

POWER FROM WITHIN

MC400 CONTROLLER

SMARTECH[®]
A DIVISION OF MECC ALTE

USER'S MANUAL

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1 Introduction.

The manual must always be available in a safe place for quick reference. Operators and technicians (doing routine and periodic maintenance) should read it carefully, understanding every paragraph. If the manual is lost or damaged, ask the installer/manufacture for a copy, indicating the model of the controller, its code, serial number and year of manufacture.

2 Safety information.

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

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

This manual contains the following indications:



WARNING! it is used for risks which, unless avoided, can cause malfunction or damage to property or persons.



INFORMATION! the message includes useful information for the development of the operation, or procedures clarifications.

3 Information concerning disposal.



INFORMATION! 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. Old electrical and electronic equipment should be recycled in a facility authorized to process these items and dispose of the components. Contact your local authority for information on where and how to deliver such products to the authorized site nearest you. Proper recycling and disposal help conserve resources and prevents detrimental effects for health and the environment.

4 Forward.

This manual describes the MC400 controller. It is a MAINS controller and is used in application composed by multiple gensets. Its main task is controlling the MAINS and the MCB circuit breaker. When needed it can send start signal to all available gensets and connect all of them to the loads through the MGCB circuit breaker. It can synchronize the gensets (all together) with the MAINS before closing MCB/MGCB. In parallel to MAINS application, it can also manage the power setpoints for the gensets. It can also manage power transfer from the MAINS to the generators and vice-versa.

5 Definitions.

ALARM: it indicates a fault that is dangerous for the loads: the controller immediately opens the proper circuit breakers (MGCB and/or GCBs) to insulate the loads from the gensets.

UNLOAD: it indicates a fault that is not immediately dangerous for the loads: if possible, the controller first unloads the power from the generators and then opens the MGCB and/or GCBs.

WARNING: it indicates a fault that does not prevent prevents the generators from operating but requires some actions by the operator.

MCB: it indicates the circuit breaker used to connect the public MAINS to the loads.

GCBs: it indicates the circuit breakers used to connect the generators to the parallel bars.

MGCB: it indicates the circuit breaker used to connect the parallel bars to the loads.

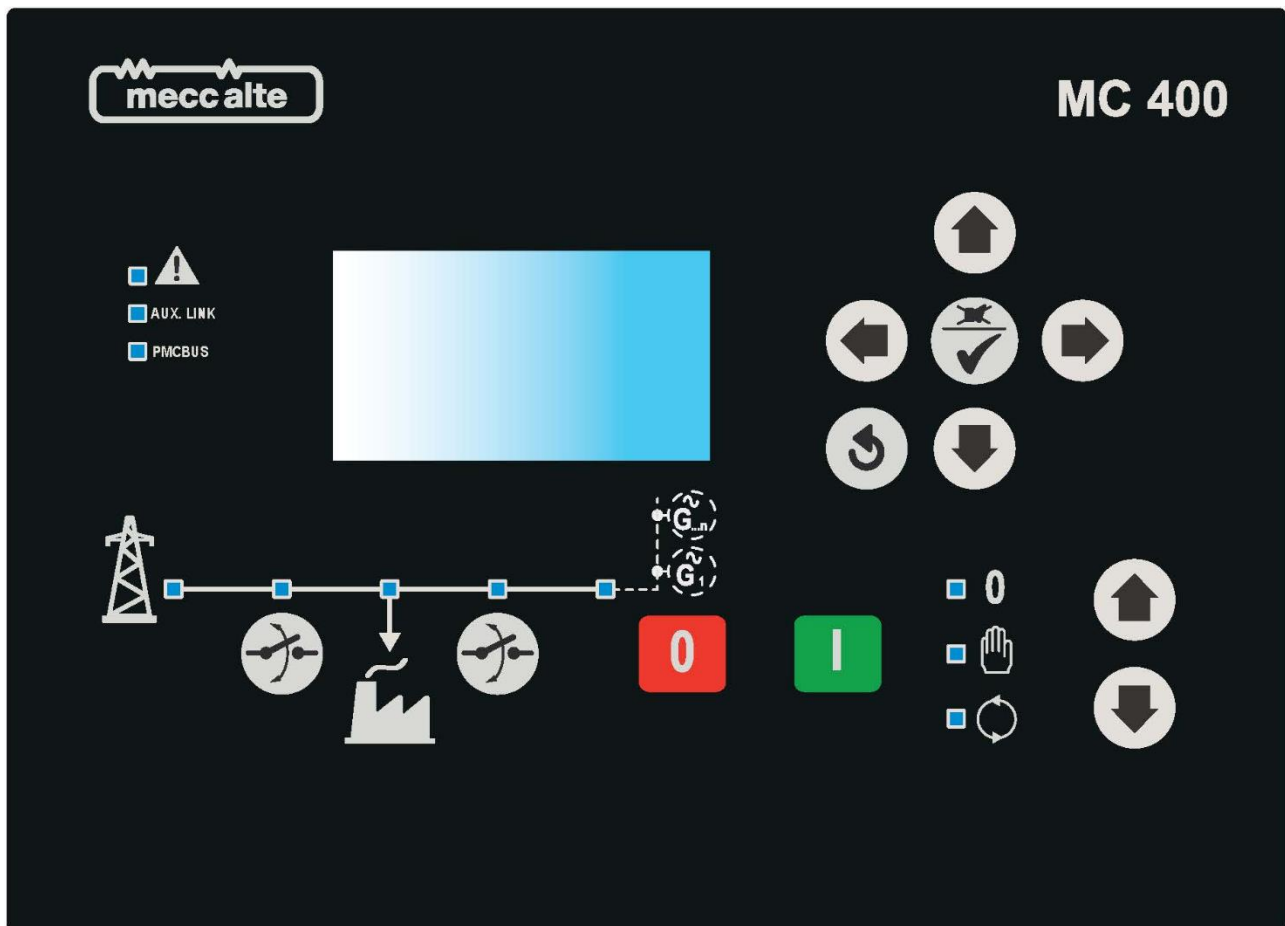
PMCB: it is the name of the Mecc Alte proprietary communication protocol (operating on CAN BUS) allowing the controllers to exchange information for parallel applications.

