



EM3000

## User's Manual

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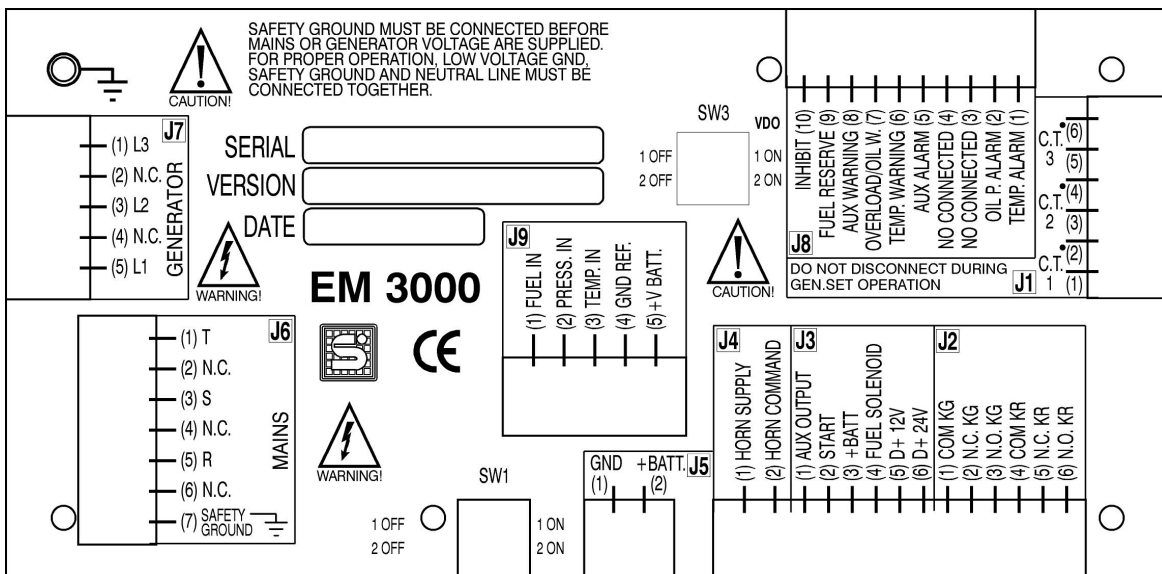
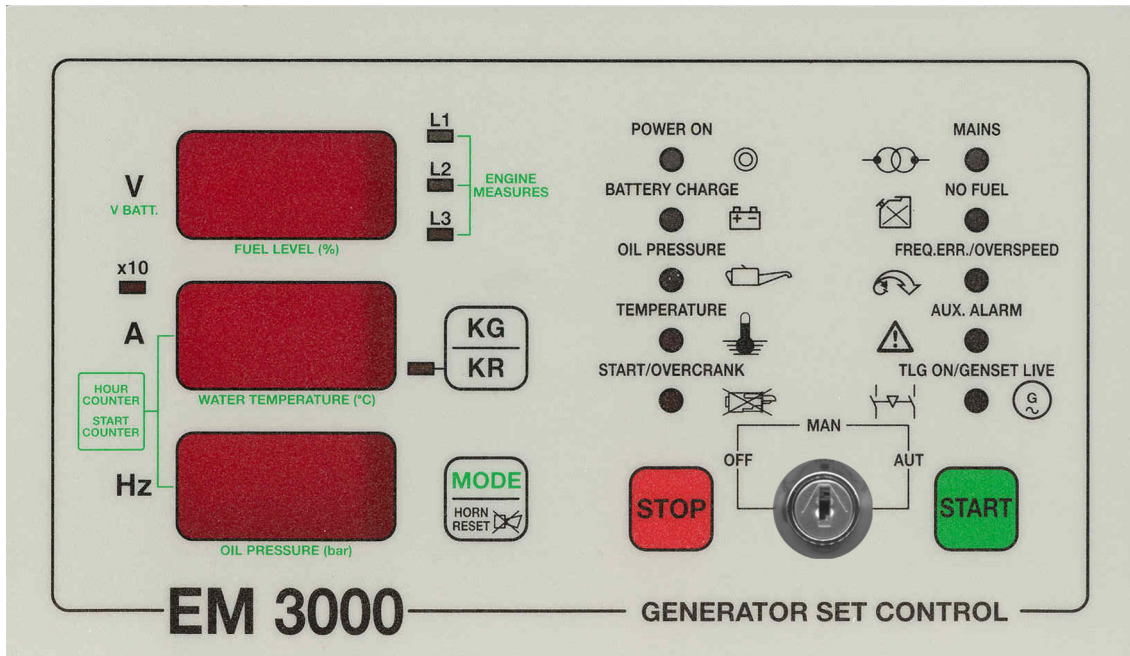
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# 1. VIEWS OF THE DEVICE



## 2. INTRODUCTION

**NOTE: Before installing the device, please carefully read par. 10 (Safety note).**

**NOTE: Before using the device, please carefully read this manual.**

Any question about this manual and about the device can be address to [techelp@sices.it](mailto:techelp@sices.it).

EM3000 is a genset controlling system; it integrates in one device all the instrumentation for the survey of the typical electric parameters of a genset, as well as the controls, the indicators and the whole genset engine monitoring system.

The operating parameters of the engine (water temperature, oil pressure, water and fuel level), of the alternator (frequency, voltages, supplied currents) as well as the whole status are constantly monitored and displayed through LEDs, alphanumeric messages and audible alarms.

The board allows both the genset manual control as well as the automatic management. EM3000 includes a complete mains sensor on the three phases: when, on any of the three phases, the minimum and maximum mains voltage values exceed or are under the limits, the genset is automatically started and made ready to supply.

The annexes show the views of the board, the interconnections diagram, the parameters and the main technical information.

### 2.1 Symbols

In this document a vertical bar on the right margin indicates that the chapter or the paragraph has been amended with respect to the document's last version.

### 2.2 Document Applicability

This version of the document is applicable starting from the SW version EB02100030116 (1.16).

## 3. DESCRIPTION OF THE DEVICE

The device is made by an external metallic structure highly mechanically resistant with its mounting studs; the front part in polycarbonate is oil- and solvent-resistant and displays all the controls and leds descriptions.

### 3.1 DESCRIPTION OF THE OPERATING CONTROLS

On the board front there are four buttons and a key selector:

#### 3.1.1 MODE / HORN RESET BUTTON:

- If pressed during an audible alarm or warning, it resets the horn; further, in case the warning ceases, it turns off the corresponding flashing indicator.
- Finally, it is used during the parameters configuration

**NOTE: the horn is automatically reset after 30 seconds, unless the automatic reset is disabled by means P.30.**

### 3.1.1.1 Engine measures option not installed

- If pressed once it allows the display of the battery voltage (in the "V" display, on the top) and of the total engine's operation hours (message "h" in the central display, the hours are indicated in the displays "A" and "Hz"); the indication is displayed for about 10 seconds;
- If pressed twice the standard indication is restored.

NOTE: the abovementioned indications are also available with dead engine, with key selector on MAN or AUTO.

NOTE: the total start number counter is no more shown using the standard procedure. Please ask to your supplier how to show it.

### 3.1.1.2 Engine measures option installed

- If pressed once change the display mode to engine measures: fuel level is shown onto V display, water temperature is shown onto A display and oil pressure onto Hz display. Only enabled measures are shown. While in this mode L1, L2 and L3 indicators are all ON. This mode is permanent until the pushbutton is pressed.
- If pressed again it allows the display of the battery voltage (in the "V" display, on the top) and of the total engine's operation hours (message "h" in the central display, the hours are indicated in the displays "A" and "Hz"); the indication is displayed for about 10 seconds;
- If pressed again the standard indication is restored.

