POWER FROM WITHIN

GC800 HMI DEVICE

SMARTECH

A DIVISION OF MECC ALTE

TECHNICAL MANUAL

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ENGLISH

Revision	Date	Notes
00	07/01/2025	First version of the manual for the version 01.00 of the device.

Table of Contents

1 Introduction

1.1 References

[1] Mecc Alte EAAM0740xx – BoardPrg4 user's manual.

[2] Mecc Alte EAAM0831xx - GC800 SCM technical manual.

1.2 General information

GC800 is an automatic genset controller. It is made up by two separate devices:

- **GC800 SCM** (System Control Module or BaseBox): the main control and management unit of the system and genset. It can manage and protect both engine and alternator. It integrates all the functionalities needed to manage the parallel of the generator both with other generators and with the mains. It can also be used for simple standby (emergency to mains) or prime-mover (stand-alone production) applications.

  It can be mounted on a standard DIN rail.

- **GC800 HMI** (Human Machine Interface): a pre-programmed capacitive touch screen operator panel solution to be connected to the GC800 SCM controller by a selectable Ethernet or serial communication resource.

  HMI offers user-friendly touch screen control, visualisation and graphical overview with a high-resolution, high-quality display that is easy to read even at very sharp angles.

  HMI it can be door mounted.

In this manual, the word **GC800** refers to the combination of GC800 SCM and GC800 HMI.

This manual refers to GC800 HMI.

1.3 Safety information

Many accidents are caused by poor knowledge and/or by the non-observance of safety regulations, which must be observed when operating and/or servicing the machine.

To prevent accidents, before using or servicing the machine you should read, understand, and observe the precautions and warnings in this manual.

Please read this manual carefully before using the device.

Safety instructions are marked with symbols in this document. These symbols express the extent of the danger:

WARNING! This symbol refers to potentially dangerous situations that, unless hazards are prevented, can lead to serious or fatal injuries. It describes the usual precautions to be taken to avoid hazard situations. Ignoring these precautions can cause serious damage to property and/or injury to persons.

WARNING! This symbol refers to risks that, unless avoided, can lead to minor or moderate injuries or damage. It may also be used for hazards that can cause damage to property and/or injury to persons.

INFORMATION! This symbol refers to information useful for performing the current operation, or explanations or clarifications for procedures.

1.4 Safety requirements

Please read this manual carefully before using the device.

For the appropriate use of this manual, it is required knowledge of the use and of the installation of generator sets.

WARNING! Every intervention must be carried out by skilled personnel.

WARNING! Do not remove or change any connection when the genset is running. Before start working on live parts of electrical systems and resources, cut the electricity and ensure it remains off for the duration of the work.

WARNING! The device has been designed and constructed solely for the intended use described in this manual. Any unauthorized modifications or use of this equipment outside its specified mechanical, electrical, or other operating limits may cause personal injury and/or property damage, including damage to the equipment.

WARNING! The device has mechanical protection rating IK06 (1 Joule) for front panel touch and must be adequately protected if it can be subjected to mechanical shocks.

WARNING! Damage to insulation or to specific components can pose a life-threatening hazard. Immediately switch off the power supply and have it repaired if there is damage to the insulation.

WARNING! All electronic equipment is sensitive to damage from electrostatic discharge, which can cause the control unit to malfunction or fail. Mecc Alte recommends handling the device with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage.

WARNING! Do not expose the device to direct sunlight. Ensure that the panel is not in permanent and direct contact with oils.

WARNING! Store this product in areas where temperatures are within the product's specifications. Do not restrict or block the product's ventilation slots.

INFORMATION! The device includes a lithium backup battery for real time clock. Field replacement of the battery is not allowed. In case of battery replacement please contact Mecc Alte.

INFORMATION! The SELV word refers to a generic secondary circuit that is designed to be protected from excessive voltages (≥42 Vac or ≥ 60Vdc) during normal operating conditions and single fault conditions. A reinforced isolation is required at the boundary between the primary and the secondary circuit. See proper SELV-related information along the manual.

1.5 Notes on the parameter's configuration of the device

INFORMATION! The device uses many configurable parameters, and it is therefore impossible to describe all their possible combinations and effects. This document describes most of them, other are described in the documents listed in chapter 1.1.1.1

WARNING! The device is supplied with a generic "default" configuration; the installer is responsible to adjust the operating parameters to the specific application.

Mecc Alte carries out a great effort to improve and update its products; therefore, they are subject to both hardware and software modifications without notice. Some of the features described in this manual may therefore differ from those present in your device.

Although most of the parameters and features can be accessed and configured by directly operating on the device, **some particular features or configurations, due to their nature, can only be set or changed through the Mecc Alte Board Programmer4 PC Software** (hereinafter called "BoardPrg4"), which can be downloaded for free from the Mecc Alte website www.meccalte.com

It simplifies a lot the configuration of the device and its use is strongly suggested. It also allows you to save the current configuration of the device on a file and to reuse it on other identical devices.

The program also allows the configuration, saving or loading of the characteristic curves of non-standard analogue sensors with resistive or live output.

BoardPrg4 can be used on all Mecc Alte devices; the connection to the PC can be via serial RS232, RS845, USB and Ethernet.

1.6 Maintenance and cleaning

The maintenance of this device must be carried out by qualified personnel, in observance of the law in force, in observance to prevent from damages to persons or things.

The cleaning of the front panel can be carried out exclusively with a soft cloth. Do not use abrasive products, detergents or solvents.

1.7 Information concerning disposal.

INFORMATION! on the disposal of electrical and electronic equipment (applicable in European countries that have adopted separate waste collection systems).

Products bearing the barred wheeled waste container symbol cannot be disposed of with normal urban waste. Electrical and electronic equipment should be recycled in a facility authorized to process these items and dispose of their components. Contact your local authority for information on where and how to deliver such products to the authorized site nearest you. Proper recycle and disposal operation helps conserve resources and prevents detrimental effects for health and the environment.

1.8 Definitions

In this document, the word **SHUTDOWN** is used to indicate a fault that makes the genset operation impossible and causes the automatic and immediate stop of the engine, with emergency procedure (without cooling period).

The word **DEACTIVATION** is used to indicate a fault that makes the genset operation impossible and causes the automatic stop of the engine, with standard procedure (with cooling period). The genset controller immediately opens the GCB circuit breaker when this kind of fault arises.

The word **UNLOAD** is used to indicate a fault that makes the genset operation impossible and causes the automatic stop of the engine with standard procedure (with cooling period). If it is possible, the genset controller gradually reduces to zero the power supplied by the genset before opening the GCB circuit breaker.

The word **WARNING** is used to indicate a fault that requires an operator action but doesn't require the automatic stop of the genset.

1.8.1 Acronyms

AIF It identifies a function for the configuration of the analogue inputs ("Analogue Input Function"). The number that follows the wording "AIF" is the code to set in the parameter that configures the function of the desired analogue input.

AOF	It identifies a function for the configuration of the analogue outputs (“Analogue Output Function”). The number that follows the wording “AOF.” is the code to be set in the parameter that configures the function of the desired analogue output.
AVR	It identifies the “Automatic Voltage Regulator” electronic device, included in any genset.
DIF	It identifies a function for the configuration of the digital inputs (“Digital Input Function”). The number that follows the wording “DIF” is the code to set in the parameter that configures the function of the desired digital input.
DOF	It identifies a function for the configuration with the digital outputs (“Digital Output Function”). The number that follows the wording “DOF” is the code to set in the parameter that configures the function of the desired digital output.
DRIVE	It defines a particular application for the genset. See the description of the type of plant in **Errore. L'origine riferimento non è stata trovata.**.
DTC	It indicates a diagnostic code (“Diagnostic Trouble Code”) received from an external device (ECU, AVR) via CAN-BUS or via RS-485.
ECU	It indicates the (“Engine Control Unit”) available in any electronic engine.
EVT	It identifies an event stored into the historical records. The number that follows the wording “EVT” is the numeric code of the event.
EXBUS	It identifies the Mecc Alte proprietary communication bus that allows the genset controller exchanging information to the connected Mecc Alte expansion modules.
GCB	This term identifies the circuit breaker (“Genset Circuit Breaker”) that connects the genset to the loads (or to the parallel bars in case of multiple gensets applications).
MCB	This term identifies the circuit breaker (“Mains Circuit Breaker”) that connects the mains to the loads.
MGCB	It indicates the circuit breaker (“Master Genset Circuit Breaker”) that connects the gensets parallel bars to the loads.
MPM	It defines a particular application for the genset. See the description of the type of plant in [2].
MPtM	It defines a particular application for the genset. See the description of the type of plant in [2].
MPtM + MSB	It defines a particular application for the genset. See the description of the type of plant in [2].
MSB	It defines a particular application for the genset. See the description of the type of plant in [2].
MSB + MSTP	It defines a particular application for the genset. See the description of the type of plant in [2].
PMCB	It identifies the Mecc Alte proprietary communication bus that allows all genset controllers exchanging information to manage the parallel functions described in the document**Errore. L'origine riferimento non è stata trovata.**.
SPM	It defines a particular application for the genset. See the description of the type of plant in [2]
SPtM	It defines a particular application for the genset. See the description of the type plant in [2]
SPtM + SSB	It defines a particular application for the genset. See the description of the type of plant in [2]
SSB	It defines a particular application for the genset. See the description of the type of plant in [2]
SSB + SSTP	It defines a particular application for the genset. See the description of the type of plant in [2]
SELV	Safety Extra Low Voltage

1.9 Conventions

In this manual, the modifications, with respect to the previous version, are signalled by a vertical bar on the right of the paragraphs. The modifications on the fields of a table are highlighted with a grey background.

1.10 Revisions of the software

Several parts of this manual refer to the device's software revisions. These revisions are marked with the assigned Mecc Alte code (shown on the rear panel of the device). The format of the code is: EB0260349XXYY, where “XX” is the main version and “YY” is the minor version. Thus, the code EB02603490100 refers to the device software release "1.00". GC800 HMI shows its own software revision, and the GC800 SCM one’s too.

2 Views of the device

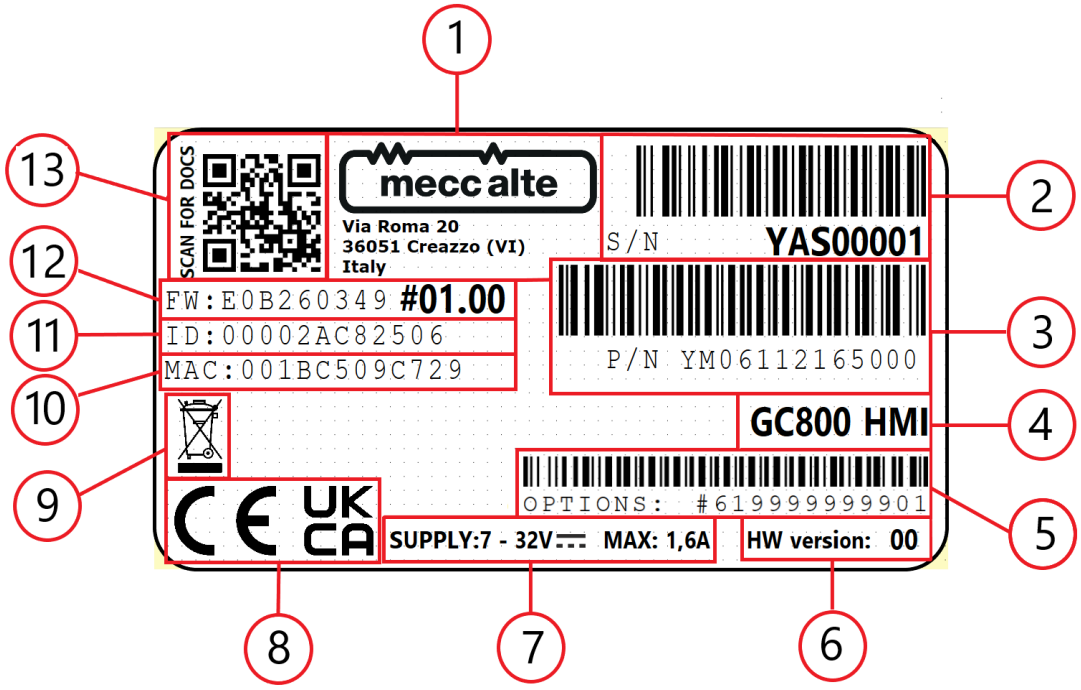
GC800 HMI front side view.

GC800 HMI rear side view.

GC800 HMI right side view.

GC800 HMI left side view.

2.1 Product label

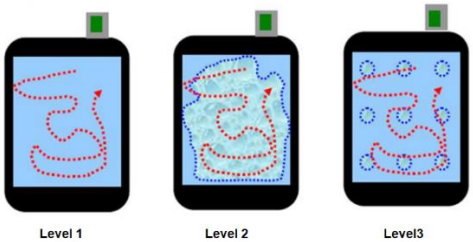


1. **Manufacturer:** address and logo.
2. **S/N:** serial number (alphanumeric and barcode).
3. **P/N**: part number (alphanumeric and barcode).
4. **Product name**: device name.
5. **Option**: option part number (alphanumeric and barcode) if available.
6. **HW version**: device revision number.
7. **Supply**: device supply range and maximum current consumption.
8. **Approvals**
9. **Environment:** symbol of recycling collection.
10. **MAC**: unique identifier assigned to a network interface controller.
11. **ID**: unique identification code assigned to the device.
12. **FW**: firmware version installed on the device.
13. **SCAN FOR DOCS**: QR-code with web link to where to download the latest device documentation.

3 Technical features

INFORMATION! GND is referred to the potential of the terminal J1-2.

WARNING! Connect the unit only to a DC power source that complies with the safety extra-low voltage (SELV) requirements.

Display.	
Type of display.	IPS transmissive type colour active matrix TFT liquid crystal display with capacitive touch screen.
Active display area.	10,1” diagonal.
Interface.	Capacitive Touch Panel (CTP), multi-touch.
Resolution.	1280 x 800 dots (WXGA).
Aspect ratio.	16:9.
Colour depth.	24 bit (16,7 million true colours).
Pixel pitch.	0,1695 x 0.1695 mm.
Colour pixel arrangement.	RGB vertical stripes.
Brightness.	900 cd/m2.
Contrast ratio.	800 CR.
Viewing angle (CR > 10).	-85° to +85° (H/V).
Backlight type.	LED, high light white.
Half Brightness Lifetime (MTBF).	Min 50000 h. MTBF: operating hours after which the maximum brightness is reduced by half compared to the original value. MTBF is increased by using the integrated dimming function, for example, time-controlled via screensaver.
Surface.	Glare.
Front glass thickness.	2 mm.
Impact protection.	IK06.
Waterproofing capacitive touchscreen.	Level 1 (wet fingers): using wet fingers to draw lines on CTP, CTP still works. Level 2 (Condensation): a thin layer of condensation formed on the touchscreen in high humidity or quick temperature changes; using fingers to draw any lines on CTP, CTP still works. Level 3 (Water Droplets): water drops with a diameter of 3 ~ 5 mm on CTP, using fingers to draw any lines on CTP, CTP still works.  Level 1 Level 2 Level3
High ESD immunity.	±6 KV (contact) e ±8 KV (air) for IEC61000-4-2 level 3 C class.

Display.	
Additional features.	Multifunction RGB led on front panel. Ambient light sensor. Automatic brightness control. Screen saver.
	INFORMATION! Pixel failures, which can occur with TFT displays, are due to production and are not covered by the warranty. **WARNING!** Ensure that the panel is not in permanent and direct contact with oils. Do not expose the device to direct sunlight: use a UV protection film.

Power Supply (J1).				
Nominal power supply (Vn).	12 VDC or 24 VDC.			
Power supply range (Vn variation).	From 7 to 32 VDC. The device detects the plant operation at 12 VDC or 24 VDC to manage its alarms when powered up and whenever OFF mode is selected.			
Maximum time of interruption of the supply voltage without resetting the device.	0 VDC for minimum 20ms from a nominal voltage of 12 VDC (voltage drop).			
Starting minimum voltage.	The operation is guaranteed during the engine cranking up to Vbat ≥ 5 VDC for indefinite time.			
Input capacitance.	About 1440 µF.			
Measurement range.	From 0 to 40 VDC.			
Sampling rate.	10 kHz.			
Measurement resolution.	12 bits.			
Measurement accuracy.	± 0,5% of full-scale reading.			
Power consumption (mA). *When the supply voltage drops below 7.5 Vdc, the luminous intensity of the display is automatically reduced to the minimum value. Under these conditions, if the touch screen is pressed, the brightness of the display is maintained at the set desired for a maximum time of 3 seconds.		Display brightness.		
	Power supply voltage.	Min.	50%.	Max.
	7,0 VDC*	550 mA	990mA	1600 mA
	7,5 VDC.	500 mA.	900 mA.	1370 mA.
	12 VDC.	310 mA.	580 mA.	880 mA.
	24 VDC.	185 mA.	315 mA.	450 mA.
	32 VDC.	150 mA.	290 mA.	400 mA.
	INFORMATION! The device absorbs a higher start-up current than the operating current. This is caused principally by the charging of the various capacitances in the input circuit and the EMC filters. Once the device is operating stably, the input current drops to the levels one would expect from the manual.			

Digital inputs 01-04 (J2).	
Type of input.	4 opto-insulated digital inputs with common power supply. Internal power supply terminal connected to the supply positive J1. They are active when the input is connected to the supply negative GND. When they are open, the voltage of the input terminals voltage is Vbat. Using parameters, you can select the function of each individual input.
Minimum pulse length.	60 ms.
Input impedance.	2,2 kΩ.
Activation/deactivation threshold.	2,5 VDC.
Voltage withstands.	± 35 VDC.
Typical current with closed contact.	5 mA @ +Vbat= 13,5 VDC. 11 mA @ +Vbat= 27 VDC.
Open circuit voltage.	Vbat.
Input signal delay.	It can be adjusted by the related parameter for each input.

Digital Output (J2)	
Type of output.	1 relay with free contacts. **INFORMATION!** Use suppression diodes on all relays and other inductive loads
Max switching capacity (resistive load).	1 ADC @ 32 VDC.
Min. switching capacity.	10 µA ,10 mVDC.

COM2 – RS232/RS485/RS422 Communication interface (J3).	
Type of interface.	RS232* or RS485 or RS422 serial port standard TIA/EIA, with galvanic insulation. The interface type is selected via software by a device parameter (P.0470). * Default Setting.
Electrical signals RS232.	TXD, RXD, GND.
Electrical signals RS485.	DATA+ (A), DATA– (B).
Electrical signals RS422.	RX+ (A), RX– (B), TX+ (Y), TX– (Z), GND.
Settings.	Baud rate selectable by parameter: 300, 600, 1200, 2400, 4800, 9600*, 19200, 38400, 57600, 115200 bps. Parity: None*, Even, Odd. Stop bit: 1*, 2. * Default Setting.
Type of transmission.	Standard Modbus RTU Master.
Line termination.	External termination required (120 Ω + matching cable).
Insulation voltage.	Functional Insulation. 1000 VDC Insulation for 60s.
Rated surge voltage.	±1 KV (1.2/50 µs).
Protections.	Internal transient voltage suppressors.
	INFORMATION! Twisted pair shielded cable is recommended to achieve specification and optimisation of immunity-noise.

COM1 - RS232 Communication interface (J4).	
Type of interface.	1 RS232 serial port standard TIA/EIA, not insulated on DB connector 9 poles male CANON.
Electrical signals.	TX, RX, DTR, DSR, RTS, GND.
Settings.	Baud rate selectable by parameter: 300, 600, 1200, 2400, 4800, 9600*, 19200, 38400, 57600, 115200 bps. Parity: None*, Even, Odd. Stop bit: 1*, 2. * Default Setting.
Type of transmission.	Standard Modbus RTU Slave.
Maximum distance.	The maximum cable length depends on cable capacitance, inductance, and screening. 15m (50ft) @ 9600bps. 10m (33ft) @ 19200bps. 7,5m (25ft) @ 38400bps. 5,0m (16ft) @ 57600bps. 2.5m (8ft) @ 115200bps.
Protections.	Internal transient voltage suppressors.

Ethernet Communication interface (J5).	
Type of interface.	1 Ethernet interface insulated. 10/100Mbps full-duplex 10T/100Tx Auto, HP Auto-MDIX support. Compliant IEE802.3/802.3u (Fast ethernet). Compliant ISO802-3/IEEE802.3 (10BASE-T). Protocol: Modbus/TCP, DHCP, DNS.
Default LAN setting.	IP address 192.168.0.1. Mask 255.255.255.0. DHCP enable.
	Use an Ethernet cable that meets or exceeds the SF/UTP CAT5e specifications.
Insulation voltage.	Functional Insulation. 1500 VAC Insulation for 60s.
Rated surge voltage.	±1 KV (1.2/50 µs).

USB Function interface (J6).	
Type of interface.	1 USB2.0 High-speed and Full-speed serial port not insulated. Connector type B.
Baud rate.	480 Mbps and 12 Mbps transfer rates provided.
Function mode.	Service port. Modbus RTU Slave. Connection to PC by CDC driver.
Maximum distance.	3m (9,84 feet).

USB Host interface (J7).	
Type of interface.	1 USB2.0 High-speed, Full-speed and low-speed serial port not insulated. Connector type A.
Baud rate.	480 Mbps, 12 Mbps, and 1.5 Mbps transfer rates provided.
Host mode.	Pen drive management.
Maximum current supplied.	350mA@5VDC with overload automatic protection.

Real-time clock.	
Type RTC.	Provides year, month, day, weekday, hours, minutes, seconds and 100th seconds based on a 32.768 kHz quartz crystal.
Battery back-up.	Rechargeable.
Life span (operation without power supply)	Approximately 6 months: depending on ambient temperature.
Battery field replacement.	Field replacement of the battery is not allowed. In case of battery replacement please contact Mecc Alte.

Horn.	
Type.	Electromagnetic sound transducer.
Sound Output.	Typ. 60 dB*. * It depends on the degree of acoustic insulation of the control cabinet.
Rate frequency.	2730 Hz.