GC: genset controller.

MC: MAINS controller.

6 Main functions.

6.1 Front panel

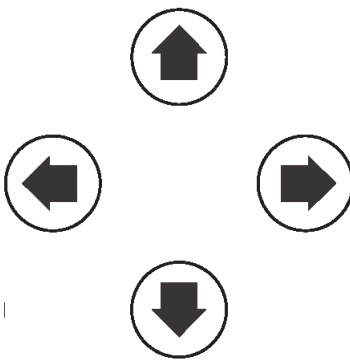


6.2 Pushbuttons.



INFORMATION! when the operator presses some of the following pushbuttons (when the controller is in MAN mode), MC400 sends proper commands to the connected GCs through the PMCB CAN BUS interface: to accept these commands, the GCs must be in AUTO mode, without anomalies (except warnings) and without any inhibition (for starting the engine and/or for closing the GCB).

Pushbutton		Description
MODE UP  MODE DOWN 	OFF/RESET	The connected gensets are stopped (see the note at the beginning of the chapter). All anomalies are reset. The loads are supplied by the MAINS (when applicable). You can modify the configuration parameters.
	MAN	The controller is ready for manual control. Press the START pushbutton to start the engines controlled by the connected GCs (see the note at the beginning of the chapter). If the MGCB exists (or it does not exist, but you set up the controller not to use the MGCB pushbutton to control the GCBs), the GCs will also close their GCBs, energizing the parallel bars. Press the STOP pushbutton to stop the engines controlled by the connected GCs (see the note at the beginning of the chapter). When possible, the GCs first unload the power from their generators, open the GCBs, cool down the engines and finally stop them. Press the MCB pushbutton for manual opening/closing the MCB circuit breaker (if available). Press the MGCB pushbutton for manual opening/closing the MGCB circuit breaker. If MGCB is not available, you can setup the controller to use the MGCB pushbutton to control the GCBs of the connected gensets (all together, bit #3 of parameter P.0495, see the note at the beginning of the chapter).  <u>INFORMATION!</u> the controller uses synchronization for closing the circuit breakers when required.
	AUTO	The controller is ready for the automatic control of the plant; so, it will start the engines controlled by the connected GCs (see the note at the beginning of the chapter) if required by the operating conditions. By pressing the START pushbutton you can activate/deactivate the TEST mode: the controller starts the engines controlled by the connected GCs (see the note at the beginning of the chapter) and, unless differently configured, it does not connect the generators to the loads. In case the application requires the use of the gensets, the controller automatically exits the TEST mode. Press again the START pushbutton to manually exit the TEST mode.  <u>WARNING!</u> unless differently configured, the STOP pushbutton activates an alarm, causing an emergency stop of the genset.

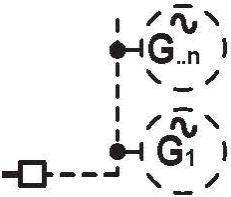
Pushbutton	Description
 UP/DOWN/LEFT/RIGHT	These pushbuttons allow navigation among the available display pages. They also allow adjusting the contrast of the display: - Press SHIFT+LEFT to decrease the contrast (lighten). - Press SHIFT+RIGHT to increase the contrast (darken). While accessing the CONFIGURATION MENUS, the vertical pushbuttons allow scrolling the menu items. During editing, they allow increasing/decreasing the edited value (used in combination with the SHIFT pushbutton they allow faster increasing/decreasing). The horizontal pushbuttons allow positioning the cursor when modifying string-type parameters. While accessing HISTORY LOGS, the vertical pushbuttons allow scrolling the available archives and scrolling the recordings inside one archive. The horizontal pushbuttons allow scrolling the pages related to a single record.
 ENTER/ACK	When the controller activates an anomaly, it also activates the internal horn: the ACK pushbutton allows silencing the horn. If pressed when the horn is deactivated, it “acknowledges” all the active anomalies: the controller automatically resets all warning-type anomalies already acknowledged if their activation cause is no more present (to reset unloads and alarms you must set the controller in OFF/RESET mode). At power on, if pressed together with ESC, it allows “acknowledging” eventual memory errors detected by the controller. In OFF/RESET mode, depending on the selected display page, if pressed together with the ESC pushbutton for at least five seconds while, it can: - reset counters to zero. - reload default values for the configuration parameters. - clear history logs. - force the CAN BUS interface exit from BUS-OFF mode). While accessing the CONFIGURATION MENUS, the ENTER pushbutton allows entering the programming mode and entering a submenu; it allows starting an editing operation and confirms the modified value. While accessing HISTORY LOGS, the ENTER pushbutton allows showing the list of the available archives and entering the selected archive.
 ESC/SHIFT	During editing, it aborts the modifications. While accessing the CONFIGURATION MENUS, it exits the current menu going back to the higher-level one (it exits program mode if pressed by the main menu). If you keep it pressed for at least two seconds, it exits the program mode but retaining the current menu position for further programming access. While pressed in standard display pages, it shows the status information on the first display line (cyclically), and, if available, it shows help messages on the last display line.

