	CANopen DI 31 (Customisable) [830]
Description	CANopen digital Input 31

Variable	CANopen DI 32 (Customisable) [831]
Description	CANopen digital Input 32

Variable	CANopen DI 33 (Customisable) [1250]
Description	CANopen digital Input 33

Variable	CANopen DI 34 (Customisable) [1251]
Description	CANopen digital Input 34

Variable	CANopen DI 35 (Customisable) [1252]
Description	CANopen digital Input 35

Variable	CANopen DI 36 (Customisable) [1253]
Description	CANopen digital Input 36

Variable	CANopen DI 37 (Customisable) [1254]
Description	CANopen digital Input 37

Variable	CANopen DI 38 (Customisable) [1255]
Description	CANopen digital Input 38

Variable	CANopen DI 39 (Customisable) [1256]
Description	CANopen digital Input 39

Variable	CANopen DI 40 (Customisable) [1257]
Description	CANopen digital Input 40

Variable	CANopen DI 41 (Customisable) [1258]
Description	CANopen digital Input 41

Variable	CANopen DI 42 (Customisable) [1259]
Description	CANopen digital Input 42

Variable	CANopen DI 43 (Customisable) [1260]
Description	CANopen digital Input 43

Variable	CANopen DI 44 (Customisable) [1261]
Description	CANopen digital Input 44

Variable	CANopen DI 45 (Customisable) [1262]
Description	CANopen digital Input 45

Variable	CANopen DI 46 (Customisable) [1263]
Description	CANopen digital Input 46

Variable	CANopen DI 47 (Customisable) [1264]
Description	CANopen digital Input 47

Variable	CANopen DI 48 (Customisable) [1265]
Description	CANopen digital Input 48

Variable	CANopen DI 49 (Customisable) [1266]
Description	CANopen digital Input 49

Variable	CANopen DI 50 (Customisable) [1267]
Description	CANopen digital Input 50

Variable	CANopen DI 51 (Customisable) [1268]
Description	CANopen digital Input 51

Variable	CANopen DI 52 (Customisable) [1269]
Description	CANopen digital Input 52

Variable	CANopen DI 53 (Customisable) [1270]
Description	CANopen digital Input 53

Variable	CANopen DI 54 (Customisable) [1271]
Description	CANopen digital Input 54

Variable	CANopen DI 55 (Customisable) [1272]
Description	CANopen digital Input 55

Variable	CANopen DI 56 (Customisable) [1273]
Description	CANopen digital Input 56

Variable	CANopen DI 57 (Customisable) [1274]
Description	CANopen digital Input 57

Variable	CANopen DI 58 (Customisable) [1275]
Description	CANopen digital Input 58

Variable	CANopen DI 59 (Customisable) [1276]
Description	CANopen digital Input 59

Variable	CANopen DI 60 (Customisable) [1277]
Description	CANopen digital Input 60

Variable	CANopen DI 61 (Customisable) [1278]
Description	CANopen digital Input 61

Variable	CANopen DI 62 (Customisable) [1279]
Description	CANopen digital Input 62

Variable	CANopen DI 63 (Customisable) [1280]
Description	CANopen digital Input 63

Variable	CANopen DI 64 (Customisable) [1281]
Description	CANopen digital Input 64

Variable	CANopen DO 1 (Customisable) [4751]
Description	CANopen digital output 1

Variable	CANopen DO 2 (Customisable) [4752]
Description	CANopen digital output 2

Variable	CANopen DO 3 (Customisable) [4753]
Description	CANopen digital output 3

Variable	CANopen DO 4 (Customisable) [4754]
Description	CANopen digital output 4

Variable	CANopen DO 5 (Customisable) [4755]
Description	CANopen digital output 5

Variable	CANopen DO 6 (Customisable) [4756]
Description	CANopen digital output 6

Variable	CANopen DO 7 (Customisable) [4757]
Description	CANopen digital output 7

Variable	CANopen DO 8 (Customisable) [4758]
Description	CANopen digital output 8

Variable	CANopen DO 9 (Customisable) [4759]
Description	CANopen digital output 9

Variable	CANopen DO 10 (Customisable) [4760]
Description	CANopen digital output 10

Variable	CANopen DO 11 (Customisable) [4761]
Description	CANopen digital output 11

Variable	CANopen DO 12 (Customisable) [4762]
Description	CANopen digital output 12

Variable	CANopen DO 13 (Customisable) [4763]
Description	CANopen digital output 13

Variable	CANopen DO 14 (Customisable) [4764]
Description	CANopen digital output 14

Variable	CANopen DO 15 (Customisable) [4765]
Description	CANopen digital output 15

Variable	CANopen DO 16 (Customisable) [4766]
Description	CANopen digital output 16

Variable	CANopen DO 17 (Customisable) [4767]
Description	CANopen digital output 17

Variable	CANopen DO 18 (Customisable) [4768]
Description	CANopen digital output 18

Variable	CANopen DO 19 (Customisable) [4769]
Description	CANopen digital output 19

Variable	CANopen DO 20 (Customisable) [4770]
Description	CANopen digital output 20

Variable	CANopen DO 21 (Customisable) [4771]
Description	CANopen digital output 21

Variable	CANopen DO 22 (Customisable) [4772]
Description	CANopen digital output 22

