language

USE AND MAINTENANCE MANUAL

TRANSLATION OF THE ORIGINAL INSTRUCTIONS — ENGLISH

GE 15 PSX
GE 20 PSX

Codice
Code
Code
Codigo
Kodezahl
Código
Код

CF6C00019003

- Gruppo Elettrogeno
- Generating Set
- Groupe Electrogene
- Grupos Electrógenos
- Stromerzeuger
- Grupo Gerador
- Генераторная Установка

Edizione
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Издание

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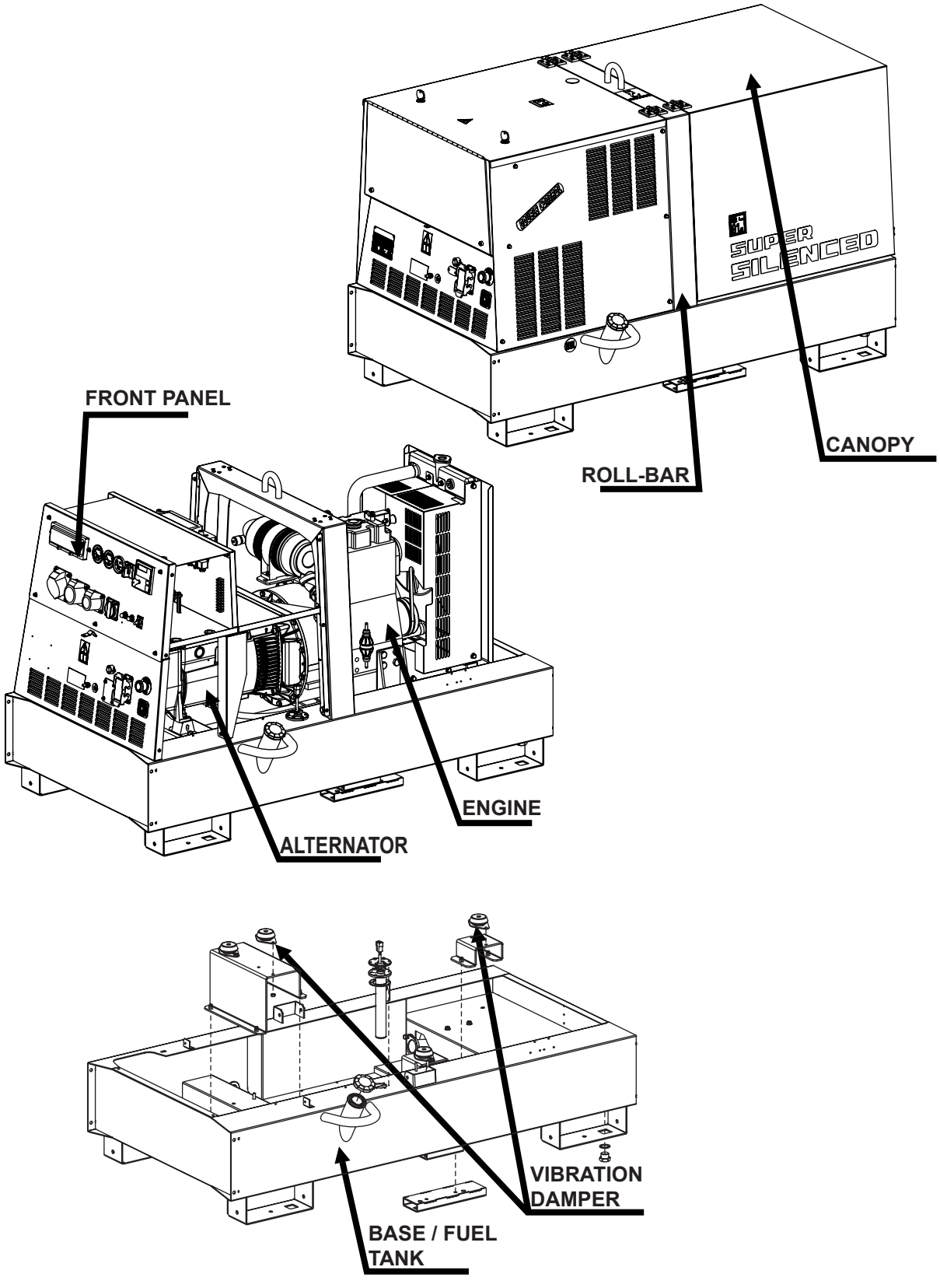
MADE IN ITALY

MOSA Energy

The generating set is a unit which transforms the mechanical energy, generated by endothermic engine, into electric energy, through an alternator.
The unit is composed of a structured base which includes a tank, an engine/alternator unit fixed on the base by elastic dampers, a roll-bar, with hook for an easy and sure lifting, a chest hinged to the roll-bar for a quick access to the engine and to the air filter.
The set is completed by a frontal panel where the sockets, the protections and the measuring instruments are mounted, all this protected by a same sized cover.



ATTENTION

This use and maintenance manual is an important part of the machines in question.
The assistance and maintenance personel must keep said manual at disposal, as well as that for the engine and alternator (if the machine is synchronous) and all other documentation about the machine.

We advise you to pay attention to the pages concerning the security (see page M1.1).

INFORMATION

Dear Customer,
We wish to thank you for having bought a high quality set.

Our sections for Technical Service and Spare Parts will work at best to help you if it were necessary.

To this purpose we advise you, for all control and overhaul operations, to turn to the nearest authorized Service Centre, where you will obtain a prompt and specialized intervention.

☞ In case you do not profit on these Services and some arts are replaced, please ask and be sure that are used exclusively original parts; this to guarantee that the performances and the initial safety prescribed by the norms in force are re-established.

☞ *The use of* ***non original spare parts will cancel immediately*** *any guarantee and Technical Service obligation.*

NOTES ABOUT THE MANUAL

Before actioning the machine please read this manual attentively. Follow the instructions contained in it, in this way you will avoid inconveniences due to negligence, mistakes or incorrect maintenance. The manual is for qualified personnel, who knows the rules: about safety and health, installation and use of sets movable as well as fixed.

You must remember that, in case you have difficulties for use or installation or others, our Technical Service is always at your disposal for explanations or interventions.

The manual for Use Maintenance and Spare Parts is an integrant part of the product. It must be kept with care during all the life of the product.
In case the machine and/or the set should be yielded to another user, this manual must also given to him.
Do not damage it, do not take parts away, do not tear pages and keep it in places protected from dampness and heat.

You must take into account that some figures contained in it want only to identify the described parts and therefore might not correspond to the machine in your possession.

INFORMATION OF GENERAL TYPE

In the envelope given together with the machine and/or set you will find: the manual for Use Maintenance and Spare Parts, the manual for use of the engine and the tools (if included in the equipment), the guarantee (in the countries where it is prescribed by law).

The Manufacturer shall not be liable for ANY USE OF THE PRODUCT OTHER THAN THAT PRECISELY SPECIFIED IN THIS MANUAL and is thus not liable for any risks which may occur as a result of IMPROPER USE. The Company does not assume any liability for any damage to persons, animals or property.

Our products are made in conformity with the safety norms in force, for which it is advisable to use all these devices or information so that the use does not bring damage to persons or things.

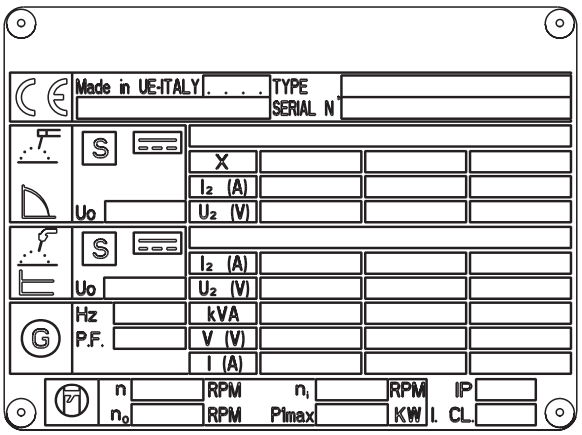
While working it is advisable to keep to the personal safety norms in force in the countries to which the product is destined (clothing, work tools, etc.).

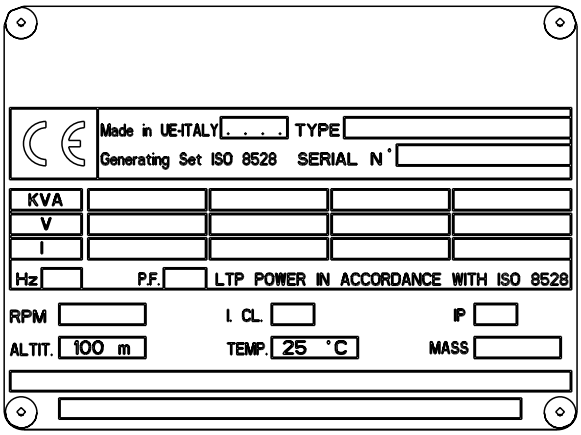
Do not modify for any motive parts of the machine (fastenings, holes, electric or mechanical devices, others..) if not duly authorized in writing: the responsibility coming from any potential intervention will fall on the executioner as in fact he becomes maker of the machine.

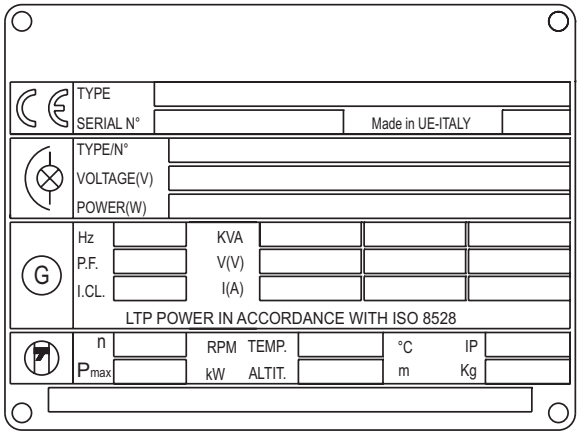
☞ ***Notice:*** *the manufacturer, who keeps the faculty, apart the essential characteristics of the model here described and illustrated, to bring betterments and modifications to parts and accessories, without putting this manual uptodate immediately.*

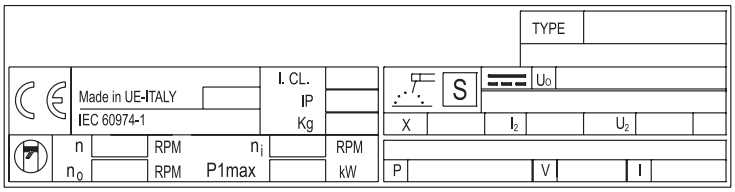
Any of our product is labelled with CE marking attesting its conformity to appliable directives and also the fulfillment of safety requirements of the product itself; the list of these directives is part of the declaration of conformity included in any machine standard equipment.
Here below the adopted symbol:

CE marking is clearly readable and unerasable and it can be either part of the data-plate.

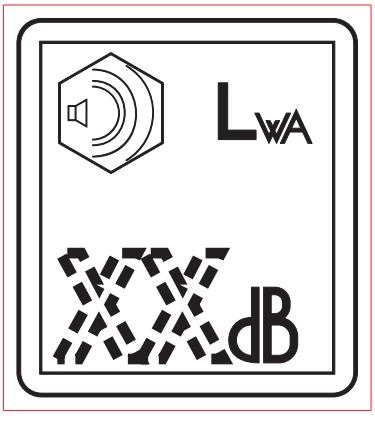








Furthermore, on each model it is shown the noise level value; the symbol used is the following:



The indication is shown in a clear, readable and indeleble way on a sticker.

GENERATOR	GE 15 PSX	GE 20 PSX
*Stand-by three-phase power	15 kVA (12 kW) / 400 V / 21.6 A	22 kVA (17.6 kW) / 400 V / 31.8 A
*PRP three-phase power	14 kVA (11.2 kW) / 400 V / 20.2 A	20 kVA (16 kW) / 400 V / 28.9 A
*PRP single-phase power	6.5 kVA / 230 V / 28.3 A	7 kVA / 230 V / 30.4 A
Frequecy	50 Hz	
Cos φ	0.8	
* *Output powers according to ISO 8528-1*		
ALTERNATOR	self-excited, self-regulated, brushless	
Type	three-phase, synchronous	
Insulation class	H	
ENGINE		
Make / Model	Perkins 403A-15G1	Perkins 404A-22G1 Perkins 404D-22G In according with Stage 3A
Type / Cooling system	Diesel 4-Stroke / Water	
Cylinder / Displacement	3 / 1496 cm^3	4 / 2216 cm^3
*Stand by power	13.3 kW (18 HP)	20.3 kW (27.6 HP)
*PRP power	12 kW (16.3 HP)	18.4 kW (25 HP)
Speed	1500 rpm	
Fuel consumption (75% of PRP)	2.8 l/h	4 l/h
Engine oil capacity	6 l	8.5 l
Starter	Electric	
* *Powers according to ISO 3046/1*		
GENERAL SPECIFICATIONS		
Tank capacity	60 l	
Running time (75% of PRP)	21.5 h	15 h
Protection	IP 23	
*Dimensions / max. Lxwxh (mm)	1720x980x1110	
*Weight on base	580 Kg	650 Kg
Measured acoustic power LwA (pressure LpA)	90 dB(A) (65 dB(A) @ 7 m)	
Garanteed acoustic power LwA (pressure LpA	91 dB(A) (66 dB(A) @ 7 m)	
* Dimensions and weight are inclusive of all parts.		

