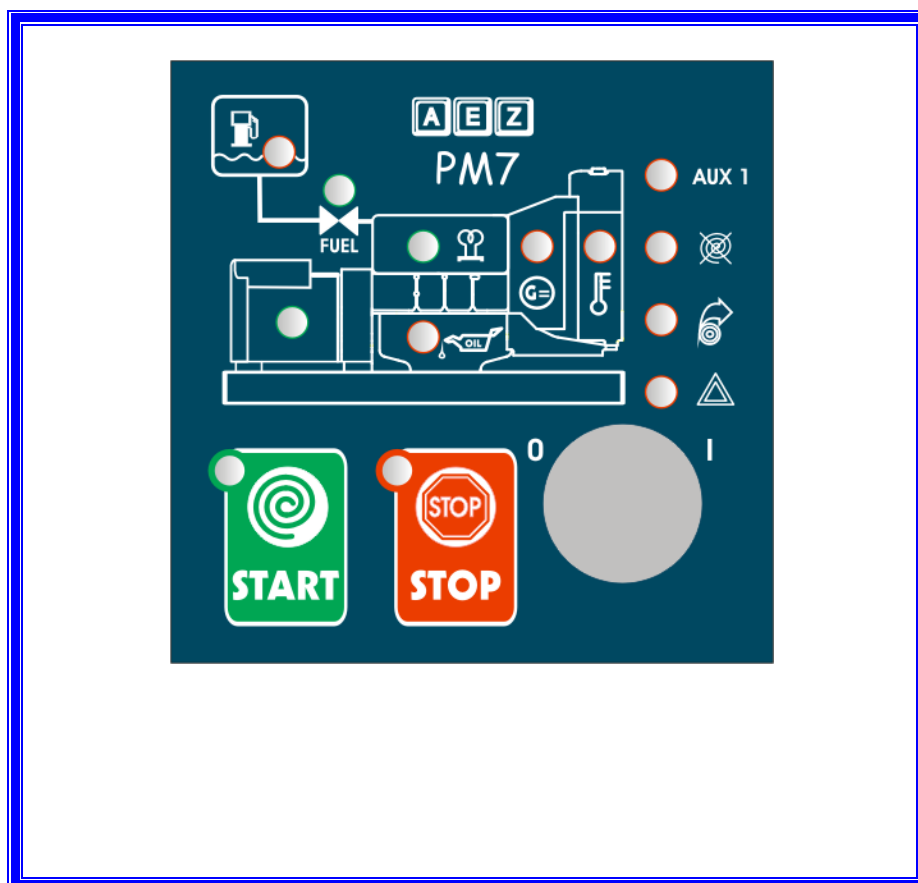




GAMMA ELETTRONICA di Zanellati Rossano
Via Dosso Alto 13 - 44026 Massenzatica (FE) Italy
Tel. +39 0533 700431 - Fax: 178 274 5261
Email: gammaelettronica@tiscali.it
Web: <http://www.gammaelettronica.altervista.org/>

Engine protection : **PM7**



User Manual



CONTENTS

<u>0</u>	<u>FOREWORD.....</u>	<u>5</u>
0.1	PURPOSE OF THE OPERATING AND MAINTENANCE MANUAL	5
0.2	HOW TO CONSULT THE INSTRUCTION MANUAL.....	6
0.3	RETENTION OF THE INSTRUCTION MANUAL	7
0.4	METHOD OF UPDATING THE INSTRUCTION MANUAL.	7
0.5	ASSIGNEES	8
0.6	GLOSSARY AND SYMBOLS.....	9
<u>1</u>	<u>GENERAL INFORMATION.....</u>	<u>13</u>
0.1	MANUFACTURER'S IDENTIFICATION DATA.....	13
1.1	UNIT IDENTIFICATION DATA AND DATAPLATES	14
1.1.1	ELECTRICAL CABINET IDENTIFICATION DATA.....	14
1.2	DECLARATIONS	15
1.3	SAFETY REGULATIONS	16
1.4	INFORMATION ON TECHNICAL ASSISTANCE	16
1.5	SALE OF THE UNIT – ELECTRICAL CABINET	16
<u>2</u>	<u>DESCRIPTION OF THE UNIT.....</u>	<u>17</u>
2.1	OPERATING PRINCIPLE	17
2.2	MAIN COMPONENTS	18
2.2.1	<i>FRONT PANEL</i>	18
2.2.2	<i>REAR PANEL</i>	19
2.3	DIMENSIONS	20
2.4	ENVIRONMENTAL CONDITIONS	21
2.5	ILLUMINATION.....	22
2.6	VIBRATION	22
2.7	NOISE EMISSIONS	22
2.8	TECHNICAL DATA	23
2.9	TOOLS.....	23
2.10	STANDARD SUPPLY	24
2.11	ELECTROMAGNETIC ENVIRONMENT.....	24
<u>3</u>	<u>SAFETY.....</u>	<u>25</u>
3.1	GENERAL SAFETY WARNINGS	25
3.2	INTENDED USE	27
3.3	CONTRAINDICATIONS	27
3.4	DANGER ZONES.....	28
3.5	SAFETY DEVICES	28
3.5.1	<i>ELECTRONIC EQUIPMENT</i>	28
3.5.2	<i>ELECTRICAL PANEL</i>	28
3.6	SIGNS	29
3.7	RESIDUAL RISKS	30

4 4.0 INSTALLATION..... 31

4.1	TRANSPORT AND HANDLING OF THE ELECTRICAL CABINET	31
4.2	STORAGE	31
4.3	PREARRANGEMENTS	32
4.4	POSITIONING.....	33
4.5	CONNECTIONS.....	34
4.5.1	POWER CONNECTIONS.....	34
4.5.2	CONNECTIONS TO THE BATTERY	34
4.5.3	STARTING AND STOPPING.....	35
4.5.4	STOPPING WITH SOLENOID VALVE	35
4.6	PRELIMINARY CHECKS	36
4.7	SETTINGS.....	37
4.7.1	PROCEDURE.....	37
4.7.2	GLOW PLUGS PREHEATING TIME.....	37
4.7.3	OVERSPEED.....	38
4.8	NO LOAD TESTS.....	39
4.8.1	CONNECTIONS	39
4.8.1.1	SPEED DETECTION SYSTEM WIRING.....	39
4.8.1.2	PICK UP	39
4.8.1.3	W SOCKET FOR BATTERY CHARGE ALTERNATORS	39
4.8.1.4	SAPRISA TYPE PERMANENT MAGNET REGULATORS	40
4.8.1.5	260 V ac ALTERNATOR.....	40
4.8.2	DIPSWITCH CONFIGURATION	41
4.8.3	PROCEDURE TO REPLACE BOARD PM7	42

5 5.0 USING THE EQUIPMENT..... 42

5.1	CONTROL PANEL	42
5.2	COMMISSIONING	43
5.3	OPERATING MODES.....	44
5.4	OPERATION	44
5.4.1	MANUAL MODE.....	44
5.4.2	AUTOMATIC OPERATION	44
5.4.3	ALARMS	45
5.4.4	STOP CONTROL	45
5.4.5	DESCRIPTION OF BOARD STATUS IN RELATION TO THE INDICATOR LIGHTS.....	46
5.4.6	STANDBY FOR COMMANDS:	46
5.4.7	LOCKED STATUS:	46
5.4.8	STOP IN PROGRESS:	46
5.4.9	START IN PROGRESS:.....	46
5.4.10	START PAUSE:.....	46
5.4.11	CONFIGURATION IN PROGRESS:.....	46

5.5 EMERGENCY STOP 47

6 MAINTENANCE..... 48

6.1	MAINTENANCE STATUS.....	48
6.2	DISCONNECTION OF THE UNIT-ELECTRICAL CABINET.....	48
6.3	PRECAUTIONS	48
6.4	ROUTINE MAINTENANCE	49
6.4.1	ELECTRICAL MAINTENANCE	49
6.4.2	ENGINE PROTECTIONS	50
6.4.3	GENERATOR PROTECTIONS.....	50
6.4.4	BATTERY EFFICIENCY	50
6.4.5	PERIODIC CHECKS.....	50

6.5 SUPPLEMENTARY MAINTENANCE..... 51

6.5.1 BATTERY REPLACEMENT PROCEDURE51

6.6 DIAGNOSTICS AND TROUBLESHOOTING 52

7 SPARE PARTS AND ACCESSORIES 53

7.1 SERVICE53

7.2 SPARE PARTS53

7.3 ACCESSORIES53

8 SUPPLEMENTARY INSTRUCTIONS 100

8.1 DECOMMISSIONING AND DISMANTLING 100

8.2 SAFE WORKING PRACTICES 100

9 ELECTRICAL EQUIPMENT ANNEX 101

9.1 ELECTRICAL DIAGRAMS 101

9.2 ELECTRICAL CABINET TEST CERTIFICATE 101

9.3 DECLARATION OF CONFORMITY OF THE ELECTRICAL CABINET 101

9.4 DECLARATION OF CONFORMITY OF COMPONENTS INSTALLED IN THE ELECTRICAL CABINET 101

HEAD.	DESCRIPTION
1	Purpose of the manual

0.1 PURPOSE OF THE OPERATING AND MAINTENANCE MANUAL

This Manual is an integral part of the Unit and is designed to supply all information required for:

- Alerting and informing operators in relation to safety issues;
- Handling of the unit, packed and unpacked, in conditions of safety;
- Correct installation of the Unit;
- Detailed knowledge of operation of the unit and its limits;
- Correct use of the unit in conditions of safety;
- Correctly executed and safe maintenance operations;
- Dismantling of the Unit in conditions of safety and in compliance with statutory legislation concerning the health and safety of workers and the environment.



The persons in charge of the company departments in which the Unit is to be installed are obliged, in compliance with statutory legislation, to read the contents of this document will be installed and to ensure the machine runners and maintenance technicians read the parts of the document that concern them.

The time required for this purpose will be amply compensated by the correct operation of the machine and its use in conditions of safety.

This document is based on the assumption that all statutory occupational hygiene, health and safety regulations are complied with in the workplace in which the Unit is to be installed.

The instructions, drawings and documents in this Manual are confidential and are the exclusive property of A.E.Z.; they must not be duplicated in their entirety or in part.

The customer is further responsible for ensuring that if the present document should be modified by A.E.Z., exclusively the updated version of the Manual be available for consultation in the place of use.

HEAD.	DESCRIPTION
2	How to consult the manual

0.2 HOW TO CONSULT THE INSTRUCTION MANUAL

This Manual has been divided into independent chapters, each of which addressed to a specific type of operator (INSTALLER, UNIT RUNNER AND MAINTENANCE TECHNICIAN), for whom the skills required to operate on the Unit in conditions of safety have been defined.

The sequence of chapters conforms to the temporal logic of the Unit's working life.

To facilitate rapid understanding of the text of this manual, the meanings of the terms, abbreviations and symbols are given in heading 6.

The Instruction Manual is composed of the cover, contents pages and a series of chapters (sections).

The first page specifies the identification data of the Unit and model (and serial number, if any), the revision number of the Instruction Manual and a photograph/drawing of the Unit described, to facilitate the user in identifying the Unit and relative manual.

Starting from the first contents page, the manual contains a table of revisions of the Instruction Manual and its parts, which correlates the revision level of the entire Manual with that of the contents and the component chapters, and which specifies the issue date of the entire Manual and the relative revision level.