Variable	CANopen DO 23 (Customisable) [4773]
Description	CANopen digital output 23

Variable	CANopen DO 24 (Customisable) [4774]
Description	CANopen digital output 24

Variable	CANopen DO 25 (Customisable) [4775]
Description	CANopen digital output 25

Variable	CANopen DO 26 (Customisable) [4776]
Description	CANopen digital output 26

Variable	CANopen DO 27 (Customisable) [4777]
Description	CANopen digital output 27

Variable	CANopen DO 28 (Customisable) [4778]
Description	CANopen digital output 28

Variable	CANopen DO 29 (Customisable) [4779]
Description	CANopen digital output 29

Variable	CANopen DO 30 (Customisable) [4780]
Description	CANopen digital output 30

Variable	CANopen DO 31 (Customisable) [4781]
Description	CANopen digital output 31

Variable	CANopen DO 32 (Customisable) [4782]
Description	CANopen digital output 32

Variable	CANopen DO 33 (Customisable) [5100]
Description	CANopen digital output 33

Variable	CANopen DO 34 (Customisable) [5101]
Description	CANopen digital output 34

Variable	CANopen DO 35 (Customisable) [5102]
Description	CANopen digital output 35

Variable	CANopen DO 36 (Customisable) [5103]
Description	CANopen digital output 36

Variable	CANopen DO 37 (Customisable) [5104]
Description	CANopen digital output 37

Variable	CANopen DO 38 (Customisable) [5105]
Description	CANopen digital output 38

Variable	CANopen DO 39 (Customisable) [5106]
Description	CANopen digital output 39

Variable	CANopen DO 40 (Customisable) [5107]
Description	CANopen digital output 40

Variable	CANopen DO 41 (Customisable) [5108]
Description	CANopen digital output 41

Variable	CANopen DO 42 (Customisable) [5109]
Description	CANopen digital output 42

Variable	CANopen DO 43 (Customisable) [5110]
Description	CANopen digital output 43

Variable	CANopen DO 44 (Customisable) [5111]
Description	CANopen digital output 44

Variable	CANopen DO 45 (Customisable) [5112]
Description	CANopen digital output 45

Variable	CANopen DO 46 (Customisable) [5113]
Description	CANopen digital output 46

Variable	CANopen DO 47 (Customisable) [5114]
Description	CANopen digital output 47

Variable	CANopen DO 48 (Customisable) [5115]
Description	CANopen digital output 48

Variable	CANopen DO 49 (Customisable) [5116]
Description	CANopen digital output 49

Variable	CANopen DO 50 (Customisable) [5117]
Description	CANopen digital output 50

Variable	CANopen DO 51 (Customisable) [5118]
Description	CANopen digital output 51

Variable	CANopen DO 52 (Customisable) [5119]
Description	CANopen digital output 52

Variable	CANopen DO 53 (Customisable) [5120]
Description	CANopen digital output 53

Variable	CANopen DO 54 (Customisable) [5121]
Description	CANopen digital output 54

Variable	CANopen DO 55 (Customisable) [5122]
Description	CANopen digital output 55

Variable	CANopen DO 56 (Customisable) [5123]
Description	CANopen digital output 56

Variable	CANopen DO 57 (Customisable) [5124]
Description	CANopen digital output 57

Variable	CANopen DO 58 (Customisable) [5125]
Description	CANopen digital output 58

Variable	CANopen DO 59 (Customisable) [5126]
Description	CANopen digital output 59

Variable	CANopen DO 60 (Customisable) [5127]
Description	CANopen digital output 60

Variable	CANopen DO 61 (Customisable) [5128]
Description	CANopen digital output 61

Variable	CANopen DO 62 (Customisable) [5129]
Description	CANopen digital output 62

Variable	CANopen DO 63 (Customisable) [5130]
Description	CANopen digital output 63

Variable	CANopen DO 64 (Customisable) [5131]
Description	CANopen digital output 64

POWER PLANT

Variable	Generator No.1 circuit breaker position [562.0]
Description	0 if circuit breaker opened, 1 if circuit breaker closed

Variable	Generator No.2 circuit breaker position [562.1]
Description	0 if circuit breaker opened, 1 if circuit breaker closed

Variable	Generator No.3 circuit breaker position [562.2]
Description	0 if circuit breaker opened, 1 if circuit breaker closed

Variable	Generator No.4 circuit breaker position [562.3]
Description	0 if circuit breaker opened, 1 if circuit breaker closed

Variable	Generator No.5 circuit breaker position [562.4]
Description	0 if circuit breaker opened, 1 if circuit breaker closed

Variable	Generator No.6 circuit breaker position [562.5]
Description	0 if circuit breaker opened, 1 if circuit breaker closed

Variable	Generator No.7 circuit breaker position [562.6]
Description	0 if circuit breaker opened, 1 if circuit breaker closed

Variable	Generator No.8 circuit breaker position [562.7]
Description	0 if circuit breaker opened, 1 if circuit breaker closed

Variable	Generator No.9 circuit breaker position [562.8]
Description	0 if circuit breaker opened, 1 if circuit breaker closed

Variable	Generator No.10 circuit breaker position [562.9]
Description	0 if circuit breaker opened, 1 if circuit breaker closed