Environmental conditions.	
Operating temperature.	From -20°C to +70°C.
Storage temperature.	From -30°C to +80°C.
Relative humidity.	5% to 95% with no condensation.
Operating altitude.	Up to 2000 m (6561 ft.).
Relative humidity.	5% to 95% with no condensation.
Impact protection.	IK06 for front panel touch. IK08 for inside panel. **WARNING!** The front touch panel has a mechanical protection rating of IK06 (1 Joule) and must be adequately protected if it can be subjected to mechanical shocks.
Pollution degree.	PD2.
Indoor/outdoor use.	Outdoor use is permitted if the protection rating of the control cabinet is equal to or higher than that of the device (IP65 external with gasket for the front panel). In any case, the IP degree of protection must be adapted to the specific installation conditions of the system.

Box.	
Material.	Aluminium.
Dimensions.	Length: 270 mm. Height: 202 mm. Depth: 48 mm.
Panel cutout.	241 mm x 174 mm.
Weight.	1400 g.
Protection degree.	IP 65 front with gasket for the front panel. IP 20 for inside panel.

Electromagnetic compatibility.	
EN 61326-1:2022.	Electrical equipment for measurement, control, and laboratory use. Electromagnetic compatibility requirements.
EN 61000-6-2:2019.	Electromagnetic compatibility (EMC) - Generic standards. Immunity for industrial environments.
EN 61000-6-4:2019.	Electromagnetic compatibility (EMC). Generic standards. Emission standard for industrial environments.

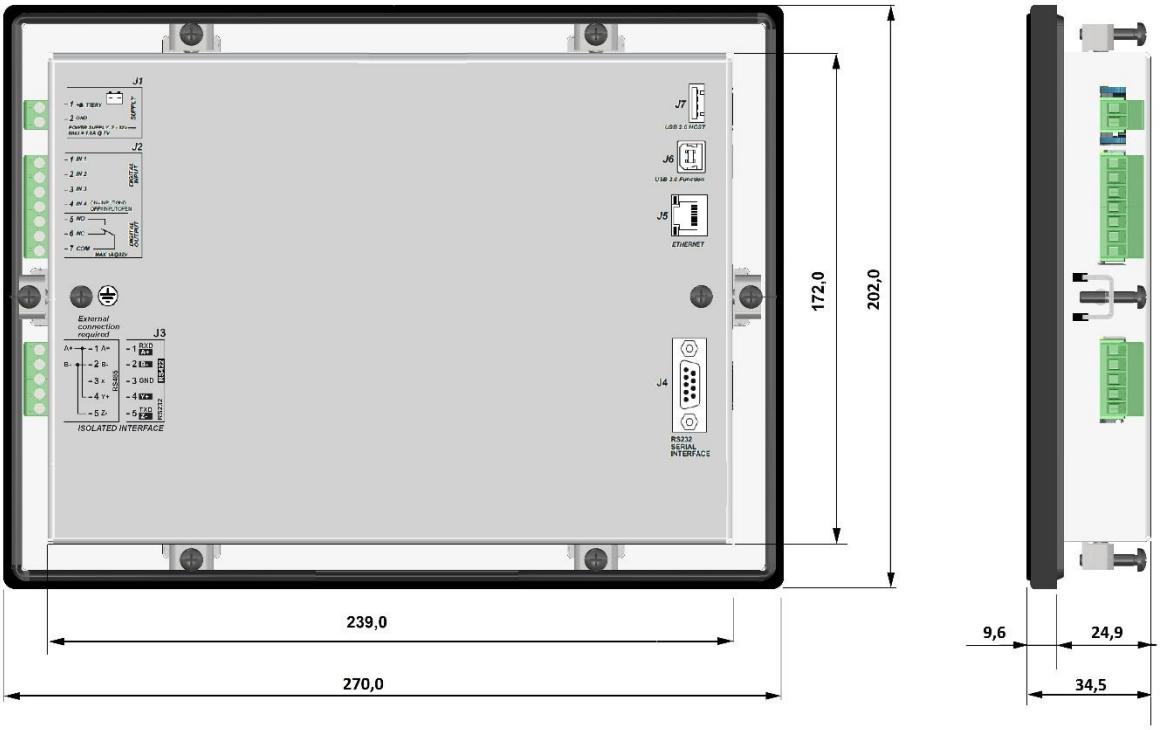
Safety requirements.	
EN 61010-1:2010. EN 61010-1:2010/A1:2019. EN 61010-1:2010/AC:2019.	Safety requirements for electrical equipment for measurement, control, and laboratory use – General requirements.

4 Installation

4.1 Mounting

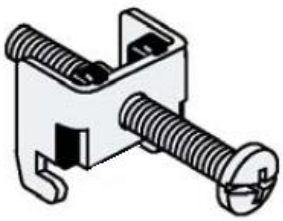
The device must be mounted permanently on the control cabinet door. The rear panel of the device must be accessible only by keys or tools and only by authorized personnel for maintenance operations. It must be impossible to remove the device without tools.

4.1.1 Dimensions



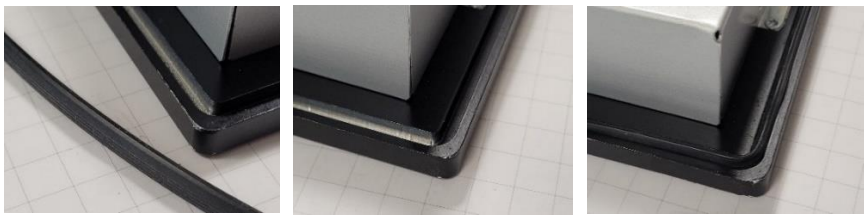
4.1.2 Fixing clamps

The device must be mounted using the six fixing clamps from the accessory pack.

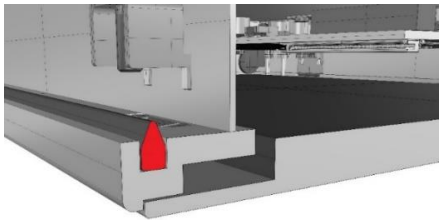


4.1.3 Gasket assembly

The supplied silicon gasket provides improved sealing between the device and the switchboard door. The gasket must be fitted to the device before installing it into the control cabinet door. Take care to ensure the gasket is correctly fitted to the device to maintain the integrity of the seal.



The gasket is shaped like a triangle. The base of the triangle must be inserted into the cavity of the device; the upper edge of the triangle must engage with the control cabinet door.



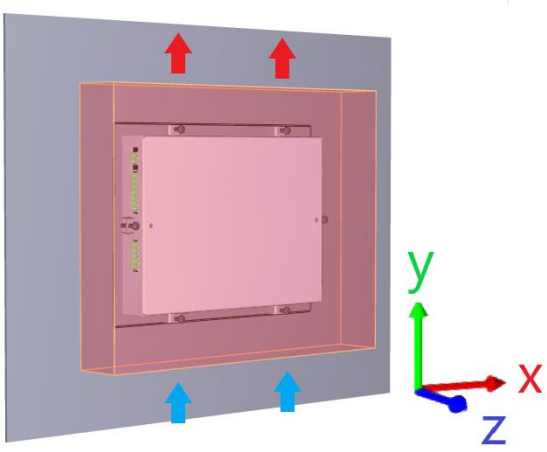
INFORMATION: a gasket that has been used for a long period may have scratches or dirt on its surface and could have lost much of its dust and drip resistance. Change the gasket once a year or when scratches or dirt become visible.

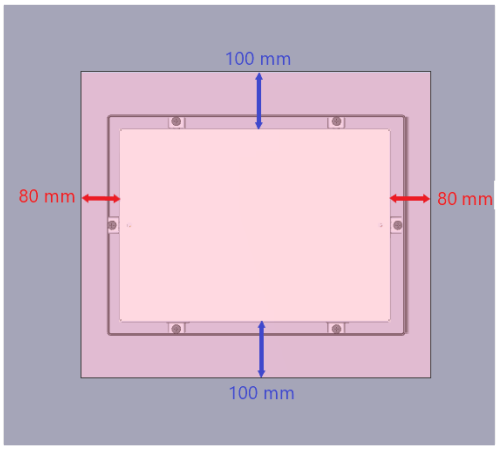
4.1.4 Checking clearances

The following clearances are required around the device to ensure sufficient self-ventilation:

- At least 80 mm to both the right and left of the mounting cutout (in **x** direction) to allow for insertion of the mounting clips, ethernet cable and terminal blocks.
- At least 100 mm above and 100 mm below the mounting cutout (in the **y** direction) for ventilation.
- At least 50 mm behind the rear panel of the device (in the **z** direction).

The following figure shows the clearances for mounting the devices and minimum free space (red color):





WARNING! The device has ventilation slots at the top and bottom (along the Y axis): do not restrict or block this product's ventilation slots.

4.1.5 Panel-cut Dimensions

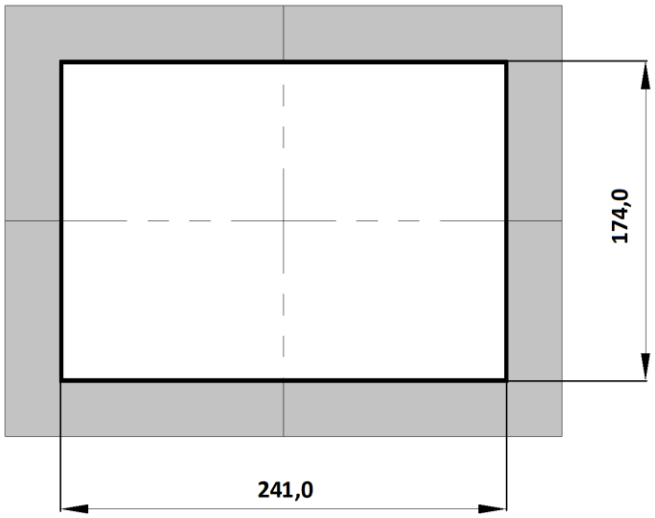
INFORMATION: the material around the mounting cutout must provide sufficient strength to guarantee lasting and safe mounting of the device.

INFORMATION: to achieve the degrees of protection described below, it must be ensured that deformation of the material cannot occur due to the force of the mounting clips or operation of the device

The degrees of protection of the device can only be guaranteed if the following requirements are met:

- Material thickness at the mounting cutout for a degree of protection IP65: 1 mm to 4 mm.
- Permissible deviation from plane at the mounting cutout: ≤ 0.5 mm This condition must also be fulfilled for the mounted device.
- Permissible surface roughness around the seal: ≤ 120 µm.
- The installation area is dry and free from contamination, such as dust or lubricant.

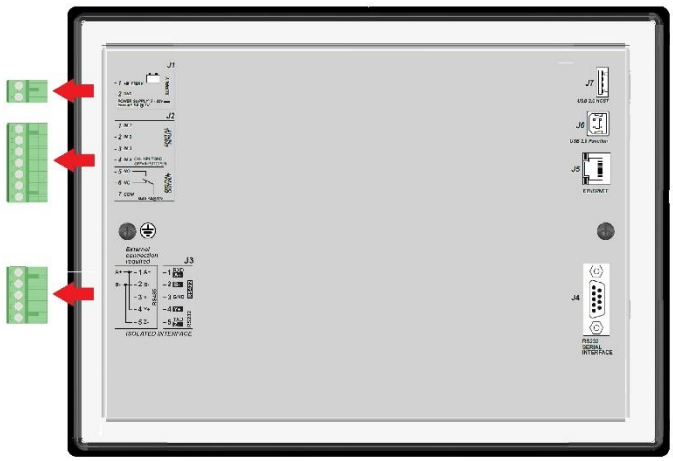
Cut out the door so that it has a groove with the dimensions 241mm x 174mm.



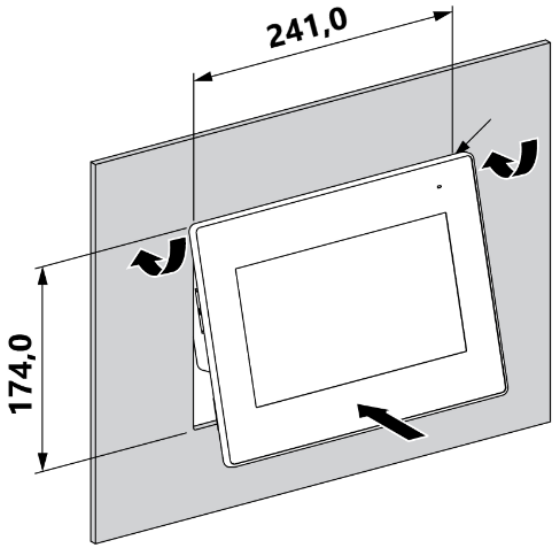
4.1.6 Mounting the device

- Place the panel on a clean and level surface with the display face pointing downward.
- Check that the installation gasket of the panel is seated securely and runs all the way around the perimeter of the frame.
- Create the correct sized opening required to install the panel, using the installation dimensions.

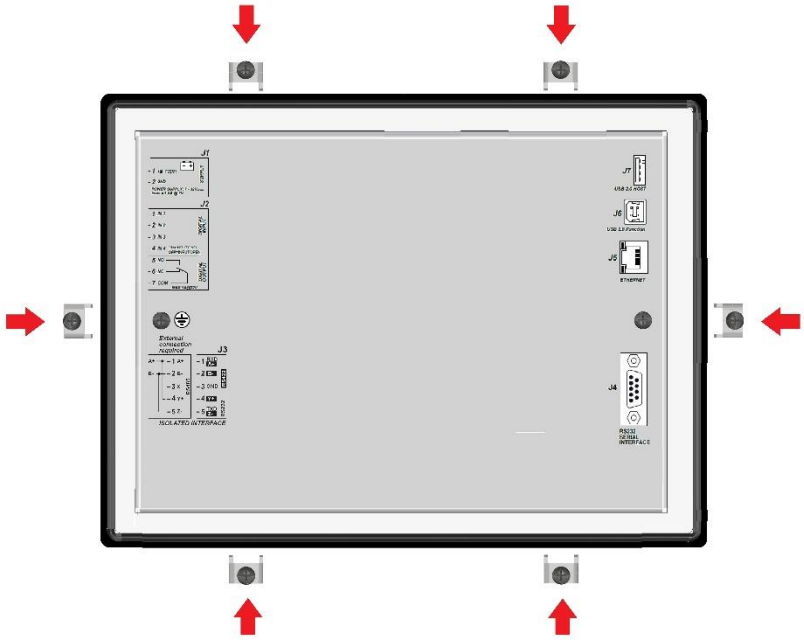
- Remove the terminal blocks.



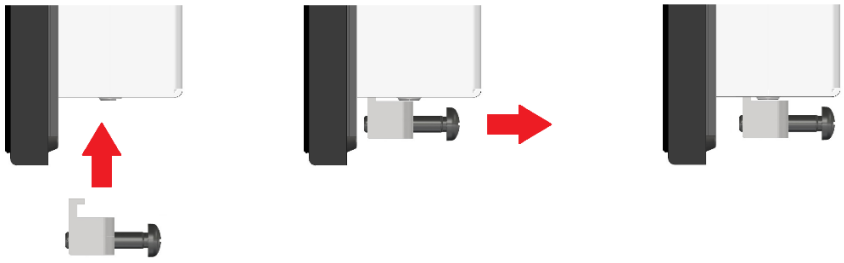
- Insert the device into the panel cutout and verify that the unit fits correctly in the cutout.

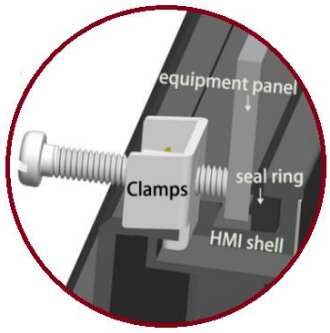


- Once the device is positioned, insert the nose of the fixing clamps into the slot on the sides of the device.



- Pull the fixing clamps backwards towards the back of the device.





- Ensure that the gasket is properly positioned in the groove and against the panel.
- Tighten the clamping screws until they contact the control cabinet door.
- Tighten the screws on all clamps, alternating from one side to the other until the front bezel is secure against the mounting panel. Torque the screws to 0,1-0,2 Nm.
- Over tightening of these screws may result in the clamp inserts or the housing breaking.
- Reattach the terminal blocks.

INFORMATION: do not exceed the recommended tightening torque.

INFORMATION: the housing is equipped with size nut inserts, which must all be tightened properly to achieve the required degree of protection.

INFORMATION: the mounting surface and the operating device may not become deformed because of the fixing clamps or through the operation of the device

4.1.7 Tightening torques.

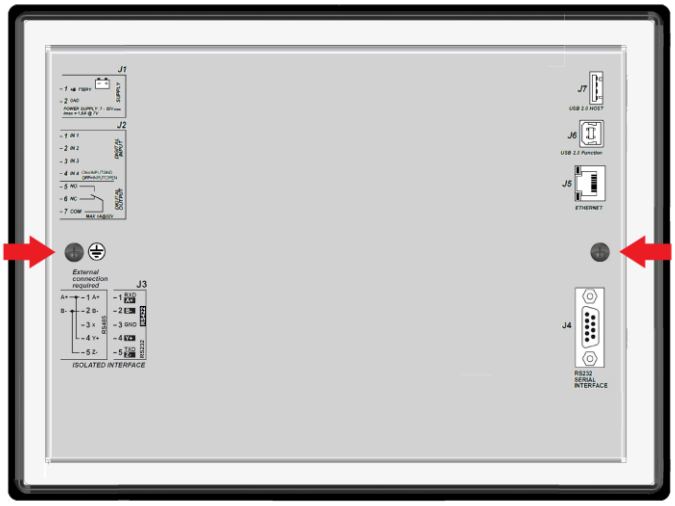
Refer to these values:

- Device on cabinet door: between 0,1 - 0,2 Nm for the six M4 screws.
- Plug connections (terminals): 0,5 - 0,6 Nm.
- Sub-D screw: 0.2 Nm.

4.2 Wiring

WARNING! It is mandatory to permanently connect the housing of the device to earth through the suitable screws. The safety connection to earth should be implemented before any other connection.

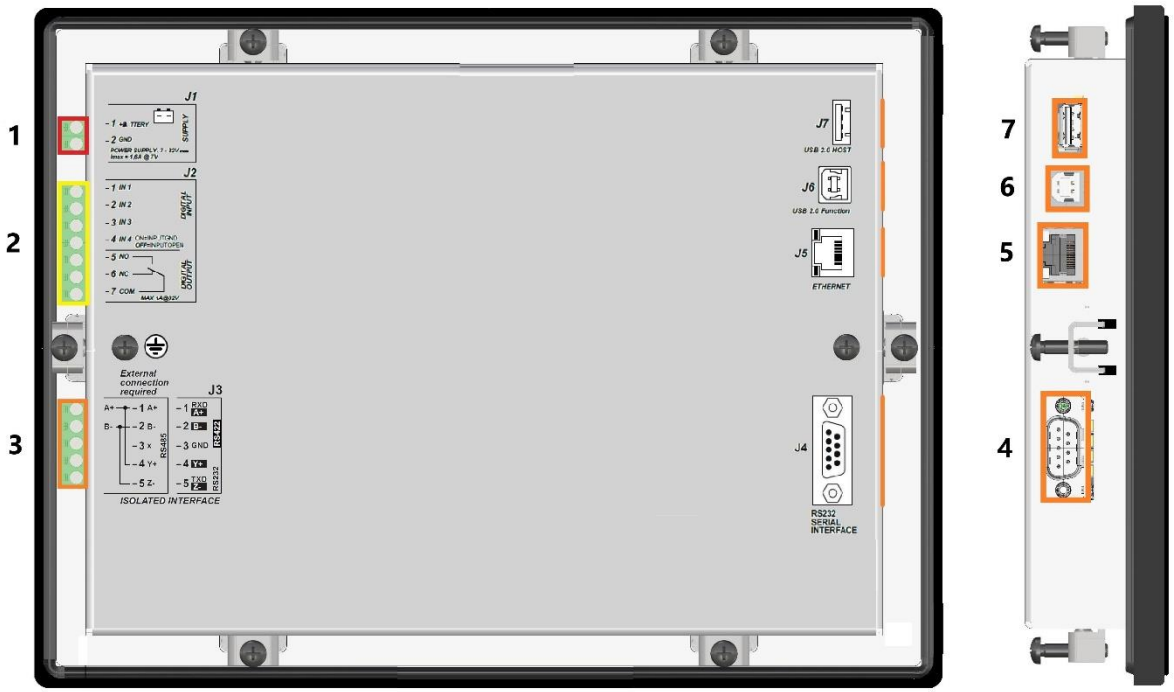
Connect Protective Earth (PE) to the unit to avoid the risk of electric shock.



Use one of the Protective Earths (PE) screws located on the back side of the sheet metal housing. The conductor providing the connection must have a wire larger than or equal to 2.5 mm² (14 AWG). The cable length should be as short as possible.

WARNING! Proper use of the device requires permanent mounting in a control cabinet. Accessing device connections shall only be possible by means of specific tools or keys. Device removal shall only be possible by means of tools.

5 Connection and configuration



Ref.	Name	Description	Pluggable Terminal Blocks / Connector
1	J1	Power Supply.	1 poles x 2,5 mm^2 screw terminal, pitch 5.08.
2	J2	Digital input 1-4.	7 poles x 2,5 mm^2 screw terminal, pitch 5.08.
		Digital outputs 1.	
3	J3	COM2 – RS232/RS485/RS422 communication interface.	5 poles x 2,5 mm^2 screw terminal.
4	J4	COM1 - RS232 communication interface.	Connector DB9 poles male CANON.
5	J5	Ethernet interface.	Connector RJ45.
6	J6	USB function interface.	Connector type B.
7	J7	USB host interface.	Connector type A.

5.1 Power supply (J1)

J1 is the supply connector: connect an uninterruptible power supply (usually the engine starter battery) to the “2 GND” and to the “1 +B” terminals.

The minus terminal “2 GND” is the reference of the digital inputs. It must be connected to the ground protection. Systems that require insulation between the battery negative and the ground protection can be used but may require care.