OUTPUT

Declared power according to ISO 8528-1 (temperature 40°C, 30% relative humidity, altitude 1000 m above sea level).
(*Stand-by) = maximum available power for use at variable loads for a yearly number of hours limited at 500 h. No overload is admitted.
(**Prime power PRP) = maximum available power for use at variable loads for a yearly illimited number of hours. The average power to be taken during a period of 24 h must not be over 80% of the PRP.
It's admitted overload of 10% each hour every 12 h.
In an approximative way one reduces: of 1% every 1000 m altitude and of 3% for every 5°C above 40°C.

ACOUSTIC POWER LEVEL

ATTENTION: The concrete risk due to the machine depends on the conditions in which it is used. Therefore, it is up to the end-user and under his direct responsibility to make a correct evaluation of the same risk and to adopt specific precautions (for instance, adopting a I.P.D. -Individual Protection Device)
Acoustic Noise Level (LwA) - Measure Unit dB(A): it stands for acoustic noise released in a certain delay of time. This is not submitted to the distance of measurement.
Acoustic Pressure (Lp) - Measure Unit dB(A): it measures the pressure originated by sound waves emission. Its value changes in proportion to the distance of measurement.
The here below table shows examples of acoustic pressure (Lp) at different distances from a machine with Acoustic Noise Level (**LwA**) of 95 dB(A)

Lp a 1 meter = 95 dB(A) - 8 dB(A) = 87 dB(A)
Lp a 4 meters = 95 dB(A) - 20 dB(A) = 75 dB(A)
Lp a 7 meters = 95 dB(A) - 25 dB(A) = 70 dB(A)
Lp a 10 meters = 95 dB(A) - 28 dB(A) = 67 dB(A)

PLEASE NOTE: the symbol LWA when with acoustic noise values, indicates that the device respects noise emission limits according to 2000/14/CE directive.

The installation and general warnings regarding operations are aimed achieving correct use of the machine and/or apparatus in the place where it is used as a genset and/or motor welder.
- Advice to the User about the safety:

☞ NB: The information contained in the manual can be changed without notice.
Any damage caused in connection with the use of these instructions shall not be considered as they are only indicative.
Remember that the non observance of the indications reported by us might cause damage to persons or things. It is understood, that local dispositions and/or laws must be respected.

⚠ DANGEROUS

This heading warns of an immediate danger for persons as well for things. Not following the advice can result in serious injury or death.

⚠ WARNING

This heading warns of situations which could result in injury for persons or damage to things.

⚠ CAUTION

To this advice can appear a danger for persons as well as for things, for which can appear situations bringing material damage to things.

⚠ IMPORTANT
⚠ NOTE
⚠ ATTENTION

These headings refer to information which will assis you in the correct use of the machine and/or accessories.

☞ **FIRST AID.** In case the operator shold be sprayed by accident, from corrosive liquids a/o hot toxic gas or whatever event which may cause serious injuries or death, predispose the first aid in accordance with the ruling labour accident standards or of local instructions.

Skin contact	Wash with water and soap
Eyes contact	Irrigate with plenty of water, if the irritation persists contact a specialist
Ingestion	Do not induce vomit as to avoid the intake of vomit into the lungs, send for a doctor
Suction of liquids from lungs	If you suppose that vomit has entered the lungs (as in case of spontaneous vomit) take the subject to the hospital with the utmost urgency
Inhalation	In case of exposure to high concentration of vapours take immediately to a non polluted zone the person involved

☞ **FIRE PREVENTION.** In case the working zone,for whatsoever cause goes on fire with flames liable to cause severe wounds or death, follow the first aid as described by the ruling norms or local ones.

EXTINCTION MEANS	
Appropriated	Carbonate anhydride (or carbon dioxyde) powder, foam, nebulized water
Not to be used	Avoid the use of water jets
Other indications	Cover eventual shedding not on fire with foam or sand, use water jets to cool off the surfaces close to the fire
Particular protection	Wear an autorespiratory mask when heavy smoke is present
Useful warnings	Avoid, by appropriate means to have oil sprays over metallic hot surfaces or over electric contacts (switches,plugs,etc.). In case of oil sprinkling from pressure circuits, keep in mind that the inflamability point is very low.

SYMBOLS

STOP **-** Read absolutely and be duly attentive

Read and pay due attention

GENERAL ADVICE **-** If the advice is not respected damage can happen to persons or things.

HIGH VOLTAGE **-** Attention High Voltage. There can be parts in voltage, dangerous to touch. The non observance of the advice implies life danger.

FIRE **-** Danger of flame or fire. If the advice is not respected fires can happen.

HEAT **-** Hot surfaces. If the advice is not respected burns or damage to things can be caused.

EXPLOSION **-** Explosive material or danger of explosion. in general. If the advice is not respected there can be explosions.

WATER **-** Danger of shortcircuit. If the advice is not respected fires or damage to persons can be caused.

SMOKING **-** The cigarette can cause fire or explosion. If the advice is not respected fires or explosions can be caused.

ACIDS **-** Danger of corrosion. If the advice is not respected the acids can cause corrosions with damage to persons or things.

WRENCH **-** Use of the tools. If the advice is not respected damage can be caused to things and even to persons.

PRESSION **-** Danger of burns caused by the expulsion of hot liquids under pressure.

ACCES FORBIDDEN *to non authorized* peaple.

PROHIBITIONS No harm for persons

Use only with safety clothing -

It is compulsory to use the personal protection means given in equipment.

Use only with safety clothing -

It is compulsory to use the personal protection means given in equipment.

Use only with safety protections -

It is a must to use protection means suitable for the different welding works.

Use with only safety material -

It is prohibited to use water to quench fires on the electric machines.

Use only with non inserted voltage -

It is prohibited to make interventions before having disinserted the voltage.

No smoking -

It is prohibited to smoke while filling the tank with fuel.

No welding -

It is forbidden to weld in rooms containing explosive gases.

ADVICE <u>No harm for persons and things</u>

Use only with safety tools, adapted to the specific use -

It is advisable to use tools adapted to the various maintenance works.

Use only with safety protections, specifically suitable

It is advisable to use protections suitable for the different welding works.

Use only with safety protections -

It is advisable to use protections suitable for the different daily checking works.

Use only with safety protections -

It is advisable to use all protections while shifting the machine.

Use only with safety protections -

It is advisable to use protections suitable for the different daily checking works.and/or of maintenance.

General installation criteria

Installation of a genset has to be planned by qualified and trained technicians, it has to be carried out by a competent organization with qualified personnel and proper equipment.

ATTENTION

Faulty installation can create damage to the genset and the User system, and injury to persons.
It is compulsory to install the genset according to the norms in force in the country of installation.

The installing company must provide a conformity declaration stating that installation has been carried out duly and according to plans and to norms in force.

Before proceeding with installation the following conditions have to be checked:

- Genset has been selected according to needs of the electrical load and to environmental conditions (temperature, altitude and humidity);
- Genset location is of appropriate dimensions and allows accessibility to genset for maintenance and/or necessary repairs;
- If genset is indoors, ensure there is enough air for engine combustion, for genset cooling (radiator and generator), and sufficient ventilation;
- If genset is indoors, a system of expulsion for engine exhaust gas is provided;
- Personnel safety has been carefully considered;
- Noise-level issues have been carefully considered;
- Fuel and lubricant stocking issues have been considered in accordance to norms in force in the country of installation.

INFORMATION

Italian and European norms define specific characteristics referring to the premises in which genset should be located, indicating possible positioning, minimum dimensions, etc.

For any doubt referring to installation location contact our technical sales office.

Outdoor installation

ATTENTION

All generating sets are equipped with a control system that is NOT influenced by standard environmental factors and is able to stop the unit in case of anomalous values in the fundamental parameters.

In order to avoid unexpected black-outs or other potentially dangerous situations, the below installation indications must be followed.

Environmental conditions

ATTENTION

Open gensets (SKID) have to be located in an area protected from rain, snow, high humidity and direct exposure to the sun.
Rain or high humidity on GE genset alternator, in particular during operation, cause an increase in voltage output, winding faults, electric discharge towards ground, with damage to the genset and injury to persons. Dust, in particular saline dust, must be avoided.
In case radiator or air filters are obstructed, there is the risk that genset will overheat or be damaged. Aspiration grills must not be obstructed by leaves, snow, etc.

Output of fumes in open air conditions

DANGER

Genset must be positioned so that exhaust gas is diffused without being inhaled by any living being.
Engine exhaust gas contains carbon monoxide, which is harmful to one's health, and in big quantities can cause intoxication and death.
Local norms in force have to be respected.

Safe distance

ATTENTION

A safe distance has to be kept between genset and fuel deposits, inflammable goods (cloths, paper, etc.), chemicals, according to indications provided by the authority in charge. In order to avoid potentially dangerous situations, area surrounding genset should be isolated so that unauthorized people will not be able to get close to the unit. Even if MOSA gensets are manufactured according to electromagnetic compatibility norms, we suggest NOT to install the genset near machinery that can be influenced by magnetic fields.

Fixing

In order to absorb vibrations produced by genset, it should be fixed to a surface with sufficient rigidity, isolated against vibrations towards other structures and with a mass equal to at least three times the genset mass.
DO NOT locate the genset on terraces or raised levels, if its characteristics have not been previously verified as suitable.

NOTE

When using a genset it is advisable to adopt precautions to avoid that fuel, lubricant and other engine liquids may accidentally cause soil pollution. The most recent generators are designed to retain possible liquid leakages, hence no specific measures are needed in this regard.
In case of doubts concerning your genset do not hesitate to contact our technical sales office.

Fixed outdoor installation

If a shelter is used to protect the genset (see figure), it should NOT be attached to it.
Even if a shelter is temporary the below indications should be followed:

ATTENTION

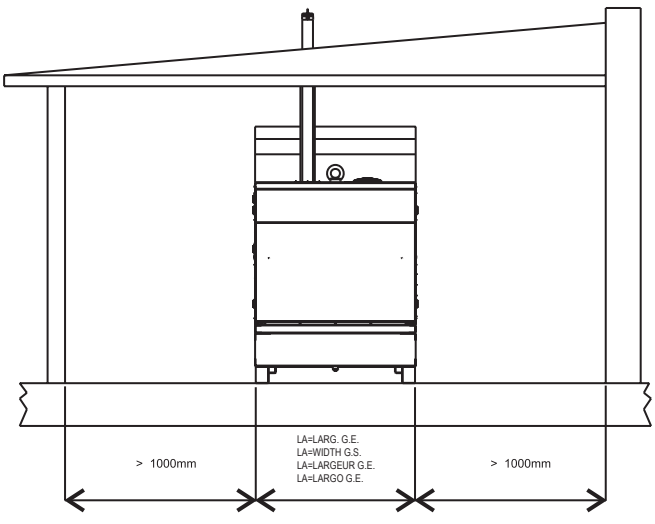
Engine and alternator when in operation produce heat:

- Shelter should NOT obstruct normal cooling of components;
- Exhaust gas should be directed in order to avoid the possibility that alternator and engine fan inhale it;
- Shelter should be made of fireproof material, as embers may come out of the exhaust pipe;
- Never cover or wrap up genset with plastic sheets or other material while operating. If genset is off, make sure engine has cooled before you cover it, or else there may be risk of damage to the genset or may catch fire.

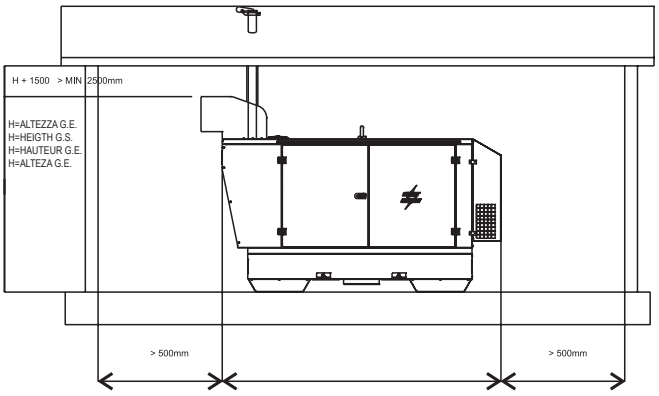
Temporary outdoor installation

Indications given for fixed installation have to be followed.
If genset is not positioned correctly, vibrations transmitted to the baseframe may cause the genset to move, this may occur while the genset has a load inserted, take on all necessary precautions to avoid this.