Variable	Generator No.11 circuit breaker position [562.10]
Description	0 if circuit breaker opened, 1 if circuit breaker closed

Variable	Generator No.12 circuit breaker position [562.11]
Description	0 if circuit breaker opened, 1 if circuit breaker closed

Variable	Generator No.13 circuit breaker position [562.12]
Description	0 if circuit breaker opened, 1 if circuit breaker closed

Variable	Generator No.14 circuit breaker position [562.13]
Description	0 if circuit breaker opened, 1 if circuit breaker closed

Variable	Generator No.15 circuit breaker position [562.14]
Description	0 if circuit breaker opened, 1 if circuit breaker closed

Variable	Generator No.16 circuit breaker position [562.15]
Description	0 if circuit breaker opened, 1 if circuit breaker closed

Variable	Generator No.17 circuit breaker position [563.0]
Description	0 if circuit breaker opened, 1 if circuit breaker closed

Variable	Generator No.18 circuit breaker position [563.1]
Description	0 if circuit breaker opened, 1 if circuit breaker closed

Variable	Generator No.19 circuit breaker position [563.2]
Description	0 if circuit breaker opened, 1 if circuit breaker closed

Variable	Generator No.20 circuit breaker position [563.3]
Description	0 if circuit breaker opened, 1 if circuit breaker closed

Variable	Generator No.21 circuit breaker position [563.4]
Description	0 if circuit breaker opened, 1 if circuit breaker closed

Variable	Generator No.22 circuit breaker position [563.5]
Description	0 if circuit breaker opened, 1 if circuit breaker closed

Variable	Generator No.23 circuit breaker position [563.6]
Description	0 if circuit breaker opened, 1 if circuit breaker closed

Variable	Generator No.24 circuit breaker position [563.7]
Description	0 if circuit breaker opened, 1 if circuit breaker closed

Variable	Generator No.25 circuit breaker position [563.8]
Description	0 if circuit breaker opened, 1 if circuit breaker closed

Variable	Generator No.26 circuit breaker position [563.9]
Description	0 if circuit breaker opened, 1 if circuit breaker closed

Variable	Generator No.27 circuit breaker position [563.10]
Description	0 if circuit breaker opened, 1 if circuit breaker closed

Variable	Generator No.28 circuit breaker position [563.11]
Description	0 if circuit breaker opened, 1 if circuit breaker closed

Variable	Generator No.29 circuit breaker position [563.12]
Description	0 if circuit breaker opened, 1 if circuit breaker closed

Variable	Generator No.30 circuit breaker position [563.13]
Description	0 if circuit breaker opened, 1 if circuit breaker closed

Variable	Generator No.31 circuit breaker position [563.14]
Description	0 if circuit breaker opened, 1 if circuit breaker closed

Variable	Generator No.32 circuit breaker position [563.15]
Description	0 if circuit breaker opened, 1 if circuit breaker closed

Variable	Mains/tie breaker No.1 circuit breaker position [976.0]
Description	On MASTER COMPACT 1B, 0 if circuit breaker opened, 1 if circuit breaker closed. On MASTER COMPACT, 0 if at least 1 of the 2 circuit breakers is opened, 1 if both circuit breakers are closed. On BTB COMPACT, 0 if circuit breaker opened, 1 if circuit breaker closed.

Variable	Mains/tie breaker No.2 circuit breaker position [976.1]
Description	On MASTER COMPACT 1B, 0 if circuit breaker opened, 1 if circuit breaker closed. On MASTER COMPACT, 0 if at least 1 of the 2 circuit breakers is opened, 1 if both circuit breakers are closed. On BTB COMPACT, 0 if circuit breaker opened, 1 if circuit breaker closed.

Variable	Mains/tie breaker No.3 circuit breaker position [976.2]
Description	On MASTER COMPACT 1B, 0 if circuit breaker opened, 1 if circuit breaker closed. On MASTER COMPACT, 0 if at least 1 of the 2 circuit breakers is opened, 1 if both circuit breakers are closed. On BTB COMPACT, 0 if circuit breaker opened, 1 if circuit breaker closed.

Variable	Mains/tie breaker No.4 circuit breaker position [976.3]
Description	On MASTER COMPACT 1B, 0 if circuit breaker opened, 1 if circuit breaker closed. On MASTER COMPACT, 0 if at least 1 of the 2 circuit breakers is opened, 1 if both circuit breakers are closed. On BTB COMPACT, 0 if circuit breaker opened, 1 if circuit breaker closed.

Variable	Mains/tie breaker No.5 circuit breaker position [976.4]
Description	On MASTER COMPACT 1B, 0 if circuit breaker opened, 1 if circuit breaker closed. On MASTER COMPACT, 0 if at least 1 of the 2 circuit breakers is opened, 1 if both circuit breakers are closed. On BTB COMPACT, 0 if circuit breaker opened, 1 if circuit breaker closed.

Variable	Mains/tie breaker No.6 circuit breaker position [976.5]
Description	On MASTER COMPACT 1B, 0 if circuit breaker opened, 1 if circuit breaker closed. On MASTER COMPACT, 0 if at least 1 of the 2 circuit breakers is opened, 1 if both circuit breakers are closed. On BTB COMPACT, 0 if circuit breaker opened, 1 if circuit breaker closed.