Although the device is protected by a built-in self-resetting fuse, it is recommended to use a 4 Aac fuse for the protection of the positive lines “1 +B”.

INFORMATION: The device absorbs a higher start-up current than the operating current. This is caused principally by the charging of the various capacitances in the input circuit and the EMC filters. Once the device is operating stably, the input current drops to the levels one would expect from the manual.

INFORMATION: when installing, connect the battery positive only after opening all fuses available in the panel.

WARNING! Connect the unit only to a DC power source that complies with the safety extra-low voltage (SELV) requirements.

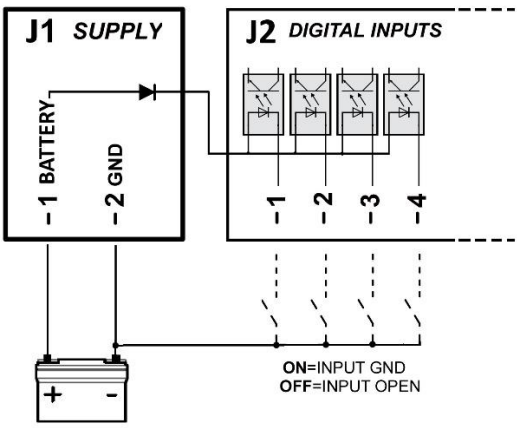
WARNING! On engines battery where a direct connection between battery minus and PE is not possible, it is recommended to use an isolated external power supply if the differential voltage between battery minus and PE exceeds 42 Vac.

WARNING! Take particular attention to non-isolated serial/USB connections.

Serial RS232 and USB of personal computers have the negative transmission reference usually connected to the EARTH. Voltage differences between device negative and PC negative (or EARTH) can cause damage to the communication ports of the PC or of the device. Use serial isolators if necessary.

5.2 Digital inputs J2

The controller is equipped with 4 opto-isolated digital inputs, with an internal common terminal connected to +VBat.

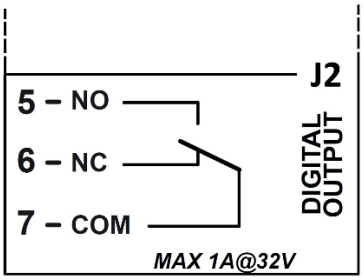


The inputs are active when the terminal is connected to the supply negative GND. When the terminals are open, the voltage on the terminals is +Vbat. Avoid situations where intermediate or undefined voltage levels can occur.

INFORMATION! It is possible to connect the same command signal in parallel to inputs of different devices (for example one signal for two GC800 HMI). It is not necessary to separate the inputs with external diodes, because each input already has an internal diode. Built-in diodes prevent incorrect activation of the input when one of the devices is switched off.

For each digital input, the controller provides one parameter allowing to configure the function of the input itself (what to do when the input activates, parameters P.2001, P.2004, P.2007, P.2010). They are available in configuration menu 1.8.2. As per factory default, all inputs are “not used”.

5.3 Digital outputs J2



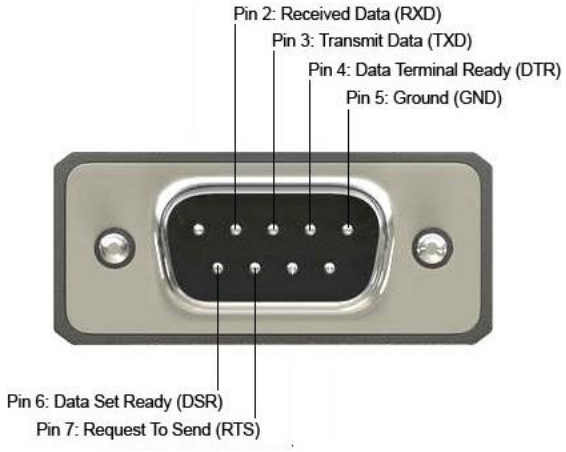
The controller provides one 1 Adc @ 32 Vdc relay with dry contacts. The device does not use this output at present firmware version.

5.4 Communication ports

The controller is equipped with many communication ports, allowing remote configuration:

- One USB 2.0 full-speed serial ports not insulated, operating in “function mode” (J6).
- One USB 2.0 full-speed serial ports not insulated, operating in “host mode” (J7, pen drive).
- One RS232 serial port (not insulated) (J4).
- One RS232 or RS485 or RS422 serial port (with galvanic insulation) (J3).
- One Ethernet ports with RJ45 (J5).

5.4.1 J4 - Serial port 1 RS232 (COM1)



RS232 port (not insulated) with DB9 male connector. Signals TXD, DTR and RTS are outputs for the controller. Signals RXD and DSR are inputs for the controller.

RS232 has no specific distance limitation. Instead, the RS232 standard defines a capacitance limitation of 2500 pF per transmitter. Since capacitance is accumulative with length, longer cables mean more capacitance. See paragraph 3 for the maximum cable length and other electrical characteristics. The specified 15 m (50 ft) distance limitation is from an appendix of the RS232 specification that explains “this distance is a good rule of thumb when you do not know the specification of your cable.”

INFORMATION! Shielding is critical for RS232: never use unshielded cables for anything but bench-top trial runs.

Supported protocols:

- Modbus RTU, in “slave mode” only.

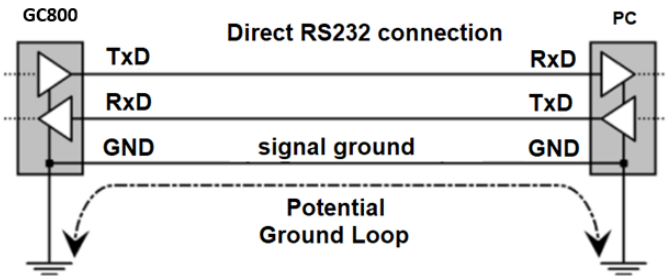
The connection can be used for:

- Firmware upgrade (RemoteWrite software): delicate operation to be performed by qualified personnel.
- Parameters setting (BoardPrg4 software).

Available configuration parameters:

- P.0453: Baud rate.
- P.0454: Setting (parity, stop bits).

5.4.1.1 RS232 and grounding



J4 RS232 port is not insulated. Thus, its GND pin is internally connected to the module's earth/supply negative terminal. Similarly, the RS232 ports of PCs, laptops and other peripherals that can be connected to J4 have an internal connection from the GND pin to the power earthing. The RS232 cable interconnects the two GND pins.

Although in principle the presence of this wire should force the two common points to be at the same voltage, the resistance and the inductance of the wire prevent it from acting as an ideal short circuit. RS232 requires this common ground connection to work properly.

Note that this would not be a problem with a computer and controller sharing a common power source, but this can cause a problem if earth loop is created.

The consequence is that in the real-world voltage differences can occur between RS232 data transmitters and receivers which can compromise data transmission and result in serious hardware damages. If the potential difference begins to rise, current flows between the RS232 port reference wire (signal ground). This can cause damage to one or both devices, from RS232 port failure to, in some cases, complete failure of the PC or controller. Thus, it is critical for EIA/RS232 that one of the following two situations be true:

- Both devices must share a common ground with no ground potential difference.
- One device must isolate its RS232 port to break any path to local ground.

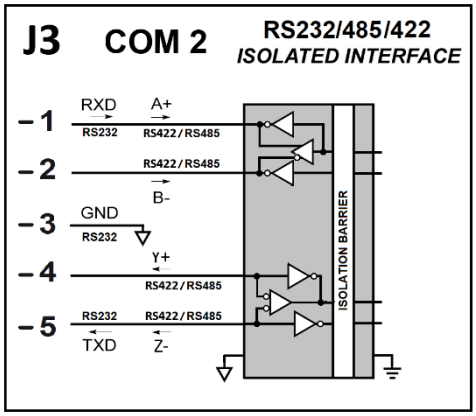
WARNING: Voltage differences between controller negative and PC negative (or earth) can cause damage to the communication ports of the PC or controller. Use serial isolators if necessary.

INFORMATION! Many PCs are not equipped with an internal RS232 serial port. Mecc Alte does not recommend the use of USB to RS232 converters if a permanent connection is required: an additional RS232 port should be added to the computer.

INFORMATION! Low-cost USB converters do not support baud rates above 19600 and are very sensitive to electrical noise.

INFORMATION! The signal ground (J4-5) is connected directly with the negative controller power supply (J1-2).

5.4.2 J3 - Serial port 2 RS232/RS422/RS485 (COM2)



The device is equipped with a RS232, RS485 or RS422 serial port standard TIA/EIA, galvanically insulated. The serial port is equipped with internal transient voltage suppressors.

The interface type is selectable via software by a controller parameter (P.0470):

- 0 – RS232

Terminal	Signal	Signal name	Signal direction
J3-1	RXD	Receiver input	In
J3-3	GND	Signal ground	
J3-5	TXD	Driver output	Out

- 1 – RS485.

Terminal	Signal	Signal name	Signal direction
J3-1/J3-5	A+	Noninverting receiver input / driver output	In/out
J3-2/J3-4	B-	Inverting receiver input / driver output	In/out
J3-3	GND	Signal ground	

- 2 – RS422.

Terminal	Signal	Signal name	Signal direction
J3-1	A+	Noninverting receiver input	In
J3-2	B-	Inverting receiver input	In
J3-3	GND	Signal ground	
J3-4	Y+	Noninverting driver output	Out
J3-5	Z-	Inverting driver output	Out

See paragraph 3 for the maximum cable length and other electrical characteristics.

Supported protocols:

- Modbus RTU, in “master mode”.

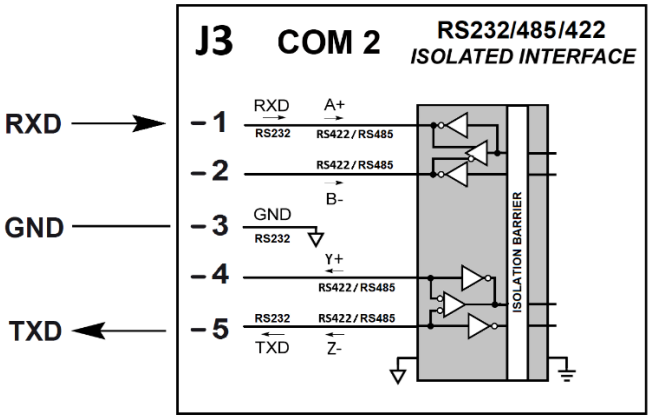
The connection can be used for:

- Connection to GC800 SCM. Recommended baud rate 115200, to reduce the display response time.

Available configuration parameters:

- P.0470: Type of serial interface (RS232 / RS485 / RS422).
- P.0473: Baud rate.
- P.0474: Setting (parity, stop bits).

5.4.2.1 RS232 mode



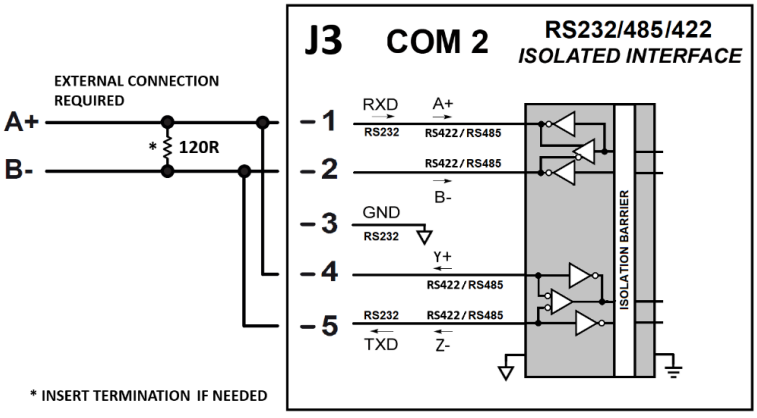
To configure the serial port in RS232 mode, set parameter P.0470 to “0”.

RS232 has no specific distance limitation. Instead, the RS232 standard defines a capacitance limitation of 2500 pF per transmitter. Since capacitance is accumulative with length, longer cables mean more capacitance. See paragraph 3 for the maximum cable length and other electrical characteristics. The specified 15 m (50 ft) distance limitation is from an appendix of the RS232 specification that explains “this distance is a good rule of thumb when you do not know the specification of your cable.”

Otherwise, using a quality low-capacitance cable with 42 pF/m (such as the Belden 1421A), you can professionally run RS232 over 55 m (180 ft). Note that the thinner the overall RS232 cable is, the higher its capacitive rating is, due to cross coupling between wires. So, expect a low-capacitance cable to appear fatter than the standard cables.

INFORMATION! Shielding is critical for RS232: never use unshielded cables for anything but bench-top trial runs.

5.4.2.2 RS485 mode



To use the serial port as RS485 mode, it is necessary to make two bridges as shown in the figure above: connect terminals J3-1 & J3-4, connect terminals J3-2 & J3-5.

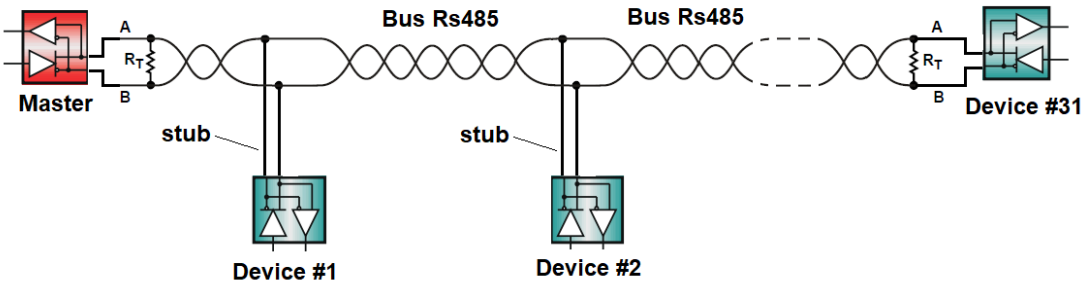
To configure the serial port in RS485 mode, set parameter P.0470 to “1”.

In RS485 (half duplex), only one signal pair is used. A single node cannot transmit and receive at the same time.

The RS485 connection requires a 120 Ohm termination resistor on both ends of the cable. **The device does not have integrated resistor**; insert it directly on terminals J3-1 & J3-2.

The maximum permissible length between a RS485 driver and receiver is 4000 ft (or 1200 m). However, both cable quality and data rates impact this distance. As data rates increase, the signal is increasingly attenuated by the parasitic RC-filter created by the cable. When high data rates are used, the application is limited to a shorter cable. It is possible to use longer cables when low data rates are used. See paragraph 3 for the maximum cable length and other electrical characteristics.

RS485 applications benefit from differential signalling over twisted-pair cable because noises from external sources couple equally into both signal lines (as common-mode noises), which is rejected by the differential receiver input. Industrial RS485 cables are of the sheathed, shielded, twisted-pair type, (STP), with a characteristic impedance of 120 Ohm and 22–24 AWG (e.g., BELDEN 3105A Multi-conductor-EIA Industrial RS485PLT/CM).



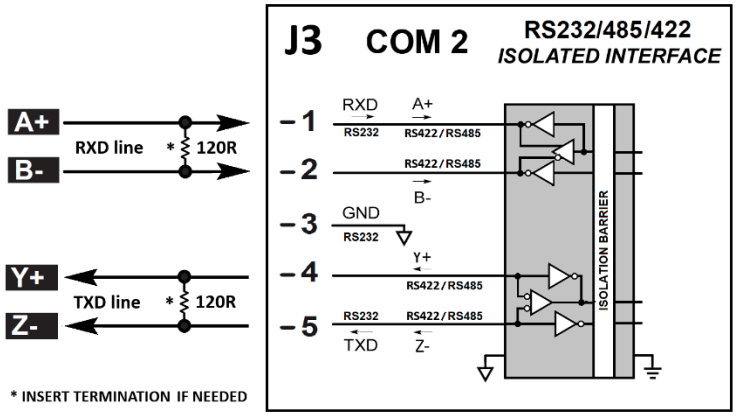
The RS485 standards suggests that its nodes be networked in a daisy-chain, also known as party line or bus topology (see image above). In this topology, the participating drivers, receivers, and transceivers connect to a main cable trunk via short network stubs. Data transmission lines should always be terminated, and stubs should be as short as possible to avoid signal reflections on the line.

Up to 32 load units can be connected on the RS485 bus: 1 master device (GC800 HMI) and 31 slave devices.

INFORMATION: A shield is most effective if it's earthed at both ends, but only if it does not act as an equipotential bonding conductor between two systems, resulting in the circulation of current in the shield. In that case, connect the shielding at one end only.

INFORMATION! For more information about RS485, refer to the TIE/EIA-422-B guideline.

5.4.2.3 RS422 mode

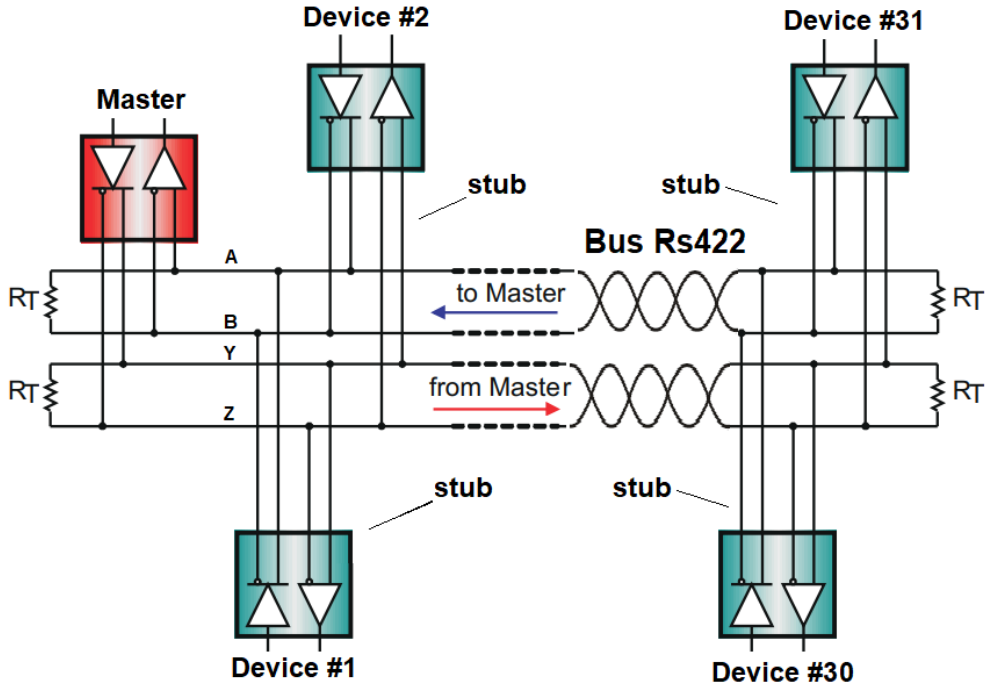


To configure the serial port in RS422 mode, set parameter P.0470 to “2”.

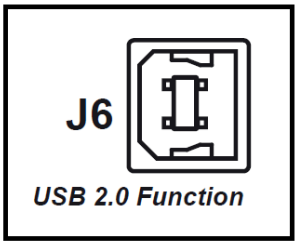
The RS422 (full duplex) implementation requires two signal pairs (four wires), and full duplex transceivers with separate bus access lines for transmitter and receiver. Full duplex mode, if the protocol supports it, allows a node to simultaneously transmit data on one pair while receiving data on the other pair.

The RS422 connection requires 120 Ohm terminating resistors at both ends of both signal pairs. **The device does not have integrated resistors**; insert them directly on terminals J3-1 & J3-2 and on terminals J3-4 & J3-5.

RS422 applications benefit from differential signalling over twisted-pairs cable because noises from external sources couple equally into both signal lines of each pair (as common-mode noises), which is rejected by the differential receiver input. Industrial RS422 cables are of the sheathed, shielded, twisted-pair type, (STP), with a characteristic impedance of 120 Ohm and 22–24 AWG (e.g., BELDEN 3105A Multi-conductor-EIA Industrial RS485PLT/CM). See paragraph 3 for the maximum cable length and other electrical characteristics.



5.4.3 J6 - USB Function mode (Type B)



USB2.0 full-speed serial port not insulated (type-B).

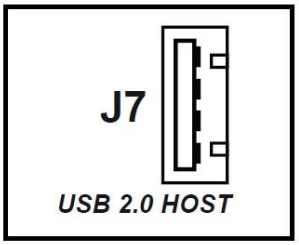
Supported protocols:

- Modbus RTU, in “slave mode”.

The connection can be used for:

- Firmware upgrade (RemoteWrite software): delicate operation to be performed by qualified personnel.
- Parameters setting (BoardPrg4 software).

5.4.4 J7 - USB Host mode (Type A)



USB 2.0 high-speed serial port not insulated (type A), operating in Host mode. The port provides 350 mA continuous current.

The controller immediately activates the USB port at power-up. A green LED near the USB type-A connector indicates the status of the USB port:

- Green LED on: port powered.
- Green LED off: port unpowered or in protection.

The port allows the connection of a USB pen drive with the following characteristics:

- 1 GB minimum capacity.
- USB 2.0 specification or less.
- Formatted in FAT16 or FAT32.
- A volume label must be set.
- Single partition only.

INFORMATION: due to the lack of detailed specifications and the variety of typically purchased USB pen drives, even if a particular pen drive appears to conform to these characteristics, it may still be unrecognized by the controller. Therefore, you should first test any given USB pen drive to assure that it can be recognized by the controller before investing in large quantities of that pen drives.

The pen drive can be used for upgrading the firmware of the controller. Just plug the pen drive with the desired firmware in the root directory. GC800 HMI will notify the presence of the new firmware to the operator, and the operator can manually decide when to upgrade it. The firmware will only be updated if the controller is in the OFF mode.

No configuration parameters are available for this port.

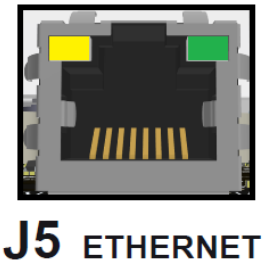
When connecting this port to a PC, it appears as an additional COM port of the PC itself. Application software can access the USB device as it would a standard COM port. Usually, Windows automatically recognize them when plugged into a USB port of the PC. If it doesn't, you will need to download and install the appropriate driver.