Pushbutton	Description
 MCB	The pushbutton is enabled in MAN mode only. It allows opening/closing the MCB circuit breaker (when available). <i>i</i> INFORMATION! to open the MCB when the engines are stopped (or when MGCB is open and no GCBs are closed) you must keep the button pressed for at least five seconds: this is because you are going to create a long blackout on the loads, and we want to be sure this is really what you want. <i>i</i> INFORMATION! the controller uses synchronization for closing the circuit breakers when required.
 MGCB	It allows opening/closing the MGCB circuit breaker (when available). The controller accepts this command in MAN mode only, and only if there are no alarms nor unloads. <i>i</i> INFORMATION! the controller uses synchronization for closing the circuit breakers when required. If you press the pushbutton for opening the circuit breaker, the controller, if possible, firstly unloads the power from the generators, and then opens the breaker. If you want to open the breaker immediately, keep the pushbutton pressed for at least one second. If MGCB is not available, you can setup the controller to use the MGCB pushbutton to control the GCBs of the connected gensets (all together, bit #3 of parameter P.0495, see the note at the beginning of the chapter).
 START	In MAN mode it can be used to start the engines controlled by the connected GCs (see the note at the beginning of the chapter). The GCs manage the crank attempts. In AUTO mode, it enables/disables the TEST mode (see above). At power on, if pressed together with the STOP pushbutton, it allows access to special functions.
 STOP	In MAN mode it can be used to stop the engines controlled by the connected GCs (see the note at the beginning of the chapter). Each GC manages the real stopping sequence: it unloads the power from the generator (when possible), it opens the GCB, it cools down the engine and finally it stops the engine. In AUTO mode, the pushbutton usually activates an alarm (forcing an emergency shutdown of the engine): however, you can configure the controller to ignore the pushbutton in AUTO mode. In OFF/RESET mode, the controller activates all its indicators while this pushbutton is pressed (LAMP TEST).

6.3 Indicators.

LED OFF	LED steady ON	LED flashing

Indicator	Meaning		Description
	OFF/RESET		Controller in OFF/RESET mode.
			Indicates that you are accessing the CONFIGURATION MENUS (also in MAN/AUTO).
			Controller not in OFF/RESET mode and you are not accessing the CONFIGURATION MENUS.
	MANUAL		Controller in MAN mode.
			Controller not in MAN mode.
	AUTO		Controller in AUTO mode.
			Flashing 50% - Controller in AUTO mode: TEST mode requested.
			Flashing 90% ON - Controller in AUTO mode: REMOTE START mode requested
			Controller not in AUTO mode.
	ALARM		At least one alarm/unload is active.
			At least one warning is active.
			No anomalies.
	COMMUNIC. INTERFACES		Communication in progress in one of the following interfaces: Ethernet, RS232, RS485, USB.
			No communication in progress on any interface.
	CAN 1 INTERFACE		The interface is in ERROR-ACTIVE mode.
			Flashing at 25% ON; the interface is in ERROR-PASSIVE mode.
			Flashing at 75% ON; the interface is in BUS-OFF mode.
	MAINS		MAINS voltages are present and within configured thresholds.
			MAINS voltages are not present.
			Flashing at 50% during transition between the previous two status.
			Flashing at 25%: MAINS voltages are present, but one of them (or the frequency) is lower than its configured threshold.
			Flashing at 75%: MAINS voltages are present, but one of them (or the frequency) is higher than its configured threshold.

Indicator	Meaning		Description
	GENERATORS	☒	Generator voltages are present.
		☐	Generator voltages are not present.
	MCB	☐	The circuit breaker is opened (or does not exist).
		☒	The circuit breaker is closed.
			Flashing at 25%: the circuit breaker is open after a closing command.
			Flashing at 75%: the circuit breaker is closed after an opening command.
	BUS/LOADS	☒	Loads/busbars voltages are present.
		☐	Loads/busbars voltages are not present.
			Flashing at 50%: during synchronization phase (opposite sequence to MGCG/MCB).
	MGCB	☐	The circuit breaker is opened.
		☒	The circuit breaker is closed (or does not exist).
			Flashing at 25%: the circuit breaker is open after a closing command.
			Flashing at 25%: the circuit breaker is closed after an opening command.
			Flashing at 50%: during synchronization phase (opposite sequence to BUS/LOADS).

6.4 Multifunctional display.

6.4.1 LCD lighting.

The back light lamp is managed by the controller, which switches it off after a configurable time (P.0492) if no pushbuttons are pressed in the meantime. Press any pushbutton to switch the lamp on again, (we recommend using the **ESC/SHIFT** pushbutton as it has no function when used alone). This function can be disabled by setting parameter P.0492 to 0.

Parameter P.0493 allows keeping the lamp on when the engines are running.

6.4.2 Contrast adjustment.

Depending on the environmental temperature conditions, you may need to adjust the contrast the contrast to view the display correctly.

Press the **ESC/SHIFT + LEFT** pushbuttons to reduce the contrast (lighten), the **ESC/SHIFT + RIGHT** pushbuttons to increase it (darken).

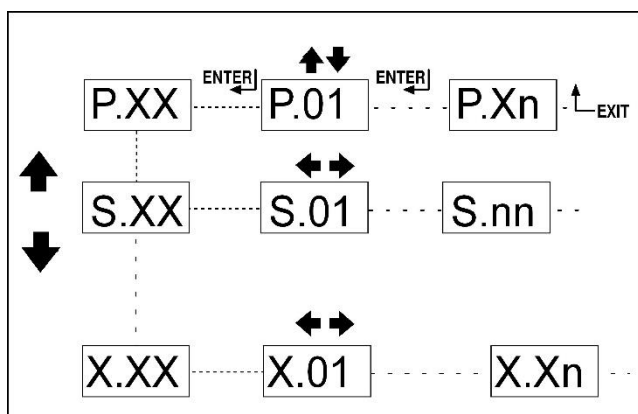
6.4.3 Mode navigation.