ABBREVIATIONS-ACRONYMS

Sect. = section
 Chap. = chapter
 Head. = heading
 Pg = page
 Fig. = figure
 Tab. = table

ACRONYMS

GE= Generator set

UNITS OF MEASURE

The units of measure are those envisaged by the international system (IS).

HEAD.	DESCRIPTION
3	Retention of the instruction manual

0.3 RETENTION OF THE INSTRUCTION MANUAL

The instruction manual must be preserved carefully and must accompany the Unit throughout all changes of ownership that occur during its lifetime.

To keep the manual in good condition handle it with care and with clean hands and avoiding placing it on soiled surfaces.

No parts of the manual must be removed, no pages torn out, and no arbitrary modifications made.

The Instruction Manual must be kept in a place where it is protected from heat and humidity and in the immediate vicinity of the Unit to which it refers.

The manufacturer can supply additional copies of the Instruction manual on request of the User.

HEAD.	DESCRIPTION
4	Method of updating the Instruction Manual.

0.4 METHOD OF UPDATING THE INSTRUCTION MANUAL.

A.E.Z. reserves the right to modify the design and make refinements to the Unit without notice to Customers and without updating the Manual already delivered to the user.

Moreover, in the event of modifications to the Unit installed on the Customer's premises, as agreed with A.E.Z. and involving the updating of one or more chapters of the Instruction Manual, the Manufacturer will send, to the persons in possession of the Instruction Manual concerned, the chapters affected by the modification, with the new global revision model of the Manual.

It is the user's responsibility, in compliance with the instructions that accompany the updated documentation, to replace in all copies of the manual in its possession, the original chapters with the new ones, the first page and contents pages with those of the new revision level.

A.E.Z. assumes responsibility for descriptions set down in Italian; any translations cannot be exhaustively checked so that in the event of deformity the Italian language version will always prevail. If necessary consult our sales department which will make any modifications it deems necessary.

HEAD.	DESCRIPTION
5	Assignees

0.5 ASSIGNEES

This Manual is addressed to: the Installer, Operator and Qualified Personnel authorized to carry out maintenance operations on the unit.

The expression “OPERATOR” refers to personnel responsible for running, adjusting, cleaning and performing routine maintenance of the unit .

The expression “QUALIFIED PERSONNEL OR QUALIFIED OPERATOR” indicates persons who have undertaken specialisation courses, training courses, etc and are experienced in the installation, operation and maintenance, repair, and transport of the unit

The expression “EXPOSED PERSON” indicates any person within an area in and/or in the vicinity of the unit wherein the presence of the person constitutes a risk for the safety, health or protection of the person in question.

Qualification of assignees (see HEAD. 0.6)

The Unit is designed for industrial use, i.e. for professional rather than generic use, so it must be utilised exclusively by qualified personnel, specifically, personnel:

- Who are of adult age;
- Who are physically and psychologically fit to perform work of substantial technical difficulty;
- Who have been adequately trained in the use and maintenance of the unit;
- Who have been judged to be fit by the employer to perform the duties assigned to them;
- Who are able to understand and interpret the operator manual and the safety prescriptions;
- Who are familiar with the emergency procedures and their implementation;
- Who are capable of activating the specific type of unit in question;
- Who are familiar with the specific applicable regulations;
- Who have understood the operative procedures defined by the Manufacturer of the unit.

HEAD.	DESCRIPTION
6	Glossary and symbols

0.6 GLOSSARY AND SYMBOLS

This heading contains a list of the special terms utilised in the manual and any terms utilised with specific meanings.

Herewith, this heading explains the abbreviations used and the meaning of the symbols utilised to indicate the operator qualification or the status of the Unit. The use of said symbols allows faster and clearer utilisation of the information required for correct utilisation of the Unit in conditions of safety.

GLOSSARY

DANGER ZONE: Any zone within and/or in the vicinity of the unit wherein the presence of an exposed person is constitutes a risk for the health or safety of said person (Annex I, 1.1.1 Directive 98/37/EC);

EXPOSED PERSON: Any person who is partly or entirely inside a danger zone (Annex I, 1.1.1 Directive 98/37/EC);

OPERATOR: Person responsible for installing, operating, adjusting, servicing, cleaning, repairing and transporting the unit (Annex I, 1.1.1 Directive 98/37/EC);

MAN-UNIT INTERACTION: Any situation wherein an operator is obliged to interact with the unit in any of its operational phases at any time during the life of the unit;

OPERATOR QUALIFICATION Minimum level of skills that the operator must possess in order to execute the described task;

NUMBER OF OPERATORS: Number of operators required to perform the task described in an optimum manner, deriving from analysis performed by the manufacturer, wherein the use of a different number of operators to that specified could impede the achievement of the desired result or endanger the safety of the personnel involved in the operation;

UNIT STATUS, i.e.:

operating mode: automatic run, with maintained activation command (JOG), stop, etc;

condition of the safety devices located on the Unit: protections activated, protections inhibited, emergency stop pushbutton pressed, type of isolation from energy sources, etc.

RESIDUAL RISK: risk that has not been possible to eliminate or reduce sufficiently in the design stage, and against which the relative protections provided are either ineffective or not completely effective; information of the presence of a residual risk is given in the manual together with the instructions and warnings to be observed to overcome the risk (see, respectively, 5.4 and 6.5.1 of European standards EN 12100-1 and EN 121000-2);

SAFETY COMPONENT: Any component utilised to ensure a safety function, which, if it develops a fault or functions incorrectly, will have a negative effect on the safety and/or health of exposed persons (e.g. lifting equipment; fixed, mobile, adjustable etc. protection; electrical, electronic, optical, pneumatic, hydraulic etc. device, that monitors or interlocks a protection, etc.).

SYMBOLS



The descriptions preceded by this symbol contain important information/prescriptions, notably connected with safety. Failure to observe them can lead to:

- ⇒ operator safety hazards;
- ⇒ invalidation of the contractual warranty;
- ⇒ waiving of responsibility by A.E.Z.

SYMBOLS RELATIVE TO THE OPERATOR QUALIFICATION








Symbol	Description
	Generic worker: operator without specific skills, able to perform only simple tasks in response to instructions imparted by qualified technical personnel.
	Driver of lifting and handling equipment: Operator authorised to use lifting and handling equipment for the unit or materials (in strict compliance with the manufacturer's instructions) in compliance with statutory legislation in the country of the user of the equipment.
	1st level unit runner : operator without specific skills, capable of performing exclusively simple duties, i.e. running of the unit by means of the controls on the control panel and operations of loading and unloading of material utilised in the production process, with protection devices installed and activated; this person is not allowed to use the unit with the maintained action control (JOG).
	2nd level unit runner : operator able to perform the duties of a level 1 unit runner and also able to work with the unit in maintained action control mode (JOG) to perform, typically, simple activities of production startup, resumption or production following pauses, and adjustments .
	Maintenance mechanic: Qualified technician able to operate the unit in normal conditions and in maintained action mode (JOG) with protections inhibited, to work on mechanical parts to make adjustments, and to perform servicing and repairs of mechanical parts when necessary. The maintenance mechanic is typically not allowed to perform work on the electrical systems when the power is connected .
	Maintenance electrician: qualified technician able to operate the unit in normal conditions and in maintained action mode (JOG) with protections inhibited; the maintenance electrician is responsible for all electrical adjustments, servicing and repair work. The maintenance electrician is authorized to work inside electrical cabinets and junction box while the electrical power is connected.
	Manufacturer's technician: Qualified technician provided by the manufacturer to carry out operations of a complex nature in special circumstances or anyway in relation to prior agreements with the user. The duties of manufacturer's technicians may be mechanical and/or electrical and/or electronic and/or software-related, on a case-by-case basis.

Table 0-6.1

UNIT STATUS SYMBOLS

1) Symbols displayed in a square / rectangle provide INFORMATION.

















Symbol	Unit status
	Unit switched off: with electrical and pneumatic supplies disconnected.
	Unit switched on: with electrical and pneumatic supplies connected and in safe stopped mode with mobile protections open (specify which); JOG control inhibited; fixed protections closed.
	Unit switched on: with the electrical and pneumatic supplies connected and in safe stopped mode with emergency stop pushbutton being locked in its depressed position or another control device for emergency stopping located in the vicinity of the area of work (specify the emergency stop pushbutton or other control to be used).
	Unit running : in automatic mode with mobile protections closed and relative interlocks active and with fixed protections closed.
	Unit running : with maintained action control (JOG), mobile protections closed and relative interlocks active and with fixed protections closed.
	Unit running : with maintained action control (JOG), with one or more selectable mobile protections open (specifying which) and relative interlocks deactivated, any remaining mobile protections closed and relative interlocks active and with fixed protections closed.
	Unit switched on: stopped and ready for startup (standby mode) by means of activation of a functional permissive (e.g. product present), mobile protections closed with relative interlock active and fixed protections closed.

Table 0-6.2

SYMBOLS RELATIVE TO SAFETY

- Symbols displayed in a triangle indicate conditions of DANGER.
- Symbols contained in a circle concern OBLIGATIONS or PROHIBITIONS.

Symbol	Designation
	Dangerous electrical voltages.
	No access for unauthorized persons.
	Do not remove the safety devices.
	Do not clean, oil, grease, repair or adjust moving parts manually.
	Generic hazard.
	Wear protective gloves.
	Wear safety shoes.
	Wear a protective helmet.
	Disconnect energy supplies before starting work or repairs.

1

1 GENERAL INFORMATION

HEAD.	DESCRIPTION
1	Manufacturer's identification data

0.1 MANUFACTURER'S IDENTIFICATION DATA

MANUFACTURER
GAMMA ELETTRONICA

LEGAL AND ADMINISTRATIVE HEADQUARTERS
Via Dosso Alto 13 – Massenzatica 44026 (Ferrara) Italy

AFTER-SALES /SPARE PARTS SERVICE
Tel.: +39 0533 790431

CONTACTS
<http://www.gammaelettronica.altervista.org/>
gammaelettronica@tiscali.it

1

GENERAL INFORMATION

HEAD.	DESCRIPTION
2	Unit identification data and dataplates

1.1 UNIT IDENTIFICATION DATA AND DATAPLATES

Each Unit is identified by :

- 1) unequivocal barcode
- 2) CE adhesive label

Always quote the barcode on the unit in all communications with the manufacturer.

Barcode : D5A57B01E

The barcode is marked on the guards of all unit modules.

1.1.1 ELECTRICAL CABINET IDENTIFICATION DATA

Each electrical cabinet is identified by an internal dataplate, affixed during the test phase, showing the electrical cabinet:

- Electrical cabinet type (unit name)
- Production Order No./Year
- Power (KVA)
- AC Circuits Data
- DC Circuits Data
- CE Marking

1

GENERAL INFORMATION

HEAD.	DESCRIPTION
3	Declarations

1.2 DECLARATIONS

The unit is constructed in compliance with the pertinent European Council Directives applicable at the time of unit sale.

Since it is not covered by the provisions of ANNEX IV of DIRECTIVE 98/37/CE, GAMMA ELETTRONICA performs a procedure of Self-Certification in order to affix the CE marking.