INFORMATION: In industrial environments, the use of the USB port for permanent connections is **strongly not recommended** because the cable length is limited, and the PC is highly sensitive to electrical noise. For this reason, the USB cable must be connected only when required, and should be removed as soon as the operation finishes.

INFORMATION: all the USB ports of the controller have an internal connection to the module's earth/supply negative terminal. Similarly, the USB ports of PCs, laptops and other peripherals that can be connected to the controller usually have an internal connection to the power earthing. This can cause a problem when connecting two such devices, as an earth loop can be created. If a voltage difference close to 0 V is present between the ground connections of both USB ports, no current flows between the connected devices, and both can operate correctly.

WARNING! If the voltage difference grows, a current start flowing across the USB port reference wire. This can cause damages to one or both devices, from a simple USB port failure to, in some cases, complete failure of the PC or of the controller. Use a USB insulator to ensure this does not occur.

5.4.5 J5 - Ethernet interface 10/100 Mbps



Device is equipped with a full-duplex Ethernet 10/100Mbps LAN interface compliant with IEE802.3/802.3u (Fast ethernet) and ISO802-3/IEEE802.3 (10BASE-T) standards.

The interface can automatically detect network speed and negotiate between 100BASE-TX and 10BASE-T, as well as full and half-duplex. It also supports HP Auto-MDIX feature, which means that automatically applies an internal cross, when needed, allowing to use both direct (EIA/TIA-568A or EIA/TIA-568B) and crossover cables.

Two integrated LEDs built-in in RJ45 connector allow to physically check the connection (as well known by the standard):

- Green led (Link/Act). It shows the physical connection status:
  - Led off: interface not connected (link is down, no activity).
  - Led on: interface connected to an external device (link is up, no activity).
  - Led blinking: interface connected to an external device with data exchange (link is up, with activity).

- Yellow led (10/100). It shows the connection speed of the interface:
  - Led off = 10 Mbps connection.
  - Led on = 100 Mbps connection.

It is possible to connect the interface to a hub/switch/router or directly to a PC (point to point connection).

Supported protocols:

- **IP:** we support it on IPv4 version only.
- **TCP/UDP.**

- **DHCP**: automatic IP assignment by a LAN server.
- **DNS**: allows to use "names" instead of IP addresses.
- **Modbus-TCP**: for remote configuration and for connection with GC800 SCM.

The connection can be used for:

- Firmware upgrade (Remote Write software): delicate operation to be performed by qualified personnel.
- Parameters setting (BoardPrg4 software).
- Connection with GC800 SCM.

Available configuration parameters:

Description	Number	Default
IP address	P.0500	192.168.0.4
Subnet mask	P.0501	255.255.255.0
Network gateway	P.0502	0.0.0.0
Primary DNS server	P.0510	0.0.0.0
Enable DHCP protocol	P.0513	1 - Yes

5.4.5.1 DHCP protocol.

The three mandatory parameters required for connecting an Ethernet interface to a LAN are the "**IP address**", the "**Subnet mask**" and, optionally, the "**Network gateway**". There are two standard ways to get their value:

- Using DHCP protocol. This feature can be enabled/disabled using the "**Enable DHCP protocol**" parameter. It is enabled as per factory default. **It requires a DHCP server in the LAN.**

  Once enabled, the controller sends proper queries on the Ethernet interface to any available DHCP server on the LAN, providing the unique MAC address of the interface.

  The MAC addresses are unique in the word, and uniquely identifies any device connected to any Ethernet (included Internet). They are assigned in factory by Mecc Alte to any Ethernet interface of each controller. You can check them on a label directly on GC800 HMI; GC800 HMI shows on a proper display page the MAC addresses of both GC800 SCM and HMI.

  If any DHCP server is available in the LAN, it answers providing at least the three mandatory parameters to be used for that interface ("**IP address**", "**Subnet mask**", "**Network gateway"**). Usually, it also provides the IP address of the available DNS server of that LAN. The controller stores all the received data and use them. GC800 HMI shows the data currently in use.

- Not using DHCP protocol. If the DHCP protocol is not enabled, the customer has to proper set the "**IP address**", the "**Subnet mask**" and, optionally, the "**Network gateway**", to match the ones in use on the connected LAN (usually a network administrator can provide these information). Some notes:
  - The "**subnet mask**" must be identical for all devices connected on the LAN.
  - The "I**P address**" (and the "**Network gateway**" address too), must follow two rules:
    - The part of the IP address corresponding to a "1" in the "subnet mask" must be identical for all devices connected on the LAN.
    - The part of the IP address corresponding to a "0" in the "subnet mask" must be unique for any device connected on the LAN.

    Both the IP address and "subnet mask" are 32 bits numbers, which are really composed by a sequence of 32 0/1 digits. The check between addresses and "subnet mask" is done by bits.

  So, you must ask the network administrator for the right "**subnet mask**" (no way to autodetect it) and for an available "**IP address**" (two identical IP addresses on the same LAN are not allowed). The "**network gateway**"

is required only if the controller must contact any other device outside the LAN (usually not required by GC800 HMI).

5.4.5.2 DNS protocol.

Once the basic parameters are set, it's possible to use the DNS protocol. DNS is a standard protocol that allows to use "names" instead of "IP addresses" for contacting devices over Ethernet. **It requires a DNS server in the LAN**.

DNS is quite useful in combination with DHCP (where the IP address of a specific device is not fixed but can be changed dynamically over the time by the DHCP server). If we assign a "name" to a device, we can use this "name" to ask the DNS server for the current IP address of that device and use it to contact the device itself.

DNS protocol is always enabled on GC800 HMI. To work, however, it requires the IP address of the DNS server. This address is usually provided by the DHCP server: if not provided (or if the DHCP protocol is disabled), you can type it using the parameter "**Primary DNS server**".

Once the DNS address is available, GC800 SCM register on it the name to be used for that Ethernet interface. The "name" is configurable by parameter P.0456.

Once the "name" for an interface is registered on a DNS server, any device on the LAN can ask the DNS server for the IP address linked to the "name" and use it for connecting to the controller. This avoid providing the "IP address" (which can change over the time) to any device requiring it.

5.4.5.3 Modbus-TCP protocol.

This is a quite common monitoring protocol. It's the Ethernet version of the Modbus-RTU protocol available on USB and serial ports. It is implemented in both master and slave mode only. It can be used for:

- Slave mode:
  - Firmware upgrade (RemoteWrite software): delicate operation to be performed by qualified personnel.
  - Parameters setting (BoardPrg4 software).
- Master mode
  - Connecting to GC800 SCM.

The standard listening port for Modbus-TCP protocol is "502", and this is also the one used by GC800 HMI (not configurable).

6 Connecting GC800 HMI to the controller GC800 SCM

GC800 HMI can be connected to the controller GC800 SCM via Ethernet or via serial port. If an Ethernet connection is chosen, you must use the ethernet port on connector J5 of GC800 HMI; if a connection via serial port is chose, you must use serial port 2 (RS232/RS485/RS422) on connector J3 of GC800 HMI.
Both connections are described in the following paragraphs.
There is also a description of the parameters that need to be set on GC800 HMI in order to configure it correctly. The parameters can be set using the USB port on the controller (J6 connector) or directly by the GC800 HMI panel (see par.6.3).

INFORMATION: Since both connections on the GC800 HMI are of the isolated type (J3 and J5), the power supply of the GC800 HMI and GC800 SCM can be two separate sources. It is however a good rule to keep the power supply negatives in common.

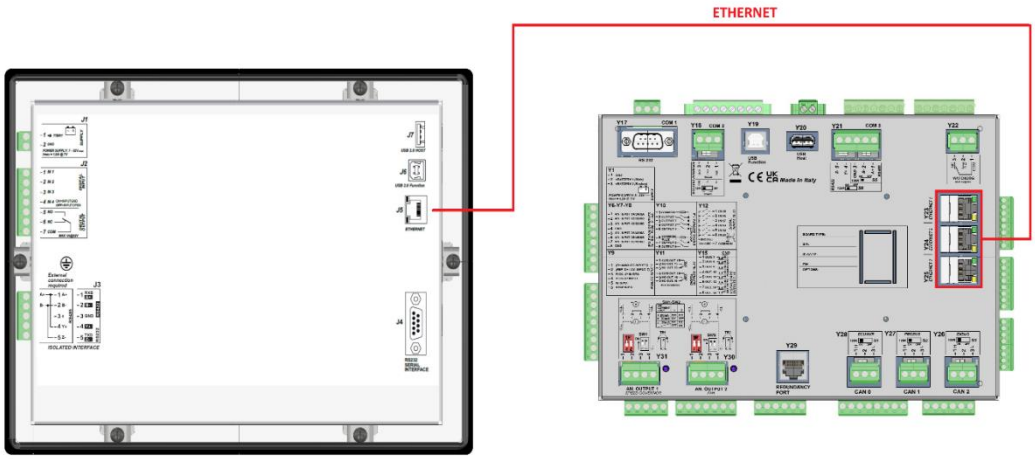
INFORMATION: The controller provides the parameter P.0004469 for protect themself against unwanted write access from any communication port. It allows configuring an alphanumeric password (maximum 7 chars). A blank password (default) means “no password”. Once the password is set into P.0469, any write access from any communication port must first be authorized by writing the password in the provided login registers (holding registers 201…204): if the password matches, the controller allows writing access **from that communication point** until the communication ends.

6.1 Connection by ETHERNET connection

To enable the connection to GG800 SCM via Ethernet, it is necessary to set the parameter P.0301 of GC800 HMI to the value "2-Ethernet".
The Ethernet connection can be made in two ways:

- With a point-to-point connection between the two controllers (only one Ethernet cable connected between the Ethernet ports of GC800 HMI and GC800 SCM).
- By connecting the GC800 HMI and GC800 SCM to existing Ethernet networks (using hubs or network switches).
- By connecting one GC800 HMI and two GC800 SCM in the systems with "hot swap redundancy".

6.1.1 Point-to-point connection



GC800 HMI has only one Ethernet port; GC800 SCM has three Ethernet ports available: one of these three ports can be used for this connection.

Configure GC800 HMI in this way (refer par. 5.4.5):

- Menu “SCM connection”
  - Parameter P.0301 (connection mode with GC800 SCM): set to “2-Ethernet”.
  - Parameter P.0302 (Modbus address of GC800 SCM port #1-Y23): set to “1”
  - Parameter P.0303 (Order of Modbus register of GC800 SCM port #1-Y23): set to “0-LSWF
  - Parameter P.0304 (password for command of GC800 SCM): set to “123”
  - Parameter P.0331 (IP address of GC800 SCM port #1-Y23): set to “192.168.0.1”
  - Parameter P.0332 (Modbus TCP Port of GC800 SCM port #1-Y23): set to “502”

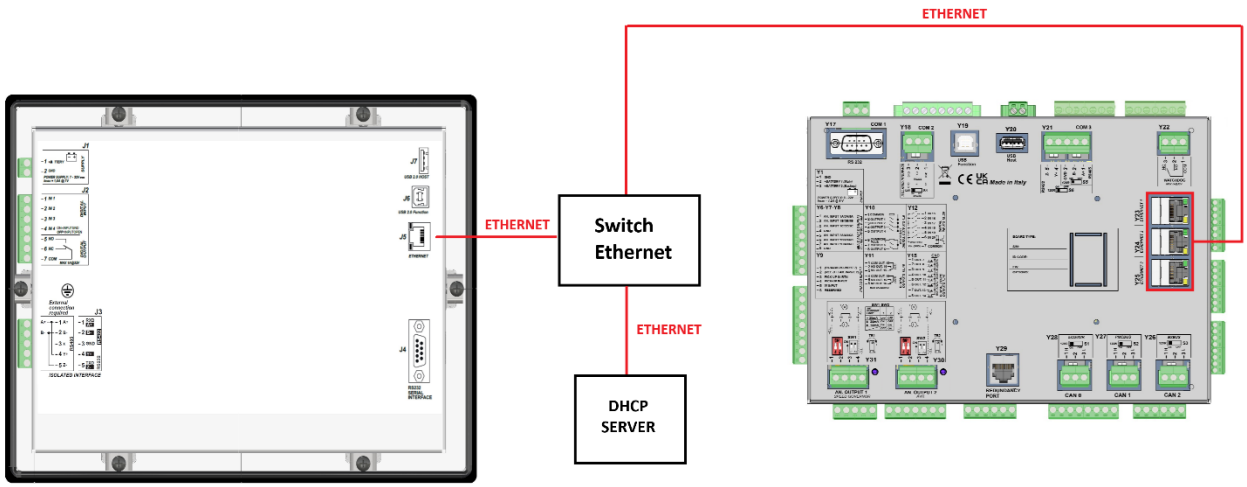
- Menu “Communication - Ethernet”
  - Parameter P.0500 (IP address of GC800 HMI): “192.168.0.4”.
  - Parameter P.0501 (sub-net mask of GC800 HMI): “255.255.255.0”.
  - Parameter P.0513 (Enable DHCP protocol of GC800 HMI): “0 – NO”

Configure GC800 SCM in this way (Refer to “GC800 SCM - Technical Manual”):

- Let's assume we are using Y23- Ethernet 1:
  - Parameter P.0500 (IP address): “192.168.0.1”.
  - Parameter P.0501 (sub-net mask): “255.255.255.0”.
  - Parameter P.0513 (Enable DHCP protocol): “0 – NO”

In this way, we have created a sub-network with mask “255.255.255.0”; two devices (with address “192.168.0.4” for GC800 HMI and “192.168.0.1” for GC800 SCM port #1) are connected to this sub-network. As you can see, the parts of the IP addresses that corresponds to "255" in the "sub-net mask" are identical, while the parts that corresponds to "0" are different.

6.1.2 Connection through Hub or Switch Ethernet



If GC800 HMI and GC800 SCM are connected to existing Ethernet networks, they can be self-configured: GC800 controller support the standard DHCP protocol.

6.1.2.1 Ethernet network with DHCP server.

As soon as the GC800 is connected to the Ethernet network, the DHCP server will tell them which IP address and which sub-net mask to use (and the IP address of the network router).
If any DHCP server is available in the LAN, it answers providing at least the three mandatory parameters to be used for that interface (“IP address”, “Subnet mask”, “Network gateway”). Usually, it also provides the IP address of the available DNS server of that LAN. GC800 controller stores all the received data and use them.

Configure GC800 HMI in this way (refer par. 5.4.5):

- Parameter P.0513 (Enable DHCP protocol): “1 – YES”

This function is enabled is enabled by default.

Configure GC800 SCM in this way (Refer to “GC800 SCM - Technical Manual”):

- Ethernet port #1 (Y23): parameter P.0513 (Enable DHCP protocol): “1 – YES”
- Ethernet port #2 (Y24): parameter P.7513 (Enable DHCP protocol): “1 – YES”
- Ethernet port #3 (Y25): parameter P.7563 (Enable DHCP protocol): “1 – YES”

As the GC800 SCM has three Ethernet ports this function can be enabled on the required port.
By default, it is enabled on all three Ethernet ports.

GC800 HMI shows, for each interface, the data currently in use.
For GC800 SCM, not knowing the IP address assigned by the server to the controller, it is not possible to know in advance which IP address to set in parameter P.0331 of GC800 HMI.
It is therefore necessary to use the SCM device name set in P.0456 "System name" for the Ethernet connection, and not the port IP address.
Once the DNS address is available for an interface, GC800 SCM register on it the name to be used for that Ethernet interface. The “names” of the three interfaces are configurable by parameter P.0456, automatically followed by “_1” for interface Y23, “_2” for Y24 and “_3” for Y25. Note that, as per factory default, P.0456 contains the unique ID of the controller, making the “names” unique in the Ethernet.

Configure GC800 HMI in this way (refer par. 5.4.5):

- Menu “SCM connection”
  - Parameter P.0301 (connection mode with GC800 SCM): set to “2-Ethernet”.
  - Parameter P.0302 (Modbus address of GC800 SCM port #1-Y23): set to “1”
  - Parameter P.0303 (Order of Modbus register of GC800 SCM port #1-Y23): set to “0-LSWF
  - Parameter P.0304 (password for command of GC800 SCM): set to “123”
  - Parameter P.0331 (IP address of GC800 SCM port #1-Y23): set to the same as parameter P.0456 of GC800 SCM with addition of '_1' if using Ethernet port # of Y23.
  - Parameter P.0332 (Modbus TCP Port of GC800 SCM port #1-Y23): set to “502

Example with DHCP enabled:

- P0456 of GC800 SCM is equal to '00002DF99DFE'.
- You want to use Ethernet port #2 (Y24) of the GC800 SCM
- Set parameter P.0331 of the GC800 HMI to '00002DF99DFE_2'.

6.1.2.2 Ethernet network without DHCP server.

If no DHCP servers are present (or if you do not wish to use them), disable the DHCP protocol on GC800 HMI and GC800 SCM by setting the following parameters to '0 - NO':

- GC800 HMI (refer par. 5.4.5):
  - Parameter P.0513
- GC800 SCM (Refer to “GC800 SCM - Technical Manual”):
  - Parameter P.0513 for Ethernet port #1 (Y23)
  - Parameter P.7513 for Ethernet port #2 (Y24)
  - Parameter P.7563 for Ethernet port #3 (Y25)

As the GC800 SCM has three Ethernet ports this function can be disabled on the required port.

At this point, ask the network administrator for the sub-net mask values for each Ethernet networks to which controllers must be connected.

It's a same procedure described in the chapter 6.1.1 "Point-to-point connection".

INFORMATION: GC800 HMI and GC800 SCM will normally be connected to the same Ethernet network (and therefore the value for the sub-net mask will be the same for both), but they could also be connected to different networks.

6.1.3 One GC800 HMI and two GC800 SCM in the systems with " Hot swap redundancy"

In the "hot swap redundancy" system you can use just one GC800 HMI, connected to both GC800 SCM controllers.

In this case, you must connect a KBACKUP contact to a digital input of the GC800 HMI and properly configure the communication detail to be used to connect to the MASTER or to the BACKUP controller.

GC800 HMI will use two ethernet configurations depending on the KBACKUP contact.

Refer to "GC800 SCM - Technical Manual": Hot redundancy chapter.

Configure GC800 HMI in this way (refer par. 5.4.5):

- Set the 1st SCM connection (GC800 SCM Master):
  - Parameter P.0301 (connection resource): set to "2-Ethernet".
  - Parameter P.0302 (Modbus address): set to "1"
  - Parameter P.0331 (device name or IP address): set the IP address of the Ethernet port used by the GC800 SCM Master (P.0500 or P.7500 or P.7550; depending on which port is used for the connection).
  - Parameter P.0332 (Modbus/TCP port): set to 502
- Set the 2nd SCM connection (GC800 SCM Backup):
  - Parameter P.0351 (connection resource): set to "2-Ethernet".
  - Parameter P.0352 (Modbus address): set to "1"
  - Parameter P.0381 (device name or IP address): set the IP address of the Ethernet port used by the GC800 SCM Backup (P.0500 or P.7500 or P.7550; depending on which port is used for the connection).
  - Parameter P.0382 (Modbus/TCP port): set to 502

The selection of which of the two GC800 SCMs (Master or Backup) is to be interrogated by the single GC800 HMI is done by setting one of the GC800 HMI's digital inputs with function 2131 - 'Selects 2nd configuration of SCM communication parameters'.

- When input is not active GC800 HMI polls GC800 SCM Master
- When input is active GC800 HMI polls GC800 SCM Backup

6.2 Connection via Serial port

The device is equipped with a serial port galvanically insulated, available on the J3 connector.
To enable the connection to GG800 SCM via serial, it is necessary to set the parameter P.0301 of GC800 HMI to the value "1-Serial port 2".

The serial connection can be made in two ways:

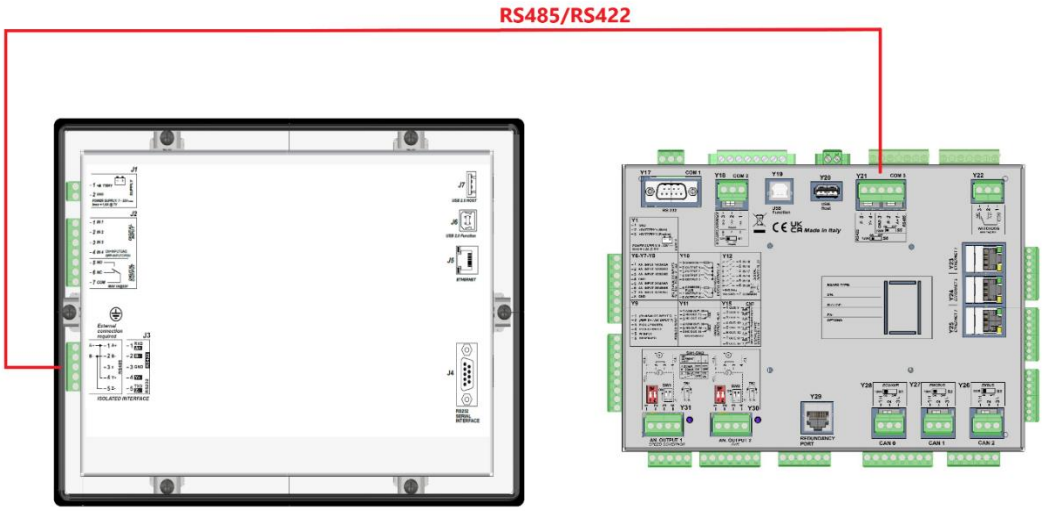
- By a RS485 Serial connection (Half-duplex)
- By a RS422 serial connection (Full duplex)

Supported protocols:

- Modbus RTU, in “master mode”.

The connection can be used for:

- Connection to GC800 SCM. Recommended baud rate 115200, to reduce the display response time.



Configure GC800 HMI in this way (refer par.5.4.2):

- Menu “SCM connection”
  - Parameter P.0301 (connection mode with GC800 SCM): set to “1-Serial port 2”.
  - Parameter P.0302 (Modbus address of GC800 SCM port #1-Y23): set to “1”.
  - Parameter P.0303 (Order of Modbus register of GC800 SCM port #1-Y23): set to “0-LSWF”.
  - Parameter P.0304 (password for command of GC800 SCM): set to “123”.