The controller provides different display modes, each composed by multiple pages.

Mode	Identifier	Description
PROGRAM	P	Configuration menus.
STATUS	S	Status information.
MEASURES	M	Electrical measurements.
PMCB	B	Parallel information.
HISTORY	H	History logs.

Use **UP** and **DOWN** pushbuttons to select one display mode; use the **LEFT** and **RIGHT** ones to select one display page in the current display mode.

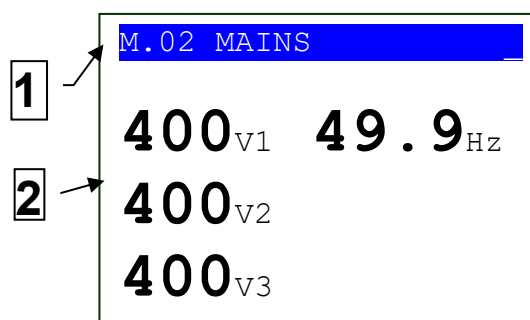
The PROGRAM and HISTORY modes require first pressing the **ENTER** pushbutton to enter the mode and then pressing **UP** and **DOWN** pushbuttons to scroll the menus. You must press **ESC** to go back in the menus tree and return in normal pushbuttons management.



Some display pages allow selecting one of the visualized items: in this case, first press the **ENTER** pushbutton to activate the “selection feature”, then you can use the navigation pushbuttons to select the desired information (instead of navigating through pages). At the end, press **ESC** to deactivate the “selection feature”.

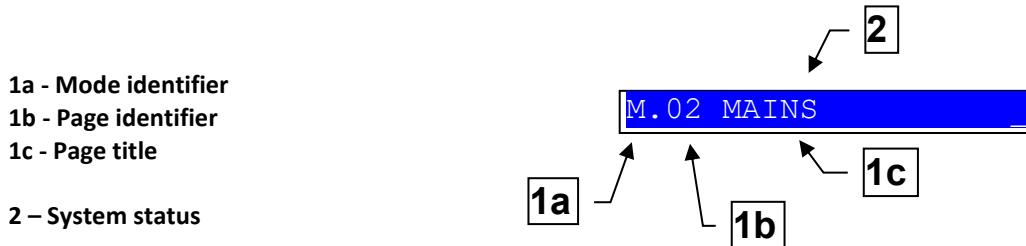
6.4.4 Display area layout.

- 1 - Status bar
- 2 - Data area



6.4.5 Top status bar.

The top status bar contains information on navigation, times and/or some status information.



Normally, the top status bar shows information allowing to uniquely identify the current page (mode identifier followed by the page identifier). It also shows a title for the page in the currently selected language.

It is however possible to ask the controller to show some status information on the top bar (instead of the page identification); the controller will show part of the information normally shown on page S.01. These statuses may be useful for understanding the behaviour of the controller. You can operate in three ways:

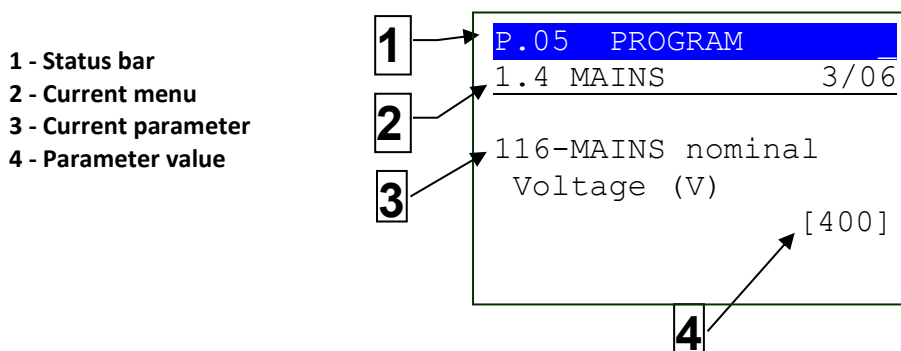
- The controller shows status information while you keep the **SHIFT** pushbutton pressed.
- You can double-click the **SHIFT** pushbutton: the controller permanently shows status information until you manually select a different page.
- By activating bit 6 of P.0495: the controller will automatically show any count-down in the top status bar.

6.5 Display mode.

6.5.1 Program (P).

! WARNING! assigning an incorrect value to one or more parameters can cause malfunctions, damage to things or injury to people. Only qualified personnel must change the parameters. Parameters can be protected by password (see 6.5.1.1).

This mode allows viewing and changing the configurable parameters.



The first line below the top status bar (2), identifies the current menu using its number (1.4 in the picture) and a description in the current language. The pair of numbers on the right indicate the selected item in the menu respect to the total number of items.

The controller identifies each programming parameter with a numeric code (3) (P.116 in the picture): this helps in finding a parameter regardless of the used language. It also shows a description of the parameter in the current language.

The controller shows the current value of the parameter below the description (4), between brackets.

6.5.1.1 Access levels.

The controller provides four different access levels (all protected by passwords), listed in order of priority:

- Super-user.
- Manufacturer.
- Installer.
- User.

Each configurable parameter is protected by one of these access levels; thus, you must first provide the password for the required access level before modifying any parameter.