Sample of outdoor installation with shelter



Sample of outdoor installation with shelter



Indoor installation

In order to avoid endangering or damaging genset following indications must be followed.
Genset installation location has to be in accordance to the norms in force.

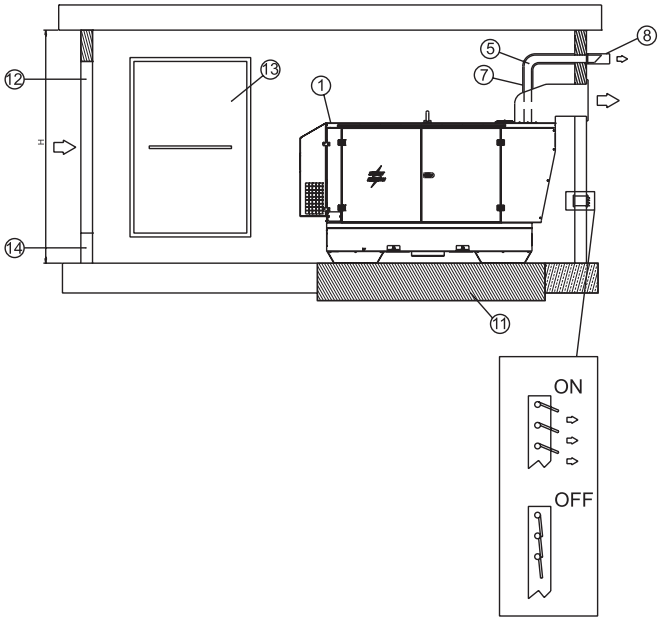
ref.	Description
1	Generating set
2	Auxiliary aspirator
5	Exhaust pipe
7	Exhaust pipe protection and insulation
8	Raincover and anti-intrusion grid
9	Exhaust conduit
11	Location area with isolated foundation
12	Air inlet with anti-intrusion grid
13	Entrance door
14	Containment step

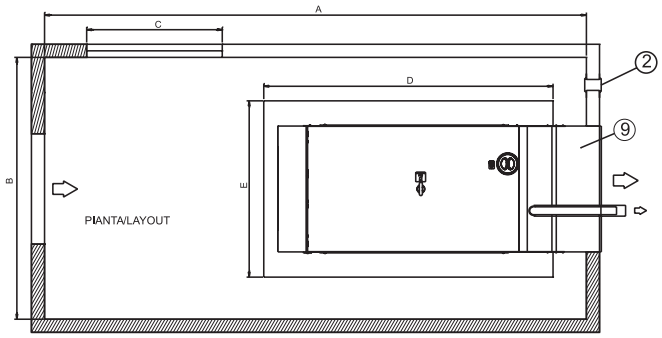
Minimum suggested dimension table	
A	Length G.E. + 1000 mm
B	Width G.E. + 2000 mm
C	Width G.E. + 200 mm
D	Length G.E. + 400 mm
E	Width G.E. + 400 mm
H	Height G.E. + 1500 mm (>2500 mm)
Note: dimensions required by norms in force have to be respected in any case.	

Surface area

The best solution is to create a base isolated from the rest of the structure, on which the genset will be located, in order to avoid vibrations being transmitted.
The base must be built with reinforced concrete and there must be the possibility to fix the genset to it by using screw anchors or rag bolts.
Base dimensions should exceed genset dimensions of at least 200 mm on each side. Base should weigh three times static genset weight (indicated on the technical date).

Floor should be levelled and suitable to sustain genset weight.
Thresholds on doors and openings should have a barrier in order to avoid liquids leaking. In case it is not possible to provide a door with a barrier, the genset should have a collection base appropriate for the quantity of liquid it contains, in any case dimensions of collection base must be in accordance to the laws in force in country of installation.





Room openings and ventilation

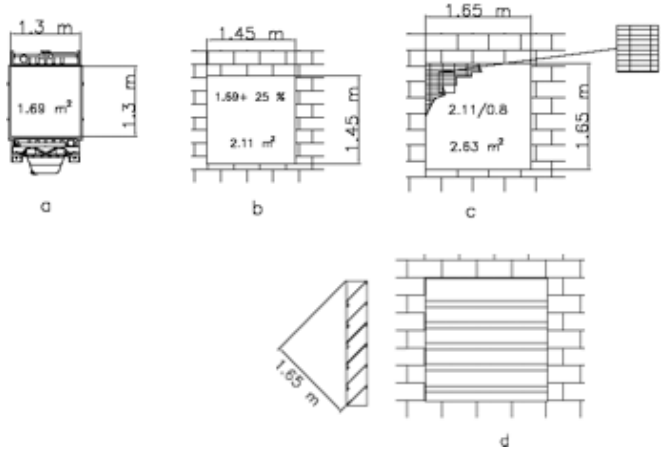
The room should have a ventilation system sufficient enough to avoid stagnation and circulation of overheated air.
Openings for incoming and outgoing air should be of appropriate size, considering minimum required air flow and maximum back pressure, values that can be checked on the engine manual.
Opening for the air entrance should be near the back part of the genset as close as possible to the ground.
If openings for air flow are not aligned with genset it may be necessary to add air conduits to avoid any air dispersion (see figure).

For open gensets installed indoors, we recommend:
- The dimensions of the air outlets be such that they have at least the same area of the radiator;
- the dimensions of the windows for air outlet is at least on the surface of the radiator.
- The dimensions of the air inlets be such that they have at least the same area of the radiator +10% for gensets up to 130 kVA or +25% for gensets beyond 130 kVA;

For canopied gensets installed indoors, we recommend:
- The dimensions of the air outlets be such that they have at least the same area of the generator air outlets, as indicated at page M2.7 of the present manual;
- The dimensions of the air inlets be such that they have at least the same area of the generator air inlets, as indicated at page M2.7 of the present manual +10% for gensets up to 130 kVA or +25% for gensets beyond 130 kVA;

The opening area has to be calculated considering protection grill surface, in order to insure that remaining free area is sufficient.
Dimensions of openings calculated as above indicated, are the minimum acceptable dimensions in case of L.T.P. use; the pressure remaining after radiator and back pressure must be considered while planning dimensions of the piping.

To calculate the opening section check below drawing:



a	Radiator surface
b	Free opening
c	Air flow opening with grill and 80% of open surface
d	Air flow opening with baffle plates

WARNING: to avoid reflux of heated air and loss of load, add an air duct between radiator and opening.

To consider the correct quantity of heat to be discharged, loss of heat on duct should be evaluated. If the duct is not appropriately insulated, room-temperature may increase considerably, for this reason it may be necessary to install an electro ventilator for correct air exchange.

Electro ventilator capacity can be calculated as follows:

$$Fan\ Capacity\ [m^3/h] = \frac{Transmitted\ heat\ [Kcal/h]}{0{,}287 \times \Delta t\ [°C]}$$

Considering:

- heat to radiation is indicated on engine/alternator technical data sheet;
- 0. 287 is specific heat for each m3 of air at 20°C;
- Δt in °C is usually considered as equal to 5 °C (worst conditions are considered).

Exhaust piping

Exhaust piping must be built in accordance to laws in force in the country of installation.
General indications:

- Minimum required thickness: 2.0 mm;
- Diameter of piping has to be calculated considering, length, number of bends, type of exhaust muffler, and any other accessory used on it. **Back pressure should not exceed values provided by manufacturer, as this causes loss of power and damage to the engine.**

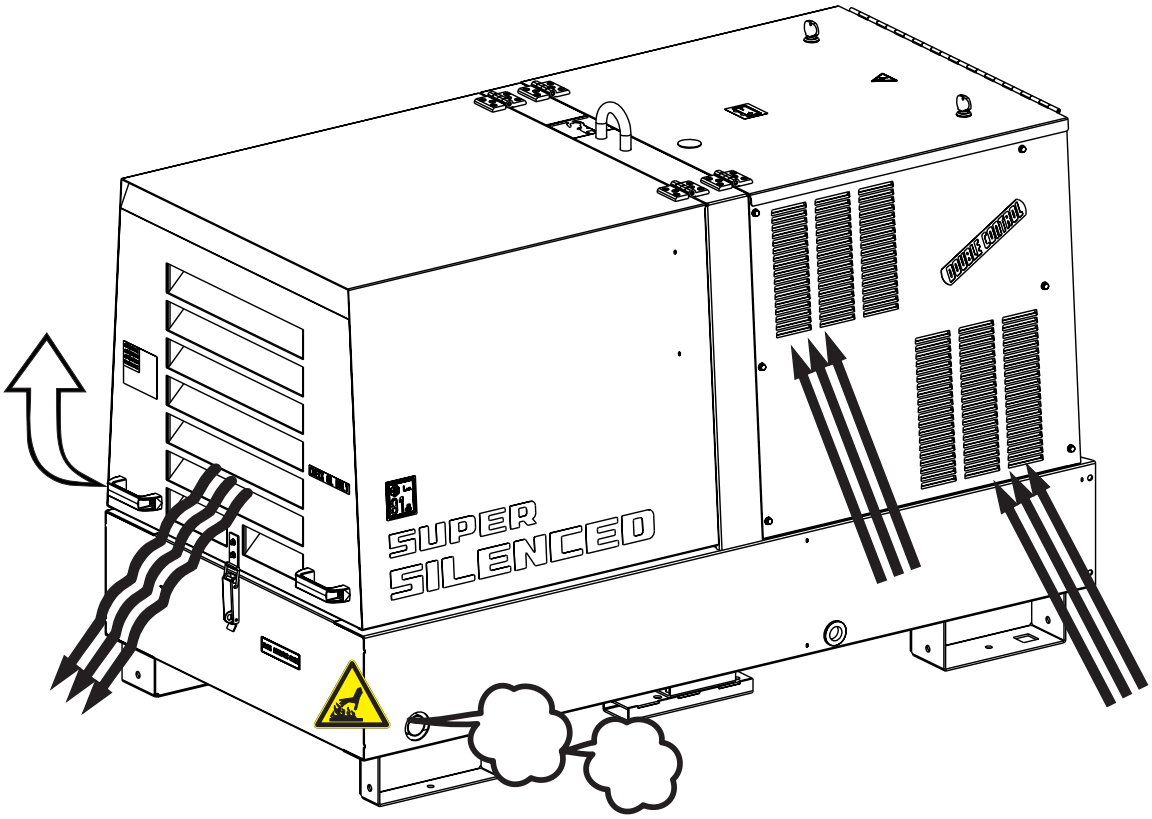
ATTENTION

Exhaust piping may reach up to 600 °C during operation, therefore it is compulsory to cover piping with appropriate insulation.

- Exhaust piping should be composed of parts, connected by flanges with gaskets, for easy disassembling and grant maximum tightness.
- Exhaust piping should be connected to engine by a flex that should absorb dilatation and separate fix part from engine piping.
- Exhaust piping should not weigh on engine manifold.