Variable	Mains/tie breaker No.7 circuit breaker position [976.6]
Description	On MASTER COMPACT 1B, 0 if circuit breaker opened, 1 if circuit breaker closed. On MASTER COMPACT, 0 if at least 1 of the 2 circuit breakers is opened, 1 if both circuit breakers are closed. On BTB COMPACT, 0 if circuit breaker opened, 1 if circuit breaker closed.

Variable	Mains/tie breaker No.8 circuit breaker position [976.7]
Description	On MASTER COMPACT 1B, 0 if circuit breaker opened, 1 if circuit breaker closed. On MASTER COMPACT, 0 if at least 1 of the 2 circuit breakers is opened, 1 if both circuit breakers are closed. On BTB COMPACT, 0 if circuit breaker opened, 1 if circuit breaker closed.

Variable	Mains/tie breaker No.9 circuit breaker position [976.8]
Description	On MASTER COMPACT 1B, 0 if circuit breaker opened, 1 if circuit breaker closed. On MASTER COMPACT, 0 if at least 1 of the 2 circuit breakers is opened, 1 if both circuit breakers are closed. On BTB COMPACT, 0 if circuit breaker opened, 1 if circuit breaker closed.

Variable	Mains/tie breaker No.10 circuit breaker position [976.9]
Description	On MASTER COMPACT 1B, 0 if circuit breaker opened, 1 if circuit breaker closed. On MASTER COMPACT, 0 if at least 1 of the 2 circuit breakers is opened, 1 if both circuit breakers are closed. On BTB COMPACT, 0 if circuit breaker opened, 1 if circuit breaker closed.

Variable	Mains/tie breaker No.11 circuit breaker position [976.10]
Description	On MASTER COMPACT 1B, 0 if circuit breaker opened, 1 if circuit breaker closed. On MASTER COMPACT, 0 if at least 1 of the 2 circuit breakers is opened, 1 if both circuit breakers are closed. On BTB COMPACT, 0 if circuit breaker opened, 1 if circuit breaker closed.

Variable	Mains/tie breaker No.12 circuit breaker position [976.11]
Description	On MASTER COMPACT 1B, 0 if circuit breaker opened, 1 if circuit breaker closed. On MASTER COMPACT, 0 if at least 1 of the 2 circuit breakers is opened, 1 if both circuit breakers are closed. On BTB COMPACT, 0 if circuit breaker opened, 1 if circuit breaker closed.

Variable	Mains/tie breaker No.13 circuit breaker position [976.12]
Description	On MASTER COMPACT 1B, 0 if circuit breaker opened, 1 if circuit breaker closed. On MASTER COMPACT, 0 if at least 1 of the 2 circuit breakers is opened, 1 if both circuit breakers are closed. On BTB COMPACT, 0 if circuit breaker opened, 1 if circuit breaker closed.

Variable	Mains/tie breaker No.14 circuit breaker position [976.13]
Description	On MASTER COMPACT 1B, 0 if circuit breaker opened, 1 if circuit breaker closed. On MASTER COMPACT, 0 if at least 1 of the 2 circuit breakers is opened, 1 if both circuit breakers are closed. On BTB COMPACT, 0 if circuit breaker opened, 1 if circuit breaker closed.

Variable	Mains/tie breaker No.15 circuit breaker position [976.14]
Description	On MASTER COMPACT 1B, 0 if circuit breaker opened, 1 if circuit breaker closed. On MASTER COMPACT, 0 if at least 1 of the 2 circuit breakers is opened, 1 if both circuit breakers are closed. On BTB COMPACT, 0 if circuit breaker opened, 1 if circuit breaker closed.

Variable	Mains/tie breaker No.16 circuit breaker position [976.15]
Description	On MASTER COMPACT 1B, 0 if circuit breaker opened, 1 if circuit breaker closed. On MASTER COMPACT, 0 if at least 1 of the 2 circuit breakers is opened, 1 if both circuit breakers are closed. On BTB COMPACT, 0 if circuit breaker opened, 1 if circuit breaker closed.

Variable	Mains/tie breaker No.17 circuit breaker position [977.0]
Description	On MASTER COMPACT 1B, 0 if circuit breaker opened, 1 if circuit breaker closed. On MASTER COMPACT, 0 if at least 1 of the 2 circuit breakers is opened, 1 if both circuit breakers are closed. On BTB COMPACT, 0 if circuit breaker opened, 1 if circuit breaker closed.

Variable	Mains/tie breaker No.18 circuit breaker position [977.1]
Description	On MASTER COMPACT 1B, 0 if circuit breaker opened, 1 if circuit breaker closed. On MASTER COMPACT, 0 if at least 1 of the 2 circuit breakers is opened, 1 if both circuit breakers are closed. On BTB COMPACT, 0 if circuit breaker opened, 1 if circuit breaker closed.

Variable	Mains/tie breaker No.19 circuit breaker position [977.2]
Description	On MASTER COMPACT 1B, 0 if circuit breaker opened, 1 if circuit breaker closed. On MASTER COMPACT, 0 if at least 1 of the 2 circuit breakers is opened, 1 if both circuit breakers are closed. On BTB COMPACT, 0 if circuit breaker opened, 1 if circuit breaker closed.