The password for the “super-user” level is unique for each controller, provided with the controller, and not modifiable by the operator. The passwords for the other levels are configurable by the following parameters, available in the menu “1.1.2 – Password”:

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

The previous parameters are password-protected too, thus you must log-in with a higher access-level to modify one of them.

Each “access level” can modify its own parameters and the ones associated with lower access-levels. For example, if an operator logs-in as an “installer”, he will be able to modify all parameters protected by “installer” and “user” access levels.

As factory default, all the previous parameters are set to “0”, meaning “no password” for the related levels. Thus, only the “super-user” access level is protected by default.

If you lose the password for an access level, you can reconfigure it using a higher-level access. Thus, if you know the “super-user” password, you can always recover any forgot ones. Contact Mecc Alte in case you lose the “super-user” password.

After configuring the password, if you want to modify any protected parameter you must first log-in, providing the right password into parameter P.0000 (menu 1.1.1 – Authentication): the controller will automatically log-out the operator after ten minutes.

6.5.1.2 Setting the parameters.

Use **UP/DOWN** pushbuttons to select the PROGRAM mode, then press **ENTER** to show the main configuration menu. Repeat the operation until you selected the final menu containing the parameter to be modified. Then, use **UP/DOWN** pushbuttons to select the required parameter in the final menu.

The controller now shows the value of the parameter between square brackets (for example: [0400]) if you can modify it; otherwise, it shows the value between “< >” (for example “<400>”). You may not have the right to modify the parameter if:

- The controller is not in OFF/RESET mode.
- The parameter is protected by an access-level, and you did not log in with a proper password.

If you have the modification right:

- Press the **ENTER** pushbutton to start editing (the square brackets start blinking).
- Use **UP/DOWN** pushbuttons to change the value (faster if they are pressed together with **SHIFT** pushbutton).
- Confirm with **ENTER** or abort with **ESC** (the square brackets stop blinking).

To exit the PROGRAM mode, press the **ESC** pushbutton many times, until you reach the page P.02.

6.5.1.3 Editing string-type parameters.

For string-type parameter, you can refer to the previous chapter. Once you started the editing (square brackets blinking), **UP/DOWN** pushbuttons operate on the selected char of the string. Use **LEFT/RIGHT** pushbuttons to select different chars.

6.5.1.4 Direct access to the last page.

You can exit the PROGRAM mode also by keeping the **ESC** pushbutton pressed for two second. In this case, the controller “remembers” where you were in the menu tree: when you press **ENTER** again from the page P.02, the controller will show the proper menu/parameter.

6.5.1.5 Parameters configuring protections.



INFORMATION! you can disable a protection by setting its trip time to zero.

6.5.2 Status information (S).

The controller can hide some of the following pages depending on the configuration (for example, if there are no expansion modules, the relevant pages are hidden).

The page **S.01 (STATUS)** shows system status information. Part of this information are displayed in the upper title bar if you press and hold the **SHIFT** pushbutton.

The page **S.02 (ANOMALIES)** shows all active anomalies (the controller forces this page in case of new ones). For each anomaly, it shows:

- A letter that identifies the type:
 - "A": Alarm.
 - "U": Unload.
 - "W": Warning.
- A three-digit numeric code that uniquely identify the anomaly. This code flashes if the anomaly has not been acknowledged yet with **ACK**.
- A description in the selected language.

If the controller cannot show all the anomalies, the operator can scroll among them by pressing **ENTER**, using **UP/DOWN** and finally pressing **ESC**.

The page **S.03 (BOARD)** displays specific information of the controller: selected language, date/time, power supply voltage, serial number (ID code), firmware revision, internal code (required for providing temporary super-user password). You can select different language from this page by pressing **ENTER**, using **UP/DOWN** and finally pressing **ENTER**.

The page **S.04 (SERIAL COMMUNICATION)** displays the status of the communication towards the available serial ports and the USB. In the case of errors, check the information in this page. In case the controller is connected to an external modem on the RS232 serial port, the two first lines display:

- The modem model.
- In case of GSM/GPRS modem:
 - The name of the provider.
 - The signal level

The page **S.05 (NETWORK)** displays information about the Ethernet interface. It shows the connection status of the cable, the MAC address and the TCP/IP main addresses.

The page **S.07 (CAN BUS)** shows the status of the available CAN BUS interfaces of the controller:

- ERROR-ACTIVE: normal operation
- ERROR-PASSIVE: communication is working despite faults (errors).
- BUS-OFF: the controller has interrupted the connection to the bus due to too many errors.

It also shows the error counters (both current and maximum value). You can clear the maximum values (and trying to force the ERROR-ACTIVE status) by pressing **ENTER**, using **UP/DOWN** to select the interface, keeping **ENTER+ESC** pressed for five seconds and finally pressing **ESC**.

The pages **S.08-09-10 (SYSTEM STATUS)** shows generic status acquired by digital inputs (the ones configured with functions 3201...3206).

The page **S.11 (DIGITAL INPUTS)** shows the status of all available digital inputs (physical, analogue used as digital, virtual). By pressing **ENTER**, you can ask the controller to show their physical status, logical status, or grouped by functions.

The page **S.12 (DIGITAL INPUTS)** shows the status of all digital inputs on expansion modules. By pressing **ENTER**, you can ask the controller to show their physical or logical status.

The page **S.13 (DIGITAL OUTPUTS)** shows the status of all digital outputs of the controller. By pressing **ENTER**, you can ask the controller to show their physical status, logical status, or grouped by functions.

The page **S.14 (DIGITAL OUTPUTS)** shows the status of all digital outputs on expansion modules. By pressing **ENTER**, you can ask the controller to show their physical or logical status.