CE Declaration of Conformity

CE DECLARATION OF CONFORMITY	
The Manufacturer	GAMMA ELETTRONICA
Address	
DECLARES THAT	
The Machine	PM7
Model	
Serial no.	
Other	
COMPLIES WITH THE FOLLOWING DIRECTIVES	
<ul style="list-style-type: none"> o European Council Directive 98/37 Concerning the harmonisation of member states' legislation relative to machines. o EC Directive 2004/108 concerning the harmonisation of member states' legislation on electromagnetic compatibility. o EC Directive 2006/95 concerning the harmonisation of member states' legislation on electrical materials destined for use within certain voltage limits. 	
Date	
<i>The proprietor</i>	

PROHIBITION OF START-UP

The unit must not be set into operation after having undergone modifications to its construction or after components have been added outside the limitations of normal routine or supplementary maintenance operations, until a new declaration of conformity is issued in relation to the requirements of directives 91/368/EEC, 93/44/EEC, 93/68/EEC and 98/37/EC, the other reference directives, and the requirements of statutory legislation.

Date

The proprietor

1

GENERAL INFORMATION

HEAD.	DESCRIPTION
4	Safety Regulations

1.3 SAFETY REGULATIONS

The unit is designed and constructed in compliance with the safety regulations stated below:

UNI EN ISO 12100-1	Unit safety – Basic concepts; general design principles – (Part 1: Basic vocabulary, methods).
UNI EN ISO 12100-2	Unit safety – Basic concepts; general design principles – (Part 2: Technical principles).
UNI EN ISO 13850	Unit safety – Emergency stopping device, functional aspects.
CEI EN 60204-1	Unit safety – Unit electrical equipment part 1: General rules.

1

GENERAL INFORMATION

HEAD.	DESCRIPTION
5	Information on technical assistance and Product warranty

1.4 INFORMATION ON TECHNICAL ASSISTANCE

GAMMA ELETTRONICA machines are covered by a warranty running for 1 (one) year, as specified in the general terms of sale. If malfunctions or faulty parts of the unit should be encountered during the period of validity of the warranty, GAMMA ELETTRONICA will perform the necessary checks on the unit and thereafter repair or replace the relative defective parts.

Note that any modifications carried out by the user without the prior express written authorisation of GAMMA ELETTRONICA will automatically invalidate the warranty and release GAMMA ELETTRONICA from any whatsoever form of liability for damage caused by a defective product.

This stipulation applies in particular to possible cases in which the foregoing unauthorised modifications are performed on safety devices such as to reduce their effectiveness.

The same considerations apply when non-original spare parts or spare parts that are different from those recommended by GAMMA ELETTRONICA as "SAFETY COMPONENTS" are utilised on the machine.

For all the above reasons we advise our customers to contact our Technical Assistance Service whenever necessary.

1

GENERAL INFORMATION

HEAD.	DESCRIPTION
6	Sale of the Unit

1.5 SALE OF THE UNIT – ELECTRICAL CABINET

Our equipment is designed, built, checked and tested in compliance with the current technical standards applicable to the sector (CEI) and the relevant European Directives (Low voltage Directive 2006/95 – EMC Directive 108/2004).

Because of the foregoing compliances, our products can be sold throughout the entire European market.

For sale of the products outside the European market, our engineering department must be consulted to provide a written assessment of the compliance of the product in relation to the regulations in force in the intended country of sale.

2 DESCRIPTION OF THE UNIT

HEAD.	DESCRIPTION
1	Operating principle

2.1 OPERATING PRINCIPLE

Engine protection board PM7 controls operation of the diesel engines.

The board is the facility to select between manual and automatic operating mode by means of an external control, wherein it is the board that controls the starting stage.

In an automatic cycle four start attempts are performed.

The board can signal the following alarms:

EMERGENCY STOP
 OVERSPEED
 NO START
 AUXILIARY ALARM
 ENGINE HIGH TEMPERATURE
 DYNAMO
 LOW ENGINE OIL PRESSURE
 LOW FUEL

When an alarm is present, the board stops the engine and simultaneously signals the cause with the relative LED and the audible alarm.

Enabling of the LOW OIL PRESSURE and DYNAMO alarms is delayed by 20 seconds from the time the board detects that the engine has started.

For overspeed protection the board has a highly versatile reading input. The input is compatible with signals from pick-ups, alternators, W sockets for pre-excitation alternators, or Saprisa type permanent magnet governor outputs.

The OVERSPEED alarm is signalled when the engine exceeds the overspeed threshold (15%) for 1 second with respect to the rated speed.

The NO START alarm is signalled after a failed automatic start cycle.

A glow plug preheating option of configurable duration can be enabled.

The board is suitable for engines with speed of 1500 rpm and 3000 rpm.

The selectable power supply is either 12 V or 24 V.

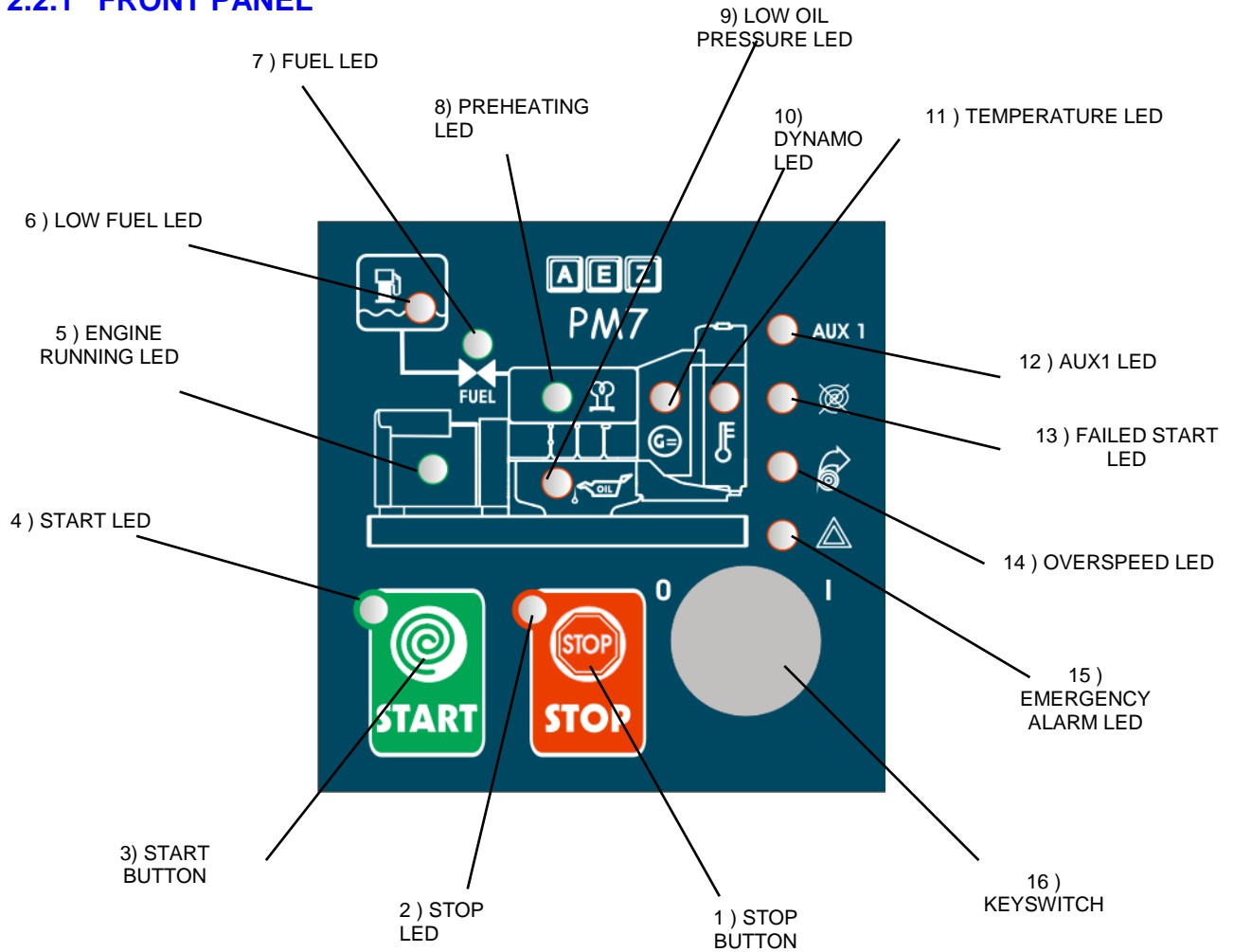
2

DESCRIPTION OF THE MACHINE

HEAD.	DESCRIPTION
2	Main components

2.2 MAIN COMPONENTS

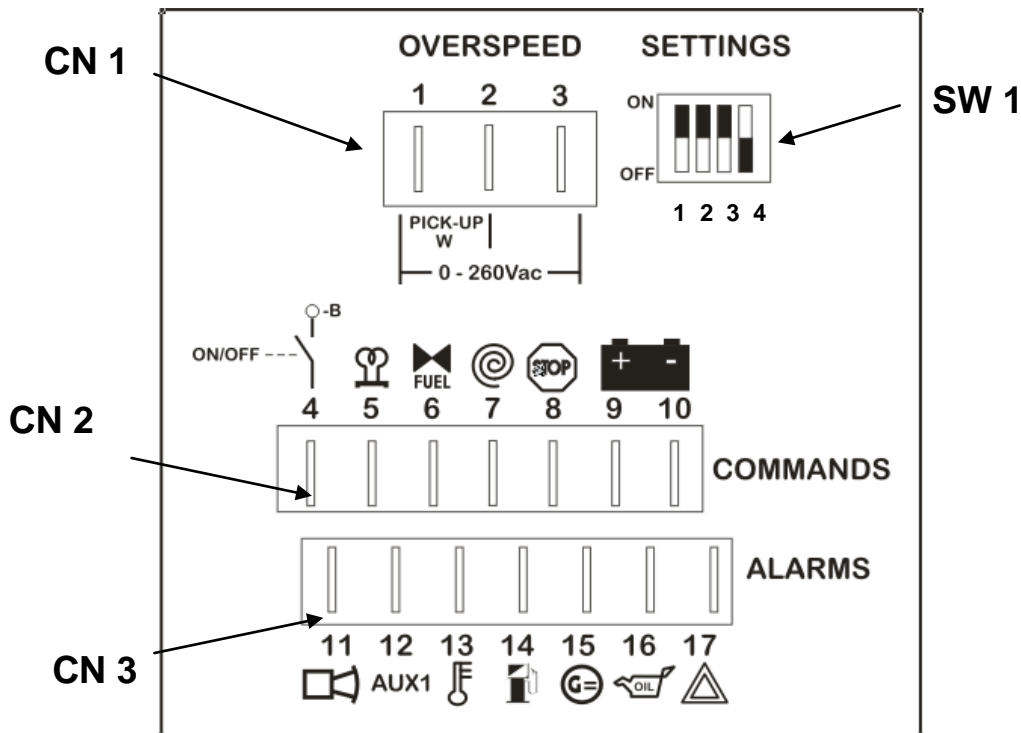
2.2.1 FRONT PANEL



1)	STOP PUSHBUTTON	Controls the engine stopping procedure. In the event of an alarm serves as internal audible alarm mute button
2)	STOP LED	Green light shows stop pushbutton. Red light indicates stopping cycle in progress or stop enable from manual control. Flashing red light indicates blocked condition.
3)	START PUSHBUTTON	Manual starting. In programming phase serves also to set glow plugs preheating time interval.
4)	START LED	Green light for start pushbutton. Yellow light indicates automatic start in progress or manual start control. Yellow flashing light indicates during in automatic start procedure in progress.