Variable	Mains/tie breaker No.20 circuit breaker position [977.3]
Description	On MASTER COMPACT 1B, 0 if circuit breaker opened, 1 if circuit breaker closed. On MASTER COMPACT, 0 if at least 1 of the 2 circuit breakers is opened, 1 if both circuit breakers are closed. On BTB COMPACT, 0 if circuit breaker opened, 1 if circuit breaker closed.

Variable	Mains/tie breaker No.21 circuit breaker position [977.4]
Description	On MASTER COMPACT 1B, 0 if circuit breaker opened, 1 if circuit breaker closed. On MASTER COMPACT, 0 if at least 1 of the 2 circuit breakers is opened, 1 if both circuit breakers are closed. On BTB COMPACT, 0 if circuit breaker opened, 1 if circuit breaker closed.

Variable	Mains/tie breaker No.22 circuit breaker position [977.5]
Description	On MASTER COMPACT 1B, 0 if circuit breaker opened, 1 if circuit breaker closed. On MASTER COMPACT, 0 if at least 1 of the 2 circuit breakers is opened, 1 if both circuit breakers are closed. On BTB COMPACT, 0 if circuit breaker opened, 1 if circuit breaker closed.

Variable	Mains/tie breaker No.23 circuit breaker position [977.6]
Description	On MASTER COMPACT 1B, 0 if circuit breaker opened, 1 if circuit breaker closed. On MASTER COMPACT, 0 if at least 1 of the 2 circuit breakers is opened, 1 if both circuit breakers are closed. On BTB COMPACT, 0 if circuit breaker opened, 1 if circuit breaker closed.

Variable	Mains/tie breaker No.24 circuit breaker position [977.7]
Description	On MASTER COMPACT 1B, 0 if circuit breaker opened, 1 if circuit breaker closed. On MASTER COMPACT, 0 if at least 1 of the 2 circuit breakers is opened, 1 if both circuit breakers are closed. On BTB COMPACT, 0 if circuit breaker opened, 1 if circuit breaker closed.

Variable	Mains/tie breaker No.25 circuit breaker position [977.8]
Description	On MASTER COMPACT 1B, 0 if circuit breaker opened, 1 if circuit breaker closed. On MASTER COMPACT, 0 if at least 1 of the 2 circuit breakers is opened, 1 if both circuit breakers are closed. On BTB COMPACT, 0 if circuit breaker opened, 1 if circuit breaker closed.

Variable	Mains/tie breaker No.26 circuit breaker position [977.9]
Description	On MASTER COMPACT 1B, 0 if circuit breaker opened, 1 if circuit breaker closed. On MASTER COMPACT, 0 if at least 1 of the 2 circuit breakers is opened, 1 if both circuit breakers are closed. On BTB COMPACT, 0 if circuit breaker opened, 1 if circuit breaker closed.

Variable	Mains/tie breaker No.27 circuit breaker position [977.10]
Description	On MASTER COMPACT 1B, 0 if circuit breaker opened, 1 if circuit breaker closed. On MASTER COMPACT, 0 if at least 1 of the 2 circuit breakers is opened, 1 if both circuit breakers are closed. On BTB COMPACT, 0 if circuit breaker opened, 1 if circuit breaker closed.

Variable	Mains/tie breaker No.28 circuit breaker position [977.11]
Description	On MASTER COMPACT 1B, 0 if circuit breaker opened, 1 if circuit breaker closed. On MASTER COMPACT, 0 if at least 1 of the 2 circuit breakers is opened, 1 if both circuit breakers are closed. On BTB COMPACT, 0 if circuit breaker opened, 1 if circuit breaker closed.

Variable	Mains/tie breaker No.29 circuit breaker position [977.12]
Description	On MASTER COMPACT 1B, 0 if circuit breaker opened, 1 if circuit breaker closed. On MASTER COMPACT, 0 if at least 1 of the 2 circuit breakers is opened, 1 if both circuit breakers are closed. On BTB COMPACT, 0 if circuit breaker opened, 1 if circuit breaker closed.

Variable	Mains/tie breaker No.30 circuit breaker position [977.13]
Description	On MASTER COMPACT 1B, 0 if circuit breaker opened, 1 if circuit breaker closed. On MASTER COMPACT, 0 if at least 1 of the 2 circuit breakers is opened, 1 if both circuit breakers are closed. On BTB COMPACT, 0 if circuit breaker opened, 1 if circuit breaker closed.

Variable	Mains/tie breaker No.31 circuit breaker position [977.14]
Description	On MASTER COMPACT 1B, 0 if circuit breaker opened, 1 if circuit breaker closed. On MASTER COMPACT, 0 if at least 1 of the 2 circuit breakers is opened, 1 if both circuit breakers are closed. On BTB COMPACT, 0 if circuit breaker opened, 1 if circuit breaker closed.

Variable	Mains/tie breaker No.32 circuit breaker position [977.15]
Description	On MASTER COMPACT 1B, 0 if circuit breaker opened, 1 if circuit breaker closed. On MASTER COMPACT, 0 if at least 1 of the 2 circuit breakers is opened, 1 if both circuit breakers are closed. On BTB COMPACT, 0 if circuit breaker opened, 1 if circuit breaker closed.