The page **S.15 (ANALOGUE INPUTS)** shows the value of the analogue inputs of the controller.

The page **S.16 (ANALOGUE INPUTS)** shows the value of the analogue inputs acquired by DITHERM and DIGRIN expansion modules. Special values:

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

The page **S.17 (ANALOGUE INPUTS)** shows the value of the analogue inputs acquired by DIVIT expansion modules. Special values:

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

The page **S.18 (ANALOGUE OUTPUTS)** shows the value of the analogue outputs of the controller. By pressing **ENTER**, you can ask the controller to show their current value or grouped by functions.

The page **S.19 (ANALOGUE OUTPUTS)** shows the value of the analogue outputs of the DANOUT expansion modules.

The page **S.20 (MAINS PROTECTION)**; the controller shows this page only if the generator can operate in parallel to the MAINS. It shows the status of all protections for the parallel with the MAINS. The disabled protections are not displayed. For each enabled protection, the controller shows a message (for example "27<<"), in REVERSE if the protection trips. Codes are: "27<<", "27<", "27Q", "59>", "59>>", "81<<", "81<", "81>", "81>>", "81R", "VJ", "DI" (by contact).

6.5.3 Electrical measurements (M).

The controller uses these pages to show AC electrical measurements. It can hide some of the following pages depending on the configuration (for example, single phase applications).

The page **M.01 (SYSTEM)** displays a wiring diagram of the application, including all available electrical measurements (average voltage, frequency, active power, power factor) and the states of the circuit breakers, of the MAINS, of the generators. The controller automatically adapts the single line diagram to the configuration. When available, you can use this page for changing the active/reactive power setpoints (press **ENTER**, select the item with **LEFT/RIGHT**, change the value with **UP/DOWN**, press **ENTER** or **ESC** to confirm).

The page **M.02 (MAINS)** shows the main electrical measurement of the MAINS (L-L voltages, frequency and phases sequence). For single and bi-phase application, it shows the available L-N voltages.

The page **M.03 (MAINS 2)** shows the L-N voltages, the N-GND voltage and the phases sequence of the MAINS. Available only for three phases – star wiring.

The page **M.04 (GENERATORS BUS)** shows the main electrical measurement of the generators' bars (L-L voltages, frequency and phases sequence). For single and bi-phase application, it shows the available L-N voltages.

The page **M.05 (GENERATORS BUS 2)** shows the L-N voltages, the N-GND voltage and the phases sequence of the generators' bars. Available only for three phases – star wiring.

The page **M.06 (CURRENTS)** shows the phase currents (the current transformers may be located on the MAINS, on the loads or on the generators' bars). If properly configured it can also show the "negative sequence" current, the auxiliary current, the neutral current and the differential current.

The page **M.07 (POWERS 1)** shows the active powers (kW), the power factors and the load type on individual phases and global.

The page **M.08 (POWERS 2)** shows the reactive (kvar) and apparent (kVA) powers on individual phases and global.

The page **M.09 (ENERGY)** shows the energy exported by the generators to the MAINS (the counters are managed by the controller). It shows partial/total counters. You can clear partial counters by pressing **ENTER**, using **UP/DOWN** to select the counter, holding **ENTER+ESC** for five seconds, and finishing with **ESC**.

The page **M.10 (ENERGY)** shows the energy absorbed by the loads from the MAINS (the counters are managed by the controller). It shows partial/total counters. You can clear partial counters by pressing **ENTER**, using **UP/DOWN** to select the counter, holding **ENTER+ESC** for five seconds, and finishing with **ESC**.

The page **M.11 (ENERGY)** shows the energy produced by the generators (the counters are managed by the controller). It shows partial/total counters. You can clear partial counters by pressing **ENTER**, using **UP/DOWN** to select the counter, holding **ENTER+ESC** for five seconds, and finishing with **ESC**.

The page **M.12 (ENERGY)** shows the energy absorbed by the generators (it makes sense only for kvar, the counters are managed by the controller). It shows partial/total counters. You can clear partial counters by pressing **ENTER**, using **UP/DOWN** to select the counter, holding **ENTER+ESC** for five seconds, and finishing with **ESC**.

The page **M.13 (REGULATIONS)** allows monitoring the parallel operation. It shows, at the same time, the voltages and the frequency of both MAINS and generators' bars. The last lines of the display allow changing some parallel-related setpoints (depending on the configuration): press **ENTER**, select the item with **LEFT/RIGHT**, change the value with **UP/DOWN**, press **ENTER** or **ESC** to confirm.

The page **M.14 (SYNCHRONISATION)** shows the synchronisation information. The last lines of the display allow changing the speed/voltage commands, allowing manual synchronization: press **ENTER**, select the item with **LEFT/RIGHT**, change the value with **UP/DOWN**, press **ENTER** or **ESC** to confirm.

The page **M.15 (SETPOINT)** shows and allow changing all the relevant setpoint for parallel operations. The available setpoints depends on the configuration: press **ENTER**, select the item with **LEFT/RIGHT**, change the value with **UP/DOWN**, press **ENTER** or **ESC** to confirm.

The pages **M.16-17-18 (EXTERNAL MEASURES)** display the measures acquired by the analogue inputs configured as generic sensors (functions 2001...2005).

6.5.4 PMCB (B).

These pages show information related to all controllers connected to the CAN BUS 1 interface.

The page **B.01 (MC/BTB DEVICES)** shows the list of MAINS controllers (MC) and tie breaker controllers (BTB) connected to the PMCB.

The pages **B.02, B.03, B.04, B.05 (GC)** shows some information for each genset controller (GC) connected to PMCB.