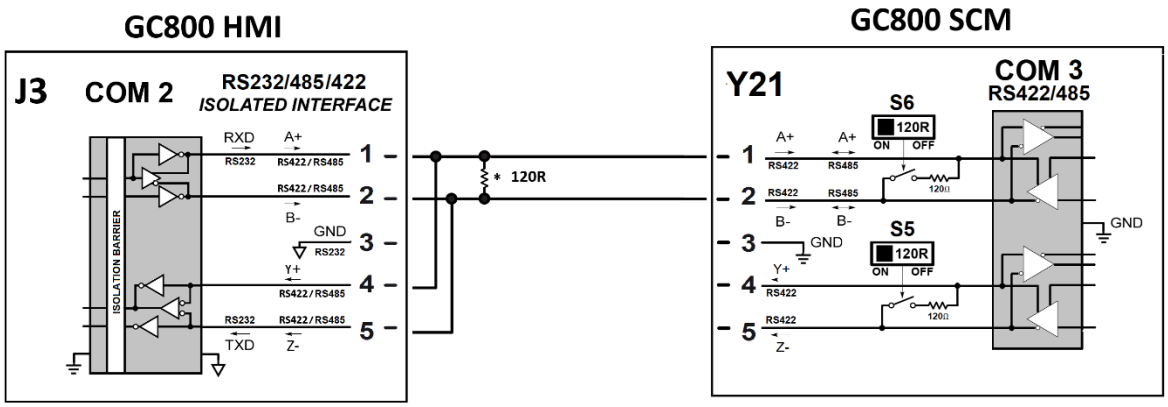
- Menu “Communication – Serial Port 2”
  - Parameter P.0473 (baud rate): “115200”.
  - Parameter P.0474 (setting): “0-8 bit, no parity, 1 stop”

Configure GC800 SCM in this way (Refer to “GC800 SCM - Technical Manual”):

- Menu “Communication – Serial port 3”
  - Parameter P.0651 (type of serial interface): set to “1-Serial port 2”.
  - Parameter P.0652 (Modbus address of GC800 SCM serial port #3): set to “1”.
  - Parameter P.0653 (baud rate of GC800 SCM serial port #3): set to “115200”.
  - Parameter P.0654 (setting of GC800 SCM serial port #3): set to “0-8 bit, no parity, 1 stop”.
  - Parameter P.0655 (Order of Modbus register of GC800 SCM serial port #3): set to “0-LSWF

6.2.1 Rs485 Mode

Connect the GC800 HMI's COM2 serial (J3) to the GC800 SCM's COM 3 serial (Y21) following the diagram below.



The RS485 line must be terminated with a 120 Ohm resistor on both ends. The resistor is already integrated in GC800 SCM but must be activated by using the S6 switch, located near J21.

The interface type is selectable via software by a controller parameter (P.0470). See paragraph 5.4.2.1 for settings. Configure GC800 HMI in this way (refer par.5.4.2):

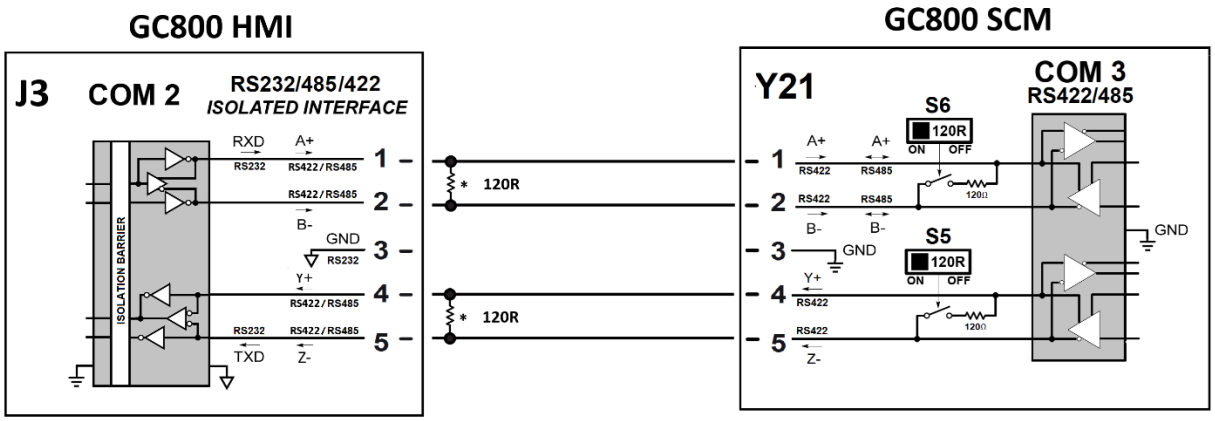
- Menu “Communication – Serial Port 2”
  - Parameter P.0470 (Connection mode): “1-RS485”.

Configure GC800 SCM in this way (Refer to “GC800 SCM - Technical Manual”):

- Menu “Communication – Serial port 3”
  - Parameter P.0653 (type of serial interface): set to “1-RS485”.

6.2.2 Rs422 Mode

Connect the GC800 HMI's COM2 serial (J3) to the GC800 SCM's COM 3 serial (Y21) following the diagram below.



The RS442 line must be terminated with a 120 Ohm resistor on both ends. The resistor is already integrated in GC800 SCM but must be activated by using the S6 and S5 switches, located near J21.

The interface type is selectable via software by a controller parameter (P.0470). See paragraph 5.4.2.1 for settings. Configure GC800 HMI in this way (refer par.5.4.2):

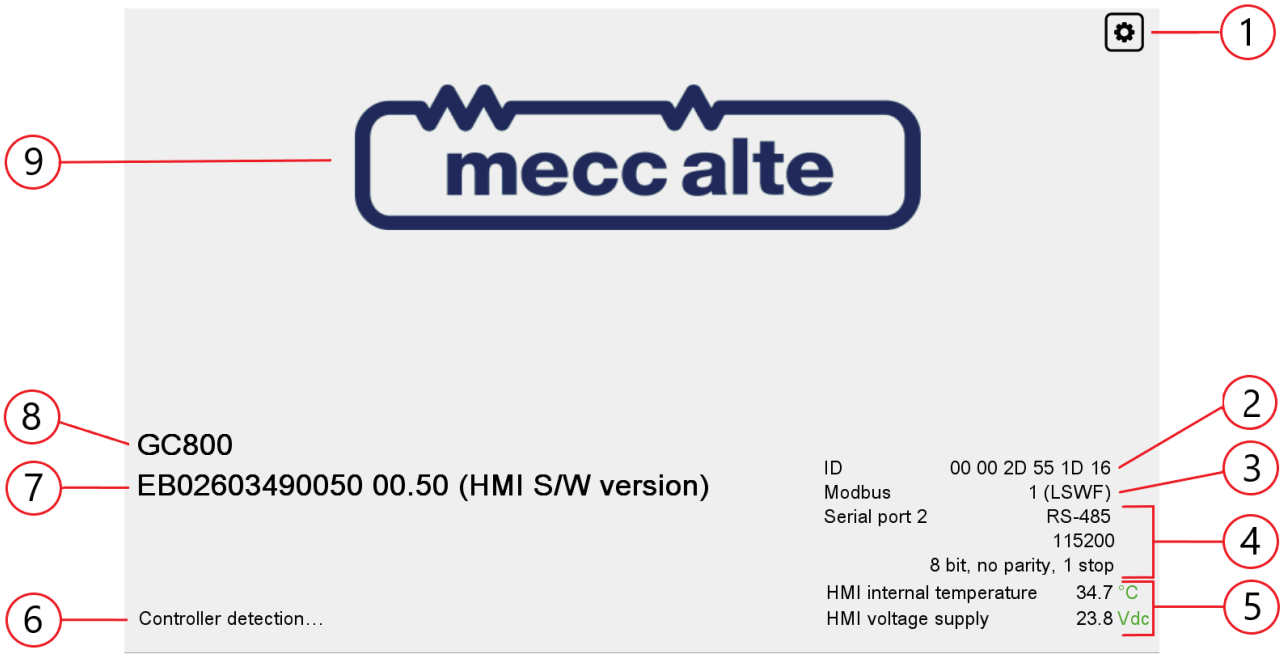
- Menu “Communication – Serial Port 2”
  - Parameter P.0470 (Connection mode): “2-RS422”.

Configure GC800 SCM in this way (Refer to “GC800 SCM - Technical Manual”):

- Menu “Communication – Serial port 3”
  - Parameter P.0653 (type of serial interface): set to “2-RS422”.

6.3 Startup screen

When the GC800 HMI is switched on, this home page is displayed. Here you can check the basic parameters required for connection with the GC800 SCM



1. **Configuration button:** A single tap on the configuration button ⚙ gives direct access to the parameter modification mode of GC800 HMI.
2. **ID**: unique identification code assigned to the GC800 HMI.
3. **Modbus**: Modbus register order.
4. **Type and configuration of the interface used by the GC800 HMI to communicate with the GC800 SCM controller:**
    - **Via serial connection**:
        - Serial port number.
        - Type o serial interface (RS232/485/422).
        - Baud rate, setting (parity, stop bits).
    - **Via ethernet connection**:
        - MAC address.
        - IP address of GC800 HMI, Subnet mask, Gateway address, DNS address.
        - IP address of GC800 SCM.
5. **HMI internal temperature and voltage supply**: the internal temperature measured by the sensor and the supply voltage.
6. **Controller detection:** indicates when GC800 HMI is searching for the GC800 SCM controller.
7. **FW version**: firmware version installed on the GC800 HMI.
8. **GC800**: device name.
9. **Manufacture logo**: Mecc Alte.

7 Configuration

The controller manages a relevant number of parameters. This chapter does not contain a list of all parameters (even if many of them are mentioned along the document). This chapter describes the general structure of the configuration and the basic knowledge required to deal with it.

INFORMATION: GC800 SCM allows to directly modify (on the display) its own parameters but also the parameters of the connected GC800 SCM.

WARNING: assigning an incorrect value to one or more GC800 SCM parameters can cause malfunctions, damage to things or injury to people. The parameters must only be changed by qualified personnel.

To avoid unintended modification, you can protect the configuration be passwords.

Mecc Alte identified four kinds of users:

- Mecc Alte (super-user) (only for GC800 SCM parameters).
- The panel builder (manufacturer).
- The installer.
- The final user.

The configuration can be completely read by each user: however, each kind of user can only modify a specific subset of the configuration, and it is possible to protect the access to that part by adding a password.

For GC800-SCM parameters only.

The “super-user” part of the configuration **is always password protected**. This part includes few parameters but very relevant to the application: unintended modification of the application type may result in damages (for example, changing from a “Drive” application to a “parallel” application). The “super-user” password is unique for each controller and is provided by Mecc Alte together with the controller itself. If you lose this password, you can get a copy by contacting Mecc Alte providing the ID number of the controller (reported on the back side and visible on GC800 HMI).

On demand, Mecc Alte can provide a secondary “super-user” password, only valid for 2 hours operation: you can provide this password to trusted people, allowing them to fully operate on the controller, but for limited time. To get this password, contact Mecc Alte providing both the ID number of the controller and the “internal code” (shown by GC800 HMI): this “internal code” will permanently change after two hours, making the password inefficient.

As “factory” default, there are no password for the other kind of users: thus, anyone can fully modify the configuration (except the “super-user” part). The controller provides three parameters for configuring passwords (their value “0” means no password):

- P.0001: for the manufacturer level.
- P.0002: for the installer level.
- P.0003: for the user level.

The controller provides an additional parameter (P.0000) acting as login. Once configured the password, if you want to modify the configuration, type your password in P.0000: the controller will compare it with the configured ones and will assign you a level among “super-user”, “manufacturer”, “installer”, “user” or “none”. Then, the controller grants you the access only to the relevant part of the configuration, depending on your level.

INFORMATION: the set access code remains in P.0000 memory for about 10 minutes after the last modification. After this period, it will be automatically reset, and you’ll have to set it again if need additional modifications.

Protection rules:

- A parameter associated to the “super-user” level can be modified by “super-users” only.
- A parameter associated to the “manufacturer” level can be modified by “manufacturers”, “super-users”.
- A parameter associated to the “installer” level can be modified by “installers”, “manufacturers”, “super-users”.
- A parameter associated to the “user” level can be modified by “users”, “installers”, “manufacturers”, “super-users”.

Obviously, it’s not possible to read back the password (once set) of a level higher than yours.

If a configured password gets lost, it is possible to reconfigure it by logging in with the higher-level password. For this reason, we advise against not setting at least the “manufacturer” password (P.0001): if, in effect, someone else sets P.0001 or another lower-level password (even only for distraction) without communicate it, it will be no longer possible to modify any parameter. By knowing the “manufacturer” password, it will be possible to nullify or modify the other passwords. Contact our service centre if the “manufacturer” password is lost.

INFORMATION: to modify the configuration, you can use the Mecc Alte tool (BoardPrg4), or you can operate directly on GC800 HMI (with some restriction). Both automatically disable (and shows in grey background) the part of configuration you are not allowed to modify. You will find security-related parameters in menu 1.1.

The following table describe your granted level in different password scenarios, assuming P.0000 (login) is not set:

P.0001 (manufacturer)	P.0002 (installer)	P.0003 (user)	Your level if P.0000 = “0”
0	0	0	Manufacturer
Set	0	0	Installer
X	Set	0	User
X	X	Set	None

7.1 Menu organization

Parameters are organized in a menu tree. The main menus are:

1) **SYSTEM**: it allows defining the electrical wirings and security.
3) **SCM CONNECTON**: it allows defining how the GC800 HMI is connected to the GC800 SCM.
4) **DEVICE:** it allows defining some controller options (screensaver, brightness…).
5) **COMMUNICATION**: it allows you to deeply configure each controller’s communication resource.
9) **LANGUAGE**: it allows selecting the language for the user interface.

7.2 Type of parameters

The controller manages the following types of parameters:

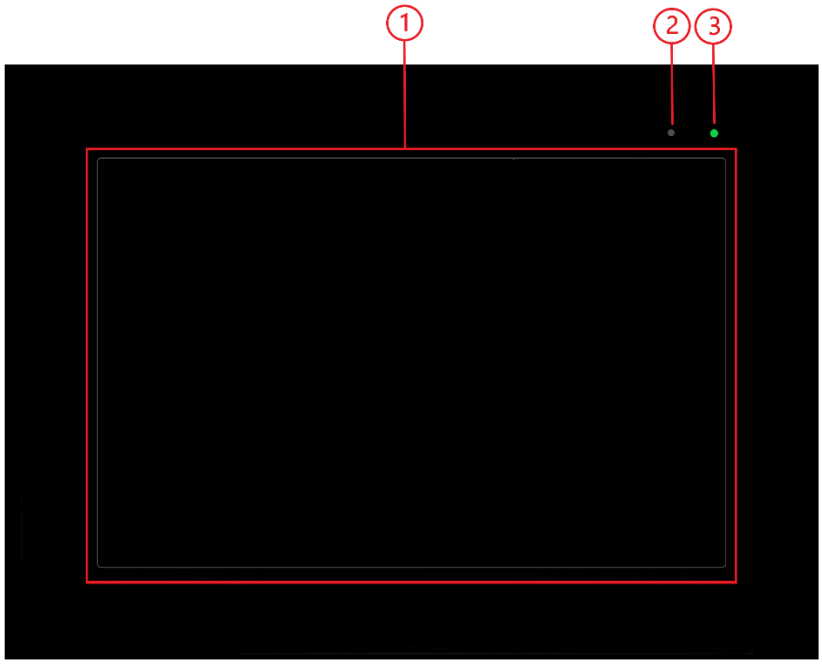
- Numeric: it allows to set values (with or without decimal part) between two limits.
- Numeric with selection among a predefined list of value (e.g., the genset baud rate for the serial ports).
- Numeric with selection among a predefined list of “number-description” couples (e.g., “generator AC wiring”).
- Time: it allows to select hours and minutes in the day (from 00:00 to 23:59). The controller does not allow to operate with AM/PM, always in 24 hours mode.
- String. It allows to type a description (for example the message for a user-defined alarm). Each string parameter has a predefined length (capacity).
- Bit-mapped: a single parameter including a group of Boolean options (on/off, usually sixteen options per parameter).
- Power factor: it allows to select:
  - Lagging: between 0.70 and 1.00.
  - Leading: between 0.80 and 1.00.

- IP addresses: allows to specify an IPv4 address.
- External file: it allows selecting an external file to be downloaded to the controller (for example for ECUs management). **This requires BoardPrg4.**

7.3 Set up limits.

The operator does not have to worry about verifying that the set value is acceptable for the controller since **it is not possible to set not acceptable values**. This is valid for each single parameter; it is possible, though, to set two or more parameters in contradictory or incompatible way. The operator oversees verifying that this does not happens.

8 Graphical User Interface



1. **Active display area, Active capacitive Touch Panel**.
2. **Ambient light sensor**
3. **Status LED:**

8.1 Touchscreen

The entire GUI device is operated using touchscreen (there is no physical buttons available). It uses the following gesture to move between pages, to provide access to all measurement and configuration data, to monitor and command the controller and other functions.

- Tapping:
  - the tap is the simplest gesture and is defined as a single tap on the touch area. It can be used to click on buttons, icons, areas, tabs, etc.
- Touching and holding:
  - the “touch and hold” gesture is defined by attaching the finger to the touch area and holding it for a certain predefined period. It can be used to commands, etc.
- Swiping:
  - the swipe gesture allows to move upwards, downwards, to the left, or to the right across the GUI.

8.2 Status LED

The status LED, located in the upper right corner of the GC800 HMI can take on different colours. It is used to indicate:

1. Blu LED blinking: normal operation
2. Yellow LED blinking: any warning active.
3. Red LED blinking: any shutdown or deactivation or unload active.

8.3 Multifunctional display

The GC800 HMI has special set of predefined screens. Each page has a different function, but a similar structure consisting of three main parts: a top status bar, a central area and a bottom status bar. Moving between pages can be done easily with a simple swipe gesture or directly using the customised button on the top bar.

8.3.1 TFT lighting

The backlight lamp is controlled by the controller, which switches off the backlight after a programmable time (P.0492) if the screen is not touched in the meantime. Touch the screen at any point to switch the lamp ON again. This function can be disabled by setting parameter P.0492 (Delay before switching off the lamp) to 0.

During engine starting phase, the lamp is automatically turned-off to reduce the power consumption of the controller board, to ensure greater autonomy for the controller itself in the event of critical conditions of the starter battery. To keep the lamp switched on during cranks, set bit 0 of parameter P.0495 (Keyboard-screen options).

8.3.2 Brightness adjustment

Depending on the environmental luminosity and/or temperature conditions, the brightness may require adjustment to view the display correctly. Two adjustment modes are available:

- Manual: move the slider, combined with parameter P.0497, to set the brightness value.
- Automatic: the value of the brightness is set automatically based on the light sensor in the front panel. This function can be enabled by setting bit 1 of parameter P.0495 (Keyboard-screen options).

8.3.3 Colour scheme

As a default, the controller shows all information on the display using a colour with a black background. However, it is possible to modify this logic using parameter P.0499 (Screen profile):

1. P.0499 = 0: black background.
2. P.0499 = 1: white background.

The colour of the messages depends on the background colour and on the type of information displayed.

8.3.4 Screen protections

8.3.4.1 Screen saver

The screen saver blanks the display screen and shows the manufacturer's logo in different positions after a programmable time (P.498) if the screen is not touched in the meantime. Touch the screen at any time to restore the previously displayed page. This function can be disabled by setting parameter P.0498 (Delay before screen saver) to 0.

8.3.4.2 Temperature

At very low temperatures information display slows down. By utilizing the thermometer, when the temperature falls under a very low threshold, the board keeps always the backlighting lamp on, that contributes to heat the display and therefore to increase its efficiency. The electronic components inside the controller have an extended working temperature range. Despite this, it is possible in critical ambient conditions that temperature goes out of this range.

The controller is provided with a hardware thermometer, for measuring its internal temperature which is shown at page “PLANT STATUS”. A protection, enabled if parameter P.0366 (High board temperature threshold) set other than zero, protects the board in the case of temperatures too high for its correct operation. If the temperature exceeds this configurable threshold, the controller forces “PLANT STATUS” page, shows the temperature in red and activates the horn for 3 seconds.

8.3.4.3 Power supply voltage

The controller shows the power supply voltage at page “PLANT STATUS”. A minimum and maximum value protection is always enabled but the thresholds are not configurable. The minimum threshold is fixed at 7,5 Vdc and the maximum at 32 Vdc. If the supply voltage exceeds one of these thresholds for 40 seconds (expect during engine start-up), the controller forces “PLANT STATUS” page, shows the temperature in red and activates the horn for 3 seconds.

8.3.5 Mode navigation

The display has different visualization modes composed by different pages. Generally, navigation among the modes happens by swapping the screen in the four directions (up/down/right/left). It is also possible to directly access the first page of the group using the dedicated button or select the requested page through the screen selection panel.

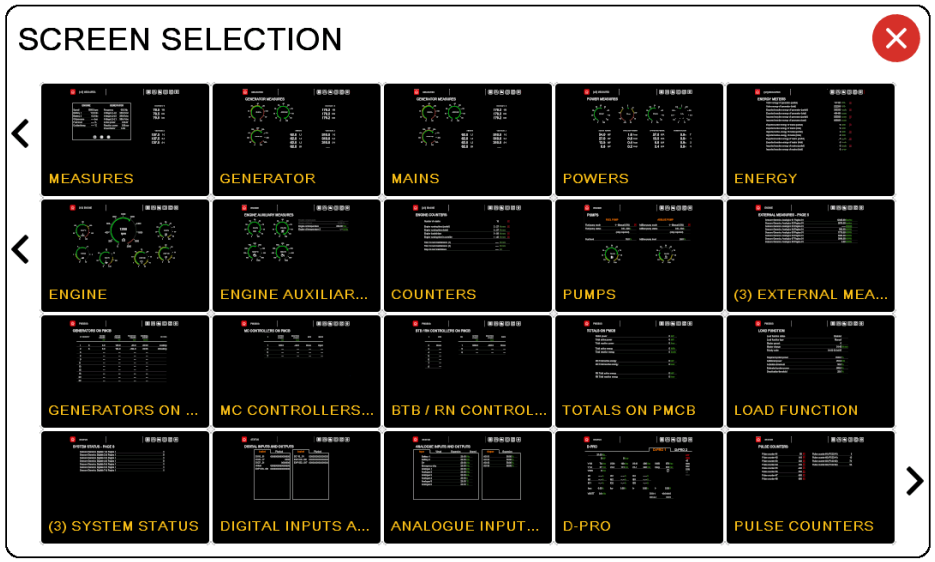
Mode	Description	Page identifier
	Screen selection panel	
MEASURES	Electrical measurements pages	
ENGINE	Engine measurements pages	
STATUS	Status information pages	
PMCB	Parallel functions pages	

The programming and history pages can only be accessed directly with dedicated buttons.