DANGER

Engine exhaust gas contains carbon monoxide, harmful to health and in large quantities can cause intoxication or death.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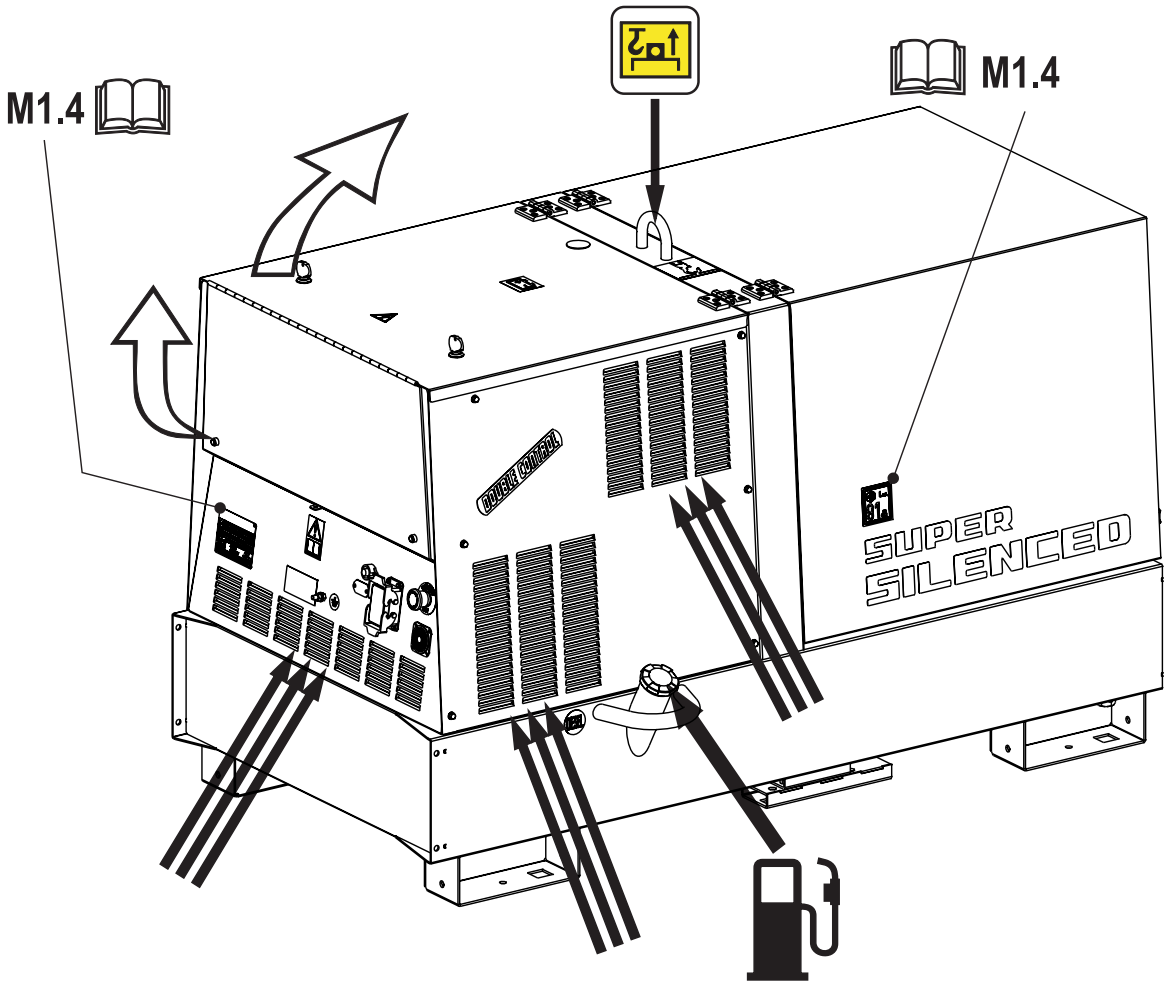
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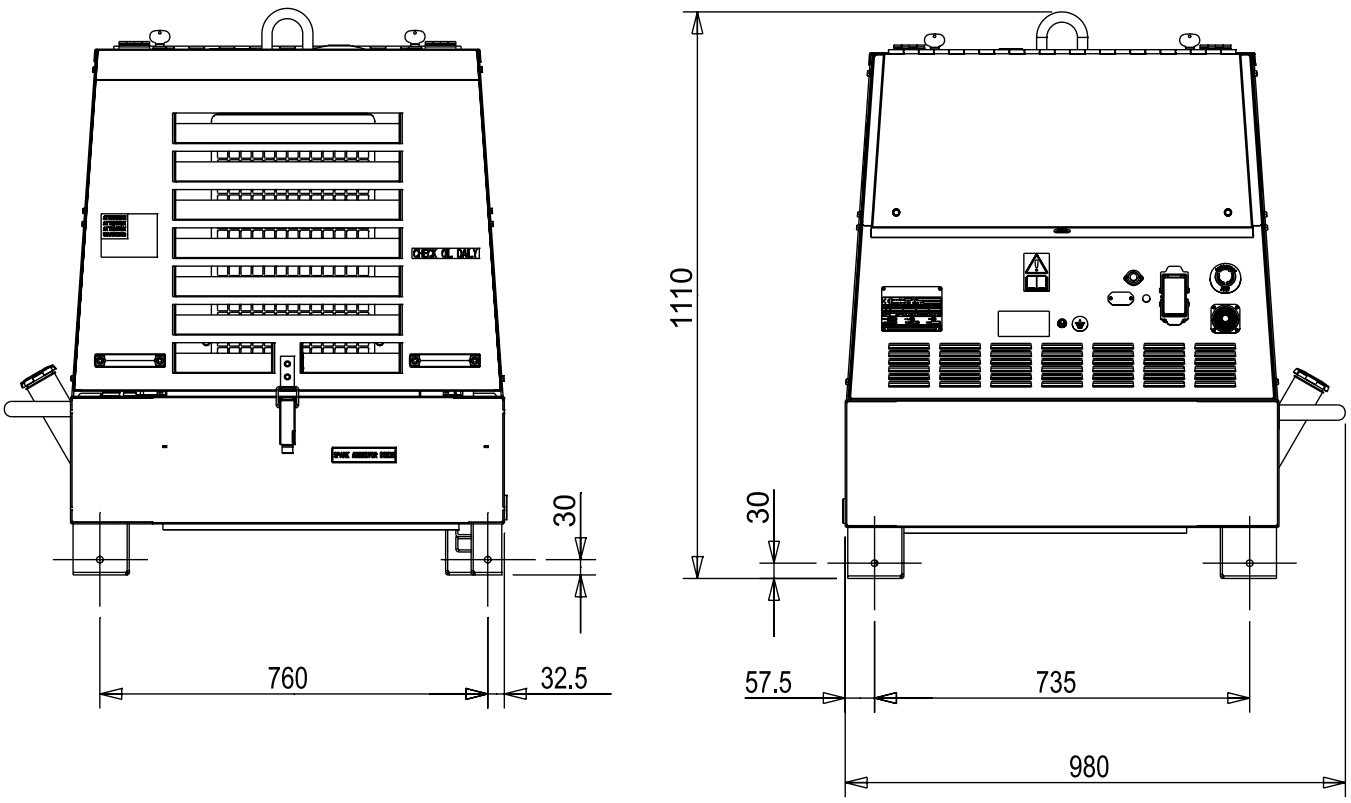
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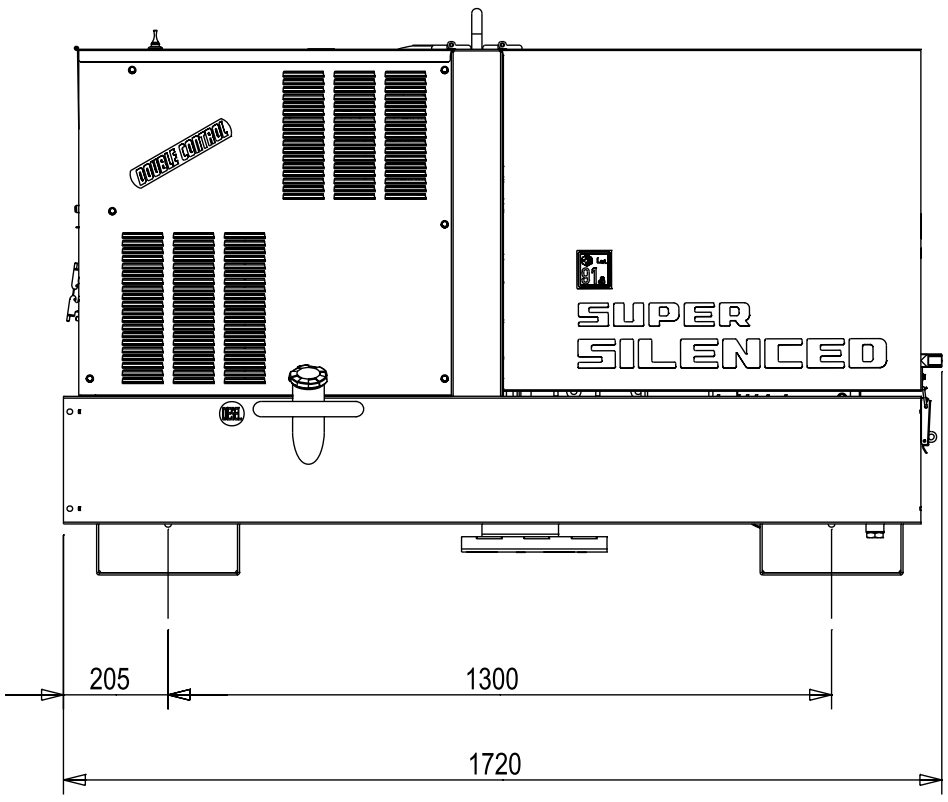
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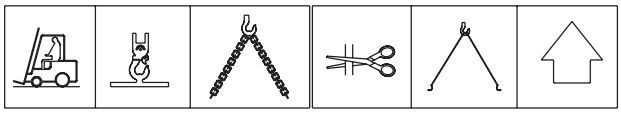
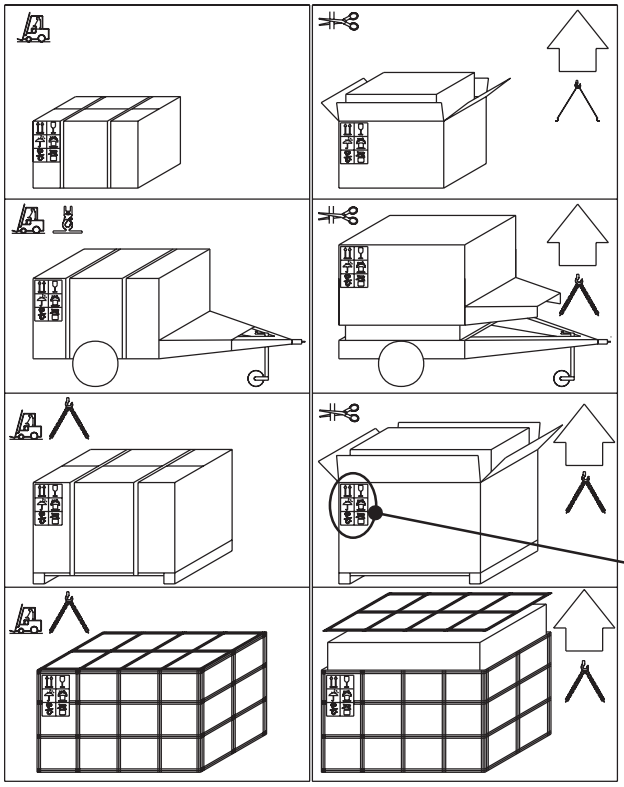
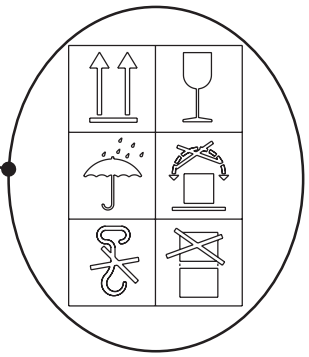
NOTE

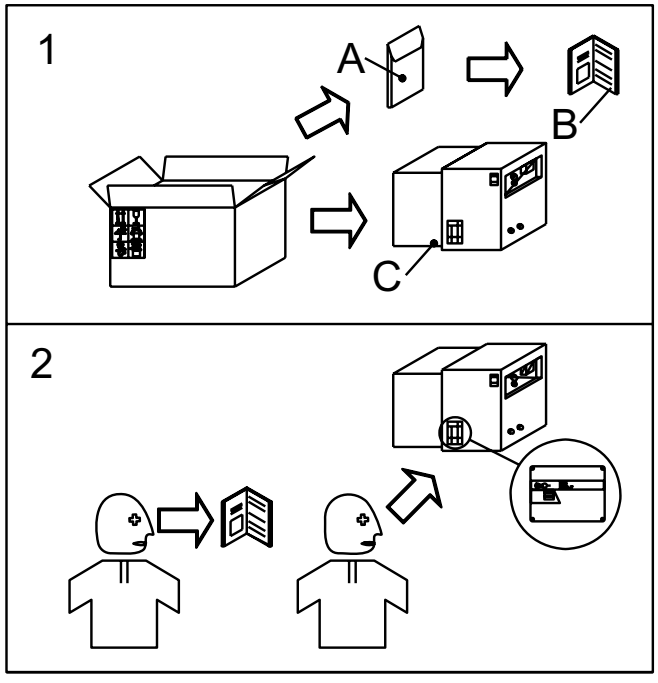




☞ Be sure that the lifting devices are: correctly mounted, adequate for the weight of the machine with it's packaging, and conforms to local rules and regulations.
When receiving the goods make sure that the product has not suffered damage during the transport, that there has not been rough handling or taking away of parts contained inside the packing or in the set.
In case you find damages, rough handling or absence of parts (envelopes, manuals, etc.), we advise you to inform immediately our Technical Service.

For eliminating the packing materials, the User must keep to the norms in force in his country.





1) Take the machine (C) out of the shipment packing. Take out of the envelope (A) the user's manual (B).
2) Read: the user's manual (B), the plates fixed on the machine, the data plate.

General precautions when handling the machine.

ATTENTION

When moving/lifting a genset it is imperative to be extremely careful. All moving operations must be carried out be qualified persons.
Due to the weight and encumbrance of the genset, an error while moving/lifting the unit may cause serious damage to it or surrounding persons.