NOTE: the abovementioned indications are also available with dead engine, with key selector on MAN or AUTO.

NOTE: the total start number counter is no more shown using the standard procedure. Please ask to your supplier how to show it.

### 3.1.2 STOP BUTTON:

It is enabled both in the manual and in the automatic mode of operation:

- if pressed in the manual mode of operation it shuts the engine down. If the genset is supplying (TLG closed) when the shutdown is commanded, the board commands the TLR switching.
- If pressed in automatic mode while in TEST function (tSt message on display A) aborts the TEST function restoring the normal automatic mode (1.11).
- if pressed in the automatic mode of operation with the engine running or after the start request (mains voltage out of the limits or periodical test), it causes the TLR switching, the immediate engine shutdown, the horn activation and, at the end of the shutdown cycle, the message "F07" (see list of alphanumeric messages, par.6). Substantially, the effect is a forced emergency shutdown of the genset.
- - it is used by the operator to set the parameters.

### 3.1.3 START BUTTON:

It is enabled only in the manual mode of operation.

If pressed with dead engine it starts the engine; the starter is automatically released after the acquisition of the engine running status through the sensing of the genset alternator voltages and frequency, and of the excitation of the battery charge alternator. During the start the led START/OVERCRANK, to indicate the starter activation, and the led BATTERY CHARGE, until the battery charge alternator is excited, will turn on.



If the parameter P.20 (Preheat Time) is greater than zero, pressing START button, the preheat function is started. Please refer to par. 4.3. During PREHEAT function the lamp START/OVERCRANK will flash (SW 1.11).

The starter activation is locked with engine already running, both if it was started through the EM3000 device and through other controls (any genset key control). Nevertheless, if the engine was started by an external command, by pressing START in the manual mode operation the genset survey by the device is activated.

**We recommend anyway to wait until the engine is completely stopped before commanding a new start.**

Starting from version 1.11, the START button, in automatic mode, can be used to start the TEST function. TEST function is similar to that of periodic test (see par. 4.2.6). The difference is that in this case the function is ended by pressing the STOP button.

In previous SW versions, the START button didn't have any effect during the automatic mode of operation.

In addition, the button is used in the parameters setting.

### 3.1.4 KG/KR BUTTON:

In the manual mode of operation it is used to command the load switching. By pressing this button with genset in window, the load is switched on the genset (TLR indicator turned off and TLG ON/GENSET LIVE indicator turned on); by pressing it again the load is switched on the mains.

Starting from version 1.10 it is possible to use this button to show the mains voltage, see par.3.3.5.

It is used in the parameters setting, too.

### 3.1.5 KEY SELECTOR

There are three possible positions for the selector: OFF – MAN – AUT; the key can removed in any of those position.

In detail, the functions of each position are the following:

#### □ OFF

The OFF position allows to disable the device, therefore it shall be used in those cases when the genset intervention is not needed (that is to avoid unwanted automatic interventions when a factory is closed, etc.) and, above all, as safety lock in case of maintenance. In fact, when the selector is in the OFF position, the controlling device is completely disabled and the genset cannot start. When the board is disabled the power consumption of the device is minimum and lower than the genset battery self self-discharge level; in that position the displays and indicators are turned off.

By switching the selector to OFF while the engine is running or during the start attempts, the engine shutdown sequence is activated, both with solenoid command in excitation and drop-down; the board turns off with dead engine or anyway after the maximum shutdown impulse time.

In addition, this position allows to reset the stored alarms that caused the genset shutdown as well as the horn.



□ MAN

By selecting this position the controls for the engine manual start and shutdown are enabled.

When the board senses the engine running status the start control is automatically disabled and the engine protections are enabled.

By switching the key to MAN from the OFF position the board executes the LAMP-TEST, shortly turning on all the displays and leds to check their efficiency; then, for a few seconds, it shows on the display the software version in use. The indication POWER ON, above the key selector, keeps turned on.

The board is now ready for the operator's commands.

With the engine running, by switching the key selector to MAN from the AUTO position, it keeps on running and the status of the load switching is kept. The genset shutdown can be commanded through the STOP button without any alarm (see par. 3.1.2 ).

□ AUT

In this position the genset operation, according to the automatic sequences, is enabled;

For a more detailed description see corresponding paragraph (4.2).

## 3.2 DESCRIPTIONS OF LEDS AND THEIR FUNCTIONS

### 3.2.1 POWER ON indicator (green)

It turns on with key selector in the MAN or AUTO position; it indicates the operation of EM3000.

### 3.2.2 X10 indicator (yellow)

It indicates that the current measure on the display "A" is expressed in tenth of amperes.

### 3.2.3 L1 L2 L3 indicators (yellow)

#### 3.2.3.1 *Three-phase mode:*

They turn on one at time when the displays are turned on in normal mode; they indicate to which phase belong the displayed value. There are:

L1 voltage between the phases L1-L2, phase current L1;

L2 voltage between the phases L2-L3, phase current L2;

L3 voltage between the phases L1-L3, phase current L3.

The frequency is independent from the displayed phase.

#### 3.2.3.2 *Single-phase mode:*

L1 indicator is ON. Displayed voltage and current are the single phase values

### 3.2.4 TEMPERATURE indicator (red)

It is enabled only with the engine running or during the start, both in the manual and automatic mode of operation; it always turns on with an audible alarm (horn).

- When **flashing**, it indicates a high water temperature **warning**, that means the water temperature is high but not enough to prevent the engine operation, which, therefore keeps supplying; the **indication** keeps turned on even after the horn reset through the MODE/Horn Reset button if the warning is still active; it disappears after the horn reset if the warning is finished. The warning doesn't prevent the indication of any other alarm or warning. The warning activation is controlled by the signal on the terminal 6 of the connector J8 (active alarm to ground), connected to the water temperature sensor. If the option "Engine Measures" is installed, this signal can be issued by the engine temperature measurement function; the warning threshold can be set by means parameter P.26.
- When **turned on**, it indicates a high water temperature **alarm**: the water temperature is so high it may cause damages in the engine and, in order to avoid them, the protection causes the automatic shutdown, the status is stored disabling any other alarm and it activates the horn. The indicator can be disabled only by switching the key selector to OFF. The alarm activation is controlled by the signal on the terminal 1 of the connector J8 (active alarm to ground), connected to the water temperature sensor.
- If it is **turned on** while it is shown the message **F36**, that can be seen only when the engine is dead, it means that there was a low cooling level alarm while the engine was running (only starting from 1.11 version).

### 3.2.5 START/OVERCRANK indicator (red)

Normally it turns on during the starter operation.

It is flashing while in preheating (ver. 1.11).

When turned on it indicates that after the maximum number of programmed attempts the engine is not running and therefore there is a failure. **The overcrank protection is enabled only in the automatic mode of operation.**

The protection avoids any further start attempt to prevent the battery discharge, it is stored, it disables any other alarm, it activates the horn and can be reset only by switching the key selector to OFF.

### 3.2.6 FREQ.ERR/OVERSPEED indicator (red)

**The overspeed protection is enabled both in the manual and in the automatic mode of operation.**

It indicates the generator frequency exceeded the set threshold with danger of engine overspeed.