Mode	Description	Page identifier
HISTORY	History logs page	
PROGRAMMING	Programming page	

8.3.6 Screen selection panel

The screen selection panel is directly accessible with the dedicated button . The panel offers a preliminary view of the currently available screens. You can choose the desired page by scrolling your finger to the left or right or by pressing the side arrows appropriately.



8.3.7 Display area layout

The display area layout is a wide central area of the screen used to display data, gauges, measures, graphics and etc. See “Display mode” for a description of screens used.

8.3.8 Top status bar

The top status bar is visible on all screens and is divided into three sections or screen zone. It contains the icons status, command and information on navigation. The home button and navigation commands are always available.

1	**Home button**		A single tap on this button returns to the main screen.
	Page title	STATUS	Provides a description in the current language of the content of the page.
2	**Icons status**		Shows some relevant statuses of the controller using the following icons.
			Any shutdown, or deactivation or unload are active and flashes if they have not yet been acknowledged. A tap on this icon will open the alarm page.
			Any warning active and flashes if they have not yet been acknowledged. A single tap on this icon will open the alarm page.
			Data saving in progress.
			The USB stick is plugged in the GC800 HMI and/or GC800 SCM unit.
			Communication in progress through the Ethernet interfaces.
			Communication in progress through USB function ports.
			Any automatic start-up inhibition of the genset is active.
			Redundancy status (see “GC800 SCM technical manual [2]“ for more information):  MASTER / COMMAND  BACKUP / WATCH  MASTER / WATCH  BACKUP / COMMAND
3	**Navigation commands**		A single tap on one of these buttons is used to display the desired page.
			Shows the “screen selection panel”: a dialogue box with an overview of available screens, then it is possible to choose one of the desired pages.
			Select the first page of the measurement screens.
			Select the first page of the engine screens.
			Select the first page of the status screens.
			Select the history log page.
			Select the programming page.

8.3.9 Bottom status bar

The bottom status bar is visible on all screens and is divided into three sections or screen zone. It contains the wiring diagram of the current plant, **the status messages and the command to change the controller mode**.

1	**Wiring diagram**		Wiring diagram of the current plant.
			Status of the voltage on the mains: • White (or black): voltage/frequency off. • Yellow: voltage/frequency on out of tolerance. • Green: voltage/frequency on and in tolerance.
			Status of the voltage on the genset: • White (or black): voltage/frequency off. • Yellow: voltage/frequency on out of tolerance. • Green: voltage/frequency on and in tolerance.
			Status of the voltage on the loads: • Black (or black): voltage/frequency off. • Yellow: voltage/frequency on out of tolerance. • Green: voltage/frequency on and in tolerance.
			Open status of the MCB circuit breaker.
			Open status of the GCB circuit breaker.
			Close status of the MCB or GCB circuit breaker.

			Open and close command of the MCB circuit breaker. Available only in manual mode. To open Mains switch MCB, with the engine off, press and hold this button for at least 5 seconds. If synchronization is required for closing, by pressing this button, the synchronization sequence will be activated. When pressed during the parallel with other generators or the mains, it controls the immediate opening of MCB (there is no transfer of load on the generators before the opening of MCB). **WARNING!** the pressing of this button to request the closing of MCB may also involve the opening of the GCB switch (depending on the type of system and the status).
			Open and close command of the GCB circuit breaker. Available only in manual mode. Circuit breaker closure is only possible if the electric measures of the genset are within the bands of tolerance. If synchronization is required for closing, by pressing this button, the synchronization sequence will be activated. If pressed during the parallel with other generators or with the mains, it controls the opening of GCB by first carrying out the discharge of the active power of the generator: by holding it for more than a second, the power discharge phase is skipped. **WARNING!** the pressing of this button to request the closing of GCB may also involve the opening of the MCB switch (depending on the type of system and the status).
			Command to start the engine. Available only in manual mode.
			Command to stop the engine. Available only in manual mode or disabled if displayed in grey.
2	**Status messages**	"Mains fault protections"	Alternates current date and time with status messages (if any). Some of them can be displayed with a waiting time (countdown).
3	**Controller mode**		Manages the operating mode of the controller.
			The operating mode of the controller is forced, and it is no longer possible to use the panel or the serial port commands to change it.
		OFF	Shows the currently operating mode and a single tap on this button opens a dialog box with four additional buttons that allow to change controller functioning mode: • **OFF** • **MAN** • **AUTO** • **TEST** The mode cannot be changed if is displayed in grey.
			Factory logo.

8.4 Graphical Objects

The GC800 HMI has special set of predefined graphical objects to display the different measures of the controller to offer a dynamic display with enhanced visual impact.

8.4.1 Numerical measures

The following graphic objects are the simplest in the application, but also the most efficient when it comes to display many measures on the screen. They are divided into three parts displaying the name, value and unit of measurement (in green).

Depending on the type of measurement, the value can be displayed in the following formats:

- Numerical value

- Binary value

- Hexadecimal value

- MAC address or serial number

- Ethernet address

8.4.2 Counters

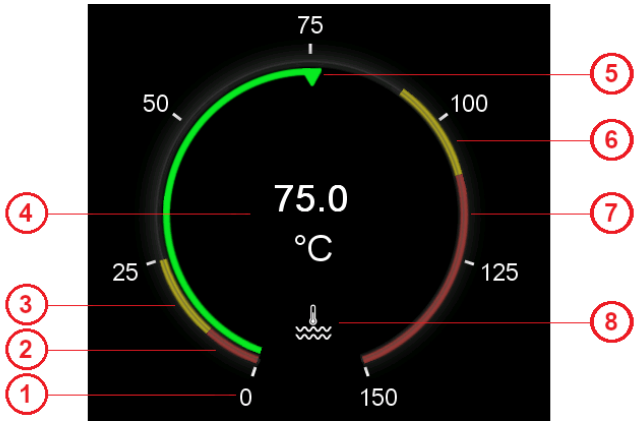
This is the graphic object used to represent the value of counters as well as having the possibility of resetting them to zero. It is divided into four parts that show the name of the counter, the value, the unit of measurement (in green) and the edit symbol . This symbol is displayed in red on resettable counters only or in grey if you do not have access rights (e.g. wrong password). To reset the counter, simply tap the edit symbol and a pop-up window will open with an indication of the counter to be reset and a request for confirmation or rejection.

Set points

This is the graphic object used to represent and modify the value of any set points. It is divided into four parts that show the name of the set-point, the value, the unit of measurement (in green) and the modify symbol . A single tap on this symbol will open a pop-up window allowing the new set point value to be set. Edit symbol is displayed in grey if you do not have access rights (e.g. wrong password) or if disabled according to the plant configuration.

8.4.3 Gauge

Guage is the graphic object used to represent electrical and engine measurements in relation to its minimum and maximum limits.



8. **Measuring scale** is the graduated scale consisting of a succession of equally spaced notches (called strokes) distributed along the length of the scale. Usually, the strokes are numbered in ascending order but some types of gauges have a central zero in order to display both positive and negative value.

9. **Minimum value** of the measurement (red) is the ratio between the minimum value threshold and the nominal value of the measurement.

10. **Low value** of the measurement (yellow) is the ratio between the low value threshold and the nominal value of the measurement.

11. **Actual value** of the measurement is the real value in numerical format and its unit of measurement.

12. **Measuring needle** is the index that graphically represents the value of the measurement. Depending on its value, the colour with which the needle and the bar are filled is green if the measure is in tolerance, red if it is out of tolerance (for alarm) or yellow if the measure is out of tolerance (warning).

13. **High value** of the measurement (yellow) is the ratio between the high value threshold and the nominal value of the measurement.

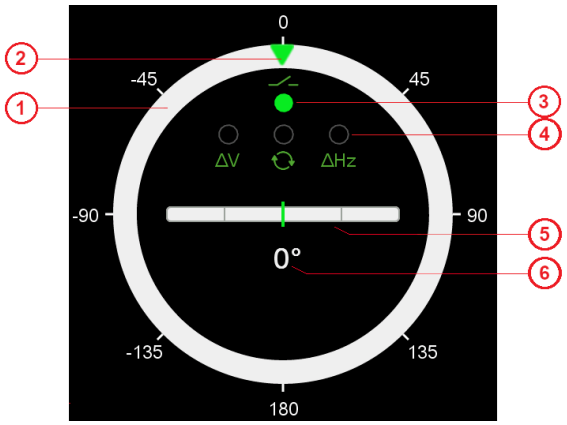
14. **Maximum value** of the measurement (red) is the ratio between the maximum value threshold and the nominal value of the measurement.

15. **Icon** is used to identify the measurement displayed by the gauge. The following icons are currently used:

	Engine speed		Engine speed
	Oil pressure		Coolant pressure
	Oil level		Coolant level
	Oil temperature		Coolant pressure
	Fuel level		AdBlue level
	Fuel temperature		Exhaust gas temperature (left manifold)
	Fuel pressure		Exhaust gas temperature (right manifold)

8.4.4 Synchronoscope

Synchroniser is the graphic object that allows to show the phase, frequency and voltage differences between the generator and the mains/bus bar as well as the synchronization conditions. It is used in the "Synchronization" page.



1. **Synchronizer scale** is the graduated phase shift scale. It has a central zero to display phase shift limits from -180° to 180°.

2. **Phase needle** indicates the phase shift between the generator and the mains/bus bar.

3. **Synchronization** when is green indicate that all synchronization conditions are respected, and the controller controls the closing of the switch.

4. **Synchronization wrong condition** when is red indicate that one or more conditions are not respected. Each dial refers to an incorrect voltage (ΔV), or wrong phase sequence or an incorrect frequency (ΔHz).

5. **Synchronizer zoom** shows the phase shift limits from -20° to 20°. The cursor position details the frequency/ voltage difference between the generator and the mains/bus bar when close to the synchronisation point.

6. **Actual value** of the phase shift is the real value in numerical format and its unit of measurement.

8.5 Display mode

8.5.1 Electrical measurements

All the information on the measurements taken by the controller on the electric lines are shown in this mode. It is identified with the title “MEASURES”, and you can scroll through the various pages by sliding your finger to the left or right. The following pages are predefined in the controller but some of them are always available while others depend on the system configuration (i.e. AVR pages are only visible if a series of standard information are acquired via CAN-BUS from the automatic voltage regulator).

1. Home
2. Generator measurement
3. Mains measurement
4. Bus/bars measurement
5. Loads measurement
6. Powers measurement
7. Energy meters
8. Three-phase sequences
9. Synchronization
10. Parallel data
11. Automatic Voltage Regulator

8.5.1.1 Home page

This is the main page of the system and contains the most important measurements (both electrical and engine measurements). It can be called up from any other page via the Home button (top left of the page). Positioned on the right-hand side of the screen, the gauge shows the engine speed while on the left-hand side the measurements are displayed in a two-column list. Using three option buttons, the desired combination can be selected:

1. Engine and Generator measurement
2. Currents and Powers measurement
3. Mains/Bus-bars and generator measurement

8.5.1.2 Generator measurement

This page shows the main electrical measures acquired from the generator. The information really displayed depends on the single-phase / two-phase / three-phase configuration and whether the neutral line is connected or not connected to the system. However, the page always displays three gauges showing the frequency, average voltage and total active power of the generator.

- Single-phase system. The controller displays the phase voltage, the neutral-battery voltage and the current.

- Two phases system with neutral connected to the controller. The controller displays the two concatenated voltages and the neutral-battery voltage, the phase voltage and the two currents.
- Three phases system with neutral connected to the controller. The controller displays the three concatenated voltages and the neutral-battery voltage, the three phase voltages, the sense of rotation and the three currents.
- Three-phase system without neutral. The controller displays the three concatenated voltages, the three currents and the sense of rotation.

Depending on the system configuration, neutral current, auxiliary current, toroid current and differential current can also be displayed.

8.5.1.3 Mains measurement

This page shows the main electrical measurements acquired from the mains and uses a structure identical to the previous one. The page is only displayed according to the system settings.

8.5.1.4 Bus/bars measurement

This page shows the main electrical measurements acquired from the bus/bars and uses a structure identical to the previous one. The page is only displayed according to the system settings.

8.5.1.5 Loads measurement

This page shows the main electrical measurements acquired from the loads and uses a structure identical to the previous one. The page is only displayed according to the system settings.

8.5.1.6 Powers measurement

This page shows the powers of the plant and is divided into two sections or screen zone.

In the high area are the gauges displaying the totals of active, reactive and apparent power and the power factor.

In the lower zone, the single and total phase values of active, reactive and apparent power and the power factor are displayed in tabular form.

8.5.1.7 Energy meters

This page displays the energy counters managed by the controller. Counters for active energy (partial and total) and reactive energy (partial and total) counters both exported and imported.

Resetting this counter is possible using the dedicated button but they are protected with the password configured by parameter P.0001 (protection level: user). If a password has been configured in P.0001, to be able to reset the counters, it must first be entered (login) in parameter P.0000 ("access code").

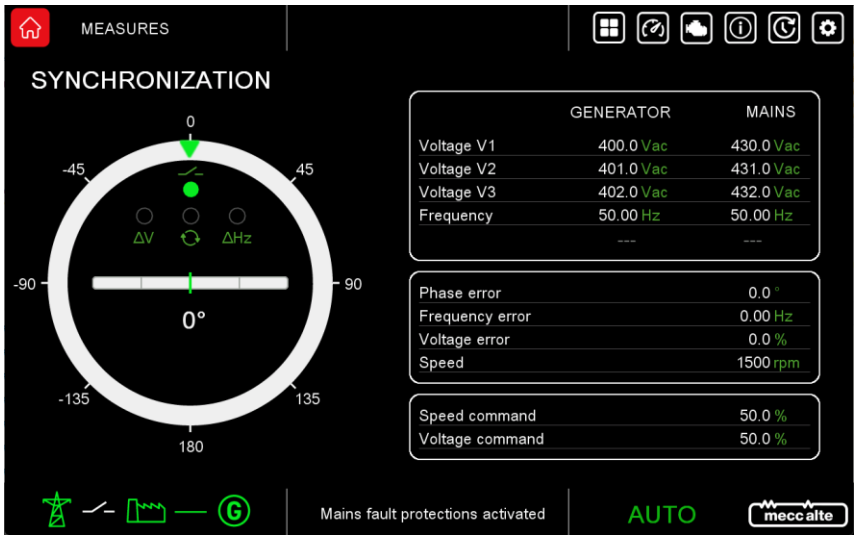
8.5.1.8 Three phase sequence

This page shows some addition voltage and current measures for generator and mains or bus/bars, but it is not available for single-phase systems. The following measures are displayed:

- Zero sequence vectors of voltages and currents.
- Positive sequence vectors of voltages and currents.
- Negative sequence vectors of voltages and currents.

8.5.1.9 Synchronization page

This page shows the necessary information for the synchronization.

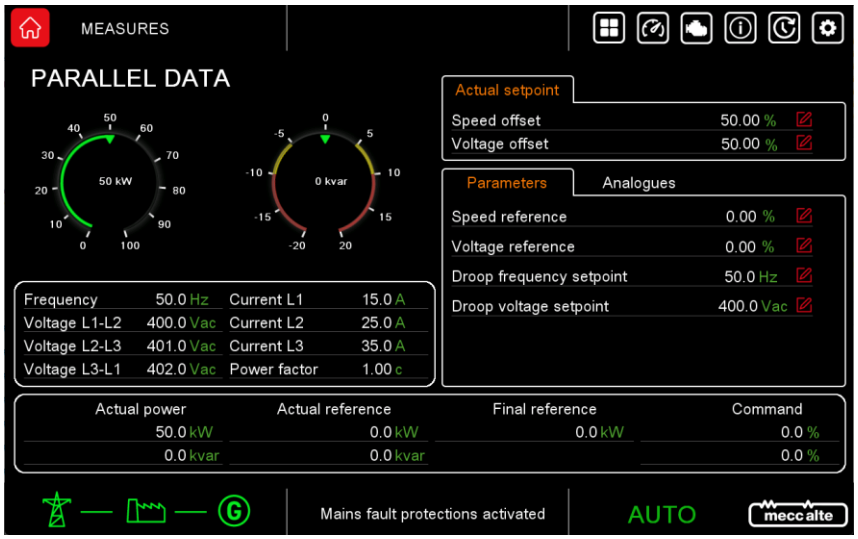


On the left side, the controller displays a gauge which graphically shows a synchronoscope, indicating the current difference of phase through a needle.

On the right side, the controller displays three panels. The first one shows the current value of voltage, frequency and rotation sense of genset and mains/bars. The second one shows the difference of phase, frequency and voltage between genset and mains/bars, besides the engine rotation speed. On the last one there are command values for the two regulators.

8.5.1.10 Parallel data

This page shows useful information when the genset is in parallel with the mains or with other gensets.



On the left side of the screen, the controller displays two gauges which graphically shows the total active and reactive power supplied by the generator. Below them, GC800-HMI shows:

- The frequency of the generator.
- The three phase-to-phase voltage of the generator.
- The three currents of the generator.

- The power factor and the cos(ϕ) (this latter one only for applications in parallel with the mains).

In the lower part of the page, the controller shows the active and reactive power reference value (if available when the generator is in parallel with the mains or with other generators). They are instantaneous values; the controller should act to ensure that the generator delivers exactly that active and reactive power. They are calculated from instant by instant, by applying any configured loading and unloading phases: for this reason, the controller also displays the final reference for the active power, which is what the generators will have to deliver at the end of loading and unloading phases.

On the right side, the first box shows and allows to change (in just one point) the adjustable setpoints for speed and voltage offset related to the regulators. The second box shows and allows to change all the adjustable parameters and/or all setpoints acquired by analogue inputs related to voltage and speed regulators. The setpoints are displayed only if they are used in the current plant configuration greyed out if not used in the mode currently being displayed (i.e. acquired from analogue but currently used as a parameter).

8.5.1.11 Automatic Voltage Regulator (AVR)

It contains a series of standard information (J1939-75) acquired via CAN-BUS from the automatic voltage regulator. The amount of information available depends on the type of device to which you are connected. Information not available is not displayed. The number of pages displayed therefore depends on the actual information transmitted by the voltage regulator.

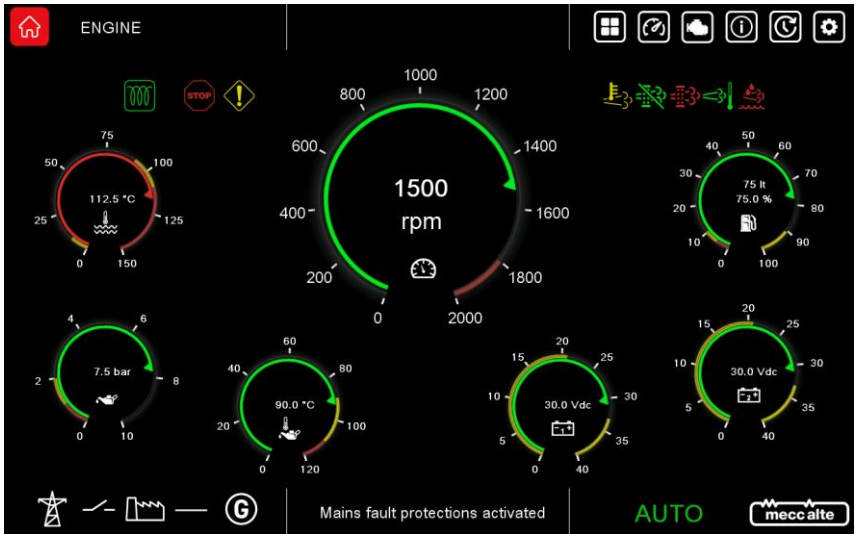
In addition, the controller supports the management of external configuration files that describe the CAN-BUS communication with the automatic voltage regulators. These files may include the definition of one or more pages for the display, dedicated to displaying the specific measures / states of that device (usually when they do not follow the J1939-75 standard). The controller offers up to six pages. The title of each page is defined in the configuration file for the voltage regulator, as well as the number of measurements shown and their description. Attention: since the descriptions are defined in the external file, they do not adapt to the language selected on the controller (typically they are in English).

8.5.2 Engine measurements

The engine related measurements and parameters are shown in this mode. The number of displayed pages and the display of some parameters can vary depending on the engine type (J1939, MTU o without communication interface). It is identified with the title ENGINE, and you can scroll through the various pages by sliding your finger to the left or right. The following pages are predefined in the controller but some of them are always available while others depend on the system configuration (i.e. CAN_BUS pages are only visible if a series of standard information are acquired via CAN-BUS).

1. Engine dashboard
2. Engine auxiliary measures
3. Engine counters
4. Fuel and AdBlue pumps
5. External measures
6. Engine control unit (ECU) measures
7. TIER4 / STAGE V measures
8. Exhaust gas treatment
9. AFR (Air Fuel Ratio)

8.5.2.1 Engine dashboard



This page displays main measurements for engine detected by the analogue sensors or directly by the engine control unit (ECU) via CAN-BUS. It looks like an engine dashboard, where the speed gauge is placed in the centre and surrounded by smaller gauges that manage the coolant temperature, oil pressure, oil temperature, battery voltages and fuel level. If some of these measures are not available, they are shown with dashes and in grey foreground.