To limit the dangers involved in moving a generating set, it is important to carefully follow the guideline set out below:

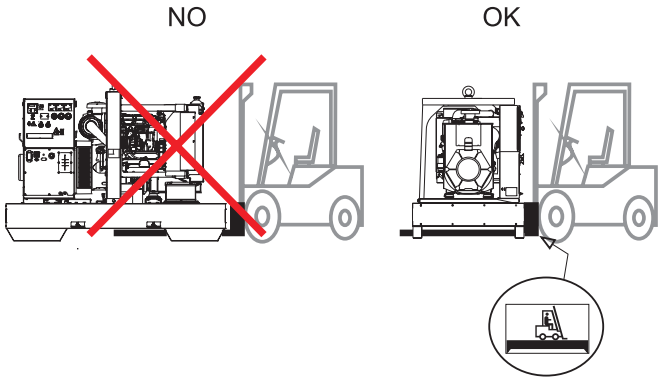
- Transportation must always take place with the engine off and electrical cables and starting battery disconnected and fuel tank empty.
- Particular attention must be paid to SKID version generating sets (without canopy) that have very delicate parts unprotected from bumps (injection pump, speed regulator, radiator, electrical panel connections and instrumentation).
- Generating sets must be protected from bad weather during transport: the units must be entirely covered, especially the electrical parts (alternator and control panel).
- Some engine parts retain heat even after it has been shut off: therefore it is necessary to wait for the engine to cool before covering it to avoid the risk of fire.
- Clear the moving zone of all possible obstacles and from all unnecessary personnel.
- Use properly sized lifting equipment regularly submitted to major overhaul by an authorized organisation. It is prohibited to fasten objects or accessories on the generating set baseframe that may modify weight and center of gravity and may cause movements unforeseen by the lifting eyes.
- Do not subject the generating set and lifting equipment to abrupt or undulating movements that pass on stress dynamics to the structure.
- Do not lift the generating set higher than what is absolutely necessary.
- Transportation of separate manual or automatic control panels must be carried out very carefully in order to avoid damage to the equipment contained inside the panel and to the instruments on the front.
- To access the hook points on the top of the unit, use approved ladders only or support from another operator: climb the ladder using non-skid shoes.

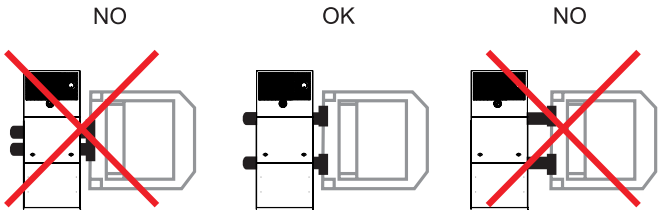
Moving method

The generating sets are lifted with different methods according to the unit's configuration. Below are the main methods of moving/lifting the genset.

Moving the generating set via forklift

When lifting with a forklift it is necessary to fork the baseframe sideways so that the forks stick out from one side to the other side, widening them to distribute the weight properly, maintaining the genset level.
Stickers on the base indicate where to place the lifter forks.





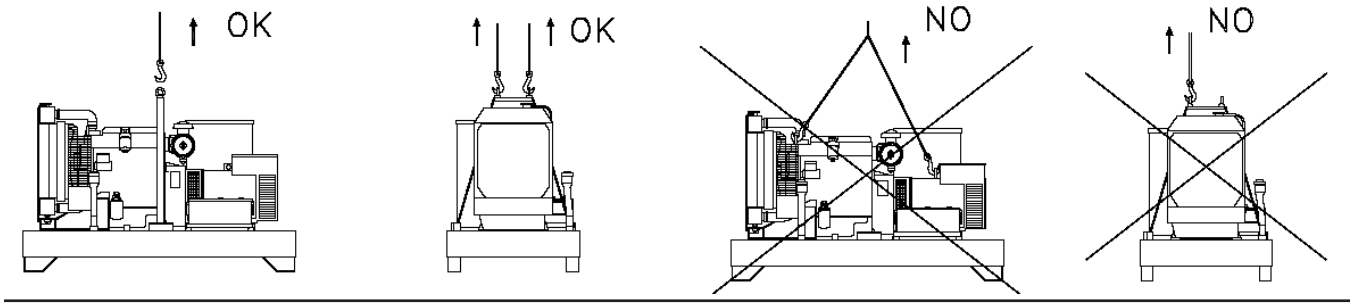
Moving the generating set via cables or chains

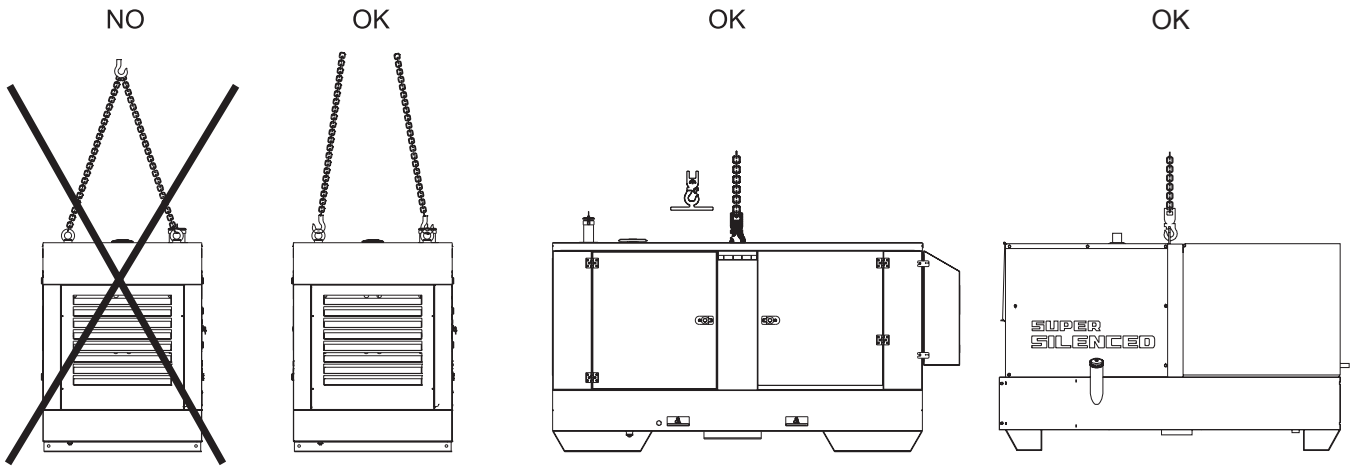
When lifting the genset with the aid of cables or chains it is necessary to use equipment periodically checked by a licensed organisation. Hook the cables only on to the points provided for this use and shown via the appropriate stickers.

For correctly moving the generating set:

- DO NOT lift the genset by fastening cables to the lifting eyes on the engine or alternator (these are only used for lifting the single components).
- DO NOT make abrupt or undulating movements that pass on stress dynamics to the structure.
- DO NOT leave the generating set suspended for longer than absolutely necessary to move the unit.
- Use all the lifting eyes provided.
- Use cables and/or chains of equal length so that the weight is distributed evenly.

Moving the generating set via cables or chains





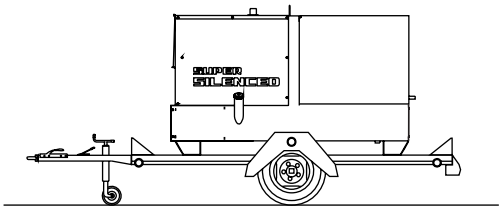
Moving by site trolley / trailer

BEWARE

DO NOT TOW the generating set without trailer, be it manually or using a vehicle.

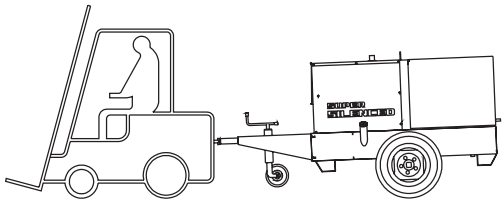
Trolleys/trailers should only be used to move the generating set for which they were designed.

Road trolley CTV:



made by using a general use standard trailer on which the genset is fixed: it is type approved for transport on public roads by licensed organisations. The maximum speed allowed is 80 km/h however, the transportation laws in force in the place of use should be respected.

Site tow CTL:



this trailer is made by the manufacturer and connected to the generating set baseframe, it can not be towed on public roads. Therefore it can only be used on private roads and no through traffic zones.
The maximum speed allowed is 40 km/h on smooth surfaces (asphalt, cement) and, in any case, the laws in force in the place of use should be respected.

Always follow the directions below for any tipe of tow:

- DO NOT park the generating set/trolley assy, on slant ground
- When parking always use the emergency/hand brake and/or safety clamps.
- DO NOT tow the trailer on bumpy roads.

Moving the unit via motor vehicle

During transportation with a motor vehicle, it is important to use appropriate belts/straps to stabilise the unit, therefore avoiding that unexpected bumps or jolts can cause damage to the baseframe, engine, or worse, overturn the load. It is the carrier's responsibility to always respect the highway code in force.

⚠ ATTENTION

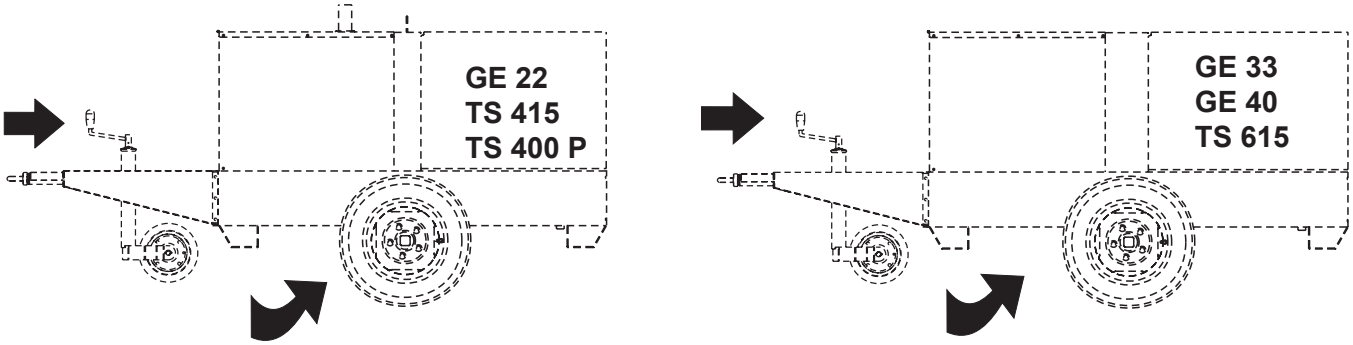
The CTL accessory cannot be removed from the machine and used separately (actioned manually or following vehicles) for the transport of loads or anyway for used different from the machine movements.

TRAILERS

The machines provided for assembling the accessory (slow towing trolley) can be towed up to a **maximum** speed of **40 Kms/hour** on asphalted surfaces.

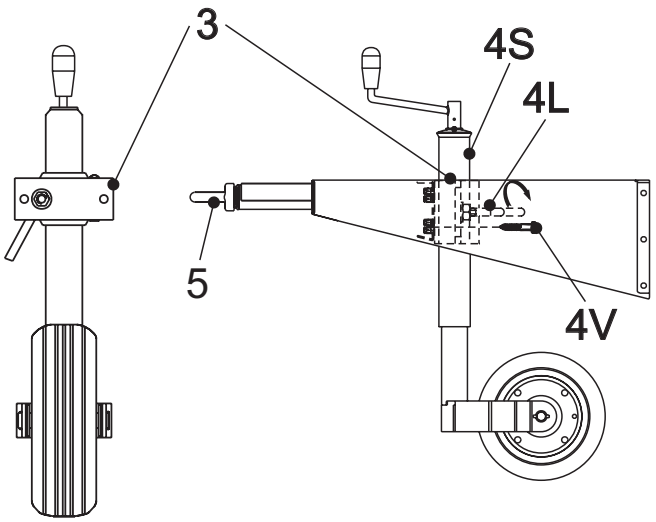
Towing on public roads or turnpikes of any type **IS EXCLUDED**, because **not** in possesion of the requirements by national and foreign traffic norms.

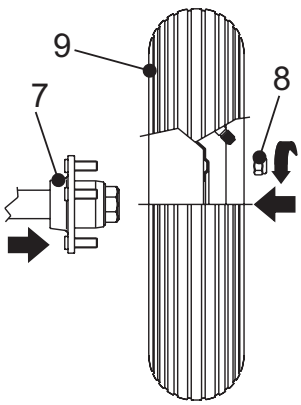
***Nota*:** Lift the machine and assemble the parts as shown in the drawing



To assemble the generating set on the trolley CTL 22 please keep to following instructions:

1) - Lift the generating set (by means of a suitable hook).
2) - Slightly fix the jaw (3) of the parking foot to the bar with the screws (4V), the nuts and the washers and tighten all parts
3) - Open the jaw so as to let the foot sprag (4S) go through
4) - Introduce into the jaw (3) the upper part (4S) of the foot and block momentaneously with the lever (4L) the whole foot.
6) - Assemble on the machine the towbar (5) complete of foot with the screws, nuts and washers.
7) - Assemble the axle (7) to the base of the machine with the screws and relative washers (two per part) so that their supports coincide.
8) - Insert the wheel (9) on the axle then screw the self blocking nuts (8).
9) - Pump the tyre (9) fixing the pressure to four atms.
10) - Lower the machine to the ground and place the parking foot definitively (regulating at the suitable height).





⚠ **ATTENTION**

Do not substitute the original tires with other types.

BATTERY WITHOUT MAINTENANCE

Connect the cable + (positive) to the pole + (positive) of the battery (after having taken away the protection), by properly tightening the clamp.