The protection causes the automatic shutdown, the status is stored disabling any other alarm, it activates the horn and can be disabled only by switching the key selector to OFF.

### 3.2.7 OIL PRESSURE indicator (red)

The protection and the indicator are enabled both in the automatic and in the manual mode of operation.

- If **flashing**, it indicates a **warning**, that means that at the corresponding input (terminal n°7 of the connector J8, active alarm to ground) a failure in the lubrication circuit was detected by the oil pressure sensor, nevertheless the pressure is still within the operation limits fixed by the engine manufacturer. The warning indication, therefore, doesn't involve the engine shutdown and the interruption of the genset power supply; it activates the horn. If the failure ends, it stays turned on until the Horn Reset button has been pressed. If the option "Engine Measures" is installed, this signal can be issued by the engine oil pressure measurement function; the warning threshold can be set by means parameter P.25.
- If **turned on**, it indicates an **alarm**, that means the oil pressure (terminal n° 2 of the connector J8, active alarm to ground) is not enough to assure the proper engine lubrication and it causes the protection intervention involving the automatic shutdown; the alarm is stored, it disables any other alarm, it activates the horn and can be reset only by switching the selector to OFF.

**NOTE: both the indicators are enabled a few seconds after the sensing of the engine running status to allow the reaching of the nominal pressure (see table of parameters). They are disabled during the engine shutdown.**

### 3.2.8 NO FUEL indicator (yellow)

It is enabled with dead engine, too, with key selector on MAN or AUTO.

It indicates that the fuel level is low.

The protection doesn't modify the engine operation and it doesn't prevent its start; it activates the horn and is reset, after the tank has been filled, by pressing the HORN RESET button; otherwise the indication is kept until the HORN RESET button is pressed. It is enabled by the signal at the terminal 9 of the connector J8 (active alarm to ground).

With the engine running, if the parameter P.29 is over 0 and the fuel warning stays for the time set through P.29, the fuel alarm is activated with the consequent engine shutdown.

It is activated by the signal at the terminal 9 of the connector J8 (active alarm to ground).

If the option "Engine Measures" is installed, this signal can be issued by the fuel level measurement function; the warning threshold can be set by means parameter P.33.

### 3.2.9 AUX ALARM indicator (red)

This indicator allows the management of an auxiliary warning and alarm. The alarm monitoring is made with the engine running. Inputs are checked when the engine is running. By means parameter P.30, it is possible to enable monitoring of AUX inputs also when the engine is dead.

- If **flashing** it indicates a **warning**, that means the corresponding input (terminal n° 8 of the connector J8, active alarm to ground) has been closed to the battery negative. The warning indicator doesn't involve the engine shutdown and the genset power supply interruption; it activates the horn. If the failure ceases, it will be displayed until the Horn Reset button has been pressed.
- If **turned on** it indicates an **alarm**, that means the corresponding input (terminal n° 5 of the connector J8, active alarm to ground) has been closed to the battery negative. The alarm is stored, disables any other alarm, it activates the horn and can be reset only by switching the selector to the OFF position.

### 3.2.10 BATTERY CHARGE indicator (yellow)

The indicator normally turns on during the engine start until this reaches the minimum speed to allow the alternator operation to charge the battery.

If the indicators turns on with the engine running, it means the alternator isn't charging the battery due to a fault or, most probably, due to the break of the belt that activates the cooling fan. **The turning on of the indicator doesn't involve any immediate alarm, but if it remains turned on for more than 45 seconds it causes the automatic shutdown** (to prevent any overheating damage for the engine), it opens the genset breaker, it automatically stops the permission to supply, it activates the horn and disables any other alarm. At the beginning of the shutdown sequence the indicator turns off but, with dead engine, the display "Hz" will show the alphanumeric message "F05", corresponding to the belt break alarm (see par. 6).

The abovementioned alarm is related to the battery charge alternator excitation (generally called D+), automatically managed by EM3000 through the terminals 5 and 6 of the connector J3, for 12V and 24V systems respectively. Further, through the alternator excitation the engine running status is sensed. **Therefore, to avoid any false alarm activation and the consequent engine shutdown, never disconnect the excitation contact D+ of the alternator (if the terminal D+ is not available on the battery charge alternator, the alarm can be disabled with a special procedure).**

### 3.2.11 MAINS indicator (yellow)

The status monitoring and the indicator are enabled both in the manual and in the automatic mode of operation.

If the indicator is turned on it means mains live and that the three phases are all within the fixed limits. If the indicator turns off it means that at least one of the phases is out of the limits.

The flashing indicator means that, even if all the conditions for its turning off have been fulfilled (mains failure or mains out of the limits), the genset, in the automatic mode of operation, will not be started since the inhibition command (terminal n° 10 of connector J8) is still enabled. The inhibition is enabled by closing the input at the battery negative.

**WARNING:** Starting from SW EB02100030107, the threshold hysteresis control is changed. Please check paragraph 8.2.

**WARNING:** up to SW version 1.12, when mains voltage return in operating window, MAINS indicator is lighted when the threshold is crossed but if the voltage doesn't reach the threshold value plus (or minus) P.02 value the genset shutdown command is not issued. Starting from version 1.13, if the generator is supplying, the indicator will be light on only if the mains voltage fall in voltage range defined by threshold voltage and P.02.

### 3.2.12 TLG ON/GENSET LIVE indicator (green)

If the indicator flashes it means GENSET is LIVE and that the generator parameters are OK.

If it turns on it indicates the load has been switched on the genset (TLG ON).

### 3.2.13 ENGINE SHUTDOWN SIGNAL

It is enabled both in the manual and in the automatic mode of operation. When the engine shutdown is commanded, for any reason (operator's request, locking alarm, remote command), or when the key selector is set in the OFF position with the engine running, the engine shutdown phase is indicated through the flashing of the measure display digits that, however, are regularly updated. If the engine shutdown is normal, the displays will turn off when the dead engine status is reached; otherwise, at the end of the shutdown impulse, with key selector on MAN or AUTO, the shutdown failure will be produced (see operation sequences) and with key in the OFF position the device will be turned off.

## 3.3 DISPLAYED MEASURES

### 3.3.1 ELECTRIC MEASURES OF POWER ALTERNATOR

EM3000 includes all the instrumentation needed to survey the operation of the genset. The display of the voltage, current and frequency measures is always enabled when the genset is working, both when supplying power and when disconnected from the users, in the manual as well as in the automatic mode of operation.

#### 3.3.1.1 *Three-phase mode*

Normally, with the engine running, there is the cyclic display of the voltage values of the alternator and of the three currents. The indication of the displayed phases is made through the sequential (yellow) leds L1, L2, L3 located above the key selector. The display can be stopped on each phase through the MODE button (see par. 2.1.1 page 4). The measure values are automatically updated even if the display has been stopped on a single phase.

The displays are activated with engine running in the manual mode of operation and at the remote start in the automatic mode of operation, and they stay activated until the engine shutdown.

The display "V" , at the top, shows the phase-to-phase voltage measure in volts; the display "A", at the centre, shows the current in amperes or tenth of amperes, if the indicator "x10" is turned on; the display "Hz", at the bottom, shows the frequency of the voltage in hertz.