In addition, this page shows all the standard warning lights (lamps) activated either by the engine control unit or by the automatic voltage regulator. This information is acquired via CAN-BUS and the lamps displayed are:

	SPN 1081 (“WAIT TO START LAMP”). It is necessary to wait for the engine control unit to finish the preliminary operations before the engine can be started.
	SPN 623 (“RED STOP LAMP”). The engine control unit (or the voltage regulator) is signalling on the CANBUS the presence of a diagnostic code (therefore a problem) that prevents its operation.
	SPN 624 (“AMBER WARNING LAMP”). The engine control unit (or the voltage regulator) is signalling on the CANBUS the presence of a diagnostic code (therefore of a problem) which at the moment does not prevent its operation.
	Indicates that the regeneration of the diesel particulate filter is inhibited following explicit command. It is usually displayed in solid yellow (it is a state, not an anomaly). If, however the condition remains for a long time and the soot level in the filter becomes extremely high, the ECU activates a diagnostic code with red lamp (icon with a STOP sign shape) and stops the engine: in this case the icon becomes red (fixed or flashing, like red lamp). It is linked to SPN 3697 (“DIESEL PARTICULATE FILTER LAMP COMMAND”) or 6915 (“SCR SYSTEM CLEANING LAMP COMMAND”). Only for DST4602 Evolution, if regeneration is in progress it is displayed in green.
	Indicates that regeneration of the diesel particulate filter is required. It is yellow. It is fixed (not blinking) if the quantity of particulate in the filter is above the "regeneration request" threshold but below the warning threshold. It becomes flashing if it is above the warning threshold. It is related to SPN 3703 (“DIESEL PARTICULATE FILTER ACTIVE REGENERATION INHIBITED DUE TO INHIBIT SWITCH”) or 6918 (“SCR SYSTEM CLEANING INHIBITED DUE TO INHIBIT SWITCH”).
	SPN 3698 (“EXHAUST SYSTEM HIGH TEMPERATURE LAMP COMMAND”). It signals a high temperature (real or possible) in the emissions management system (HEST – High Emission System Temperature), probably because regeneration is in progress or about to start: the ECU could apply a reduction in engine performance (derating). It is yellow, not flashing.

	SPN 5245 (“AFTERTREATMENT DIESEL EXHAUST FLUID TANK LOW LEVEL INDICATOR”). Indicates a low level of the Diesel Exhaust Fluid (DEF) tank. It can be steady if the level is below normal, flashing if the low level determines a power derating.
	Indicates that the engine emissions system has a malfunction or is working outside the standard operating conditions. It is yellow, it can be fixed or flashing. It is related to SPN 1213 ("MALFUNCTION INDICATOR LAMP") and 3038 ("FLASH MALFUNCTION INDICATOR LAMP").

Note: the controller forces this page to be displayed every time a lamp is activated.

8.5.2.2 Engine auxiliary measures

This page shows other quantities for the engine management, when they are acquired using the analogue inputs of the controller. If the same measurements are acquired using the CANBUS connection, they are displayed on other pages. This page is automatically hidden if none of the following measures are available:

- coolant level (AIF.1210 or AIF.1211 functions in the configuration of the analogue inputs).
- oil level (AIF.1200 or AIF.1201 functions in the configuration of the analogue inputs).
- air temperature in the intake duct (AIF.1601 function in the configuration of the analogue inputs).
- turbocharger pressure (AIF.1641 function in the configuration of the analogue inputs).
- exhaust gas temperature (left bank) (AIF.1603 function in the configuration of the analogue inputs).
- exhaust gas temperature (right bank) (AIF.1605 function in the configuration of the analogue inputs).

If some of these measures are not available, they are hidden.

8.5.2.3 Engine counters

This page contains various counters which concern the engine:

- Number of cranks counter (resettable to zero).
- Counter of operating hours (resettable to zero).
- Counter of operating hours (total, not resettable to zero).
- Counter of load operating hours with GCB closed (resettable to zero)
- Counter of operating hours in OVERRIDE (resettable).
- Counter of the remaining hours to maintenance 1 (not resettable).
- Counter of the remaining hours to maintenance 2 (not resettable).
- Days remaining and date for the next maintenance (not resettable).

Resetting this counter is possible using the dedicated button but they are protected with the password configured by parameter P.0001 (protection level: user). If a password has been configured in P.0001, to be able to reset the counters, it must first be entered (login) in parameter P.0000 ("access code").

8.5.2.4 Fuel and AdBlue pumps

This page is available only if at least one output is configured for the fuel pump or AdBlue pump management. The right-hand side of the screen shows the fuel pump and the left-hand side the AdBlue pump. The following information is the same for both pumps:

- The current managing mode of the pump (MAN-OFF, MAN-ON, AUTO).

- The pump status (on/off).
- An indication of the level referred to the pump management (required starting, required stop, in hysteresis).
- The current fuel/fluid level in the tank.
- A gauge that graphically indicates the current fuel/fluid level, including start/stop thresholds of the pump.

Using the dedicated button , it is possible to change the pump managing mode from this page, without going to programming.

8.5.2.5 External measures

These pages are dedicated to the displaying of the measurements acquired from the analogue inputs configured as "generic sensor". The operator has the possibility to acquire measures that are not in any way linked to the board, and to show them on the display. It can also group them and display them on one of the eight available pages.

The page uses one line for each configured input: it shows the text configured for the analogue input, followed by a measure and its units (in green). If more than 16 inputs are configured, it is possible to scroll through the hidden ones via a scrollbar (maximum 32 inputs per page are supported).

If there are no configured inputs on a page, the page is not displayed.

8.5.2.6 Engine control unit (ECU) measures

It contains a series of standard information (J1939) acquired via CAN-BUS from the engine control unit. The number of information available depends on the type of control unit to which you are connected. Information not available is not displayed. The number of pages displayed therefore depends on the actual information transmitted by the engine control unit.

8.5.2.7 TIER4 / STAGE V measures

The right-hand side of this page shows the “DPF regeneration” and the left-hand side the “Emission level exceedance”.

8.5.2.7.1 DPF Regeneration

The controller fully supports the TIER4 (US) and STAGE V (EU) directives concerning generators emissions. This page displays the fundamental states in the management of the filter regeneration and allows you to inhibit or force the regeneration of the particulate filter. In fact, it allows you to modify parameter P.0446 directly, without entering the programming menus.

8.5.2.7.2 Emission levels exceedance

It contains a series of standard diagnostic information (J1939-DM32) concerning the exceeding of the emission levels, acquired via CAN-BUS from the engine control unit. The controller displays this page only if the ECU transmits this diagnostic information.

A maximum of eight diagnostic information is managed, each of which contains:

- The SPN code, that identifies the engine component causing or having the problem.
- The FMI code, that identifies the type of problem.
- The time (in hours) from here this diagnostic code is active.
- The time (in hours) that this diagnostic code has been active in the past.
- The remaining time (in hours) to the derating of the engine performances.

If two or more codes are active at the same time, they are alternated on the display every two seconds.

8.5.2.8 Exhaust gas treatment

It contains a series of standard information (J1939) acquired via CAN-BUS from the engine control unit, concerning emissions management (AFTERTREATMENT). The number of information available depends on the type of control unit to which you are connected. Information not available is not displayed. The number of pages displayed therefore depends on the actual information transmitted by the engine control unit.

8.5.2.9 AFR (Air Fuel Ratio)

This page is dedicated to the management of the AFR, the control of the air/gas mixture for gas engines. The page is displayed only if the management of the AFR is enabled.

The following information are showed on the left side of the page:

- The manual position for the mixer and the MAN/AUTO command (modification is possible by using)
- The AFR status indicates with the following abbreviations that allow you to understand under what conditions the system is operating:
    - **"2ND"**: during engine cranking and in no-load operation the controller uses the alternative position setpoints.
    - **"CH4"**: the position of the mixer during cranking is determined by the percentage of methane in the gas (P.1311 = 1).
    - **“PID”**: the regulation loop on the AFR-IN measurement is active.
    - **"DB"**: the regulation loop on the AFR-IN measurement is suspended because the regulation error is very small (dead band).
    - **"UD_DB"**: The controller is not activating UP and DOWN commands to adjust the position of the mixer because the position error very small (dead band).
    - **“DRT”**: a derating of the generator power setpoint is active due to a high temperature of the air/gas mixture (MAT).
    - **“CORR”**: the setpoint correction for the AFR-IN is active due to temperature of the air / gas mixture (MAT).
- The correction of the setpoint for the position of the mixer, calculated with the PLC as a function of an external quantity (temperature or other)
- The power supplied by the generator (as kW and as %). If the generator is working in parallel to the grid, it also shows the final setpoint for the active power (which can be reduced in the case of high temperature of the air/gas mixture - MAT).
- The temperature of the air/gas mixture (MAT, if available).
- The percentage of methane in the gas (CH4, if available).
- The AFR-IN measurement is displayed with the unit of measurement set in the configuration of the analogue input that acquires it. When the generator is supplying a power higher than the threshold P.1333, the controller also shows the setpoint for this value, calculated from the table and the active power supplied (the regulation PID operates on this setpoint).
- The actual position of the mixer (if available), together with its setpoint.
- The position of the actuator controlled by the speed regulator (if it is not available, the command of the controller is displayed).

On the right side of the screen, a graphic and a table showing the setpoints for regulation (maximum seven points). For each point they show:

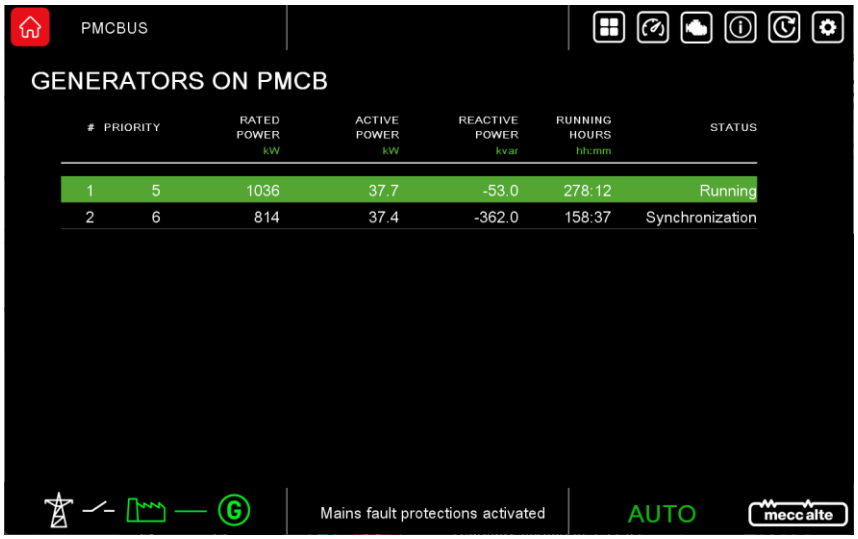
- The generator power (%).
- The equivalent value in kW.
- The corresponding setpoint for the AFR-IN measurement (mBar).

8.5.3 Measurement from CAN-BUS PMCB

The measurement of the statuses acquired by the CAN-BUS PMCB, which connects among them all Mecc Alte devices are shown in this mode. It is identified with the title PMCB, and you can scroll through the various pages by sliding your finger to the left or right. The following pages are predefined in the controller and all pages of this mode are only shown if the CAN-BUS PMCB is enabled (P.0800 <> 0).

1. Generators on PMCB
2. Mains controllers on PMCB
3. BTB / RN controllers on PMCB
4. Total counters on PMCB
5. Load function

8.5.3.1 Generators on PMCB



This page shows the significant data of each genset that operates on the PMCB can bus and shows up to eleven gensets at the same time, but if your plant uses more than that, you can use a scroll bar to see the others (maximum 31 gensets are supported). It is used one line for each controller, which contains the PMCB address, the priority, the rated power, the active power, the reactive power, the running hours and the status. Inside the list, the genset that manages data is highlighted with a green background.

8.5.3.2 Mains controllers on PMCB

This page shows the significant data of each mains controllers (MC) that operates on the PMCB can bus and shows up to eleven controllers at the same time, but if your plant uses more than that, you can use a scroll bar to see the others (a maximum 16 MC are supported). It is used one line for each MC, which contains the PMCB address, the active power, the reactive power, the MCB and MGCB circuit breaker status.

8.5.3.3 BTB / RN controllers on PMCB

This page shows the significant data of each bus tie breakers (BTB) and renewable controllers (RN) that operates on the PMCB can bus. It shows up to eight controllers at the same time. One line is used for each BTB, which contains the PMCB address and circuit breaker status (BTB), and one line for each RN which contains the PMCB address, active power, reactive power and circuit breaker status (RNCB).

8.5.3.4 Totals on PMCB

This page shows the totals calculated on all controllers connected on CAN-BUS PMCB. The following are shown:

- The total nominal power of the supplying gensets (kW).
- The total active power supplied (kW).
- The total reactive power supplied (kvar).
- The total active energy (kWh, sum of energy counters).
- The total reactive energy (kvar, sum of energy counters).

8.5.3.5 Load function

This page is dedicated to the "load management" function. The term "load management" refers to the capacity of the system to start/stop the generators to have the strictly necessary running generators to supply the users (with a little margin, but not too much). This page shows all relevant information for this function. The displayed information is:

- The enabling for this board of the "load management" function.
- The currently selected "load management" mode (determining the criterion by which the generators to be started are chosen).
- The "master" generator (it is the generator with highest priority, the one that should never be stopped). For some "load management" modes this information is not displayed.
- Depending on the selected mode, the board can display in how many hours and minutes the system will select a new "master" generator.
- The list of addresses of the generator control boards, ordered by priority (first the generators with higher priority, the ones that will be stopped last). If the currently selected load function mode is “4-Manual priority” and there are different gensets with the same priority, they are enclosed into round brackets to highlight that they will be started/stopped tighter. For some "load management" modes this information is not displayed.
- The power supplied by the generators (percentage of the maximum power the currently supplying generators can withstand).
- The threshold (%) to be compared with the power calculated in the previous point, beyond which a new generator should be started (or it is necessary to switch to the higher combination of generators at rated power level)
- The power supplied by the generators (percentage of the maximum one) calculated if the generator with lowest priority is stopped (or that the combination of generators having the lowest rated power is stopped).
- The threshold (%) to be compared with the power calculated at the previous point, below which the generators with the lowest priority should be stopped (or it is necessary to switch to the lower combination of generators at a rated power level).

8.5.4 Status information

The information on the system status is shown in this mode. It is identified with the title STATUS, and you can scroll through the various pages by sliding your finger to the left or right. The following pages are predefined in the controller but some of them are always available while others depend on the system configuration (i.e. Pulse counter page is only the controller is configured as pulse-counter).

1. Plant status
2. Alarm and warning list
3. Communication status
4. Ethernet status
5. Generic sensors
6. Digital inputs and outputs status

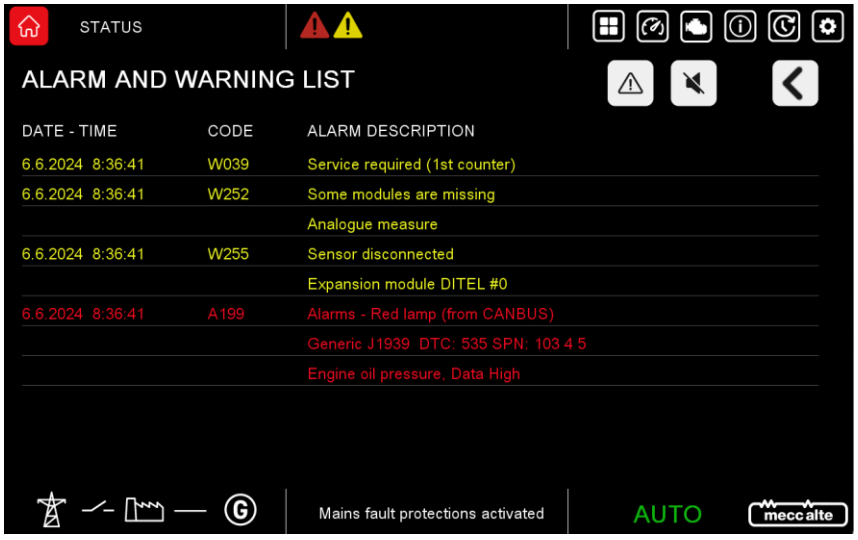
7. Analogue inputs and outputs status
8. D-PRO
9. Pulse counters

8.5.4.1 Plant status

The left side of this page shows the system status information (part of this information is also shown on the bottom status bar). The right side contains a lot of information related to GC800 controller:

- Date/time in extended format (complete with seconds and day of the week based on the currently selected language). Date and time of the controller is also always visible without seconds on the bottom bar and is alternate with other status messages (if any).
- The icon is used as an indication of the current daylight-saving-time (summer-time).
- The temperature inside the GC800-SCM and GC800-HMI.
- The power supply voltage of GC800-HMI.
- The serial number of the board.
- GC800-SCM main firmware version.
- GC800-SCM secondary firmware version.
- GC800-HMI firmware version.
- The "internal code": this number should be provided to MeccAlte along with the serial number to get the temporary password for the modification of parameters. This password is valid for 2 hours of engine running: after this time a new "internal code" is generates, which therefore makes the old password void.

8.5.4.2 Alarm and warning list



This is automatically displayed in case a new anomaly arises or can be called up from another page by pressing the alarm icons on the top status bar. It shows the alarm history in the form of a table, from the most recent fault to the oldest. The anomaly flashes until it has not been acknowledged yet and is yellow if is a warning or red in the other types of alarm. Each line of the alarm history is divided into three columns showing the following information:

DATE-TIME: the date and time of appearance of the anomaly

CODE: the alphanumeric code identifying the anomaly, composed as follows:

- A letter identifying the type of it:
  - “A”: alarm.
  - “D”: deactivation.
  - “U”: unload.
  - “W”: warning.

- Three digits numeric code that uniquely identify the anomaly.

ALARM DESCRIPTION: the alphanumeric description, based on the currently selected language, which in some cases can be customized through the controller parameters.

Usually, each fault uses just one line of the display; but some anomalies can show additional diagnostic information on the second line. Some anomalies with additional diagnostic information are:

- 211 ("PMCB: shared input written by multiple devices"). It shows an additional message that identifies the type, the number of the shared input and the PMCB address of the controller that is writing it.
- 273 (“incoherent parameters”). It shows an additional message helping to understand the problem.
- 252 (“some modules are missing”). It shows an additional message that identifies the configured expansion module, but that does not communicate with the controller.
- 253: (“some analogue measures are missing”). It shows an additional message that identifies the acquisition channel and the expansion module from which we expect to receive a measure, which is lacking instead.
- 254 (“duplicated address”). It shows an additional message that identifies the type and the address of the expansion module that is connected twice to the controller.
- 255 (“connection interrupted with a sensor”). It shows an additional message that identifies the channel of acquisition and the expansion module which is sending the information of “broken wire”.
- 900 (“incoherent parameters on PLC”). It shows an additional message helping to understand the problem.

Three lines are used for special anomalies 198 and 199 ("yellow light" and "red light" from CAN-BUS). In this case the controller shows also the diagnostic codes received from the extern electronic device (Engine Control Unit, Automatic Voltage Regulator). For each diagnostic code it is shown:

- The name of the external device who generated it.
- The SPN code (it is a code defined by the SAE J1939 standard, which identifies the mechanical component that is having the problem) (if available).
- The FMI code (it is a code defined by the SAE J1939 standard, which identifies the type of problem) (if available).
- How many times this diagnostic code has been activated (OC) (if available).
- The alarm code specific for the connected external device (DTC) (if available).
- An alphanumeric description (the same in English) of the problem (if available).

If one or more of the previous types of information are not available, they are replaced by dashes or not displayed. If there are more active diagnostic codes at the same time, they are cyclically alternated on the display every 2 seconds. The diagnostic codes are stored (even if the external device deactivates them) until the operator acknowledges the “yellow/red lamp from CAN-BUS” warnings.

The buttons in the top right-hand corner allow the alarm status to be managed:

	It allows to reset the alarms.
	It allows to disable the siren, when pressed while the siren is activated. It allows to "Recognize" the presence of anomalies, if pressed while the siren is not active. "Recognized" early warnings will be automatically deleted if the cause is no longer present.
	Return to the previously viewed page.

8.5.4.3 Communication status

This page is dedicated to the status of the serial communication towards serial ports, USB (Function / Host) and CAN-BUS interfaces. It is possible to select which controller to be displayed via the selection tab (GC800-SCM or HMI).

CAN-BUS interface available are:

- CAN0: dedicated to communication with engine electronic controls (ECU and AVR).
- CAN1: dedicated to communication with the other boards (PMCB).
- CAN2: dedicated to communication with expansion modules (EXBUS).

For each interface, the following statuses are available:

- DISABLE: CAN-BUS interface disabled by programming.
- ERROR-ACTIVE: normal operations.
- ERROR-PASSIVE: the hardware interface is working, but there are problems in communication.
- BUS-OFF: Genset has interrupted the connection to the CAN-BUS due to too many errors.

For each interface, the actual and the maximum value of the transmission and reception error counters are shown with the possibility of resetting them using the dedicated button.

8.5.4.4 Ethernet status

This page is dedicated to the status of the communication via TCP/IP on the Ethernet interfaces. It is possible to select which controller to be displayed via the selection tab (GC800-SCM or HMI). For each interface, it shows:

- The serial number of the board.
- The MAC address of the physical net interface.
- The IP address of the controller, the address of the router/gateway, the Subnet-mask and the DNS server address. Those values can be the ones set with the parameters of the controller, or those dynamically acquired by server DHCP.
- The IP address of the remote controller (only for GC800-HMI view).
- The number of active connections.
- The status of the connections.

The following statuses are available:

- “Idle”: no ongoing communication and Ethernet cable disconnected.
- “Idle - linked”: no ongoing communication and cable connected to Ethernet network.
- “Communication in progress” ongoing communication and cable connected to Ethernet network.