5)	ENGINE STARTED LED	Indicates that the engine has exceeded 600 rpm (9 / 18 Hz) and is considered to be started.
6)	LOW FUEL LED	Low fuel alarm (IN 14)
7)	FUEL LED	Fuel output enabled (OUT 6)
8)	PREHEATING LED	Glow plugs preheating in progress (OUT 5)
9)	LOW OIL PRESSURE LED	Low oil pressure signal or alarm (IN 16)
10)	DYNAMO LED	Dynamo signal or alarm (IN 15)
11)	TEMPERATURE LED	Engine high temperature alarm (IN 13)
12)	AUX1 LED	Auxiliary alarm (IN 12)
13)	NO START LED	Failure to start alarm
14)	OVERSPEED LED	Overspeed alarm
15)	EMERGENCY ALARM	Emergency stop alarm (IN 17)
16)	KEYSWITCH	Powers board On / Off

2.2.2 REAR PANEL



All connectors are located on the board rear panel and are 6.3 mm Faston type.

CN 1 : Overspeed.

1 : Common

If alternator is used this input must be connected to NEUTRAL.

If pick-up is used it can be connected to either of the two contacts.

If using the W socket refer to heading 4.8.1.3. for correct connection.

2 : Input from 2.5 to 50 vrms.

3 : Input from 10 to 300 vrms . To be connected to LIVE.

CN 2 : Controls

4 : Optically coupled input for automatic start control

5 : 150 mA open collector transistor output. Glow plugs preheating

6 : 30 A relay output Fuel Control

7 : 30 A relay output Start Control
 8 : 30 A relay output Stop Control
 9 : 12 / 24 V battery input
 10 : -Battery

CN 3 : Alarms

11 : 75 mA external audible alarm output.
 12 : Auxiliary alarm 1 input
 13 : Engine high temperature alarm input
 14 : Low fuel input
 15 : Dynamo input
 16 : Low oil pressure input
 17 : Optically coupled emergency alarm input

SW 1 : Settings

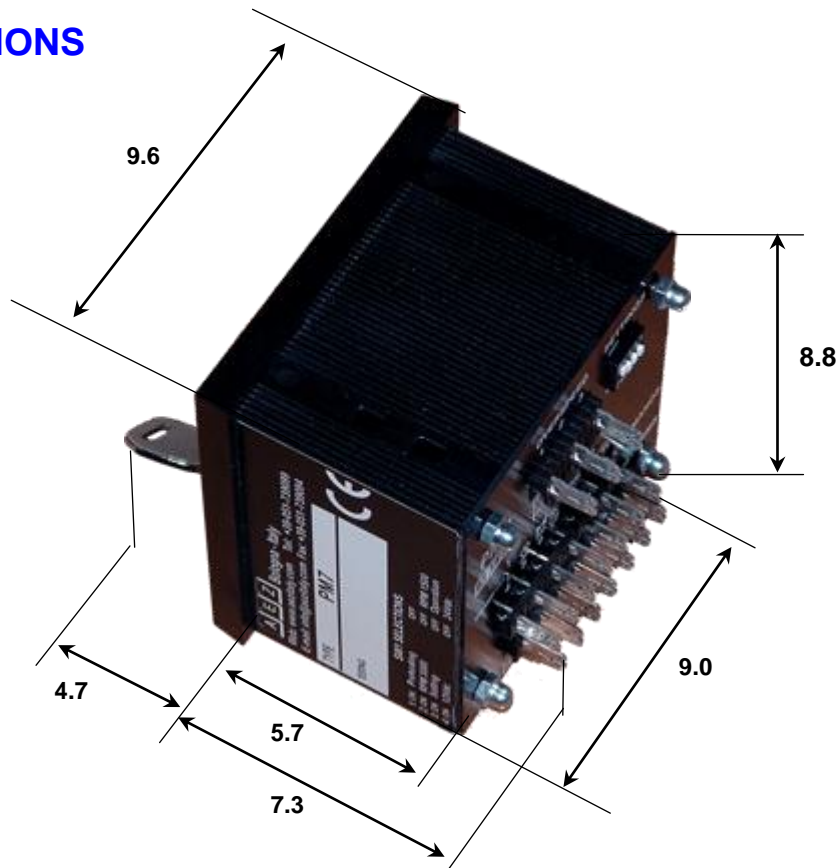
1 Glow plugs preheating selection.
 2 1500 rpm or 3000 rpm engine. ON position 3000 rpm.
 3 Overspeed and preheating calibration. ON position calibration, OFF position normal operation.
 4 Power supply voltage 12 / 24 V. ON position 12 V.

2

DESCRIPTION OF THE MACHINE

HEAD.	DESCRIPTION
3	Dimensions

2.3 DIMENSIONS



All dimension are expressed in centimetres.

2

DESCRIPTION OF UNIT PM7

HEAD.	DESCRIPTION
4	Environmental conditions

2.4 ENVIRONMENTAL CONDITIONS

The unit does not call for specific environmental conditions. It must be installed inside a cabinet. Ensure that the surface on which the system is installed (Generator Set + Electrical cabinet) is a solid and perfectly level floor.

Warning : The unit must not be used in areas subject to the presence of potentially explosive or corrosive atmosphere or high levels of dust !!!!

Conditions:	Operating limits
1. Room air temperature limits	- 20°C ≤ ≥ + 60 °C
2. Room humidity limits	< 50% at maximum temperature of 40° C Higher relative humidity values are permissible at temperatures lower than 20° C
3. Altitude limits	≤ 1000 m above sea level
4. Surrounding environmental limits – Contaminants	Corrosive atmospheres and contaminants- Contaminant particulates : Do not install the unit in areas subject to the presence of: corrosive particles and contaminants, such as, for example, fine particulate, acid, corrosive gas, salt spray, etc.)
5. Potentially explosive atmospheres	The unit is not designed to operate in potentially explosive atmospheres. (ATEX directive 94/9/EC).
6. Ionizing and not-ionizing radiation	The unit cannot be subjected to ionizing or non-ionizing radiation (e.g. microwaves, UV, laser, X-rays)

It is prohibited to use the unit in atmospheres that are:

- dusty;
- corrosive;
- subject to fire risk;
- explosive.

2

DESCRIPTION OF THE MACHINE

HEAD.	DESCRIPTION
5	Illumination

2.5 ILLUMINATION

The unit is equipped with backlighting to ensure visibility of the buttons and the status of the unit . However, it is good practice to ensure that the lighting in the installation site is such as to ensure a good level of visibility of all points, without hazardous glare effects, and allowing easy reading of the control panels and rapid identification of the emergency stop pushbuttons.

HEAD.	DESCRIPTION
6	Vibration

2.6 VIBRATION

In conditions of use that comply with the indications for correct use, vibrations are not such as to give rise to conditions of danger.

HEAD.	DESCRIPTION
7	Noise emissions

2.7 NOISE EMISSIONS

The unit has no noise emissions except for the beeper, which can emit more than 75 dB; the beeper sounds exclusively in the presence of alarm conditions.

2

DESCRIPTION OF THE UNIT

HEAD.	DESCRIPTION
8	Technical Data

2.8 TECHNICAL DATA

The main technical data relative to the Unit in question are given below:

Power supply	12 and 24 V \pm 30%
Current in rest conditions	150 mA
Input frequency range	4 Hz ... 8 KHz
Input voltage range	CN1 1 - 2 2.5V ... 50V (Rms) CN1 1 - 3 10V ... 300V (Rms)
Alarm visual signalling	LEDs
Alarm audible signalling	internal beeper
Frequency input, PAE, external control	optically coupled
Low fuel, start, stop outputs	Max 30 A relay
Preheating output	open collector transistor (150 mA)
Remote alarm output	open collector transistor (75 mA)
Connections	6.3 mm Fastons, 20 A continuous duty 30 A intermittent duty
Dimensions (h x w x d)	96 mm, 96 mm, 81 mm
Operating temperature	- 20 ... + 60 °C
Weight	380 g
Humidity	+ 80 % not condensing
Compliance with standards	EN 60255-1 EN50081-2 EN
Protection rating	IP55

2

DESCRIPTION OF THE UNIT

HEAD.	DESCRIPTION
9	Tools supplied with the Electrical cabinet

2.9 TOOLS

If the unit is supplied together with an electrical cabinet, it will be complete with a key to open the electrical cabinet door lock.

HEAD.	DESCRIPTION
10	Standard supply

2.10 STANDARD SUPPLY

The unit is supplied complete and ready for placing into service.

It is supplied with:

- Operating and maintenance instructions;
- Fixing accessories

If the unit is supplied with an electrical cabinet, also the following documents are provided:

- Declaration of conformity of the electrical cabinet
- Electrical cabinet test certificate
- Any declarations of conformity relative to components installed in the electrical cabinet

HEAD.	DESCRIPTION
11	Electromagnetic environment

2.11 ELECTROMAGNETIC ENVIRONMENT

The unit is designed to operate correctly in an electromagnetic environment of the industrial type, within the Emission and Immunity limits envisaged by the following harmonised Standards:

CEI EN 61000-6-2 **Electromagnetic compatibility (EMC)**
Generic standards – Immunity for industrial environments (2006)

CEI EN 61000-6-4 **Electromagnetic compatibility (EMC)**
Generic standards – Emission for industrial environments

HEAD.	DESCRIPTION
1	General Precautions

3.1 GENERAL SAFETY WARNINGS



Before setting the Unit into operation read the instructions in this Manual carefully and follow the relative indications carefully.

GAMMA ELETTRONICA has applied the maximum attention to detail during the design of this unit to ensure that it is **INTRINSICALLY SAFE** as far as possible. It has also equipped the unit with all the necessary protections and has supplied sufficient information to ensure that it can be used in a safe and correct manner.

For this purpose the following information is supplied in each chapter, whenever necessary, in relation to each instance of man-unit interaction:

- Minimum qualification of the operator involved;
- Unit status;
- Residual risks;
- Required or recommended personal protective equipment;
- Prevention of human error;
- Prohibitions/obligations relative to incorrect conduct that can be reasonably predicted;



Observe this information meticulously.

The user is invited to integrate the information supplied by GAMMA ELETTRONICA with supplementary work instructions such that do not conflict with the instructions given in this manual, with the aim of contributing to the safe use of the unit.

For example, care must be taken in relation to the clothing of persons interacting with the machine.

- Do not wear metal jewellery (rings, necklaces, etc.) that could come into contact with electrical live components causing very serious injuries or fatal electric shock.
- Do not wear large rings or bracelets that could cause the hands to become entrapped in moving parts of the machine.

Whenever necessary the manual contains additional user recommendations concerning preventive measures, personal protective equipment, information designed to prevent human error and prohibitions concerning reasonably predictable behaviour that is not permitted.

Strict observance of the following prescriptions is anyway essential:

- It is strictly prohibited to operate the unit in automatic mode when maintenance technicians are working on the system;
- It is strictly prohibited to inhibit the safety devices installed on the Unit;
- All works on the system must be carried out with the key selector set to 0, which is the safety condition that prevents the generator set from being started up;

- Do not modify any parts of the unit under any circumstances; in the event of malfunctions due to failure to observe this stipulation GAMMA ELETTRONICA cannot be held liable for the consequences. Always contact GAMMA ELETTRONICA directly if you consider that modifications to the unit are necessary;
- Clean the surfaces of the control module with a soft dry cloth or a cloth slightly moistened with a mild detergent solution; do not use solvents of any type, including alcohol or petrol, as these substances may damage the surfaces;
- Install the unit as specified at the time of the order; refer to the diagrams supplied by GAMMA ELETTRONICA; if the unit is not positioned as agreed beforehand, the manufacturer cannot be held liable for any problems that may arise.