In detail:

- Display of L1 (led L1 turned on): the display V shows the voltage between the phases L1-L2 (terminals 5 and 3 of the connector J7); the display A shows the current sensed by the amperometric transformer C.T.1 (terminals 1-2 of the connector J1)
- Display of L2 (led L2 turned on): the display V shows the voltage between the phases L2-L3 (terminals 3 and 1 of the connector J7); the display A shows the current sensed by the amperometric transformer C.T.2 (terminals 3-4 of the connector J1)
- Display of L3 (led L3 turned on): the display V shows the voltage between the phases L1-L3 (terminals 5 and 1 of the connector J7); the display A shows the current sensed by the amperometric transformer C.T.3 (terminals 5-6 of the connector J1)

The indication of the frequency is independent from the displayed phase.

### **3.3.1.2 Single phase mode**

The display "V" , at the top, shows the phase-to-neutral voltage measure in volts; the display "A", at the centre, shows the current in amperes or tenth of amperes, if the indicator "x10" is turned on; the display "Hz", at the bottom, shows the frequency of the voltage in hertz.

Led L1 is turned on.

The measured voltage is the voltage across terminal 5 and 1 of connector J7 (L3-L1), current value is related to C.T.1. input.

### **3.3.2 START BATTERY VOLTAGE**

To view the battery voltage, possible with key selector on MAN or AUTO in any genset status, press the MODE button. The battery voltage is showed in volts in the display "V".

### **3.3.3 HOUR-COUNTER**

It is showed together with the battery voltage by pressing the MODE button. It is available at any time with the device turned on.

The display A shows the indication "h"; the engine operation hours are showed on the displays A and Hz.

The device also counts the engine operation for hours fractions that are counted even if not displayed.

### **3.3.4 START-COUNTER**

The total number of engine starts is shown by means a special procedure. The display A shows the indication "c"; the total number of starts is showed on the displays A and Hz.

The number increases at every effective start of the engine, both manual and automatically commanded. Unsuccessful starts are not included.

### **3.3.5 MAINS VOLTAGE MEASURE**

Starting from ver. 1.10, pressing the button KR/KG it is possible to read the MAINS VOLTAGE values.

The values are shown at the same time by all the three displays (V = L1-L2, A = L2-L3, Hz = L3-L1) until the button is pressed.

It is not possible to use this function in MANUAL if the engine is running (in this case the button is used to LOAD/UNLOAD the generator).

Starting from version 1.13, if mains is set as mono-phase, only phase L1 is shown (other display will be cleared).

### **3.3.6 ENGINE MEASURES**

If the board is equipped by ENGINE MEASURES option and if they are enabled, it is possible to show fuel level percentage (display V), coolant temperature (display A) and oil pressure (display Hz).

To enable the measures, please, refer to par. 8.4.

To show the measures, please refer to par. 3.1.1.2.

## 4. OPERATION SEQUENCES

### 4.1 MANUAL MODE OF OPERATION

#### 4.1.1 START AND SHUTDOWN

The manual mode of operation is obtained by setting the key selector on MAN; the engine start and shutdown, and the load switching are directly controlled by the operator.

Therefore, to start the genset:

- set the key on MAN and wait until the end of the LAMP TEST and the indication of the software version of the device;
- press START; the starter is automatically released as soon as the engine is running; the BATTERY CHARGE indicator turns off (if the battery charger alternator is normally working) and the measure displays turn on;
- **wait until the genset has reached the full operating conditions and is ready to supply.**

Now the genset is ready to be connected to the user and the load can be switched through the TLG/TLR button.

To shutdown the genset in any moment simply press STOP; TLG opens automatically and the engine shutdown is commanded; during the shutdown phase the digits of the three displays flash until the engine is turned off.

(See also the descriptions of each control)

**By setting the key selector in the OFF position the engine is stopped after the TLG switching.** With dead engine the device turns off (led POWER ON turned off).

#### 4.1.2 ENABLED PROTECTIONS DURING THE MANUAL MODE OF OPERATION

During the manual mode of operation the protections on the engine operating parameters are always enabled; any fault for oil pressure, water temperature, water level, battery charge and belt break cause the corresponding alarms; for the details on the alarms see the descriptions of the corresponding indicators in the previous sections.

**The overspeed protection is always enabled.**

**No load switching is carried out if the genset is not within the operation limits (minimum and maximum voltage and frequency).**

**After the switching has been executed, the protections of minimum and maximum alternator voltage, minimum and maximum frequency and overload are enabled;** in case of intervention they cause the engine shutdown, the load opening, the horn activation and the corresponding alphanumeric message for the alarm.

For further details see the TABLE OF PARAMETERS in par. **Errore. L'origine riferimento non è stata trovata.** as well as the list of alphanumeric messages in par. 6.

**With disabled load no voltage or frequency alarm is caused** therefore the operator is free to change them to allow the engine pre-heating at low speed before supplying power, or to execute maintenance or tests on the genset.



**IMPORTANT NOTE:** any alarm is activated if the corresponding fault lasts for a fixed time (see TABLE OF PARAMETERS) in order to avoid false interventions; the overspeed protection has a delay time of 800ms.

## 4.2 AUTOMATIC MODE OF OPERATION

### 4.2.1 INTRODUCTION

The automatic mode of operation is obtained by setting the key selector on AUTO; the start, the shutdown and the power supply are all of them electronically managed by the device.

The genset intervention is automatically commanded by the internal mains sensor when the mains limits are exceeded (minimum and maximum mains voltage), condition indicated by the turning off of the MAINS indicator. The flashing of such indicator will indicate the inhibition command (terminal 10 of J8).

After the full operating condition have been reached and after the P06 time, the device will command the excitation of the TLR relay (turning off of the led TLR) and, after the P22 time, the excitation of TLG with the turning on of the TLG ON/GENSET LIVE led.

**If the STOP button is pressed during the automatic mode of operation, at start or with the engine running, the engine will be immediately stopped;** the load will be switched on the mains, the horn activated, any other alarm disabled and, with dead engine, the message "F07" will be displayed.

**By setting the key selector on OFF, the load is switched on the mains and the genset shutdown commanded.**

With dead engine the device turns off (POWER ON indicator turned off).

### 4.2.2 AUTOMATIC START SEQUENCE

When a mains failure or a mains out of limits condition is sensed, after the P04 time (intervention delay for mains voltage failure) and if the inhibition command is not enabled, EM3000:

- turns the MAINS indicator off
- monitors the engine status; if it is already running (if, for instance it was manually started), it prevents the starter activation and it passes directly to the genset automatic management
- opens the fuel solenoid and it activates the excitation of the battery charge alternator
- activates the starter; the measure displays turn on.

The starter is automatically released as soon as the engine is running; if the engine doesn't start, the starter is release after a fixed time and a new start attempt takes place (see TABLE OF PARAMETERS); if the engine doesn't start after a programmed number of attempts the locking alarm F22 is generated (see list of alphanumeric messages).

With the engine running the device:

- monitors the frequency and the voltages of the alternator; if they do not reach the programmed values in due time or exceed those values, the locking alarm F08 takes place;
- when the supply conditions are reached and after the P06 time (genset supply delay) the load switching sequence is activated;

### 4.2.3 Inhibition

In case of inhibition signal, when a mains failure or a mains out of limits condition are sensed, the MAINS indicator flashes and the device doesn't command the genset start sequence.

In the same way, if the genset is running in the automatic mode of operation and the inhibition command is enabled, the device commands the shutdown sequence after the P07 time for cooling.

Starting from software version 1.08, in case the genset is operating, the acknowledgement of INHIBITION input will require the time set by parameter P.05.