Variable	Mains presence on the common bus bar [4032]
Description	Status report: There is currently a mains closed on the bus bar

GENERATOR PROTECTIONS

Variable	Fail to synchronize [4051]
Description	The automated system does not manage to synchronize the voltages on both sides of the circuit breaker (Check that the speed regulation and the AVR are controlled in the right range and adjust the PID settings)

Variable	Mismatch rotophases level 1 [4053.0]
Description	Active when the level 1 protection triggered.

Variable	Mismatch rotophases level 2 [4053.1]
Description	Active when the level 2 protection triggered.

Variable	Minimum AVR output level 1 [4211.0]
Description	Active when the level 1 protection triggered.

Variable	Minimum AVR output level 2 [4211.1]
Description	Active when the level 2 protection triggered.

Variable	Maximum AVR output level 1 [4212.0]
Description	Active when the level 1 protection triggered.

Variable	Maximum AVR output level 2 [4212.1]
Description	Active when the level 2 protection triggered.

Variable	Generator over frequency level 1 [4250.0]
Description	Active when the level 1 protection triggered.

Variable	Generator over frequency level 2 [4250.1]
Description	Active when the level 2 protection triggered.

Variable	Generator under frequency level 1 [4251.0]
Description	Active when the level 1 protection triggered.

Variable	Generator under frequency level 2 [4251.1]
Description	Active when the level 2 protection triggered.

Variable	Generator over voltage level 1 [4252.0]
Description	Active when the level 1 protection triggered.

Variable	Generator over voltage level 2 [4252.1]
Description	Active when the level 2 protection triggered.

Variable	Generator under voltage level 1 [4253.0]
Description	Active when the level 1 protection triggered.

Variable	Generator under voltage level 2 [4253.1]
Description	Active when the level 2 protection triggered.

Variable	Generator minimum KW level 1 [4254.0]
Description	Active when the level 1 protection triggered.

Variable	Generator minimum KW level 2 [4254.1]
Description	Active when the level 2 protection triggered.

Variable	Generator maximum KW level 1 [4255.0]
Description	Active when the level 1 protection triggered.

Variable	Generator maximum KW level 2 [4255.1]
Description	Active when the level 2 protection triggered.

Variable	Generator reverse KW level 1 [4256.0]
Description	Active when the level 1 protection triggered.

Variable	Generator reverse KW level 2 [4256.1]
Description	Active when the level 2 protection triggered.

Variable	Generator minimum KVAR level 1 [4257.0]
Description	Active when the level 1 protection triggered.

Variable	Generator minimum KVAR level 2 [4257.1]
Description	Active when the level 2 protection triggered.

Variable	Generator maximum KVAR level 1 [4258.0]
Description	Active when the level 1 protection triggered.

Variable	Generator maximum KVAR level 2 [4258.1]
Description	Active when the level 2 protection triggered.

Variable	Generator reverse KVAR level 1 [4259.0]
Description	Active when the level 1 protection triggered.

Variable	Generator reverse KVAR level 2 [4259.1]
Description	Active when the level 2 protection triggered.

Variable	Generator maximum current level 1 [4260.0]
Description	Active when the level 1 protection triggered.

Variable	Generator maximum current level 2 [4260.1]
Description	Active when the level 2 protection triggered.

Variable	Generator maximum neutral current level 1 [4261.0]
Description	Active when the level 1 protection triggered.

Variable	Generator maximum neutral current level 2 [4261.1]
Description	Active when the level 2 protection triggered.

Variable	Generator short-circuit level 1 [4262.0]
Description	Active when the level 1 protection triggered.

Variable	Generator short-circuit level 2 [4262.1]
Description	Active when the level 2 protection triggered.

Variable	Uneven kW sharing fault level 1 [4263.0]
Description	Active when the level 1 protection triggered.

Variable	Uneven kW sharing fault level 2 [4263.1]
Description	Active when the level 2 protection triggered.

Variable	Uneven kVAR sharing fault level 1 [4264.0]
Description	Active when the level 1 protection triggered.

Variable	Uneven kVAR sharing fault level 2 [4264.1]
Description	Active when the level 2 protection triggered.

Variable	Generator earth fault current level 1 [4267.0]
Description	Active when the level 1 protection triggered.

Variable	Generator earth fault current level 2 [4267.1]
Description	Active when the level 2 protection triggered.

Variable	Generator voltage unbalance level 1 [4268.0]
Description	Active when the level 1 protection triggered.

Variable	Generator voltage unbalance level 2 [4268.1]
Description	Active when the level 2 protection triggered.

Variable	Generator current unbalance level 1 [4269.0]
Description	Active when the level 1 protection triggered.

Variable	Generator current unbalance level 2 [4269.1]
Description	Active when the level 2 protection triggered.

Variable	Generator rotophase level 1 [4272.0]
Description	Active when the level 1 protection triggered.

Variable	Generator rotophase level 2 [4272.1]
Description	Active when the level 2 protection triggered.

BUS PROTECTIONS

Variable	Bus over frequency level 1 [4300.0]
Description	Active when the level 1 protection triggered.

Variable	Bus over frequency level 2 [4300.1]
Description	Active when the level 2 protection triggered.

Variable	Bus under frequency level 1 [4301.0]
Description	Active when the level 1 protection triggered.