**IMPORTANT !**

A.E.Z. refutes all liability for injury to persons or animals and damage to property caused by the Unit in the event of:

- use of the Equipment by inadequately trained personnel;
- improper use of the equipment;
- electrical power supply defect;
- incorrect installation;
- insufficient maintenance;
- unauthorised modifications or repairs;
- use of non-original replacement parts or parts that are not specifically designed for the model;
- total or partial failure to comply with instructions;
- use in conflict with specific national regulations;
- calamities and natural disasters.

Checks and tests

Checks must be carried out as indicated at the relative chapter of this manual.

Checks must be carried out by qualified personnel; the checks must be both visual and functional to ensure the absolute safety of the unit.

The results of this check must be set down in a specific report.

**WARNING !**

If faults are detected, they must be remedied before returning the Unit to operation, and the expert who performs the check must make a note on the datasheet of the repair work performed, thus providing approval for use of the Unit.

The person responsible for the check must inform GAMMA ELETTRONICA promptly if potentially dangerous anomalies are detected.

Turn the key to 0 in the event of malfunctions and carry out the necessary checks and/or repairs.

HEAD.	DESCRIPTION
2	Intended use

3.2 INTENDED USE



Maintenance electrician: **qualified technician able to operate the unit in normal conditions and in maintained action mode (JOG) with protections inhibited; the maintenance electrician is responsible for all electrical adjustments, servicing and repair work.** The maintenance electrician is authorized to work inside electrical cabinets and junction boxes while the electrical power is connected.

The Unit features can perform functions on the basis of its configuration. Refer to chapter 5 "Using the Equipment".



The use of products/materials other than those specified by GAMMA ELETTRONICA such that can cause damage to the Unit and potential danger for the operator and / or the persons in the vicinity of the Unit, is considered as negligence or improper use.

HEAD.	DESCRIPTION
3	Contraindications

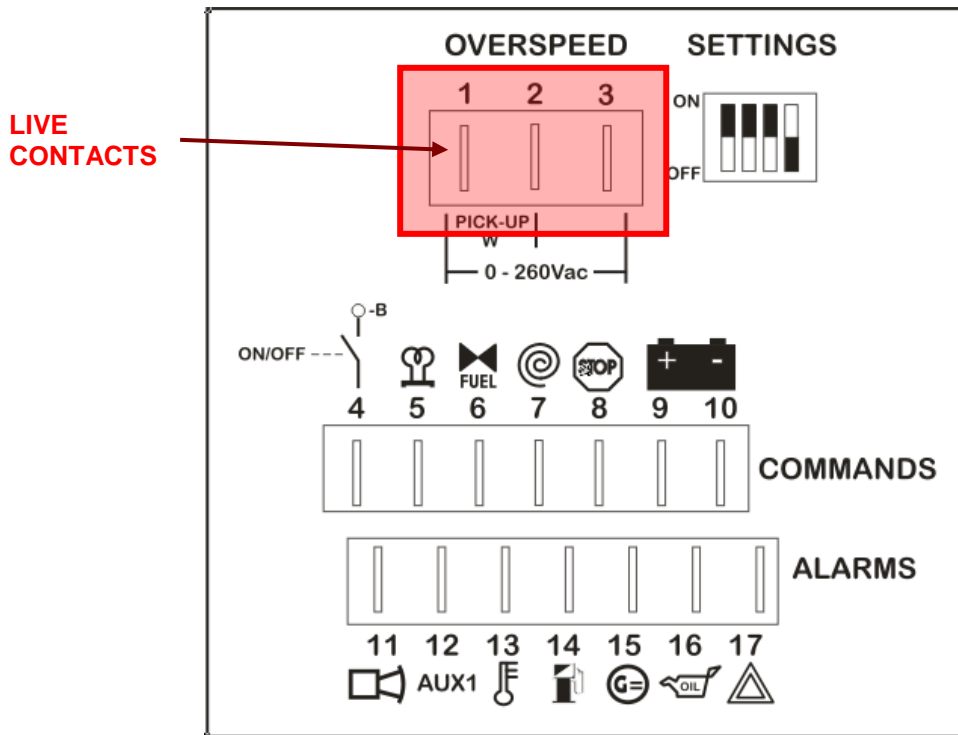
3.3 CONTRAINDICATIONS

Do not use the Unit:

- For uses other than those specified in heading 3.2 or not mentioned in this manual;
- in explosive or corrosive atmospheres or atmospheres with high concentrations of dust or oily substances suspended in the air;
- In atmosphere subject to fire risks;
- Outdoors where it is exposed to the weather;
- With the safety devices inhibited or malfunctioning;

HEAD.	DESCRIPTION
4	Danger zones

3.4 DANGER ZONES



3

SAFETY

HEAD.	DESCRIPTION
5	Safety devices

3.5 SAFETY DEVICES

3.5.1 ELECTRONIC EQUIPMENT

1. Key to switch off the unit. If the key is set to 0 the generator set cannot be started.

3.5.2 ELECTRICAL PANEL

The following safety devices are installed in the electrical cabinet:

1. Emergency stop control (mushroom head pushbutton)
2. Protections against accidental contact of the live electrical parts
3. Residual current protection depending on the equipment to be installed in the electrical cabinet

HEAD.	DESCRIPTION
6	Signs

3.6 SIGNS

The signs to be installed in the immediate proximity of the Unit and in the relative operating area are as follows:

- sign indicating prohibition to carry out maintenance operations with the electrical cabinet powered.
- sign indicating unit operating modes.
- sign instructing the operator to set the unit to locked out mode (key on 0) before performing maintenance.



HEAD.	DESCRIPTION
7	Residual risks

3.7 RESIDUAL RISKS

DEFINITION OF RESIDUAL RISK:

"Danger that cannot be totally eliminated by design means and protection techniques, or potential but hidden risk."

Pay attention to the following residual risks, which are present at the time of use of the unit and that cannot be eliminated.



WARNING: ELECTRICAL RISKS FOR LIVE ELECTRICAL PARTS

Operations on the electrical cabinet must be carried out only by qualified operators and with the unit power supply device disconnected.



WARNING: ELECTRICAL RISKS DUE TO RESIDUAL VOLTAGE

See the sign on the electrical cabinet.

4

4 INSTALLATION

HEAD.	DESCRIPTION
1	Transport and handling

4.1 TRANSPORT AND HANDLING OF THE ELECTRICAL CABINET



Driver of lifting and handling equipment: **operator authorised to use lifting and handling means for the unit or materials (in strict compliance with the manufacturer's instructions) in compliance with statutory legislation in the country of the user of the equipment.**

The electrical cabinet must be transported with a normal transport vehicle capable of supporting the weight and handling the relative dimensions

Depending on the size of the electrical cabinet it can be handled either on a pallet or by lifting from lifting attachments; in both cases suitable measures must be adopted to prevent the cabinet from falling over.

In the case of handling by lifting attachments use lifting chains capable of supporting the weight of the electrical cabinet as shown on the transport documents.

Since the electrical cabinet is supplied fully assembled the only procedure required is to position it in the chosen installation position. If the cabinet is to be combined with other equipment be sure to leave sufficient space for the installation of said other equipment.



N.B.

A.E.Z. declines all liability for injury to persons or animals or damage to property caused by the use of lifting systems other than the systems prescribed above.

4

INSTALLATION

HEAD.	DESCRIPTION
2	Storage

4.2 STORAGE

In the event of disuse, the Unit /Electrical cabinet must be stored adopting the following precautions:

- Store the Unit /Electrical cabinet in an indoor environment;
- Protect the Unit /Electrical cabinet against impact and stress;
- Protect the Unit /Electrical cabinet against humidity and high temperature differences;
- Prevent the Unit /Electrical cabinet from coming into contact with corrosive substances;



If the Unit /Electrical cabinet is stored for prolonged periods it is advisable to perform a functional check before placing it in service.

4

INSTALLATION

HEAD.	DESCRIPTION
3	Prearrangements

4.3 PREARRANGEMENTS

Prearrangements for installation



Maintenance electrician: **qualified technician able to operate the equipment in normal conditions and in maintained action mode (JOG) with protections inhibited; the maintenance electrician is responsible for all electrical adjustments, servicing and repairs.** The maintenance electrician is authorized to work inside electrical cabinets and junction boxes while the electrical power is connected.

Preparation of the electrical system

Connection to the electrical mains that supplies and combines synchronism with other machines must be carried out by expert and qualified personnel, working in compliance with the electrical wiring diagram and the provisions of Legislation and Technical Standards concerning safety in the workplace and safety of electrical equipment.

Suitable safety devices must be prepared for operation of the equipment in compliance with prescriptions concerning safety in the workplace.



The company assumes no liability for injury to persons and/or animals caused by the failure to observe this instruction.

To achieve an acceptable level of safety, the electrical system to which the Unit /Electrical cabinet is connected must be equipped with, under the sole responsibility of the user, an efficient protective earth system depending on the provisions in the country of the user, and all other matters required for correct execution in compliance with best technical practice and in conformity with Legislation and/or Technical standards concerning safety in the workplace and the safety of electrical systems.

Prepare connections for earthing of the frame of the Unit /Electrical cabinet.



WARNING !

These works are anyway always to be carried out by the user under its sole responsibility and no claims can be raised against the manufacturer for damage to property and injury to persons/animals caused by an incorrectly executed electrical hook-up.

4

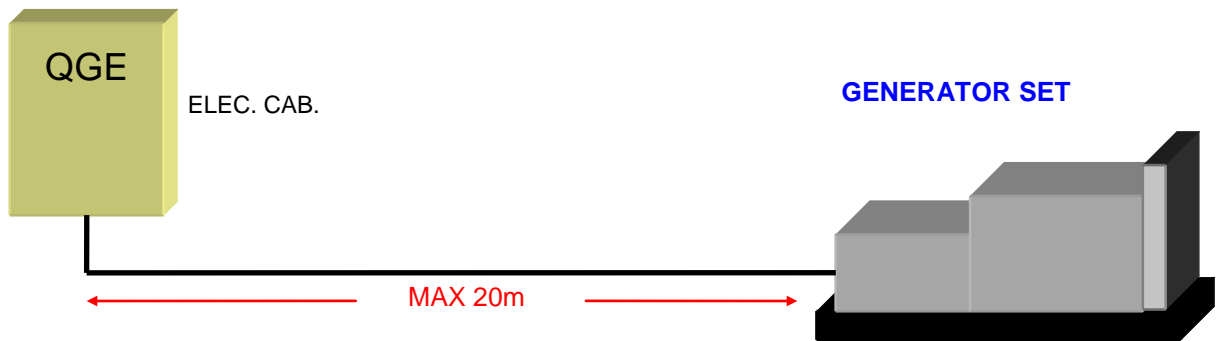
INSTALLATION

HEAD.	DESCRIPTION
5	Positioning

4.4 POSITIONING

The electrical cabinet must have a protection rating (IP) suitable for the place in which it is to be installed:
 IP 42 (normal supply) for indoor sites;
 IP 55 in the event of exposure to water jets or for cabinets exposed to rainfall.

It is good practice to avoid installing the electrical cabinet at distances of more than 20 m from the generator set.