### 4.2.4 AUTOMATIC SHUTDOWN SEQUENCE

When the mains is restored, EM3000:

- turns the MAINS led on;
- waits for the P05 time (mains restored delay); if, for the programmed time the mains stays within the limits, it commands the opening of TLG and TLR (the latter after the P22 time from the opening of TLG); the led TLG ON/GENSET READY, turned on, starts flashing and the led TLR turns on;
- keeps the engine running for a gradual cooling (see TABLE OF PARAMETERS par. **Errore. L'origine riferimento non è stata trovata.**)

**NOTE: If during the engine cooling a new mains failure occurs, the shutdown sequence will be aborted with the immediate load switching.**

- it shuts down the engine; during the shutdown the digits of the three displays flash until the engine shutdown is completed.

**NOTE: if during the engine shutdown the conditions for a new intervention take place, a new start will be commanded after the engine will stop.**

If after the time programmed for the engine shutdown, this is still running, a new alarm takes place: the horn is activated, any other alarm disabled, any new start request is prevented and the indication F21 is displayed.

### 4.2.5 ENABLED ALARMS IN THE AUTOMATIC MODE OF OPERATION

The protections enabled in the manual mode of operation with load on TLG are valid in automatic too: besides the engine parameters protections, **the protections of minimum and maximum alternator voltage, of minimum and maximum frequency, of overspeed and overload are enabled.**

In case of intervention, the protections cause the load switching on the mains, the genset shutdown, the horn activation and the light or alphanumeric indication of the alarm; they are stored and disable any other alarm; they can be reset moving the key selector to OFF.

**IMPORTANT NOTE: any alarm is activated if the corresponding fault lasts for a fixed time (see TABLE OF PARAMETERS) in order to avoid false interventions; the overspeed protection has a delay time of 800ms.**

For further details see the TABLE OF PARAMETERS (par. **Errore. L'origine riferimento non è stata trovata.**) and the list of the indicators and alphanumeric messages.

## 4.2.6 GENSET AUTOMATIC TEST CYCLE

With the key selector in automatic it is possible to start the genset periodically even without any request of intervention, to check the engine operation, lubricate all its mechanical parts, keep the battery charged and check the operation of the whole system, to keep the genset perfectly efficient.

The interval between the periodical test cycles and the duration of the test are programmed by the user (see par.7 SETTING USER'S PARAMETERS); by setting 0 hours for the interval, the test cycle will not be carried out. The hours count starts from the last start or turning on of the device.

All the protections and alarms of the normal automatic operation are enabled.

During the test cycle the load switching is not enabled; if an automatic intervention of the genset is needed, the test is interrupted passing to the normal automatic operation with the immediate load switching on the genset.

During the TEST function it will be shown the message **tSt** onto display A.

## 4.3 Preheat Operation

Starting from ver. 1.11.

Setting P.20 to a value greater than 0, the preheat function is enabled.

To use this function, it is to be connected a relays between the terminal J3-1 (AUX OUTPUT) and J3-4 (FUEL SOLENOID). A flywheel diode must be connected in parallel to the relays coil having the cathode connected toward terminal J3-4. The relays contacts can be used for preheat supply.

If the operation is enables, start sequences are modified in the following way:

- a) in MAN, pressing the START button, the start motor is not supplied at once, but must be wait for the P.20 time. START button must be kept pressed until the crank.
- b) In AUTO, each START attempt is preceded from the preheat cycle. If the START button is pressed for begin the TEST cycle, the button must not be kept pressed because the START sequence is automatic.

The preheat status is shown by means START/OVERCRANK lamp flashing.

## 5. EXCITATION OR DROP-OUT SHUTDOWN

The device activates at the same time both the fuel solenoid output and the aux output, in the manual as well as automatic mode of operation

In particular:

- the FUEL SOLENOID output (terminal 4 connector J3) is battery positive with engine running and not connected with dead engine;
- the AUX OUTPUT (terminal 1 connector J3) is not connected with engine running and battery negative when the engine must be turned off.

In case of shutdown failure:

- the FUEL SOLENOID output remains unconnected
- the AUX OUTPUT remains grounded until the alarm is reset (key on OFF).

NOTE: if the engine is turned off by setting the key on OFF, in case of shutdown failure after the time programmed for the stop impulse the board turns off and the AUX OUTPUT released.

**The shutdown command remains active for at least 5 seconds from the sensing of dead engine if the P44 parameters is set on 0 (excitation shutdown), such time is decreased to 1 or 2 seconds with P44 set on 1 (if P.43 is set to a value less than 2 Hz, this time is increased of 3 seconds).**

## 6. ALPHANUMERIC MESSAGES

The alarms caused by faults on the electric quantities of the alternator and any other alarm causing the genset shutdown are displayed with dead engine (except the shutdown failure alarm) through the indication on the display Hz of the letter " F " followed by a number. In detail the messages are:

### 6.1 F01, MINIMUM VOLTAGE

It indicates the system sensed for a programmed time, a voltage value below the minimum threshold, even on one phase only.

The fault sensing is enabled with genset supplying and inhibited during the phase of engine shutdown; it switches the load on the mains, causes the automatic shutdown, is stored, it disables any other alarm and can be reset only by setting the selector in the OFF position.

Starting from ver. 1.16, if P.13 is set to 0, the alarm is not issued.

### 6.2 F02, MAXIMUM VOLTAGE

It indicates the system sensed for a programmed time, a voltage value exceeding the maximum threshold, even on one phase only.

The fault sensing is enabled with genset supplying and inhibited during the phase of engine shutdown; it switches the load on the mains, causes the automatic shutdown, is stored, it disables any other alarm and can be reset only by setting the selector in the OFF position.

### **6.3 F03, MINIMUM FREQUENCY**

It indicates the system sensed, for a programmed time, a frequency value below the minimum threshold.

The fault sensing is enabled with genset supplying and inhibited during the phase of engine shutdown; it switches the load on the mains, causes the automatic shutdown, is stored, it disables any other alarm and can be reset only by setting the selector in the OFF position.

Starting from ver. 1.16, if P.11 is set to 0, the alarm is not issued.

### **6.4 F04, MAXIMUM FREQUENCY**

It indicates the system sensed for a programmed time a frequency value exceeding the maximum threshold .

The fault sensing is enabled with genset supplying and inhibited during the phase of engine shutdown; it switches the load on the mains, causes the automatic shutdown, is stored, it disables any other alarm and can be reset only by setting the selector in the OFF position.

### **6.5 F05, BELT BREAK**

It indicates the battery charger is not active due to the belt break and therefore the battery is not being charged and the engine cooling system is not working.

The fault sensing, inhibited during the engine shutdown, takes place if it lasts more than 45 seconds. The protection switches the load on the mains, causes the automatic shutdown, is stored, it disables any other alarm, activates the horn and can be reset only by setting the selector in the OFF position.

### **6.6 F06, OVERLOAD**

It indicates that at least on one phase the maximum limit of overload current programmed for the genset has been exceeded.

The fault sensing is enabled with genset supplying; it switches the load on the mains, causes the automatic shutdown, is stored, it disables any other alarm, activates the horn and can be reset only by setting the selector in the OFF position.

### **6.7 F07, AUTOMATIC SHUTDOWN**

Only in the automatic mode of operation; it indicates the manual STOP command of the device has been pressed with the engine running, at the start or between an unsuccessful start attempt and the following one.