Check the state of the battery from the colour of the warning light which is in the upper part.

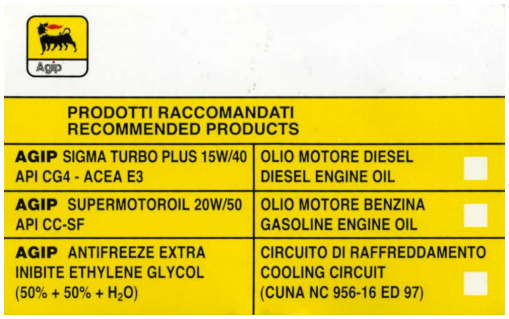
- Green colour: battery OK
- Black colour: battery to be recharged
- White colour: battery to be replaced

DO NOT OPEN THE BATTERY.

LUBRICANT

RECOMMENDED OIL

MOSA recommends selecting **AGIP** engine oil. Refer to the label on the motor for the recommended products.



PRODOTTI RACCOMANDATI RECOMMENDED PRODUCTS	
AGIP SIGMA TURBO PLUS 15W/40 API CG4 - ACEA E3	OLIO MOTORE DIESEL DIESEL ENGINE OIL
AGIP SUPERMOTOROIL 20W/50 API CC-SF	OLIO MOTORE BENZINA GASOLINE ENGINE OIL
AGIP ANTIFREEZE EXTRA INIBITE ETHYLENE GLYCOL (50% + 50% + H_2O)	CIRCUITO DI RAFFREDDAMENTO COOLING CIRCUIT (CUNA NC 956-16 ED 97)

Please refer to the motor operating manual for the recommended viscosity.

REFUELLING AND CONTROL:

Carry out refuelling and controls with motor at level position.

1. Remove the oil-fill tap (24)
2. Pour oil and replace the tap
3. Check the oil level using the dipstick (23); the oil level must be comprised between the minimum and maximum indicators.

ATTENTION

It is dangerous to fill the motor with too much oil, as its combustion can provoke a sudden increase in rotation speed.

AIR FILTER

Check that the dry air filter is correctly installed and that there are no leaks around the filter which could lead to infiltrations of non-filtered air to the inside of the motor.

FUEL

ATTENTION

Stop engine when fueling. Do not smoke or use open flames during refuelling operations, in order to avoid explosions or fire hazards.

Fuel fumes are highly toxic; carry out operations outdoors only, or in a well-ventilated environment.

Avoid accidentally spilling fuel. Clean any eventual leaks before starting up motor.

Refill the tank with good quality diesel fuel, such as automobile type diesel fuel, for example.

For further details on the type of diesel fuel to use, see the motor operating manual supplied.

Do not fill the tank completely; leave a space of approx. 10 mm between the fuel level and the wall of the tank to allow for expansion.

In rigid environmental temperature conditions, use special winterized diesel fuels or specific additives in order to avoid the formation of paraffin.

COOLING LIQUID

ATTENTION

Do not remove the radiator tap with the motor in operation or still hot, as the liquid coolant may spurt out and cause serious burns. Remove the tap very carefully.

Remove the tap and pour the liquid coolant into the radiator; the quantity and composition of the liquid coolant are indicated in the motor operating manual. Replace the tap, ensuring it is perfectly closed.
After refilling operations, allow the motor to run for a brief time and check the level, as it may have diminished due to air bubbles present in the cooling circuit; restore the level with water.
To replace the liquid coolant, follow the operations described in the motor operating manual.

ATTENTION:

The engine cooling system is originally filled with coolant type:
AGIP ANTIFREEZE EXTRA

During the engine life it is strongly recommended to use the same coolant type. This is because a coolant change would require a careful cleaning of the cooling system, which is not an easy job. A lack in tacking these precautions would result in the mix of different additives used in different coolants which would originate gelatinous substances capable of obstructing the cooling system.

PRODOTTI RACCOMANDATI RECOMMENDED PRODUCTS	
AGIP SIGMA TURBO PLUS 15W/40 API CG4 - ACEA E3	OLIO MOTORE DIESEL DIESEL ENGINE OIL
AGIP SUPERMOTOROIL 20W/50 API CC-SF	OLIO MOTORE BENZINA GASOLINE ENGINE OIL
AGIP ANTIFREEZE EXTRA INIBITE ETHYLENE GLYCOL (50% + 50% + H_2O)	CIRCUITO DI RAFFREDDAMENTO COOLING CIRCUIT (CUNA NC 956-16 ED 97)

ELECTRICAL CONNECTIONS

ATTENTION

A qualified electrician should carry out electrical connections according to the norms in force.

The electrical connection to the User system is a very important operation: safety and good operation of the genset and User system depend on a correct electrical connection.

Before supplying User system always check:
- that wires connecting gen-set to the user plant are suitable to the supplied voltage and are in accordance to the applicable rules;
- wire type, section and length have been calculated considering environment conditions and in force norms;
- ground is functioning correctly: earth fault relay device works only if this connection is operating;
- that direction of the phases corresponds to the user plant phase rotation, and none of the phases has been accidentally connected to neutral.

GROUNDING CONNECTION

The grounding connection to an earthed installation **is obligatory** for all models equipped with a differential switch (circuit breaker). In these groups the generator star point is generally connected to the machine's earthing; by employing the TN or TT distribution system, the differential switch guarantees protection against indirect contacts.
In the case of powering complex installations requiring or employing additional electrical protection devices, the coordination between the protection devices must be verified.
For the grounding connection, use the terminal (12); comply to local and/or current regulations in force for electrical installations and safety.

Check daily

NOTE

Do not alter the primary conditions of regulation and do not touch the sealed parts.

The starting of the unit can be effected in 3 different modes:

1) Start with EP6 key (Engine Control)

Put the "Local/Remote" selector on Local. Turn the key on "ON", the EP6 display shows, only on the machines with mounted glow plugs for 5 secs, the symbol "UUUU", then the message "Sta" appears the engine can be started, for then turn the key on "start" and start the engine.

On the display the word "Sta" remains for about 20 sec then automatically disappears; the engine **must be** started within 20 secs, otherwise the EP6 blocks the starting and on the display the word "fail" appears. Turning the key on "OFF" the EP6 is reset and a new starting cycle can be fixed.

Stop:

it is COMPULSORY to disconnect the load first, then to stop the engine turn the key on "OFF".

2) **Remote starting with TCM35**

Put the "Local/Remote" selector on Local. Connect TCM35 to the plug on the front panel and put the switch on "0".

Turn the key on ON in the EP6, wait for the various signals to go out then press the button "AUTO" in the EP6 until the led "AUTO" flashes.

Shift the switch on "I" in the TCM35 and automatically the starting cycle will start. On the machines with mounted glow plugs appears in the display EP6 (for about 5 secs), the symbol "UUUU"; the starting cycle includes 3 starting trials.

When the engine starts the led "AUTO" remains lit continuously and simultaneously the red warning light will light in the TCM35.

Stop:

it is COMPULSORY to disconnect the load first, then shift the switch of the TCM35 on "0", the engine will stop immediately.

3) **Start with Automatic start unit (EAS)**

Put the "Local/Remote" selector on Remote. Connect the EAS to unit.

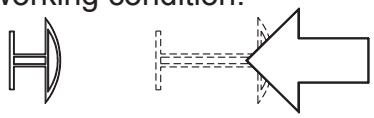
The EAS controls the starting as well as the stop of the engine.

Follow attentively the instructions reported in the EAS manual.

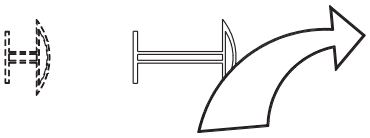
CAUTION

MACHINE WITH EMERGENCY BUTTON

Pressing the button the engine will stop immediately in any working condition.



Turn clockwise to reset the button.



CAUTION

RUNNING-IN

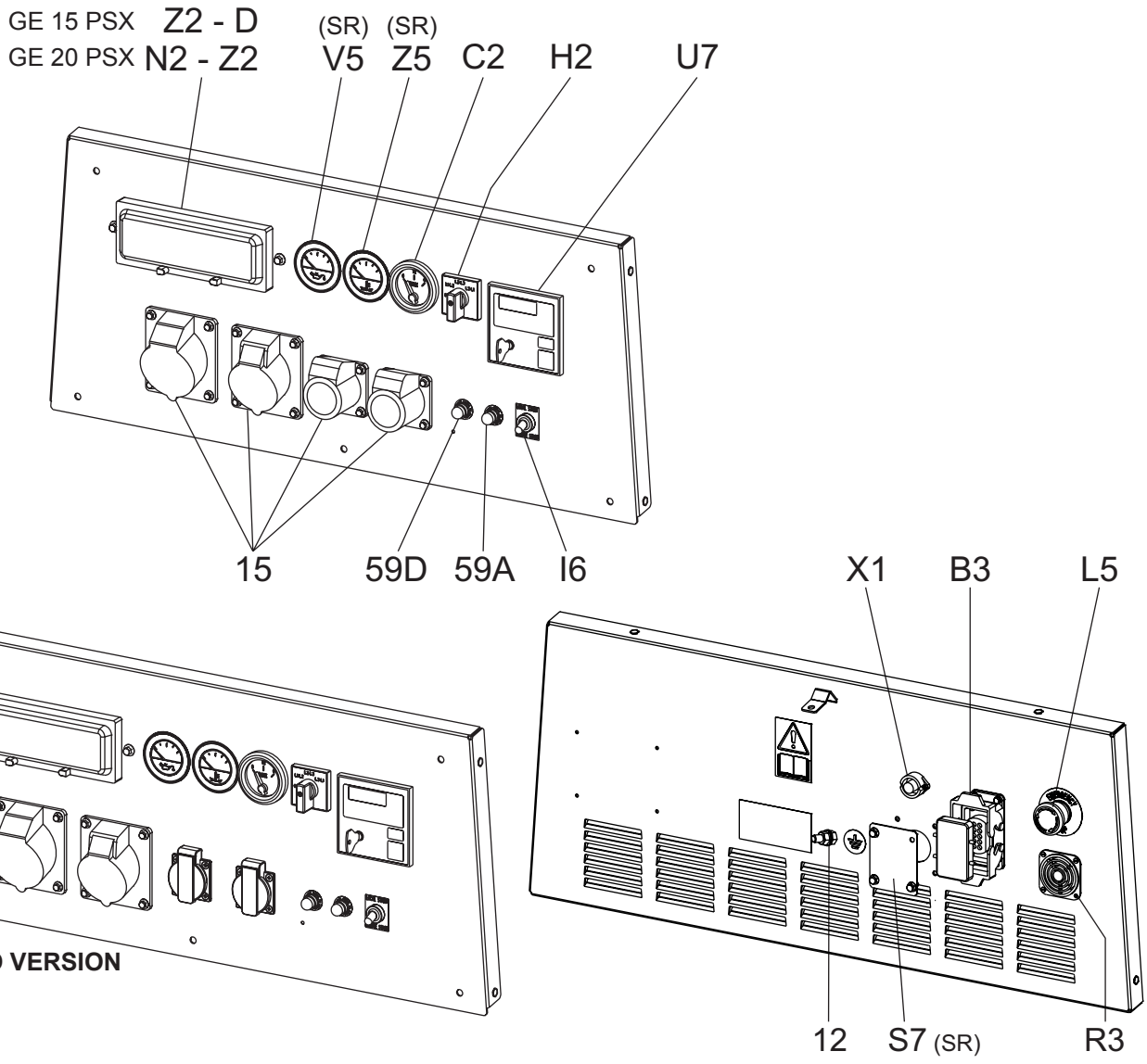
During the first 50 hours of operation, do not use more than 60% of the maximum output power of the unit and check the oil level frequently, in any case please stick to the rules given in the engine use manual.