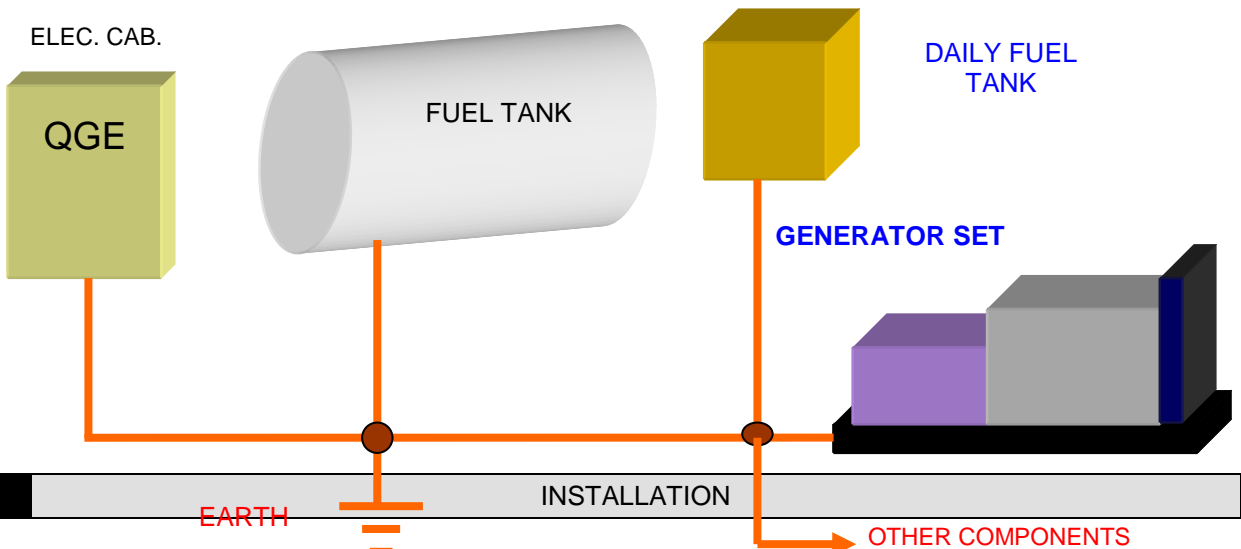


This requirement is related to the overcurrent caused by lightning striking the public grid causing significant voltage spikes in the electrical cabinet if the connection line is longer than 20 m.

If the need to install the electrical cabinet at distances of more than 20 m is unavoidable, consult our engineering department to arrange a suitable technical solution.

PROTECTIVE EARTH CONNECTION (PE)

WARNING !!
 To guarantee reliability of the system it is essential to connect all components of the system to earth



4

INSTALLATION

HEAD.	DESCRIPTION
5	Connections

4.5 CONNECTIONS



Maintenance electrician: **Qualified technician able to operate the equipment in normal conditions and in maintained action mode (JOG) with the protections inhibited; the maintenance electrician is responsible for all electrical adjustments, servicing and repair work.** The maintenance electrician is authorized to work inside electrical cabinets and junction boxes while the electrical power is connected.

4.5.1 POWER CONNECTIONS

Connection diagrams and guideline tables for sizing the line and auxiliary conductors are provided in order to facilitate installation.

It should be noted that all machines and lines must normally be protected against short-circuits and overloads and all preventive measures against direct accidental contacts must be adopted (see standards CEI 64-8/4), so the start of the electrical power cable at the point of mains supply must be equipped with an automatic circuit breaker of suitable rating (and electivity); in addition, the user line must be equipped with a residual current device.

EN 60439-1	TABLE A1	VALUES FOR A SINGLE CONDUCTOR	
SWITCHING. AMPERE I_{th}	NUMBER OF CONDUCTORS	MINIMUM CROSS SECTION IN mm^2	MAXIMUM CROSS SECTION IN mm^2
25A	1	2,5	6
40A	1	6	10
60A	1	10	16
90A	1	16	25
110A	1	25	35
125A	1	35	50
160A	1	50	70
200A	1	70	95
260A	1	95	120
350A	1	150	185
400A	1	185	240
500A	2	95	120
630A	2	120	150
800A	2	240	300
1000A	3	240	300
1250A	4	240	300
1600A	5	240	300
2000A	6	240	300
2500A	7	240	300

For further information contact your installer or our engineering department.

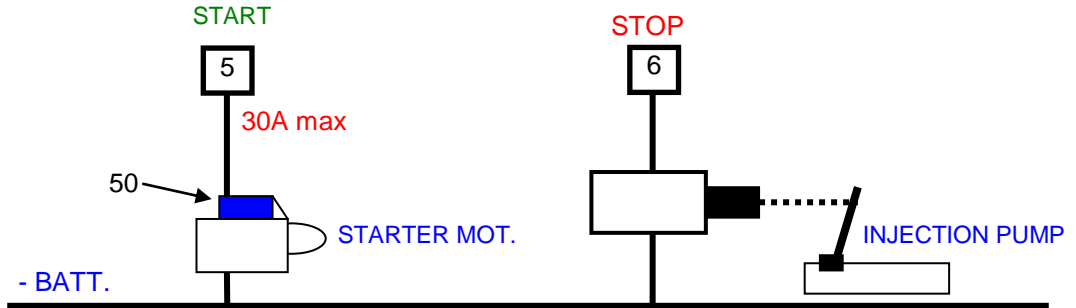
4.5.2 CONNECTIONS TO THE BATTERY

To power the Unit it is good practice to connect directly to the battery cables connected to the starter motor; the use of the engine earth to connect the battery negative (-B) frequently leads to problems.

4.5.3 STARTING AND STOPPING

These controls can be used to activate devices directly with current ratings of up to 30 A . To control electromagnets excited during stopping use terminal N°6

Fig. : 3

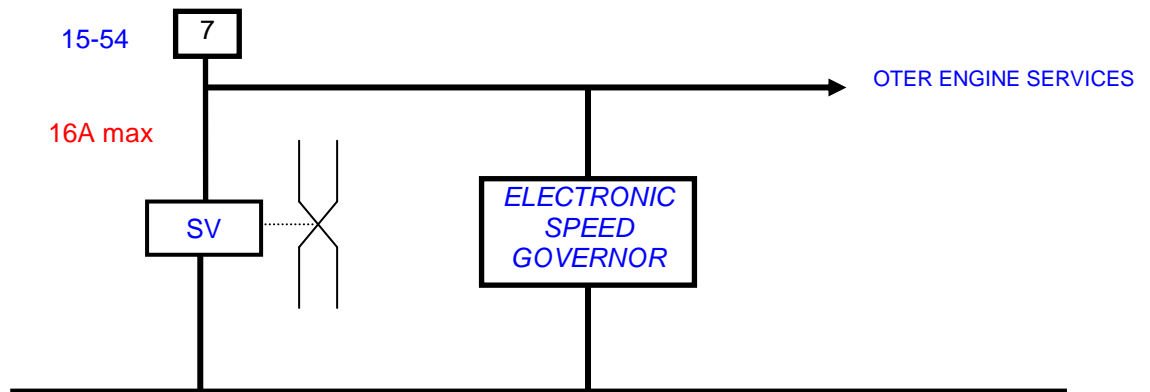


Operation : with the stop instruction the electromagnet is energised and the engine is stopped. To cause the engine to stop the engine rotation speed is checked by means of the frequency measurement input. Once 20" have elapsed from detection of zero speed, the electromagnet is de-energised automatically, thus avoiding the need for calibrations and adjustments.

4.5.4 STOPPING WITH SOLENOID VALVE

Stopping with SOLENOID VALVE normally energised during operation of the generator set and power supply to generator set auxiliary services.

Connection 7, defined 15/54, supplies +B with a maximum of 16A from the time in which starting of the Generator Set is activated, and the signal falls at the time of the stop control,



HEAD.	DESCRIPTION
6	Preliminary checks

4.6 PRELIMINARY CHECKS



Maintenance electrician: **Qualified technician able to run the equipment in normal conditions and in maintained action mode (JOG) with protections inhibited; the maintenance electrician is responsible for all electrical adjustments, servicing and repair work.** The maintenance electrician is authorized to work inside electrical cabinets and junction boxes while the electrical power is connected.

Whenever the Unit is placed in service carry out the following operations beforehand:

- Check all safety systems;
- Check the protections; check the signs.

Before setting the Unit into operation, a series of checks and tests must be carried out in order to prevent errors or accidents during Commissioning:

- Check that the Unit has not been damaged during installation;
- Use special care when checking the condition of the electrical cabinets, control panels, electrical cables and pipelines;
- Check that all the external energy sources are connected properly;
- Carefully check the *input of the frequency measurement line* without which the board is unable to control any functions correctly.

HEAD.	DESCRIPTION
7	Settings

4.7 SETTINGS



Maintenance electrician: **Qualified technician able to operate the Unit in normal conditions and in maintained action mode (JOG) with protections inhibited; the maintenance electrician is responsible for all electrical adjustments, servicing and repair work.** The maintenance electrician is authorized to work inside electrical cabinets and junction boxes while the electrical power is connected.



WARNING!

During the parameters adjustment phase exclusively the signals of the alarms are enabled and not the protections. It is the operator's job to stop the engine in the presence of an alarm if he considers it to be necessary.

The EMERGENCY STOP alarm is always enabled

The following parameters can be set in this stage: glow plugs preheating time interval and overspeed threshold.

During the entire phase of parameters setting the START (4) LED and STOP LED (2) will be illuminated with a flashing yellow light.

4.7.1 PROCEDURE

1. Power off the board.
2. Set switch SW1 - 3 to ON.



3. To configure the glow plugs preheating time interval set SW1 – 1 ON and follow the steps described in heading 4.7.2. Otherwise go directly to heading 4.7.3.



4.7.2 GLOW PLUGS PREHEATING TIME

4. Power on the board by turning the key to 1.
5. **Press and hold down** START PUSHBUTTON (3) for a time equivalent to the required PREHEATING TIME.
6. When START PUSHBUTTON (3) is released the time elapsed is saved. During this time interval glow plugs heating output 5 (CN 2) is enabled.

Press the STOP PUSHBUTTON to activate heating time again.

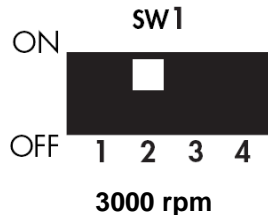
If you do not wish to set the overspeed threshold, set calibration switch SW1- 3 to OFF.

The board assumes normal operating status.

To set the overspeed threshold perform the procedure described below.

4.7.3 OVERSPEED

7. Set SW1 - 2 on the basis of nominal engine speed.



8. Power on the board by turning the key to 1 (if it was not powered).

9. Start the system by pressing START PUSHBUTTON (3). Only in this stage the board considers the generator set to be started on the basis of the LOW OIL PRESSURE input (16 CN 3) .

Engine started conditions are indicated by the ENGINE STARTED LED (5).

10. Wait for the engine nominal speed (1500/3000 rpm) to assume steady state conditions, otherwise correct the speed setting.

11. Set SW1-3 to OFF. The board saves the speed value.



12. Wait for the START and STOP LEDs to be steadily illuminated (several seconds).

13. Stop the engine (STOP PUSHBUTTON 1).

14. Wait for the engine to stop and power off the board by setting the power switch to 0.

The overspeed adjustment procedure is now completed.



WARNING!

Engines equipped with a mechanical speed governor are factory set for no-load operation at a frequency of approximately 52 Hz. Overspeed is calculated on the basis of this value.

4

INSTALLATION

HEAD.	DESCRIPTION
9	No load tests

4.8 NO LOAD TESTS

4.8.1 CONNECTIONS

Once the connections have been made as per the diagram, pay special attention to the speed reading function, without which it is not possible to control correct operation of the board.