The pressure on the STOP button will cause the automatic shutdown, will switch the load on the mains, will be stored, will disable any other alarm, will activate the horn and could be reset only by setting the selector in the OFF position.

## 6.8 F08, FULL OPERATION NOT REACHED

Only in the automatic mode of operation; it indicates that for the programmed time from the engine running condition, the condition for which voltage and frequency are between the minimum and maximum threshold has not been reached. The alarm sensing causes the automatic shutdown, is stored, disables any other alarm, activates the horn, and can be reset only by setting the key selector in the OFF position.

Starting from ver. 1.16, if P.11 and P.13 are set to 0, the alarm is not issued.

## 6.9 F16, EXTERNAL OVERLOAD

Starting from version SW 1.12, if terminal J8-7 is configured as OVERLOAD input, activation of this input, also when engine is dead, issue an overload alarm followed by genset block.

## 6.10 F21, SHUTDOWN FAILURE

It indicates the engine did not stop in the maximum time limit. The alarm causes the horn activation and disables any other alarm. It can be reset only by setting the key selector in the OFF position.

In case of shutdown failure, the excitation shutdown command is kept until the device is turned off (key in the OFF position).

NOTE: if the shutdown failure takes place following to a shutdown sequence caused by the intervention of a protection, the message F21 is not displayed. If, by setting the key selector in the OFF position the engine doesn't stop, the board will turn off after the programmed time.

## 6.11 F22, OVERCRANK

Only in the automatic mode of operation; it indicates the engine did not start after the maximum number of start attempts programmed. It prevents other starts, it activates the horn, disables any other alarm, is stored and can be reset only setting the key selector in the OFF position. This alarm is also indicated by the turning on of the START/OVERCRANK indicator.

## 6.12 F36, LOW COOLING WATER LEVEL

Starting from ver. 1.11.

It is possible by means parameter P.30, to configure the input TEM WARNING (J8-6) to monitor the cooling water level. In this case the status is monitored also when the engine is not running.

This alarm blocks the engine.

# 7. SETTING USER'S PARAMETERS

The manufacturer supplies the device with the operating parameters already set; they assure the optimal and safe genset operation and are the result of tests on the specific system.

In the TABLE OF PARAMETERS to each parameter it corresponds a code composed of the letter P followed by a number.

To set the parameters proceed as follows **with dead engine**:

- set the key selector in the OFF position (led POWER ON TURNED OFF)
- set the two **SW1 microswitches on the back of the device** in the ON position; the led POWER ON will turn on;
- press the MODE button; the led L1 will turn on; the display V show the message P01 and the display Hz will show the set value;
- with START (FORWARD) and STOP (BACKWARD) all the parameters can be browsed until reaching the one to be changed;
- press the TLG/TLR button; the led L1 will turn off while the led L2 will turn on;
- with START (INCREASE) and STOP (DECREASE) change the displayed value until reaching the desired value;
- press again the TLG/TLR button; the led L2 will turn off while the led L1 will turn on again; it is possible to browse any other parameter to change it;
- to quit the setting press the MODE button; the led L1 will turn off; **set again both the SW1 microswitches in the OFF position.**

Now the parameters are set; the led POWER ON keeps turned on. To turn off the board set the key selector in the MAN position, wait until the end of the lamp-test and then set again the key in the OFF position.

**REMEMBER TO SET AGAIN BOTH THE MICROSWITCHES IN THE OFF POSITION;** otherwise, you can enter accidentally the programming procedure causing, with the engine running, a wrong operation.

**IMPORTANT NOTE: do not change for any reason the position of the two SW 2 microswitches on the bottom side of the board, since the whole programming configuration can be lost.**

## 7.1 How to determine P.30, P.36 and P.39 value

Some parameters are bit-managed. Each 1 bit enables a function and each 0 bit disables a function. Each bit corresponds to a value. The parameter must be set with the result obtained by summing the values associated to the bits you wish to put at 1. 8 bits are available. The bit-managed parameters are explained by a table like the following one:

Bit	Value	Description
0	1	Enable function 1
1	2	Enable function 2
2	4	Enable function 3
3	8	Enable function 4
4	16	Enable function 5
5	32	Enable function 6
6	64	Enable function 7
7	128	Enable function 8



- If it's required to disable all functions set the value 0 for the parameter.
- If it's required to enable all functions, set 255 (1+2+4+8+16+32+64+128) for the parameter.
- If it's required to enable only selected functions, values of the selected are to be summed (for example, to enable only the functions 3, 4, 6 and 8, the value 4+8+32+128 = 172 is to be set for the parameter).

## 8. TABLE OF PARAMETERS

### 8.1 Table of parameters

CODE	DESCRIPTION	MIN. VALUE	MAX. VALUE	DEFAULT VALUE	UNIT OF MEAS.
P.01	Intervention threshold for minimum mains voltage	0	500	320	V
P.02	Mains voltage hysteresis	0	50	10	V
P.03	Generator's voltage recognition threshold for engine running	0	500	50	V
P.04	Delay of genset intervention for mains voltage failure	1	999	3	Sec.
P.05	Mains contactor closing delay from main restoration	1	999	15	Sec.
P.06	Generator set contactor closing delay from generator at operating speed	1	20	5	Sec.
P.07	Duration of engine cooling cycle	0	999	40	Sec.
P.08	Duration of start impulse	1	20	5	Sec.
P.09	Duration of shutdown impulse	7	300	30	Sec.
P.10	Number of start attempts	1	15	3	
P.11	Protection threshold for genset minimum frequency	0 ver. 1.16 10 prev. vers.	60	43	Hz
P.12	Protection threshold for genset maximum frequency	52	70	58	Hz
P.13	Protection threshold for genset minimum voltage	0 ver. 1.16 10 prev. vers.	500	350 **	V
P.14	Protection threshold for genset maximum voltage	100	550	450 **	V
P.15	Protection threshold for maximum mains voltage	100	550	480	V
P.16	Protection threshold for overload current	0	100	100%	% C.T. ratio
P.17	C.T. ratio	0	6000	5	/5A
P.18	Interval between the genset starts for periodical test	0	999	0	Hours
P.19	Duration of genset operation in the periodical test	0	60	0	Min.
P.20	Duration of Preheat cycle	0	99	0	Sec.
P.21	Protection threshold for frequency	55	99	60	Hz

	overspeed				
P.22	Dead time between contactors changeover	0	5	2	Sec.
P.23	Delay time for the intervention of the genset protections for minimum frequency, voltage and for overload.	1	20	10	Sec.
P.24	Delay time for the intervention of the genset protections for maximum frequency and voltage	1	20	5	Sec.
P.25	Low oil pressure alarm (warning) threshold	0	100	0	Tenth of BAR
P.26	High water temperatur alarm (warning) threshold	41	180	180	°C
P.29	Delay time for the fuel alarm from fuel warning (0 = disabled)	0	600	0	Sec.
P.30	Configuration mask	0	255	254	-
P.31	Disabling time from starting for oil pressure alarm	5	120	20	Sec.
P.32	Timeout from engine running for generator's parameters in window	5	120	20	Sec.
P.33	Minimum fuel level alarm (warning) threshold	0	100	0	%
P.36	Engine measures option mask enable	0	255	207	-
P.37	Board address for serial communication	0	255	0	-
P.38	Waiting time between two start attempts	2	99	4	Sec.
P.39	Enabling mask	0	255	255	-
P.40	External alarms filter time	5	100	5 ver. 1.13 20 prev. vers.	1/10 Sec
P.41	Minimum holding time for contactors command.	0	15	0	Sec.
P.42	Engine running recognition frequency	5	70	10	Hz
P.43	Dead engine recognition frequency	0	10	5	Hz
P.44	Excitation/drop-out shutdown	0	1	1	-
P.45	Three-phase or single-phase mode selection	0	4 ver. 1.13 1 prev. vers.	0	-
P.46	Conversion value for fuel level=0%	0	127	0	-
P.47	Conversion value for fuel level=100%	128	255	255	-

NOTES:

The indicated default values are only a reference since they may change according with the genset model used.