NOTE

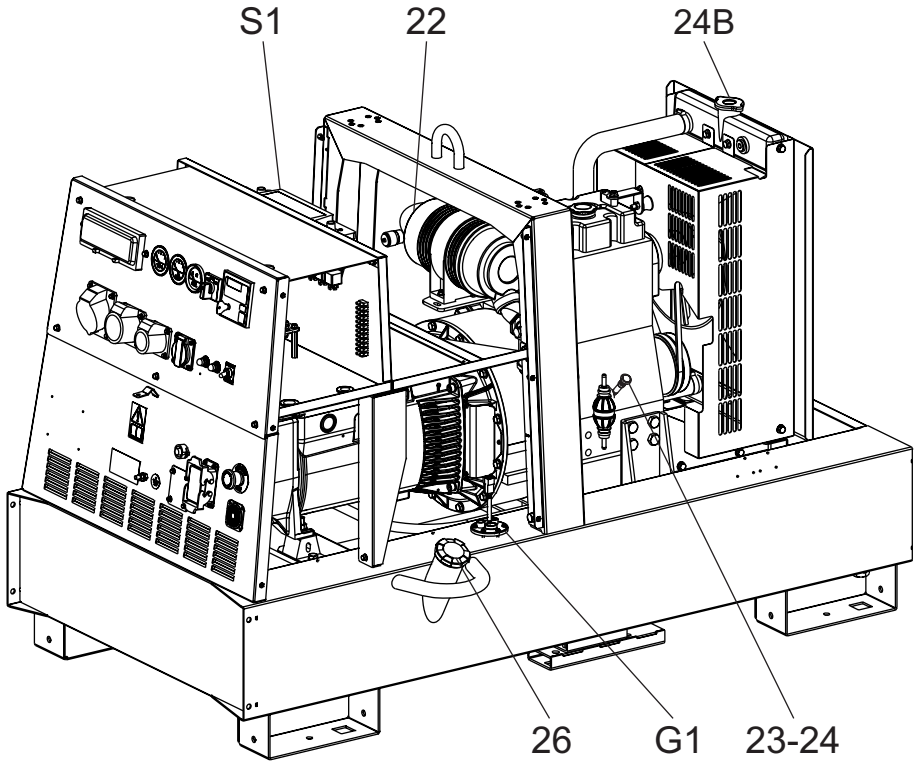
For safety reason the key must be kept by qualified personel.

CONTROLS LEGENDE

4A	Hydraulic oil level light
9	Welding socket (+)
10	Welding socket (-)
12	Earth terminal
15	A.C. socket
16	Accelerator lever
17	Feed pump
19	48V D.C. socket
22	Engine air filter
23	Oil level dipstick
24	Engine oil reservoir cap
24A	Hydraulic oil reservoir cap
24B	Water filling cap
25	Fuel prefilter
26	Fuel tank cap
27	Muffler
28	Stop control
29	Engine protection cover
30	Engine cooling/alternator fan belt
31	Oil drain tap
31A	Hydraulic oil drain tap
31B	Water drain tap
31C	Exhaust tap for tank fuel
32	Button
33	Start button
34	Booster socket 12V
34A	Booster socket 24V
35	Battery charge fuse
36	Space for remote control
37	Remote control
42	Space for E.A.S.
42A	Space for PAC
47	Fuel pump
49	Electric start socket
54	Reset button PTO HI
55	Quick coupling m. PTO HI
55A	Quick coupling f. PTO HI
56	Hydraulic oil filter
59	Battery charger thermal switch
59A	Engine thermal switch
59B	Aux current thermal switch
59C	Supply thermal switch wire feeder-42V
59D	Pre-heater (spark plug) thermal switch
59E	Supply thermal switch oil/water heather
59F	Electropump thermal switch
63	No load voltage control
66	Choke control
67A	Auxiliary / welding current control
68	Cellulosic electrodes control
69A	Voltmeter relay
70	Warning lights
71	Selecting knob
72	Load commut. push button
73	Starting push button
74	Operating mode selector
75	Power on warning light
76	Display
79	Wire connection unit
86	Selector
86A	Setting confirmation
87	Fuel valve
88	Oil syringe
A3	Insulation monitoring
A4	Button indicating light 30 l/1' PTO HI
B2	Engine control unit EP2
B3	E.A.S. connector
B4	Exclusion indicating light PTO HI
B5	Auxiliary current push button
C2	Fuel level light
C3	E.A.S. PCB
C6	Control unit for generating sets QEA
D	Ground fault interrupter (30 mA)
D1	Engine control unit and economiser EP1
D2	Ammeter
E2	Frequency meter
E6	Frequency rpm regulator
E7	Voltmeter regulator
F	Fuse
F3	Stop switch
F5	Warning light, high temperature
F6	Arc-Force selector
G1	Fuel level transmitter
H2	Voltage commutator
H6	Fuel electro pump
H8	Engine control unit EP7
I2	48V A.C. socket
I3	Welding scale switch
I4	Preheating indicator
I5	Y/▲ switch
I6	Start Local/Remote selector
I8	AUTOIDLE switch
L	A.C. output indicator
L5	Emergency button
L6	Choke button
M	Hour counter
M1	Warning level light
M2	Contactor
M5	Engine control unit EP5
M6	CC/CV switch
N	Voltmeter
N1	Battery charge warning light
N2	Thermal-magnetic circuit breaker/ Ground fault interrupter
N5	Pre-heat push-button
N6	Connector - wire feader
O1	Oil pressure warning light/Oil alert
O8	V/A digital instruments and led VRD PCB
P	Welding arc regulator
P8	Water in fuel
Q1	Starter key
Q3	Derivation box
Q4	Battery charge sockets
Q7	Welding selector mode
R3	Siren
S	Welding ammeter
S1	Battery
S3	Engine control unit EP4
S6	Wire feeder supply switch
S7	Plug 230V singlephase
T	Welding current regulator
T4	Dirty air filter warning light/indicator
T5	Earth leakage relay
T7	Analogic instrument V/Hz
U	Current trasformer
U3	R.P.M. adjuster
U4	Polarity inverter remote control
U5	Relase coil
U7	Engine control unit EP6
V	Welding voltage voltmeter
V4	Polarity inverter control
V5	Oil pressure indicator
W1	Remote control switch
W3	Selection push button 30 l/1' PTO HI
W5	Battery voltmeter
X1	Remote control socket
Y3	Button indicating light 20 l/1' PTO HI
Y5	Commutator/switch, serial/parallel
Z2	Thermal-magnetic circuit breaker
Z3	Selection push button 20 l/1' PTO HI
Z5	Water temperature indicator



SCHUKO VERSION



Z2	Thermal-magnetic circuit breaker	General switch for the gen-set. It protects both gen-set and related electrical circuit from over current /short circuit.
D	Ground fault interrupter (30 mA)	Device for protection against not-direct contacts for TN and TT systems (neutral grounded to frame)
N2 (GE 20 PSX)	G.F.I. and circuit breaker	General switch for the gen-set. Works as both circuit breaker and G.F.I.
2xZ2	Thermal-magnetic circuit breaker for single-phase sockets	Protects against short-circuits and overcurrents of electrical plants powered by single-phase sockets.
V5 (SR)	Oil pressure indicator	Indicates engine oil pressure (bar).
Z5 (SR)	Water temperature indicator	Indicates cooling liquid temperature (C).
C2	Fuel level gauge	Indicates fuel in the reservoir (%).
H2	Voltage commutator	Selection of visualized line voltage.
U7	Engine control unit EP6	Engine control unit. Genset stop/ start. Handling of generator alarms. display of alarms, Voltage, Hz, hour counter, Amps, battery voltage, operation messages.
15	A.C. socket	AUX sockets for load connection.
59D	Thermal switch for pre-heating plugs	Protects against over-current and short circuit in pre-heating plugs
59A	Engine thermal switch	Protection against over-currents and short circuits in the engine electrical system.
I6	Start Local/Remote selector	Selection of engine control in use. Local start: control on board, EP6 operated. Remote start: external control, EAS operated.
12	Earth terminal	Ground connection point for gen-set.
X1	Remote control socket	Connection for TCM35 remote control or for a NO clean contact, both operating only if EP6 is set to AUTO.
B3	E.A.S. connector	Connection for automatic intervention unit (AMF + ATS). 10 pin connector.
L5	Emergency button	To be pushed in case of danger. Immediate stop of the gen-set.
R3	Siren	Gen-set acoustic alarm.
S7 (SR)	Plug 230V single-phase	External supply for engine heater (mains).

WARNING

It is absolutely forbidden to connect the unit to the public mains and/or another electrical power source .

Access <u>forbidden</u> to area adjacent to electricity-generating group for all non-authorized personnel.

WARNING

For the canopy generator sets provided with doors, the following instruction shall be observed. During the normal operation, the doors of the engine compartment and/or the electrical box shall be kept closed, locked up if possible, as they must be considered in all respects as protection barriers. The access to the internal parts shall occur for maintenance purposes only, by qualified personnel and, in any case, when the engine is stopped.

The electricity-generating groups are to be considered electrical energy producing stations.
The dangers of electrical energy must be considered together with those related to the presence of chemical substances (fuels, oils, etc.), rotating parts and waste products (fumes, discharge gases, heat, etc.).

GENERATION IN AC (ALTERNATING CURRENT)

Before each work session check the efficiency of the ground connection for the electricity-generating group if the distribution system adopted requires it, such as, for example, the TT and TN systems.

Check that the electrical specifications for the units to be powered - voltage, power, frequency - are compatible with those of the generator. Values that are too high or too low for voltage and frequency can damage electrical equipment irreparably.
In some cases, for the powering of three-phase loads, it is necessary to ensure that the cyclic direction of the phases corresponds to the installation's requirements.

Connect the electric devices to be powered to the AC sockets, using suitable plugs and cables in prime condition.

Before starting up the group, make certain no dangerous situations exist on the installation to be powered.
Check that the thermal-magnetic switch (Z2) is in the OFF position (input lever in downward position).

Start up the electricity-generating group, positioning the thermal-magnetic switch (Z2) and differential switch (D) to ON (input lever in upward position).
Before powering on the utilities, check that the voltmeter (N) and frequency meter (E2) indicate nominal values; in addition, check on the voltmeter change-over switch (H2) (where it is assembled) that the three line voltages are the same.
☞ In the absence of a load, the values for voltage and frequency can be greater than their nominal values. See sections on VOLTAGE and FREQUENCY.

OPERATING CONDITIONS

<u>POWER</u>

The electrical power expressed in kVA on an electricity-generating group is the available output power to the reference environmental conditions and nominal values for: voltage, frequency, power factors (cos φ).
There are various types of power: PRIME POWER (PRP), STAND-BY POWER established by ISO 8528-1 and 3046/1 Norms, and their definitions are listed in the manual's TECHNICAL SPECIFICATIONS page.

☞ During the use of the electricity-generating group **NEVER EXCEED** the power indications, paying careful attention when several loads are powered simultaneously.

<u>VOLTAGE</u>

GENERATORS WITH COMPOUND SETTING (THREEPHASE)
GENERATORS WITH CONDENSER SETTING (SINGLEPHASE)

In these types of generators, the no-load voltage is generally greater than 3–5% with respect to its nominal value; f.e. for nominal voltage, threephase 400Vac or singlephase 230Vac, the no-load voltage can be comprised between 410-420V (threephase) and 235-245V (singlephase). The precision of the load voltage is maintained within ±5% with balanced loads and with a rotation speed variation of 4%. Particularly, with resistive loads (cos φ = 1), a voltage over-elevation occurs which, with the machine cold and at full load, can even attain +10 %, a value which in any case is halved after the first 10-15 minutes of operation.
The insertion and release of the full load, under constant rotation speed, provokes a transitory voltage variation that is less than 10%; the voltage returns to its nominal value within 0.1 seconds.

GENERATORS WITH ELECTRONIC SETTING (A.V.R.)

In these types of generators, the voltage precision is maintained within ±1,5%, with speed variations comprised from -10% to +30%, and with balanced loads. The voltage is the same both with no-load and with load; the insertion and release of the full load provokes a transitory voltage variation that is less than 15%; the voltage returns to its nominal value within 0.2–0.3 seconds.

<u>FREQUENCY</u>

The frequency is a parameter that is directly dependent on the motor's rotation speed. Depending on the type of alternator, 2 or 4 pole, we will have a frequency of 50/60 Hz with a rotation speed of 3000/3600 or 1500/1800 revolutions per minute.

The frequency, and therefore the number of motor revolutions, is maintained constant by the motor's speed regulation system.
Generally, this regulator is of a mechanical type and presents a droop from no-load to nominal load which is less than 5 % (static or droop), while under static conditions precision is maintained within ±1%.Therefore, for generators at 50Hz the no-load frequency can be 52–52.5 Hz, while for generators at 60Hz the no-load frequency can be 62.5-63Hz.
In some motors or for special requirements the speed regulator is electronic; in these cases, precision under static operating conditions attains ±0.25%, and the frequency is maintained constant in operation from no-load to load (isochronal operation).

POWER FACTOR - COS φ

The power factor is a value which depends on the load's electrical specifications; it indicates the ratio between the Active Power (kW) and Apparent Power (kVA). The apparent power is the total power necessary for the load, achieved from the sum of the active power supplied by the motor (after the alternator has transformed the mechanical power into electrical power), and the Reactive Power (kVAR) supplied by the alternator. The nominal value for the power factor is cos φ = 0,8; for different values comprised between 0.8 and 1 it is important during usage not to exceed the declared active power (kW), so as to not overload the electricity-generating group motor; the apparent power (kVA) will diminish proportionally to the increase of cos φ.
For cos φ values of less than 0.8 the alternator must be downgraded, since at equal apparent power the alternator should supply a greater reactive power. For reduction coefficients, contact the Technical Service Department.