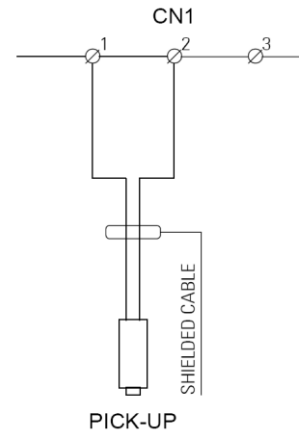
4.8.1.1 SPEED DETECTION SYSTEM WIRING

The system is prearranged for various separate detection types, so it can adapt to any engine.

4.8.1.2 PICK UP

Magnetic sensor that detects engine speed by means of the teeth of the gear with which the starter motor is meshed. Rotation generates an alternative current signal at a frequency that is directly proportional to the rotation speed.

Connect to the wires from the pick up to 1 CN 1 and 2 CN 1.
the wires from the pick-up should be twisted together or shielded.



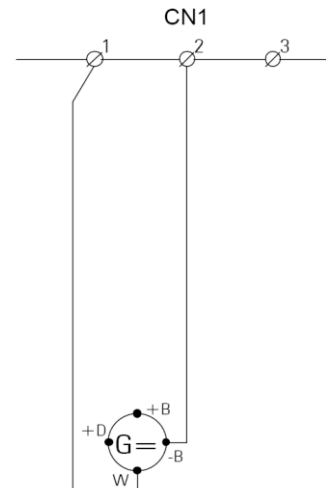
4.8.1.3 W SOCKET FOR BATTERY CHARGE ALTERNATORS

The alternator for battery charging can be equipped with a W socket carrying an alternative current voltage signal at a frequency that is directly proportional to the engine rotation speed.

Connect – B to connector 2 CN1.
Connect the W wire from the alternator to connector 1 CN1.



WARNING! It may occur in certain cases that the voltage on output W is single pole. In this case:
if it is positive, connect W to CN1 – 1 and –Batt to CN1 – 2.
if it is negative connect W to CN1 – 2 and –Batt to CN1 – 1.

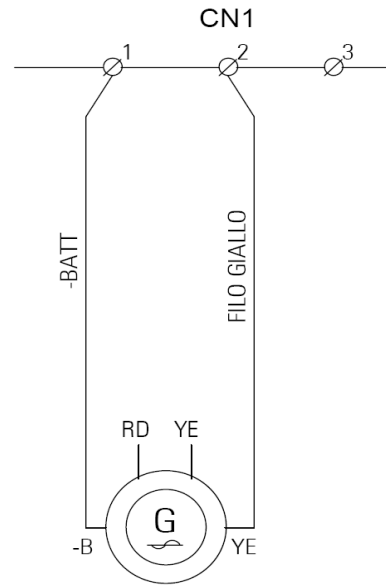


4.8.1.4 SAPRISA TYPE PERMANENT MAGNET REGULATORS

Small engines do not require high current levels to charge the batteries so they can be equipped with alternators constructed with permanent magnets. These devices can supply an alternative current voltage at a frequency that is directly proportional to the engine rotation speed.

Connect - B to connector 1 CN1.

Connect one of the two yellow wires from SAPRISA permanent magnet alternator to connector 2 CN1.

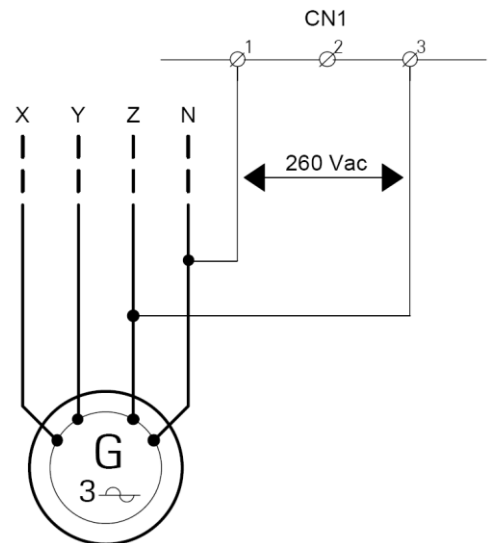


4.8.1.5 260 V ac ALTERNATOR

When PM7 is installed to protect a generator set, it can be connected directly to the AC output of the generator, the frequency of which is directly proportional to the engine rotation speed.

Connect the NEUTRAL wire from the alternator to connector 1 CN1.

Connect one of the PHASE wires from the alternator (260 V ac) to connector 3 CN1.



WARNING! Make sure the phase wire is not connected to connector 2 CN1.

4.8.2 DIPSWITCH CONFIGURATION

PM7 is factory set as follows :

SW1-1 = OFF if ON = Glow plugs preheating time of 10 seconds.

SW1-2 = OFF 1500 rpm

SW1-3 = OFF Normal operation

SW1-4 = OFF 24V battery if ON = 12V battery

Speed detection on connections CN1 1-3 260Vac 50Hz.

It is not necessary to enter the programming phase if the factory parameters are suitable for the required type of operation.

4.8.3 PROCEDURE TO REPLACE BOARD PM7

- Turn the key to 0
- Make sure the Generator Set is stopped
- Disconnect all Fastons
- Remove the board
- Install the new Unit making sure the key is set to 0
- Reconnect all Fastons except those of the battery
- Check that voltage and polarity on the battery Fastons
- Connect the battery Fastons
- Set the key to 1
- If necessary, configure the board as described in heading 4.7



WARNING! It is strictly prohibited to work on live electrical parts.



WARNING! If the battery is connected with reverse polarity (+B to 10 and –B to 9) the engine may be started immediately. Pay special attention to the battery connections

5

5

USING THE EQUIPMENT

HEAD.	DESCRIPTION
1	Control Panel

5.1 CONTROL PANEL

Turn the key to power on engine protection board PM7; with the key set to zero current consumption is zero.

At the time of power on the board performs the LED test and then it assumes stand-by mode.

The two green LEDs corresponding to the Start and Stop pushbuttons are illuminated so that they are visible at night time.

In this condition it is possible to control manual operation or automatic operation from a remote location.

The protection is enabled for all external alarm signals with the exception of the LOW OIL PRESSURE and DYNAMO signals.

HEAD.	DESCRIPTION
2	Commissioning

5.2 COMMISSIONING



First level unit runner : Operator without specific skills capable of performing exclusively simple duties, i.e. running of the equipment by means of the pushbuttons on the control panel and operations of loading and unloading the materials utilised during production with the protection devices installed and activated; this person is not allowed to use the equipment with the maintained action control (JOG).

After having powered on the Unit or the line to which the Unit is connected, proceed as follows:

Perform a careful visual inspection of the entire Unit and make sure that there are no persons or materials that could obstruct normal operation or any objects that have been inadvertently left on top of the Unit.

Check that all the Unit safety devices are enabled and reset them if necessary. In particular:

- Emergency Stop controls unlocked;
- Correct operation of the safety barriers, if present, or protections not removed
- Protective guards.

HEAD.	DESCRIPTION
3	Operating modes

5.3 OPERATING MODES

The unit features two operating modes:

- automatic mode: input 4 enables automatic operation of the board. If it is connected to –B, this control starts a four-attempt engine start routine. the engine is kept running as long as input 4 is connected to –B
- manual mode: starting and stopping of the generator set can be controlled manually from the control panel.

HEAD.	DESCRIPTION
4	Operation

5.4 OPERATION

5.4.1 MANUAL MODE

Press START PUSHBUTTON (3) to start the engine.

The LED corresponding to Start pushbutton (4) illuminates yellow when the start control is active. When the engine speed exceeds the 600 rpm engine started threshold LED (5) lights and after 20 seconds also the LOW OIL PRESSURE and DYNAMO alarms are enabled.

If the glow plugs preheating function is enabled, before the engine start control the preheating stage is activated. Pressing and holding down START PUSHBUTTON (3) output (5 CN2) is enabled and the green preheating LED illuminates.

Once the heating time interval has elapsed the start procedure is activated.

Release START PUSHBUTTON (3) to stop the preheating function; the next time the Start pushbutton is pressed engine starting will be controlled.

Press STOP PUSHBUTTON (1) to stop the engine.

Once the stopping procedure is terminated, a new manual or automatic procedure can be activated. If the engine stop command is transmitted before engine started status has been confirmed, the stopping cycle is not enabled.

In manual mode the automatic start and stop controls are inhibited.

If the manual start procedure is stopped before the engine starts, after a 60 second delay interval the board deactivates the FUEL output (15_54).

5.4.2 AUTOMATIC OPERATION

When the external automatic start contact is closed (4 CN 2) the board controls the cycle, signalled by the yellow Start LED (4).

If preheating is enabled the glow plugs preheating output (5 CN 2) is activated and the corresponding green LED (8) illuminates.

Once the preheating time interval has elapsed the start procedure is activated.

The automatic start cycle is composed of 4 start attempts of a duration of 5 seconds each, interspaced by a pause interval of the same duration.

If the engine fails to start, the no start condition is signalled with an audible alarm and illumination of the no start warning LED (13).

If the engine speed exceeds the engine started threshold (approx. 600 rpm) the start control is inhibited and the engine started LED (8) illuminates. After 20 seconds with the engine running the LOW OIL PRESSURE and DYNAMO alarms are enabled.

When the external automatic start contact is opened (4 CN 2) the engine stops.

Once the stopping procedure is terminated, a new manual or automatic procedure can be activated. In automatic operating mode the START PUSHBUTTON (3) is inhibited.

The STOP PUSHBUTTON (1) to stop the engine.

In this case once the stopping procedure is terminated the board assumes locked status, as signalled by flashing of the red stop LED (2) .

The only way to quit locked status is to reset the board by setting the key to zero.

5.4.3 ALARMS

When the board is powered on all the engine protections are enabled, with the exclusion of LOW OIL PRESSURE and DYNAMO, which are enabled 20 seconds after the engine is considered to be started (about 600 rpm).

When an alarm trips the stop cycle is activated. The cycle is composed of:

storage and display of the cause of engine stopping.

deactivation of the fuel output with power disconnected from the fuel solenoid valve, the actuator, etc.

timed activation of the stop control for the electromagnet

activation of the internal audible alarm and external alarm output

The stop control for the electromagnet is maintained for 20 seconds after the engine speed falls below the engine running threshold.

After tripping of an alarm it is no longer possible to restart the engine except by resetting the board - achieved by disconnecting the board power supply (key to 0).

The audible alarm can be muted by pressing the STOP BUTTON (1)

5.4.4 STOP CONTROL

The stopping cycle is composed of:

deactivation of the fuel output with power disconnected from the fuel solenoid valve, the actuator, etc.

timed activation of the stop control for the electromagnet







signalling by means of the red LED (2) on the stop button.

The stop control for the electromagnet is maintained for 20 seconds after the engine speed falls below the engine running threshold (approximately 600 rpm).

Once the stopping procedure has been terminated the board reassumes standby status ready to receive a new start control.

N.B. The stop control with the STOP PUSHBUTTON (1) transmitted during automatic operation sets the board to locked status.