The page **B.06 (TOTALS)** shows some total value of all genset controllers supplying in parallel: the nominal power (MDPT, kW), the active power (kW and %), the reactive power (kvar), the active energy (kWh) and the reactive energy (kvarh).

The pages **B.07, B.08 (LOAD FUNCTION)** shows the information related to the feature (implemented by all Mecc Alte genset controllers) that automatically starts the number of gensets required to supply the loads (and periodically rotates them to equalize their usage). It shows the list of available gensets (in their priority order), the actual power related to the start/stop power threshold, the equalizing strategy. Depending on the configuration, you can select the MASTER genset (the highest priority on) by pressing **ENTER**, using **UP/DOWN** and confirm with **ENTER**.

The page **B.09 (LOAD SHEDDING)** shows some information related to this feature, including the enabled information, the activation status, the power absorbed by the loads (even respect to configured thresholds) and the activation/deactivation status of each output.

The page **B.10 (PEAK SHAVING)** shows some information related to this feature, including the enabled information, the activation status, the power absorbed by the load (even respect to configured thresholds) and some count-down when available.

6.5.5 History logs (H).

You can use these pages to view periodical and “on event” data recorded by the controller.

Use **UP/DOWN** pushbuttons to select the HISTORY mode, then press **ENTER** to show the list of available archives.

Use again **UP/DOWN** pushbuttons to select the required archive, and press **ENTER** to show its first record.

Now you can use **UP/DOWN** to scroll among all available records in the archive. On the top-right of the display, the controller shows which record is currently shown, respect to total number of records. The archives are circular: when they are full, each new recording overwrites the older one. Each record is associated with its recording date/time.

The controller shows recorded data using multiple pages, you can scroll among the pages of a single record using **LEFT/RIGHT**.

To exit the HISTORY mode, press the **ESC** pushbutton many times, until you reach the page H.01.

7 Operating principles.

The controller supports different applications, selectable by parameter P.0802. The following paragraph briefly describes all of them.

7.1 MPM.

The acronym means “Multiple Prime Mover”. MAINS and MCB are not managed. The controller (in AUTO mode) always starts the generators.

MGCB is optional. if present, the controller manages it to connect/disconnect the generators’ bars to the loads (**without synchronization in this case**). The controller waits for having enough available power from the generators (the ones with GCB closed) before closing MGCB (parameter P.0806).

7.2 MSB.

The acronym means “Multiple Stand By”. This is the classic emergency-to-MAINS application. **Parallel operations are not allowed.**

MAINS and MCB are managed. The controller (in AUTO mode) opens MCB to protect the loads from anomalies on the MAINS; then it starts the generators.

MGCB is optional. if present, the controller manages it to connect/disconnect the generators’ bars to the loads (without synchronization in this case). The controller waits for having enough available power from the generators (the ones with GCB closed) before closing MGCB (parameter P.0806).

After returning from a MAINS failure, the controller opens MGCB (if present, otherwise sends a command to the connected GCs for opening their GCB) and closes MCB: there is a short blackout on the loads. **The next application avoids this second blackout on the loads.**

7.3 MSB + MSTP.

The acronym means “Multiple Stand By” plus “Multiple Short Time Parallel”. This is the classic emergency-to-MAINS application. **Parallel operations are allowed for a brief time.**

See the description for MSB application. After returning from a MAINS failure, the controller synchronizes the generators’ bars to the MAINS (by sending speed/voltage commands over the PMCB CAN BUS to all GCs) and closes the MCB. Then the controller gradually transfers the loads from the generators to the MAINS (the maximum duration of this stage is configurable with P.0890); then it opens MGCB (or it sends a GCB opening command to the GCs if MGCB does not exist).

7.4 MPTM.

The acronym means “Multiple Parallel to MAINS”. This is a production only application in parallel to MAINS. **Parallel operations are allowed. The generators cannot supply the loads.**

MAINS and MCB are managed.

If the voltages/frequency of the MAINS are correct (threshold in menu 8.8.2), the controller starts the generators. MGCB is optional. if present, the controller manages it to connect/disconnect the generators’ bars to the MAINS (with synchronization in this case). The controller usually closes MGCB as soon as the first GCB is closed; P.9513 allows to close MGCB before closing any GCB (in this case, MGCB closure happens without synchronization).

The power setpoints for the whole production are configured in MC400: the GCs will share these setpoints, depending on the rated power of each one. The GCs will use ramps to reach the required power setpoints.

In case of MAINS failure, the “interface protections” trip (menu 8.8.11) opening the interface device. Parameter P.0900 allows selecting the circuit breaker acting as “interface device”. For this application, since the generators cannot supply

the loads, we suggest using MGCB (if available) as “interface device, leaving MCB always closed. After a configurable delay (P.0899), if the mains failure persists, the controller stops the engines.

7.5 MPTM + MSB.

The acronym means “Multiple Parallel to MAINS” + “Multiple Stand By”. This is production application if MAINS is present, is an emergency application in case of mains failure. **Parallel operations are allowed. The generators can supply the loads.**

MAINS and MCB are managed.

The controller always starts the generators. MGCB is optional. if present, the controller manages it to connect/disconnect the generators’ bars to the MAINS (with synchronization if MAINS is present and MCB is closed). The controller usually closes MGCB as soon as the first GCB is closed; P.9513 allows to close MGCB before closing any GCB (in this case, MGCB closure happens without synchronization).

The power setpoints for the whole production are configured in MC400: the GCs will share these setpoints, depending on the rated power of each one. The GCs will use ramps to reach the required power setpoints.