\*\* values for 380-400V systems

\*\*\* value set by the manufacturer

## 8.2 Parameter P.02

Starting from SW EB02100030107, the threshold hysteresis control is changed. Former SW version applied P.02 parameter as percentage value of threshold (low or high for both generator and mains voltages).

Now P.02 value has the meaning of VOLT and it is added (or subtracted) to threshold value only during return into operating windows.

**WARNING:** for SW version previous than 1.13, during mains voltage return in operating window, MAINS indicator is lighted when the threshold is crossed but if the voltage doesn't reach the threshold value plus (or minus) P.02 value the genset shutdown command is not issued. When generator is supplying, SW version 1.13 lights on the MAINS indicator only when mains falls back the threshold value plus or minus P.02 (before this change you can found MAINS lighted on but the generator, correctly, running).

## 8.3 Configuration mask table (P.30)

VALUE	ENABLED FUNCTION
1	If 0 enable AUX inputs monitoring also when engine is dead. Default is 0 (default changed starting from version 1.11)
2	If 0 disable the 30 seconds HORN timeout.
4	If 0 disable fuel valve test during power on. Default 1 (starting from ver. 1.09)
8	If 0 makes input TEMP. WARNING (J8-6) working as LOW COOLING WATER LEVEL (from ver. 1.11)
16	If 0 enable fuel valve retention until STOP sequence (from ver. 1.11)
32	If 0, input J8-7 has the function of LOW OIL PRESSURE WARNING; if 1 has the function of OVERLOAD input (starting from 1.12). Default 1
64	Reserved (must be active)
128	Reserved (must be active)

Before version 1.08 this parameter was not available.

The total of the value of each function you intend to enable has to be set through the P.30 parameter.

## 8.4 Engine measures option mask enable (P.36)

VALUE	ENABLED FUNCTION
1	1 = Water temperature measure enable
2	1 = Oil pressure measure enable
4	1 = Fuel level measure enable
8	For fuel level measures. 0 = minimum resistor value when min. fuel level (VDO compatibility); 1 = maximum resistor value for min. fuel level (VEGLIA comp.). Default 1. (starting from ver. 1.13)
16	Coolant temperature sensor type 1. 0 for VDO. 1 for VEGLIA(BORLETTI)/BERU. By default is VDO.
32	Oil pressure sensor type. 0 for VDO. 1 for VEGLIA (BORLETTI). By default is VDO.
64	Coolant temperature sensor type 2. If type is VDO, 0 for 150°C type, 1 for 120 °C type (by default is 120 °C) (starting from ver. 1.16). If type is VEGLIA/BERU, 0 for BERU, 1 for VEGLIA (by default is VEGLIA) (starting from ver. 1.13)
128	Reserved (must be active)

The total of the value of each function you intend to enable has to be set through the P.36 parameter.

### 8.4.1 SW configuration for Engine Instruments

16 and 64 values allow to select from a list of four different type of coolant temperature sensors:

- VDO 150°C sensor type: 16 and 64 values must not be included in the programmed P.36 value.
- VDO 120°C (standard) type: include only 64 value to calculate P.36 value.
- BERU sensor type: include only 16 value to calculate P.36 value.
- VEGLIA sensor type: include both 16 and 64 values to calculate P.36 value.

**The minimum value shown on the display is 39 °C or 49 °C (VDO 150 °C).**

**The maximum measured temperature is 119 °C or 129 °C (VDO 150 °C).**

## 8.4.2 HW configuration for Engine Instruments

If it is required to change the sensors selection after receipt of EM3000, please check that the selected sensor is compatible to the hardware configuration of the board, otherwise the readings of the measure will not be correct.

If using VDO sensor for oil pressure, dipswitch 1 of SW3 must be in ON position, otherwise it must be in OFF position.

If using VDO sensor for coolant temperature, dipswitch 2 of SW3 must be in ON position, otherwise it must be in OFF position.

For board produced before 1/1/2004 , ask more information to SICES.

## 8.5 Enabling Mask (P.39)

VALUE	ENABLED FUNCTION
1	Water temperature warning
2	Water temperature alarm
4	Oil warning
8	Oil alarm
16	Engine running from D+
32	Auxiliary alarm
64	Fuel level
128	Belt break

The total of the value of each function you intend to enable has to be set through the P39 parameter.

## 8.6 Parameter P.43

Starting from ver. 1.10.

Setting a value less than 2, it is disabled the engine dead acknowledge by means generator frequency. In this case it is used the generator voltage (the threshold is set by P03). A further 3 seconds delay is added when the engine is dead.

This function may be useful when the generator neutral line is not connected to ground.

## 8.7 Three-phase or single-phase mode selection (P.45)

It is possible to use EM3000 also in single-phase systems. P.45 is used to configure the board for this application.

P.45 = 0 for three-phase mode.

P.45 = 1 for single-phase (both mains and generator).

P.45 = 2 for mains only single-phase (generator three-phase)

P.45 = please don't set this value

P.45 = 3 for generator only single-phase (mains three-phase)

Value greater than 1 are valid only starting from ver. 1.13

Carefully check for connections in single-phase mode (see par. 9)

## 8.8 Use of parameters P.46 and P.47 for fuel level reading calibration

Parameters P.46 and P.47 can be used to define the low and high limits of fuel level measure sensor. Setting P.46 it is possible to define the value at which the display will show 0%. Setting P.47 it is possible to define the value at which the display will show 100%.

In this way it is possible to get a true percentage reading of fuel.

Please, follow these steps:

- 1) Set P.46 to 0 and P.47 to 255.
- 2) Exit Programming mode e select MAN, press MODE pushbutton
- 3) Move the fuel level sensor to 0% level position. Wait for at least 5 seconds. Record the fuel level display reading.
- 4) Move the fuel level sensor to 100% level position. Wait for at least 5 seconds. Record the fuel level display reading.
- 5) Enter again the programming mode and set P.46 at the recorded value of point 3) multiplied by 2.5.
- 6) Set P.46 at the recorded value of pint 4) multiplied by 2.5.