Variable	Bus under frequency level 2 [4301.1]
Description	Active when the level 2 protection triggered.

Variable	Bus over voltage level 1 [4302.0]
Description	Active when the level 1 protection triggered.

Variable	Bus over voltage level 2 [4302.1]
Description	Active when the level 2 protection triggered.

Variable	Bus under voltage level 1 [4303.0]
Description	Active when the level 1 protection triggered.

Variable	Bus under voltage level 2 [4303.1]
Description	Active when the level 2 protection triggered.

Variable	Bus voltage unbalance level 1 [4314.0]
Description	Active when the level 1 protection triggered.

Variable	Bus voltage unbalance level 2 [4314.1]
Description	Active when the level 2 protection triggered.

Variable	Bus measure error [4315]
Description	Fault report: Bus measure error, an other generator is on the bus bar but the module does not read bus voltage.

Variable	Bus rotophase level 1 [4318.0]
Description	Active when the level 1 protection triggered.

Variable	Bus rotophase level 2 [4318.1]
Description	Active when the level 2 protection triggered.

ENGINE PROTECTIONS

Variable	Engine over speed level 1 [4200.0]
Description	Active when the level 1 protection triggered.

Variable	Engine over speed level 2 [4200.1]
Description	Active when the level 2 protection triggered.

Variable	Engine under speed level 1 [4201.0]
Description	Active when the level 1 protection triggered.

Variable	Engine under speed level 2 [4201.1]
Description	Active when the level 2 protection triggered.

Variable	Battery minimum voltage level 1 [4202.0]
Description	Active when the level 1 protection triggered.

Variable	Battery minimum voltage level 2 [4202.1]
Description	Active when the level 2 protection triggered.

Variable	Battery maximum voltage level 1 [4203.0]
Description	Active when the level 1 protection triggered.

Variable	Battery maximum voltage level 2 [4203.1]
Description	Active when the level 2 protection triggered.

Variable	Engine minimum oil pressure level 1 [4204.0]
Description	Active when the level 1 protection triggered.

Variable	Engine minimum oil pressure level 2 [4204.1]
Description	Active when the level 2 protection triggered.

Variable	Engine maximum water temperature level 1 [4205.0]
Description	Active when the level 1 protection triggered.

Variable	Engine maximum water temperature level 2 [4205.1]
Description	Active when the level 2 protection triggered.

Variable	Minimum speed output level 1 [4209.0]
Description	Active when the level 1 protection triggered.

Variable	Minimum speed output level 2 [4209.1]
Description	Active when the level 2 protection triggered.

Variable	Maximum speed output level 1 [4210.0]
Description	Active when the level 1 protection triggered.

Variable	Maximum speed output level 2 [4210.1]
Description	Active when the level 2 protection triggered.

COMMUNICATION

Variable	Controller communication fault [600]
Description	Communication cannot be established. Check the wiring between the controllers, the product number and the number of controllers declared for each part number.

Variable	Missing GENSYS COMPACT PRIME [605]
Description	Missing at least one GENSYS COMPACT PRIME module on the CAN bus

Variable	Missing MASTER COMPACT or BTB COMPACT [608]
Description	Absence of at least one MASTER COMPACT or BTB COMPACT module on the CAN bus

Variable	Missing HYBRID COMPACT [612]
Description	Missing at least one HYBRID module on the CAN bus

Variable	Missing BAT COMPACT [613]
Description	Missing at least one BAT COMPACT module on the CAN Bus

Variable	J1939 Fault [650]
Description	Communication with ECU cannot be established. Check ECU wiring and power supply.

Variable	Forced droop from inverter communication loss [903]
Description	In a hybrid setting, if the controller managing the inverter loses communication with it, it forces other controllers in droop mode via CAN bus.

Variable	Modbus server (Customisable) [904]
Description	Modbus server connection timeout. The associated label can be changed for display when the error occurs.

Variable	CANopen fault [4750]
Description	Communication with I/O extension cannot be established. Check the wiring and power supply of the CANopen extension module

STATUSES

Variable	Phase sequence match [306]
Description	Identical phase order on both sides of the circuit breaker (OK = 1 or NOK = 0)

Variable	Voltage match [307]
Description	Identical voltage amplitudes on both sides of the circuit breaker (OK = 1 or NOK = 0)

Variable	Frequency match [308]
Description	Identical frequencies on both sides of the circuit breaker (OK = 1 or NOK = 0)

Variable	Phase match [309]
Description	The phase difference between the voltages on either side of the circuit breaker is zero (OK = 1 or NOK = 0)

Variable	Synch check relay OK [310]
Description	Active if the sources are synchronized on both sides of circuit breaker (OK = 1 or Not OK = 0). Do not confuse with the closing order.

Variable	Engine start [4006]
Description	Active if the automated system wants to start the engine. Inactive if the automated system wants to stop the engine.

Variable	Production request [4007]
Description	Active if the automated system wants to produce power with the generator(s). Inactive if the automated system does not want to produce power with the generator(s).

Variable	Generator electrical fault summary [4656]
Description	Fault report: Active if at least one protection configured as an electrical fault is active.

Variable	Alarms summary [4658]
Description	Fault report: Active if at least one protection configured as an alarm is active.

Variable	Soft shut down summary [4659]
Description	Fault report:Active if at least one protection configured as Soft shut down is active.