8.5.4.5 Generic status

These pages are dedicated to the view of the generical statuses acquired through the digital inputs, configured as "generic statuses". The operator has the possibility to acquire the digital status information that are not in any way

related to the functioning of the board and shown on the display. It can also group them (by any standard) and display them on one of the eight available pages.

The page uses one line for each configured input: it shows the text configured for the digital input, followed by the logic status of the input ("1" or "0"). If more than 16 inputs are configured, it is possible to scroll through the hidden ones via a scrollbar (maximum 32 inputs per page are supported).

If there are no configured inputs on a page, the page is not displayed.

8.5.4.6 Digital input and output status

This page shows the status of digital inputs and outputs in two separated tables.
On the left table there are digital inputs (DI), analogue inputs used as digital (DI 27…21), virtual digital inputs (DV), expansion board digital inputs (EXP) and shared digital inputs (DS). On the right table there are digital outputs (DO) and expansion board digital outputs (EXP).

Using selection tab, it is possible to view the inputs in two different ways:

- LOGIC STATE: The controller shows the input's logic level (active or inactive) used in the management of the operating sequence.
- PHISICAL STATE: The controller shows the electrical level (active or inactive, or high or low) really present on the input; this can be the opposite in comparison to the corresponding logic state.

8.5.4.7 Analogue input and output status

This page shows the status of analogue inputs and outputs in two separated tables. All measurements are identified by name, value and unit (in green).

The left-hand table is reserved to analogue input and is possible to select the desired type using a selection tab. The available types are analogue inputs, virtual analogue inputs (AV), expansion board analogue inputs (AI EXP) and shared analogue inputs (AS). The measurement acquired by the expansion modules can be replaced by:

- "------" if the expansion module does not transmit the measurement.
- "OPEN": if the module signals that the sensor is disconnected.
- "+OVER": if the module signals that the input signal has a too high value, symptom of a fault.
- "-OVER": if the module signals that the input signal has a too low value, symptom of a fault.

The right-hand table is reserved to analogue outputs and is possible to select the desired type using a selection tab. The available types are analogue outputs (AO) and expansion board analogue outputs (AO EXP).

8.5.4.8 D-PRO

This page is only available for compatibility with older products.

This page is shown only if the controller is configured to communicate via CANBUS with any D-PRO protection relay. It shows all measurements received by the protection relay and the status of the protections configured using the following colours:

- The protection number is in grey if the specific protection is disabled by a D-PRO digital input
- The protection number is in black (or white) if the specific protection is enabled but it has not triggered now
- The protection number is in red and in reverse if the specific protection has triggered

A selection tab allows to select D-PRO1 or D-PRO2.

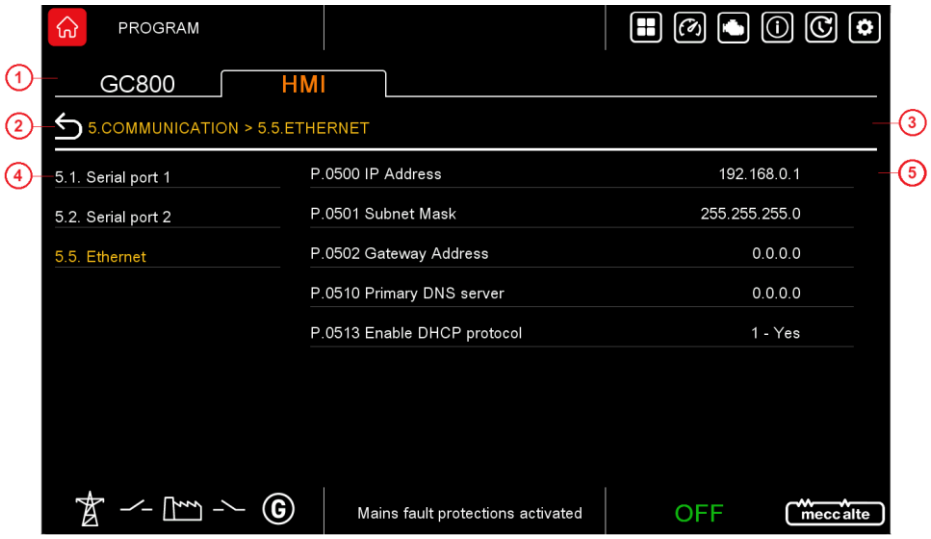
8.5.4.9 Pulse counters

This page is displayed only if the controller is configured as pulse-counter or is configured to communicate via CANBUS with a PC22 expansion module. This page shows the values of the configured counters and the possibility of resetting them using the dedicated button .

8.5.5 Programming

8.5.5.1 Programming structure

Here is described the general structure of the programming and the operating procedure which allows to read and/or modify the parameters.



1. **Programming selection tab** is used to select the specific programming to be displayed between remote controller (GC800) or local interface (GC800 HMI) or Firmware Update.
2. **Previous menu:** this arrow allows you to return to the previous menu of the programming structure.
3. **Menu title** identifies the name of the displayed menu and its path.
4. **Menu** is the list of available menus.
5. **Parameters** is the list of available parameters.

8.5.5.2 Access to programming

The programming is accessible in any operation status of the controller. A single tap on the configuration button gives direct access to the parameter modification mode.

8.5.5.3 Menu selection

The name of the current menu (i.e. “5. COMMUNICATION”) is always shown in the “title line” [3]. The lines of the “menu area” [4] are used to view the menu items, that is, the submenus.

A single tap on one of the menu items selects the submenu. In turn, the new submenu may contain other submenus (i.e. “5. COMMUNICATION > 5.5 ETHERNET”) or parameters. In this case, the list of available parameters will be displayed in the “parameter area” [5] and the menu name will be highlighted in dark yellow.

Tapping “previous menu arrow” [2] allows you to leave parameters list or menu and going back to the previous one.

8.5.5.4 Parameter list

The lines of the “parameters area” [5] are used to view a list of all available parameters for the selected menu, with the possibility of scrolling through the hidden ones via a scrollbar. Each items shows:

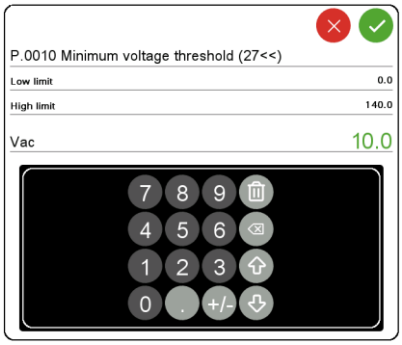
- univocal parameter code (“P.” and four decimal digits) followed by the description in the current language
- value of the variable
- unit of measurement (if required) in green.

8.5.5.5 Modification of a parameter

A parameter cannot be changed if displayed in grey. In this case, it could be necessary to set a suitable password.

Once the parameter has been found, a simple tap on its value is all that is required to start editing it. Depending on the type of parameter, an appropriate setting dialog box will open. There are the following types of parameters.

8.5.5.5.1 Numeric parameters

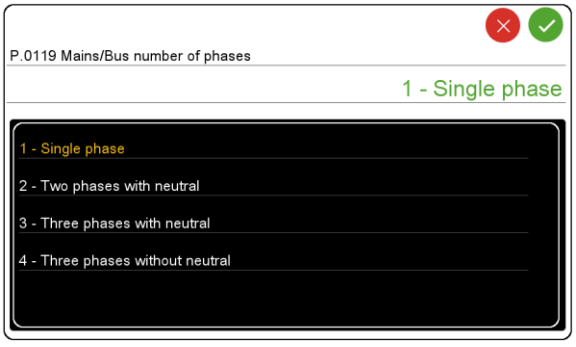


These parameters are managed as number. It is possible to set the value using the numeric keypad, according to its limits. The value is also modifiable using ▲▼ digits, respectively to increase or decrease the value of one unit. While confirming the new value, a check is made for consistency with the setting limits: if incorrect, the set value is highlighted in red.

Time setting is handled in the same way except that the controller manages setting limits between 00:00 and 23:59.

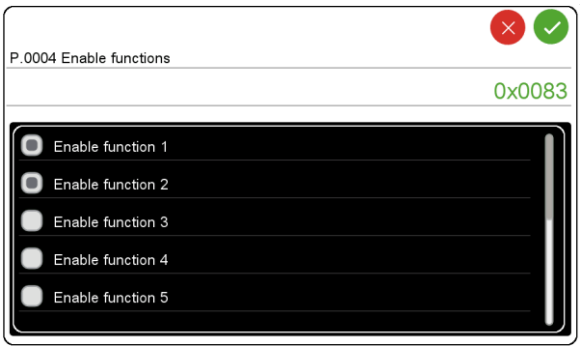
Ethernet address setting is handled in the same way except that the controller manages setting limits between 0.0.0.0 and 255.255.255.255.

8.5.5.5.2 Numeric parameters with selection among a list



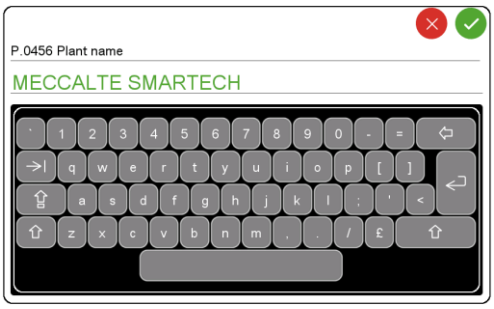
These parameters allow the value to be selected from a predefined list. Once the desired value has been found and selected, a single tap is all it takes to confirm the new value with the green tick.

8.5.5.5.3 Bit parameters



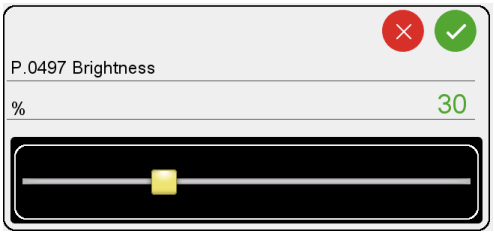
These parameters are managed in bit. It is possible to activate/deactivate the individual bit with a simple tap on the associated option button. Each bit at 1 enables a function and each bit at 0 disables a function. Up to 16 bits can be used. A hexadecimal value is attributed to each bit. The parameter is set with the result of the sum of the hexadecimal values linked to the functions enabled.

8.5.5.5.4 String parameters



These parameters are managed as string and is possible to use the keyboard to select the characters. Depending on the language set in the system, the keyboard used will also be adapted (i.e. if the language set is Arabic, then the Arabic keyboard will be used).

8.5.5.5.5 Slide parameters



This parameter is used to manage the brightness of the screen. Decrease the brightness (darken) by moving the yellow slider to the left or increase the brightness (lighten) by moving to the right. Finally, a single tap to the green tick to confirm the new value.

8.5.5.6 Exit from programming

Touching one of the other of the other navigation buttons will exit the programming menu.

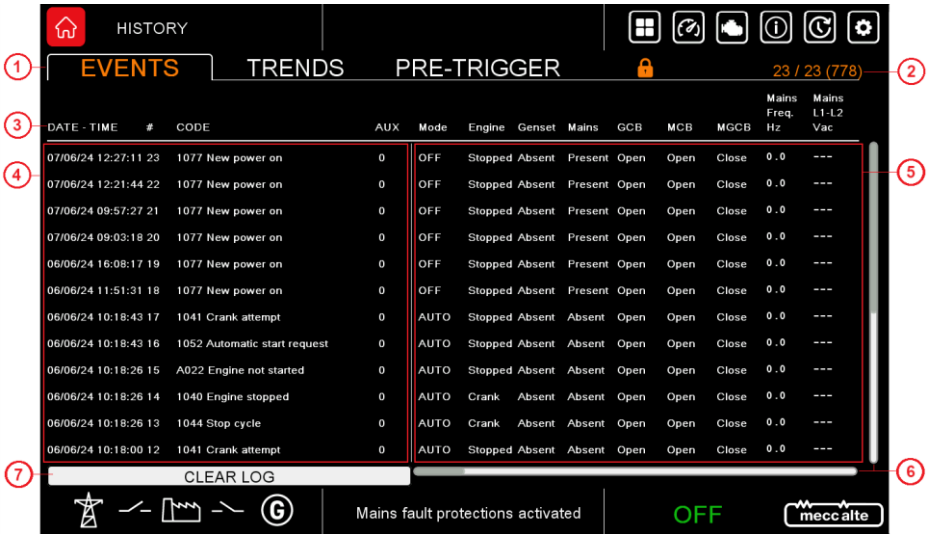
8.5.6 History logs

The controller supports three types of logs:

- **EVENTS**: when something happens in the plant, a new event is added to this archive.
- **TRENDS**: periodically, a new event is added to this archive.
- **PRE-TRIGGER:** when a generic or specific protection trips, events are recorded for a specified time. The purpose is to give the operator the situation before and after the trip of a specific protections.

8.5.6.1 History log structure

The general structure of these three types of history logs is similar and is described here.



16. **History selection tab** is used to choose which log to display between events or trends or pre-trigger.

17. **History counters** show which event is currently displayed, the total number of recorded events and the maximum size of the archive. The most recent event is associated to the highest number.
    History log lock. A flashing orange lock is used to indicate that records are locked. The board does not perform recordings in the archives if it is in OFF mode and when an alarm, a deactivation or an unload have been activated.

18. **History column title** identifies the name of the displayed history fields.

19. **History log common data** identifies archive fields common to all records. Each line shows the recording date/time, the event index, any auxiliary data and, for event archive only, the event code and its description (variable depending on the selected language).

20. **History log configurable data** identifies archive fields that depends on the information configured for the record. Through BoardPrg4 program, it is possible to select which other information must be registered at every event. The capacity of the archive depends on how many information are memorized at every event. If the archive is full and a new event occurs, the less recent is overwritten.
    The information that was not available at the time of recording are displayed with dashes

21. **History log scroll bars** allow to scroll through events in chronological order (vertical bar) or according to recorded fields (horizontal bar). It is also possible to highlight a record with a simple tap, which may be useful to fix an important event before scrolling with the bars. The selected record will be displayed with an orange background.

22. **History log clear command** allows to delete all data in the archive. A request for confirmation is made via a dialog box.

8.5.6.2 Access to history logs

The history logs page is accessible in any operation status of the controller. A single tap on the history button gives direct access to the archives.

8.5.6.3 Exit from history logs

Touching one of the other of the other navigation buttons will exit the archives.

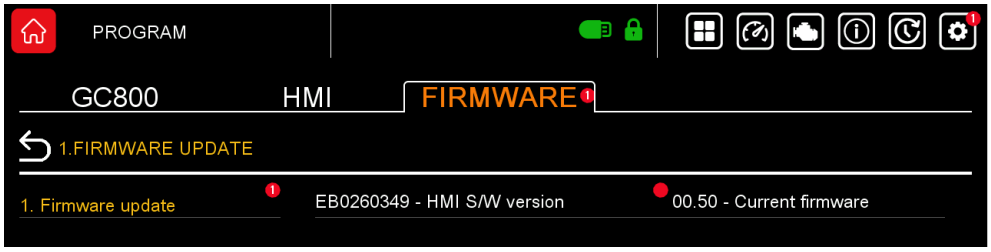
8.6 Language selection

The device allows to select the language to use for all writings displayed on the multifunctional viewer. Currently, 3 languages are supported and directly available: English, Italian and Arabic (English as default). To choose the preferred language, enter to the HMI programming and select the '9-Language' menu and then change the 'Language' parameter.

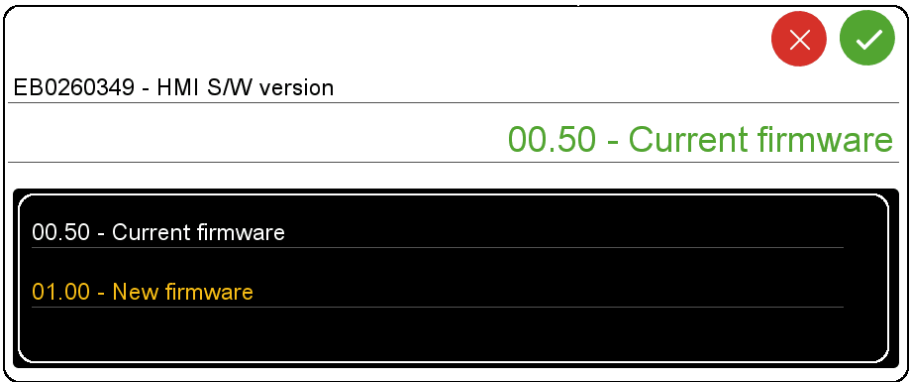
8.7 Firmware update procedure

Loading/replacing the firmware of the device is a specific operation and it requires a particular procedure and special programs and normally this procedure must be carried out by qualified personnel. The firmware is only updated when the controller is in OFF mode and can be done by connecting to a PC or using an USB stick. In the first case, as soon as the transfer of the firmware from the PC to the controller is finished, the update starts automatically. In the second case, the operator can manually decide when to upgrade it.

Just plug the pen drive with the desired firmware in the root directory. If there is a newer firmware than the one currently loaded on the controller, GC800 HMI will indicate via a red dot with a number inside (counting the new firmware on the USB stick) the sequence of operations to follow to get to the "Firmware update" menu:



A simple tap on the current value will open the following dialog box. Select the new firmware and confirm with the green tick to start firmware update:



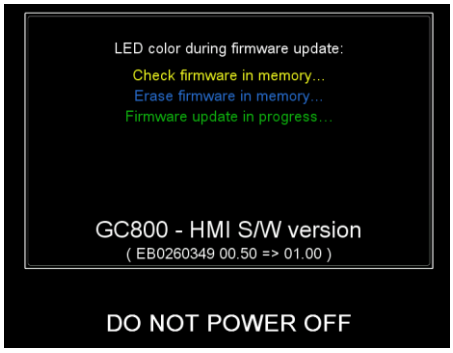
The update wizard will evolve with appropriate display pages showing the various steps:

- Read file from USB stick to verify if correct

- Copy firmware from USB stick to memory
- Check firmware in internal memory
- Execute firmware update

8.7.1 GC800 HMI firmware update

During the execution of the firmware update on the HMI board, the progress status is indicated on the front LED using a colour code. When completed, the led will be white and the controller will reboot automatically. If the procedure fails, the controller will freeze with a steady red led (please contact service).



- Yellow flashing led: check firmware in memory
- Blue flashing led: erase firmware in memory
- Green flashing led: firmware update in progress

WARNING! Do not remove the USB stick.

WARNING! Do not switch off the controller.

WARNING! Do not disconnect the controller from the power supply

8.7.2 GC800 SCM firmware update

During the execution of the firmware update on the SCM board, the progress status is indicated by the animated wait symbol on an appropriate page. When finished, a new page will indicate:
- if the procedure was successful: the string 'Firmware update competed' will appear combined with a green tick
- if the procedure was not successful: the string 'Firmware update failed' will appear combined with the red tick.

A simple tap on the tick is enough to restart the controller.

WARNING! Do not remove the USB stick.

WARNING! Do not switch off the controller.

WARNING! Do not disconnect the controller from the power supply

MECC ALTE SPA (HQ)

Via Roma
20 – 36051 Creazzo Vicenza – ITALY

T: +39 0444 396111
F: +39 0444 396166
E: info@meccalte.it
aftersales@meccalte.it

MECC ALTE PORTABLE

Via A. Volta
1 37038 Soave
Verona – ITALY

T: +39 0456 173411
F: +39 0456 101880
E: info@meccalte.it
aftersales@meccalte.it

MECC ALTE POWER PRODUCTS

Via Melaro
2 – 36075 Montecchio
Maggiore (VI) – ITALY

T: +39 0444 1831295
F: +39 0444 1831306
E: info@meccalte.it
aftersales@meccalte.it

ZANARDI ALTERNATORI

Via Dei Laghi
48/B – 36077 Altavilla Vicenza – ITALY

T: +39 0444 370799
F: +39 0444 370330
E: info@zanardialternatori.it

UNITED KINGDOM

Mecc Alte U.K.
LTD 6 Lands' End
Way Oakham
Rutland LE15 6RF

T: +44 (0) 1572 771160
F: +44 (0) 1572 771161
E: info@meccalte.co.uk
aftersales@meccalte.co.uk

SPAIN

Mecc Alte España S.A. C/
Rio Taibilla, 2
Polig. Ind. Los Valeros 03178
Benijofar (Alicante)

T: +34 (0) 96 6702152
F: +34 (0) 96 6700103
E: info@meccalte.es
aftersales@meccalte.es

CHINA

Mecc Alte Alternator (Nantong) Ltd
755 Nanhai East Rd
Jiangsu Nantong HEDZ 226100
People's Republic of China

T: +86 (0) 513 82325758
F: +86 (0) 513 82325768
E: info@meccalte.cn
aftersales@meccalte.cn

INDIA

Mecc Alte India PVT LTD Plot
NO: 1, Talegaon Dhamdhere
S.O.
Taluka: Shirur,
District: Pune - 412208
Maharashtra, India

T: +91 2137 673200
F: +91 2137 673299
E: info@meccalte.in
aftersales@meccalte.in

U.S.A. AND CANADA

Mecc Alte Inc. 1229
Adams Drive
McHenry, IL, 60051

T: +1 815 344 0530
F: +1 815 344 0535
E: info@meccalte.us
aftersales@meccalte.us

GERMANY

Mecc Alte Generatoren GmbH
Bucher Hang 2
D-87448 Waltenhofen

T: +49 (0)831 540755 0
E: info@meccalte.de
aftersales@meccalte.de

AUSTRALIA

Mecc Alte Alternators PTY LTD 10
Duncan Road, PO Box 1046 Dry
Creek, 5094, South Australia

T: +61 (0) 8 8349 8422
F: +61 (0) 8 8349 8455
E: info@meccalte.com.au
aftersales@meccalte.com.au

FRANCE

Mecc Alte International S.A.
Z.E. la Gagnerie
16330 St. Amant de Boixe

T: +33 (0) 545 397562
F: +33 (0) 545 398820
E: info@meccalte.fr
aftersales@meccalte.fr

FAR EAST

Mecc Alte (F.E.) PTE LTD
10V Enterprise Road, Enterprise 10
Singapore 627679

T: +65 62 657122
F: +65 62 653991
E: info@meccalte.com.sg
aftersales@meccalte.com.sg

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