In case of MAINS failure, the “interface protections” trip (menu 8.8.11) opening the interface device. Parameter P.0900 allows selecting the circuit breaker acting as “interface device”. For this application, since the generators can supply the loads, we suggest using MCB (if available) as “interface device, leaving the generators supplying the loads.

After returning from a MAINS failure, the controller synchronizes the generators’ bars to the MAINS (by sending speed/voltage commands over the PMCB CAN BUS to all GCs) and closes the MCB. Then the GCs will use ramps to reach the required power setpoints.

7.6 Operations in OFF/RESET mode.

The controller keeps all engines stopped, with their GCBs open. If MGCB exists, it is open too. If MCB exists (application other than MPM), it is usually closed (the controller can open it to protect the load against abnormal voltages/frequency on the mains). The protections are all disabled.

7.7 Operations in MAN mode.

The operator has full control on starting/stopping the engines and opening/closing the circuit breakers, using the pushbuttons of the front panel. Since the protections are enabled, the controller can always open the circuit breakers and stop the engines.



INFORMATION! when the operator presses the following pushbuttons, the controller may send proper commands to the connected GCs through the PMCB CAN BUS interface: to accept these commands, the GCs must be in AUTO mode, without anomalies (except warnings) and without any inhibition (for starting the engine and/or for closing the GCB).

Press the **START** pushbutton to start the engines (message to GCs over the PMCB CAN BUS). The “GENERATORS” indicator will activate as soon as the first generator closes its GCB, supplying the parallel bars.

Press the **STOP** pushbutton to stop the engines (message to GCs over the PMCB CAN BUS). The “GENERATORS” indicator will deactivate as soon as all generators opened their GCBs, leaving the parallel bars not supplied.

Press the **MCB** pushbutton to open/close the MCB circuit breaker. You can always open MCB, but if you want to open it when the engines are stopped (or when MGCB is open and no GCBs are closed) you must keep the button pressed for at least five seconds: this is because you are going to create a long blackout on the loads, and we want to be sure this is really what you want.

If you press the **MCB** pushbutton to close the breaker, the controller will activate the synchronization procedure if there are voltages on both MAINS and loads. Manual synchronization may operate in two ways:

- Automatic (P0848 = 1): the controller automatically synchronizes the generators with the MAINS and closes the breaker.
- Manual (P0848 = 0): the controller only provides the “synchronized” information, the operator must take care of all other things (from display page M.14):
 - Press the **ENTER** pushbutton: the controller highlights the frequency command.
 - Use **LEFT/RIGHT** pushbuttons to select frequency or voltage command.
 - Use **UP/DOWN** pushbuttons to change the frequency or the voltage command.
 - When the controller indicates that the generators are synchronized to the MAINS, press again **MCB** to close the breaker.
 - Press **ESC** to finish the frequency/voltage adjust phase.

Press the **MGCB** pushbutton to open/close the MGCB circuit breaker. You can always open MGCB. The controller always tries to unload the power from the generators (if possible) before opening the breaker: if you want to open it immediately, keep the pushbutton pressed for at least one second.

If you press the pushbutton to close the breaker, the controller will activate the synchronization procedure if there are voltages on both generators' bars and loads (see the description above)

7.8 Operations in AUTO mode.

Depending on the selected application, the controller starts the generators when needed. It also automatically opens/closes the breakers (with/without synchronization) as required by the applications. It always tries (if possible) to softly load/unload the generators and the mains transformer.

7.9 Operations in TEST mode.

TEST mode makes sense only when the generators are usually stopped. The purpose of this operating mode is to evaluate the operating condition of the generators in preparation for emergency situations (e.g. a MAINS failure) and to periodically keep the mechanical parts efficient and lubricated.

The controller allows executing the TEST sequence only when in AUTO mode. The TEST sequence can be scheduled and executed automatically by the controller, it can be triggered by digital inputs, or it can also be manually triggered by the operator by pressing the **START** pushbutton. Once activated, the controller performs the following operations:

- The “AUTO” indicator starts flashing indicating “TEST in progress”.
- The controller tries to start the engines (by sending commands through the PMCB CAN BUS).
- The “GENERATORS” indicator is on (correct voltage/frequency of the generator).
- The controller keeps the MCB closed and MGCB open, leaving the loads supplied by the MAINS. You can configure a different behaviour with P.0222:

The controller automatically ends the TEST sequence:

- In case of a MAINS failure.
- At the end of the scheduled period.
- When the triggering digital inputs are off.
- For manually triggered TESTs, when the operator presses again the **START** pushbutton.

 **WARNING!** Pressing the **STOP** pushbutton causes the activation of an alarm, which results in an immediate stop of the engine. The operator must then reset the alarm.

8 Special setting.

8.1 Selecting the language.

The controller can display messages in various languages. To select the current language, use navigation pushbuttons to select the display page S.03, then:

- Press the **ENTER** pushbutton: the square brackets around the currently selected language will start flashing.
- Use the **UP** and **DOWN** pushbuttons to scroll among the available languages.
- Press **ENTER** to confirm the selected language or press **ESC** to abort the operation.



INFORMATION! You can use BoardPrg4 to download additional languages to the controller.

8.2 Date/Time setting.

The controller provides an internal clock/calendar used primarily for the functions:

- Weekly schedulers.
- Adding date/time information in history logs.

The display page S.03 shows current date/time. You can modify the current date/time in two ways:

- Using BoardPrg4.
- Using the parameters available in the menu 4.7.1 (see 6.5.1 for instruction on finding and modifying parameters).

You can modify the date/time in any operating mode of the controller.



INFORMATION! controllers connected through the PMCB CAN BUS interface keep their clock/calendar synchronized. If you want to change the date/time of all controllers, please operate on the one with lower PMCB address.

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