Variable	Hard shut down summary [4660]
Description	Fault report: Active if at least one protection configured as Hard shut down is active.

Variable	Soft shut down + Help [4661]
Description	Fault report: Another product is called for help, this output is associated with input Remote Soft shutdown + Help.

Variable	Generator electrical faults + Help [4662]
Description	Fault report: Another product is called for help, this output is associated with input Remote Fault + Help.

Variable	Default LED [4664]
Description	Status report: Active if the fault LED on the front of the product is lit (active on fault, reset on acknowledge and reset command).

Variable	Alarm LED [4665]
Description	Status report: Active if the alarm LED on the front of the product is lit (active on alarm, reset on acknowledge and reset command).

Variable	Auto mode LED [4666]
Description	Status report: Active if the Auto mode LED on the front of the product is lit

Variable	Test mode LED [4667]
Description	Status report: Active if the Test mode LED on the front of the product is lit

Variable	Manu mode LED [4668]
Description	Status report: Active if the Manu mode LED on the front of the product is lit

Variable	Generator LED [4669]
Description	Status report: Active if the Generator LED on the front of the product is lit (active when speed is detected)

Variable	Protection validation [4681]
Description	Status report: Active when all protections are activated after starting sequence (Under frequency, under voltage, oil pressure, temperature, etc...)

Variable	Override ON (Fault is currently inhibited) [4708]
Description	Status report: Override mode is ON, at least one protection is currently inhibited by the override mode

Variable	Generator breaker LED [4734]
Description	Status report: Active if the Generator breaker LED on the front of the product is lit

Variable	Bus LED [4736]
Description	Status report: Active if the Bus LED on the front of the product is lit

HYSTERESIS

Variable	Hysteresis 1 output [4710]
Description	Activation of analog Hysteresis function n°1, configuration of funtion is in Configuration/programming/Hysteresis

Variable	Hysteresis 2 output [4711]
Description	Activation of analog Hysteresis function n°2, configuration of funtion is in Configuration/programming/Hysteresis

Variable	Hysteresis 3 output [4712]
Description	Activation of analog Hysteresis function n°3, configuration of funtion is in Configuration/programming/Hysteresis

Variable	Hysteresis output activation on DI1 [4713]
Description	Output activation for 'Hysteresis on digital input' n°1. Function is managed by configurable low/high digital inputs in Digital Input menu.

Variable	Hysteresis output activation on DI2 [4714]
Description	Output activation for 'Hysteresis on digital input' n°2. Function is managed by configurable low/high digital inputs in Digital Input menu.

Variable	Hysteresis output activation on DI3 [4715]
Description	Output activation for 'Hysteresis on digital input' n°3. Function is managed by configurable low/high digital inputs in Digital Input menu.

Variable	Hysteresis output activation on DI4 [4716]
Description	Output activation for 'Hysteresis on digital input' n°4. Function is managed by configurable low/high digital inputs in Digital Input menu.

Variable	Hysteresis output activation on DI5 [4717]
Description	Output activation for 'Hysteresis on digital input' n°5. Function is managed by configurable low/high digital inputs in Digital Input menu.

Variable	Hysteresis output activation on DI6 [4718]
Description	Output activation for 'Hysteresis on digital input' n°6. Function is managed by configurable low/high digital inputs in Digital Input menu.

Variable	Hysteresis output activation on DI7 [4719]
Description	Output activation for 'Hysteresis on digital input' n°7. Function is managed by configurable low/high digital inputs in Digital Input menu.

Variable	Hysteresis output activation on DI8 [4720]
Description	Output activation for 'Hysteresis on digital input' n°8. Function is managed by configurable low/high digital inputs in Digital Input menu.

REMOTE BUTTONS

Variable	Shift button [951.0]
Description	Active (1) if the button is pressed. Inactive (0) otherwise.

Variable	Right arrow button [951.1]
Description	Active (1) if the button is pressed. Inactive (0) otherwise.

Variable	Down arrow button [951.2]
Description	Active (1) if the button is pressed. Inactive (0) otherwise.

Variable	Left arrow button [951.3]
Description	Active (1) if the button is pressed. Inactive (0) otherwise.

Variable	Up arrow button [951.4]
Description	Active (1) if the button is pressed. Inactive (0) otherwise.

Variable	Enter button [951.5]
Description	Active (1) if the button is pressed. Inactive (0) otherwise.

Variable	Esc button [951.6]
Description	Active (1) if the button is pressed. Inactive (0) otherwise.

Variable	Fault/Alarm/info button [951.7]
Description	Active (1) if the button is pressed. Inactive (0) otherwise.

Variable	Generator breaker button [951.9]
Description	Active (1) if the button is pressed. Inactive (0) otherwise.

Variable	Stop button [951.10]
Description	Active (1) if the button is pressed. Inactive (0) otherwise.

Variable	Start button [951.11]
Description	Active (1) if the button is pressed. Inactive (0) otherwise.

Variable	Man button [951.12]
Description	Active (1) if the button is pressed. Inactive (0) otherwise.

Variable	Test button [951.13]
Description	Active (1) if the button is pressed. Inactive (0) otherwise.

Variable	Auto button [951.14]
Description	Active (1) if the button is pressed. Inactive (0) otherwise.