## 9. CONNECTIONS

TERMINAL N°	FUNCTION	NOTES
J1 1-2.....	phase "L1" amperometric signal input	one side grounded through C.T.
J1 3-4.....	phase "L2" amperometric signal input	one side grounded through C.T.
J1 5-6.....	phase "L3" amperometric signal input	one side grounded through C.T.
<b>For single-phase mode connect only terminal 1-2 of J1.</b>		
J2 1.....	Common TLG	(non-voltaged contact)
J2 2.....	TLG norm. closed output	(non-voltaged contact)
J2 3.....	TLG norm. open output	(non-voltaged contact)
J2 4.....	Common TLR	(non-voltaged contact)
J2 5.....	TLR norm. closed output	(non-voltaged contact)
J2 6.....	TLR norm. open output	(non-voltaged contact)

- J3 1.....Excitation shutdown output (battery negative)
- J3 2.....Start output (battery positive)
- J3 3.....Positive input battery outputs common supply
- J3 4.....Fuel solenoid output (battery positive)
- J3 5.....12V battery charger excitation output (battery positive)
- J3 6.....24V battery charger excitation output (battery positive)

- J4 1..... Horn supply positive output (battery positive)
- J4 2..... Horn command output (battery negative)

- J5 1..... Battery supply negative input
- J5 2..... Battery supply positive input

J6 1-3-5-7.....mains voltage sensor + safety ground input

**For single phase mode connect mains phase to terminal 5 of J6 and neutral to terminal 3 of J6.**

J7 1-2-3.....three-phase alternator voltage sensor input

**For single phase mode connect generator phase to terminal 1 (L3) of J7 and neutral to terminal 5 (L1) of J7.**

- J8 1.....water temperature alarm sensor input (battery negative)
- J8 2.....oil pressure alarm sensor input (battery negative)
- J8 3.....Ground
- J8 4.....Not connected
- J8 5.....auxiliary alarm sensor input (battery negative)
- J8 6.....water temperature warning sensor input (battery negative)
- J8 7.....oil pressure warning sensor input (battery negative)
- J8 8.....auxiliary warning input (battery negative)
- J8 9.....fuel reserve sensor input (battery negative)
- J8 10.....Inhibition input (battery negative)



NOTE: one side of the amperometric transformers (C.T.) must be grounded;

IMPORTANT: IT IS NECESSARY TO CONNECT TO SAFETY EARTH THE DEVICE CASE DUE TO ITS HIGH VOLTAGES.

## 10. SAFETY NOTE

**DUE TO THE HIGH VOLTAGE CONNECTED TO THE MEASURE INPUTS, THE DEVICE ENCLOSURE MUST BE CONNECTED TO SAFETY GROUND.**

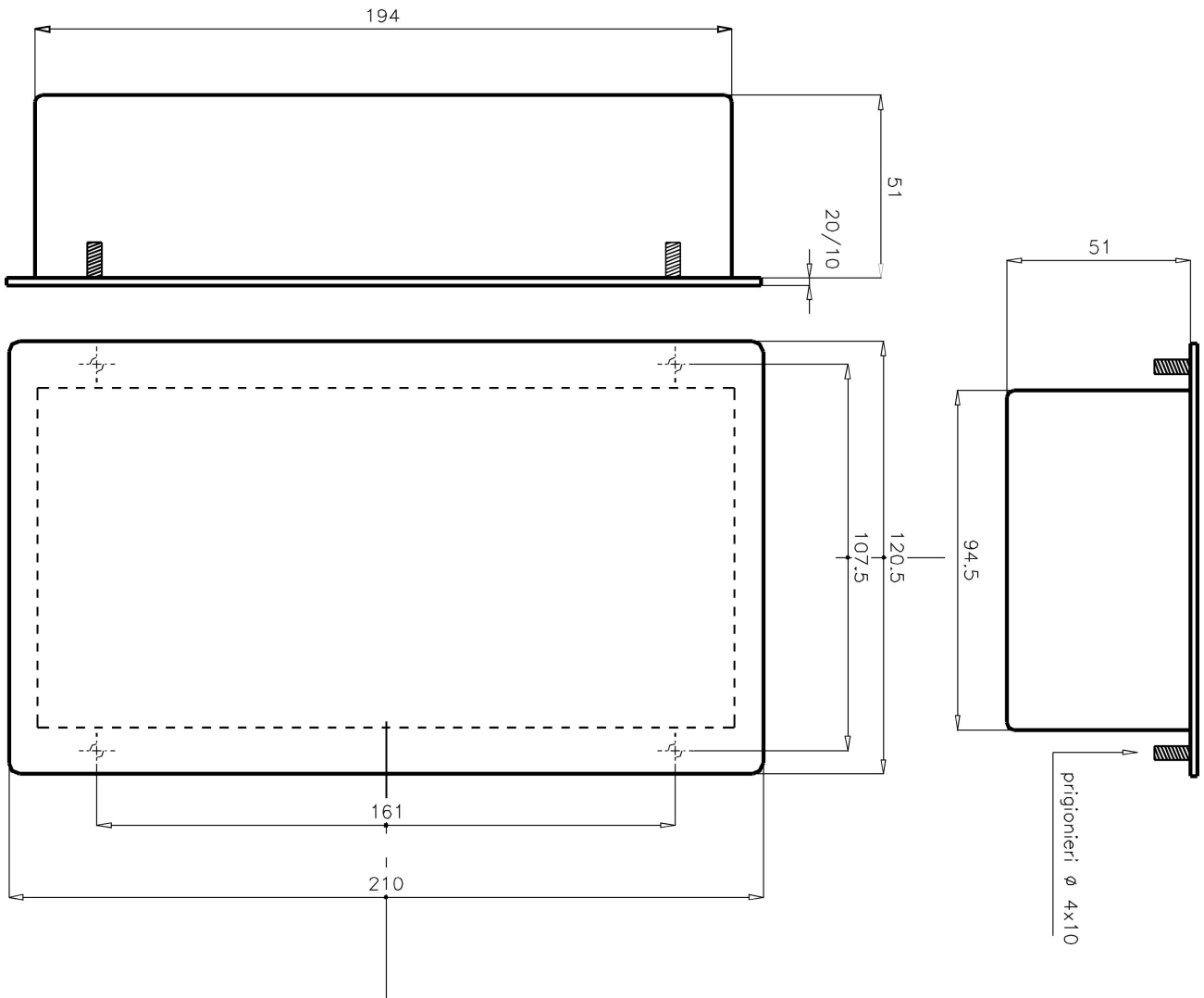
For a proper use of the device, it must be mounted in a fixed way onto a panel or cabinet. The rear panel of the device must not be accessible without the use of tools or keys. The device must not be removable without tools.

For proper safety ground connection, it is to be connected both terminal J6-7 and the rear panel screw near J7 connector. The safety connection can be made also by means one of the four fixing studs of the front panel.

The generator and mains voltage lines connected to the measure inputs of EM3000 must have an overcurrent protection (such as fuse). The input load of the board is about 1Mohm. A 1A protection threshold is suitable.

The safety heart connection wire must be at least equal in section as the wires used to cable the mains and generator voltage line to the board. The section of the wire must be conform to the overcurrent protection value used.

## 11. SIZES



## 12. MAIN TECHNICAL DATA



Nominal system voltage:	230 / 400 / 440 Vca
L-N max. voltage < 300 Vac CAT III (EN61010-1)	
Max. voltage pulse = 4kV 1.2/50 us	
Max working voltage $\leq$ 370Vac (L-N)/640 Vac (L-L) (value are valid for generator and mains voltage having neutral connected to ground and negative supply of the board connected to ground; device must be properly mounted and cabled)	
Nominal voltages of measurement:	230 / 400 / 440 Vac
Supply voltage:	from 7.5 Vdc to 32 Vdc
Maximum voltage of continuous supply:	38 Vdc
Nominal frequency:	50 Hz or 60 Hz
Ambient operating temperature:	-15 to + 60 °C
Storage temperature:	-40 to + 85 °C
Absorbed power in MAN. or AUT. mode with dead engine:	< 0.5W
Absorbed power in MAN. or AUT. mode with engine running:	< 7W
Overall size (in mm):	180 (l) x 90 (h) x 60 (w)
Weight: about 670 g (standard version).	

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