5.4.5 DESCRIPTION OF BOARD STATUS IN RELATION TO THE INDICATOR LIGHTS

	<p>5.4.6 Standby for commands: The board waits for manual or automatic commands. If the engine is running, pressing the START button produces no effect. If the engine has been started in automatic mode, pressing the STOP pushbutton causes the board to assume locked status (see 5.4.7)</p>
	<p>5.4.7 Locked status: A manual stop has been activated after an automatic start. Turn the key to 0 and to 1 again to reset the board</p>
	<p>5.4.8 Stop in progress: The stop relay is energised</p>
	<p>5.4.9 Start in progress: The start relay is energised</p>
	<p>5.4.10 Start pause: The board is in the process of an automatic start procedure and is currently standing by for 5 seconds before the next start attempt.</p>
	<p>5.4.11 Configuration in progress: The board is being configured. Warning: in this stage the only active protection is the emergency stop control.</p>

5

USING THE EQUIPMENT

HEAD.	DESCRIPTION
5	Emergency stop

5.5 EMERGENCY STOP

Press the red mushroom head “Emergency” Pushbutton (fig. 5.5.1) to perform the Unit Emergency Stop manoeuvre. All moving parts will stop immediately.



5.5.1

6

6 MAINTENANCE

HEAD.	DESCRIPTION
1	Maintenance status

6.1 MAINTENANCE STATUS

Maintenance operations must be carried out with the Unit locked out, i.e. key set to 0.

6

MAINTENANCE

HEAD.	DESCRIPTION
2	Disconnection of the Unit

6.2 DISCONNECTION OF THE UNIT-ELECTRICAL CABINET

Maintenance electrician: **Qualified technician able to operate the unit in normal conditions and in maintained action mode (JOG) with protections inhibited; the maintenance electrician is responsible for all electrical adjustments, servicing and repair work.** The maintenance electrician is authorized to work inside electrical cabinets and junction boxes while the electrical power is connected.

Before carrying out any Maintenance or Repair works, the Unit/Electrical cabinet must be isolated from the power supply.

6

MAINTENANCE

HEAD.	DESCRIPTION
3	Special precautions

6.3 PRECAUTIONS

When carrying out Maintenance or Repair work adhere to the following instructions:

- Before starting work, display a "MAINTENANCE IN PROGRESS" sign in a clearly visible position;
- Do not use solvents or inflammable materials;
- Do not disperse lubricants or coolants in the environment;
- To gain access to elevated parts of the Equipment, use the most suitable means in relation to the work to be performed;
- Do not climb on parts of the Equipment because they are not designed to support the relative loads;
- When the works have been completed, refit and secure all the protections and guards that were previously removed or opened;



A.E.Z. declines all liability for failure to observe the listed prescriptions and for all other nonconforming uses of the machine or uses that are not mentioned in the present instructions.

6

MAINTENANCE

HEAD.	DESCRIPTION
4	Routine maintenance

6.4 ROUTINE MAINTENANCE



Maintenance electrician: **Qualified technician able to operate the unit in normal conditions and in maintained action mode (JOG) with protections inhibited; the maintenance electrician is responsible for all electrical adjustments, servicing and repair work.** The maintenance electrician is authorized to work inside electrical cabinets and junction boxes while the electrical power is connected.



N.B.

Failure to observe the requirements automatically releases A.E.Z. from any whatsoever liability for the purposes of the Warranty.

6.4.1 ELECTRICAL MAINTENANCE

Any work required must be performed exclusively by specialised personnel.

All control, monitoring and reset functions can be carried out from the control module panel.

To access the devices inside the electrical cabinet perform the procedure given below:

1. Set the key to 0.
2. Check to ensure that the generator set has come to a complete stop.
3. Open the cabinet and check for possible faults :
 - fuses;
 - automatic circuit breakers;
 - thermal relays.

After completing the maintenance work, repeat the above procedure in reverse to reset.

The electrical cabinet is designed to function without any form of maintenance, although the following aspects must be monitored:

every 30-60 days	the battery electrolyte level.
every 30 days	water, oil and fuel levels
every 30 days	engine preheating temperature (if present)
every 30 days	generator set automatic starting test
every 6 months	battery efficiency

ELECTRICAL MAINTENANCE

For GENERATOR maintenance refer to the respective manual; the following indications concern the generator set electrical control and monitoring devices.



WARNING !

If the electrical cabinet is powered by the mains supply and the generator supply, before opening it for maintenance purposes disconnect the mains supply and stop the generator set. In any case, always set to key to 0 before proceeding

6.4.2 ENGINE PROTECTIONS

On the engine, disconnect the wire from the relative detector sensor and connect it to engine ground for approximately 5". The audible alarm will sound, the engine will stop, and the engine stopped alarm will appear on the Unit panel.

6.4.3 GENERATOR PROTECTIONS

Activate the accelerator or actuator lever manually to cause an upward or downward change in engine revs; this will cause a change in the frequency in Hz until the protection threshold trips, with the consequent alarm status and lockout.

6.4.4 BATTERY EFFICIENCY

The accumulation capacity, i.e. the ability to crank the engine a sufficient number of times to guarantee efficient operation of the generator set must be checked at 12 month intervals by means of the following procedure:

the check must be carried out with the battery fully charged, with voltage higher than 13.5V for generator sets with 12V battery and at voltages higher than 27V for 24V generator sets. With the key set to 0 disconnect the electromagnet, the safety solenoid valve or actuator, and all other components necessary to prevent the generator set from starting up, i.e. avoid feeding the injection pump so that, when it is cranked, the engine will turn over without starting. Connect input 4 to the battery negative; there should be 4 start attempts, with virtually constant cranking speed from the first attempt to the fourth.

If 4 start attempts are not obtained (minimum 4) the batteries must be changed.

6.4.5 PERIODIC CHECKS

To maintain your generator set in good working order it is essential to carry out periodic checks in addition to the checks planned by the engine manufacturer and the installer:

- Check the batteries electrolyte level every 15 days after the Unit has been installed, and request technical service if electrolyte consumption is excessive. After an initial period perform the check every 30-60 days.
- In generator sets equipped with engine preheating, at the time of the batteries electrolyte level check, check also that the engine is warm. Otherwise request technical service. (WARNING! A cold engine in low ambient temperature conditions may be difficult to start and may not deliver the required power output once it is running)
- When new electrical machines are connected to electrical systems supplied by the generator set, request a technical check to ascertain the adequacy of CG/CR mains/generator set switching to the new load.

SUMMARY:

- Periodically check the electrolyte level in transparent battery cells.
- Touch the engine to check whether or not it is warm (only engines with preheating function).

HEAD.	DESCRIPTION
5	Supplementary maintenance

6.5 SUPPLEMENTARY MAINTENANCE



Maintenance electrician: **Qualified technician able to operate the unit in normal conditions and in maintained action mode (JOG) with protections inhibited; the maintenance electrician is responsible for all electrical adjustments, servicing and repair work.** The maintenance electrician is authorized to work inside electrical cabinets and junction boxes while the electrical power is connected.



Maintenance mechanic: **qualified technician able to operate the unit in normal conditions and in maintained action mode (JOG) with protections inhibited, to work on mechanical parts to make adjustments, and to perform servicing and repairs of mechanical parts when necessary.** The maintenance mechanic is typically not allowed to perform work on the electrical systems when power is connected.

6.5.1 BATTERY REPLACEMENT PROCEDURE

Turn the key to 0.

Disconnect the BATTERY and BATTERY CHARGE fuses (if present).

Replace the battery, refit the fuses and reset the operating program.

HEAD.	DESCRIPTION
6	Diagnostics and troubleshooting

6.6 DIAGNOSTICS AND TROUBLESHOOTING

All electrical cabinets are marked with an order number on the test dataplate affixed to the interior of the cabinet. All technical and construction data are associated with the order number. Refer to this number when making requests for technical assistance or spare parts.

Always specify also the following data:

1. Type of electronic board
2. Battery voltage
3. Type of speed detection system
4. Signals present on the PM7 board at the time of the fault
5. Manual or automatic operation

Does not start	Attempts to start	Short and rapid starts	Alarm due to failure to start	Alarm generated	Does not start	Nothing	TROUBLESHOOTING	
							PROBABLE CAUSE	CORRECTIVE ACTION
•	•	•	•				Battery discharged	Charge the battery
						•	Battery polarity inverted	Check and invert the leads
•	•	•	•				Battery connections loose or oxidised	Clean, tighten and grease the battery terminals
			•				Starter motor pinion fails to mesh with crown wheel	Renew pinion or entire starter motor
				•			Once engine has started overspeed alarm trips	Calibrate electronic speed governor, calibrate overspeed parameter value of PM7 board
				•			Immediate low fuel alarm	Refuel.
				•			Low oil pressure	Renew pressure switch
				•			Engine high temperature	Renew thermostat
				•		•	Emergency stop pushbutton pressed	Twist and pull pushbutton head
					•		Stopping system is faulty	Clean the system from residues, lubricate or renew

7

7 SPARE PARTS and ACCESSORIES

HEAD.	DESCRIPTION
1	Service

7.1 SERVICE

GAMMA ELETTRONICA is always at your complete disposal for any information concerning the use, maintenance, installation etc. of the Unit/Electrical cabinet.

Customers are advised to ensure their queries are clearly stated with reference to this Manual and the instructions contained herein.

7

SPARE PARTS ACCESSORIES

HEAD.	DESCRIPTION
2	Spare parts

7.2 SPARE PARTS

For spare part requirements always contact **GAMMA ELETTRONICA**

USE EXCLUSIVELY GENUINE ORIGINAL REPLACEMENT PARTS.



N.B.

A.E.Z. cannot be held liable for breakages, faults, injury to persons or damage to property caused by the use of non-original replacement parts.

7

SPARE PARTS and ACCESSORIES

HEAD.	DESCRIPTION
3	Accessories

7.3 ACCESSORIES

Always consult **GAMMA ELETTRONICA** for queries in relation to the accessories supplied with the machine.

8

8 SUPPLEMENTARY INSTRUCTIONS

HEAD.	DESCRIPTION
1	Decommissioning and dismantling

8.1 DECOMMISSIONING AND DISMANTLING

At the end of their life-cycle, the unit/electrical cabinet must not be disposed of with normal urban waste materials. The unit/electrical cabinet can be consigned to a specific sorted waste collection centre authorised by the local municipal council.

Separate plastic parts, electrical and electronic components for sorted collection and recycling in compliance with statutory legislation.

With regard to the metal structural parts of the electrical cabinet, simply divide the steel parts and those made of other metals or alloys so that they can be recycled for resmelting correctly.

Disposing of materials separately makes it possible to avoid negative environmental impact and negative effects on health; it also makes it possible to recycle the component material, thus achieving big savings in energy consumption and the use of natural resources.

8

SUPPLEMENTARY INSTRUCTIONS

HEAD.	DESCRIPTION
2	Safe working practices

8.2 SAFE WORKING PRACTICES

Personnel should be notified of special procedures and suitably informed for:

- Safe use of the Unit /Electrical cabinet;
- Emergency situations;

9

9 ELECTRICAL EQUIPMENT Annex

HEAD.	DESCRIPTION
1	Electrical diagrams

9.1 ELECTRICAL DIAGRAMS

9

ELECTRICAL EQUIPMENT ANNEXES

HEAD.	DESCRIPTION
2	Electrical cabinet test certificate

9.2 ELECTRICAL CABINET TEST CERTIFICATE

9

ELECTRICAL EQUIPMENT ANNEXES

HEAD.	DESCRIPTION
3	Declaration of conformity of the electrical cabinet

9.3 DECLARATION OF CONFORMITY OF THE ELECTRICAL CABINET

9

ELECTRICAL EQUIPMENT ANNEXES

HEAD.	DESCRIPTION
4	Declaration of conformity of components installed in the electrical cabinet

9.4 DECLARATION OF CONFORMITY OF COMPONENTS INSTALLED IN THE ELECTRICAL CABINET