START-UP OF ASYNCHRONOUS MOTORS

The start-up of asynchronous motors from an electricity-generating group can prove critical because of high start-up currents the asynchronous motor requires (I start-up = up to 8 times the nominal current In.). The start-up current must not exceed the alternator's admissible overload current for brief periods, generally in the order of 250–300% for 10–15 seconds.
To avoid a group oversize, we recommend following these precautionary measures:
- in the case of a start-up of several motors, subdivide the motors into groups and set up their start-up at intervals of 30–60 seconds.
- when the operating machine coupled to the motor allows it, see to a start-up with reduced voltage, star point/triangle start-up or with autotransformer, or use a soft-start system.

In all cases, when the user circuit requires the start-up of an asynchronous motor, it is necessary to check that there are no utilities inserted into the installation, which in the case of a voltage droop can cause more or less serious disservices (opening of contact points, temporary lack of power to control and command systems, etc.).

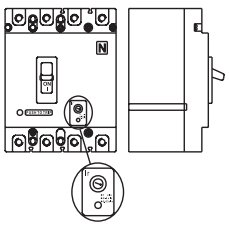
SINGLE-PHASE LOADS

Power to monophase utilities by means of three-phase generators requires some operating limitations.
- In single-phase operation, the declared voltage tolerance can no longer be maintained by the regulator (compound or electronic regulator), since the system becomes highly unbalanced. **The voltage variation on the phases not affected by the power can prove dangerous; we recommend sectioning the other loads eventually connected**.
- The maximum power which can be drawn between Neutral and Phase (start connection) is generally 1/3 of the nominal three-phase power; some types of alternators even allow for 40%. Between two Phases (triangle connection) the maximum power cannot exceed 2/3 of the declared three-phase power.
- In electricity-generating groups equipped with monophase sockets, use these sockets for connecting the loads. In other cases, always use the "R" phase and Neutral.

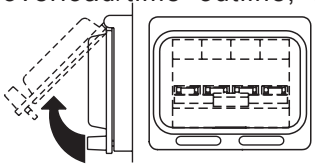
ELECTRIC PROTECTIONS

THERMAL-MAGNETIC SWITCH

The electricity-generating group is protected against short-circuits and against overloads by a thermal-magnetic switch (Z2) situated upstream from the installation. Operating currents, both thermic and magnetic, can be fixed or adjustable in relation to the switch model.



☞ In models with adjustable operating current **do not modify** the settings, since doing so can compromise the installation's protection or the electricity-generating group's output characteristics. For eventual variations, contact our Technical Service Department.
The intervention of the protection feature against overloads is not instantaneous, but follows a current overload/time outline; the greater the overload the less the intervention. Furthermore, keep in mind that the nominal operating current refers to an operating temperature of 30°C, so that each variation of 10°C roughly corresponds to a variation of 5% on the value of nominal current.

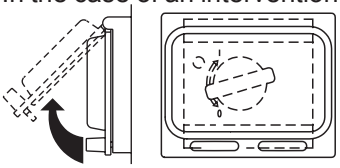


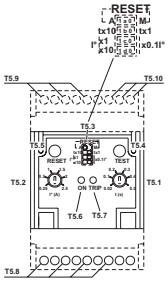
In case of an intervention on the part of the thermal magnetic protection device, check that the total absorption does not exceed the electricity-generating group's nominal current.

DIFFERENTIAL SWITCH

The differential switch or differential relay guarantee protection against indirect contacts due to malfunction currents towards the ground. When the device detects a malfunction current that is higher than the nominal current or the set current, it intervenes by cutting off power to the circuit connected.

In the case of an intervention





by the differential switch, check that there are no sheathing defects in the installation: connection cables, sockets and plugs, utilities connected.

☞ Before each work session, check the operation of the differential protection device by pressing the test key. The electricity-generating group must be in operation, and the lever on the differential switch must be in the ON position.

THERMIC PROTECTION

Generally present to protect against overloads on an individual power socket c.a.

When the nominal operating current has been exceeded, the protection device intervenes by cutting off power to the socket.

The intervention of the protection device against overloads is not instantaneous, but follows a current overload/time outline; the greater the overload the less the intervention.

In case of an intervention, check that the current absorbed by the load does not exceed the protection's nominal operating current.

Allow the protection to cool off for a few minutes before resetting by pressing the central pole.

ATTENTION

Do not keep the central pole on the thermic protection forcefully pressed to prevent its intervention.

USAGE WITH EAS AUTOMATIC START-UP PANEL

The electricity-generating group in combination with the EAS automatic start-up panel forms a unit for distributing electrical energy within a few seconds of a power failure from the commercial electrical power line.

Below is some general operating information; refer to the automatic panel's specific manual for details on installation, command, control and signalling operations.

- ❑ Perform connections on the installation in safety conditions. Position the automatic panel in RESET or LOCKED mode.
- ❑ Carry out the first start-up in MANUAL mode.
  Check that the generator's LOCAL START / REMOTE START switch (I6) is in the REMOTE position.
  Check that the generator switches are enabled (input lever in upward position).
  Position the EAS panel in manual mode by pressing MAN. key, and only after having checked that there are no dangerous situations, press the START key to start the electricity-generating group.
- ❑ During the operation of the generator, all controls and signals from both the automatic panel and group are enabled; it is therefore possible to control its operation from both positions.
  In case of an alarm with a shutdown of the motor (low pressure, high temperature, etc.), the automatic panel will indicate the malfunction that has caused the stoppage, while the generator's front panel will be disabled and will no longer supply any information.

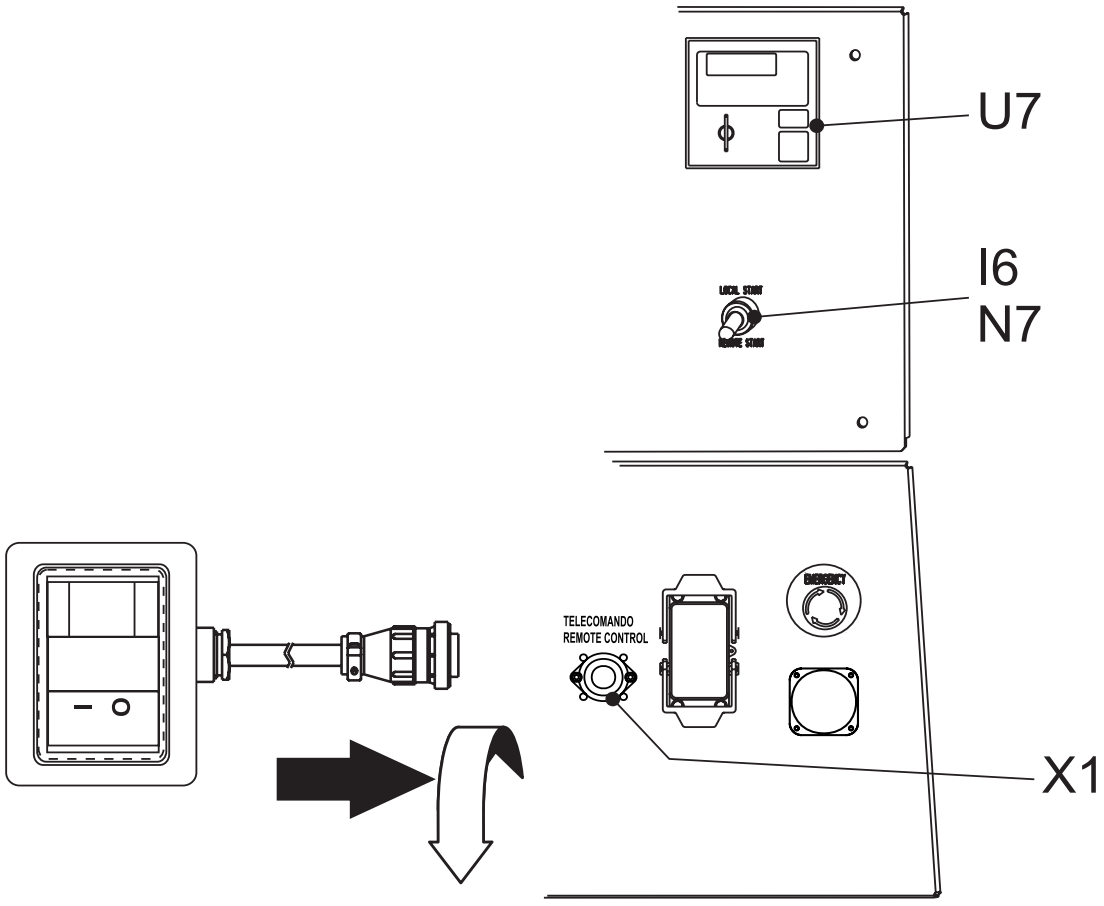
MAKE SURE

➔ The selector LOCAL START/REMOTE START (I6) of the generating set must be switched on LOCAL-START.
➔ Put the selector „switch board (N7)“ on ON.

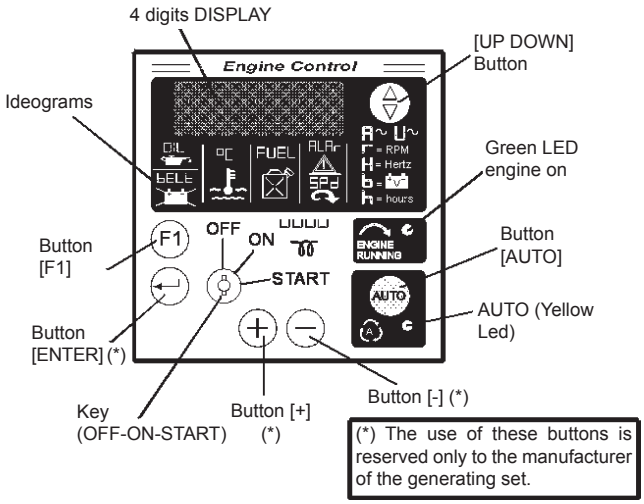
The coupling of the TCM 35 with the generating set, ready for remot starting, permits to work far from the set itself.
The remote control is connected to the front plate (X1), and/or rear plate, with a multiple connector.

N.B. The remote control TCM 35 can be used only with machines equipped with control and protection device EP6 (U7).

For use of TCM 35 see page M21 (start and stop) of this manual.



FRONT PANEL



1.0 INTRODUCTION

The EP6 features Engine and Generating Set control and monitoring. The EP6 provides visual indication by means of LEDs (solid state lamps) and a Display (see section 10.0). It features OFF, MAN and AUTO operating modes. The display gives Messages for alarms and Measurement indications.

EP6 has programmable parameters. Please contact the producer of the generating set to receive instructions related to programming.

2.0 OPERATING MODE selection

The EP6 features AUTO (section 2.1), MANUAL (section 2.2) and OFF (section 2.3) operating modes. When the power supply is switched on, the EP6 behaves as follow:

A) if the KEY-SWITCH is in the ***OFF position,*** the EP6 enters the OFF operating mode.

B) if the KEY-SWITCH is in the ***ON position,*** the EP6 enters the AUTO operating mode. That is, if the EP6 was in AUTO prior to the supply removal. If not, the EP6 enters the MANUAL operating mode.

2.1 AUTO operating mode

To enter the "AUTO" operating mode use the following instructions:

A) - Turn ON the key switch: the Display and LEDs illuminate for 1 second.

B) - Wait for the end of the LAMP test, then push the AUTO pushbutton after the [UUUU] (Pre-glow) or [Sta-] (Start prompt) has been displayed. After this, the yellow Led AUTO will illuminate. If the REMOTE START input is not operative, the LED will flash. If operative, the LED illuminates continuously and a start cycle will take place (***NOTE***: the EP6 shuts down the display during the crank).

C) - In order to cancel the AUTO operating mode, push the AUTO pushbutton (the yellow Led will turn OFF) or turn the KEY-SWITCH to OFF. Once in AUTO, the EP6 waits for a REMOTE START activation (see section 7.0). In case of an Automatic Periodic Test (A.P.T.), the display will show the message [tESt].

2.2 MANUAL operating mode

To start the engine follow the instructions:

A) - Turn ON the KEY-SWITCH; the EP6 illuminates the LEDs and Display.

B) - If the display shows the message [uuuu], the EP6 is counting the PRE-GLOW time; wait until the message disappears.

C) - After the display shows the flashing message [StA-] (*NOTE*), turn the Key to START position (momentary position with spring-loaded return) until the engine starts. The message [. . . .] indicates a MANUAL start.

D) - To stop the engine, turn the KEY SWITCH to OFF.

NOTE: **EP6 shows the blinking [StA-] message for 20 seconds. After this time, if the engine does not start, the EP6 displays the message [FAIL] (Fail to start, see section 4.07).To clear the alarm, turn the KEY-SWITCH to OFF.**

2.3 OFF operating mode

This function is obtained by turning the KEY SWITCH to OFF. The OFF operating mode clears the fault alarms and shuts down the Display after 5 seconds. A blinking dot indicates the presence of the power supply. Press one of the pushbuttons to energize the display. In OFF operating mode, the EP6 allows reading of the parameters (see section 6.0).

3.0 DISPLAY features

The EP6 features a 4 Digit Display (section10.0) to show measurements, settings and error messages. The [UP-DOWN] pushbutton selects one of the following menus:

[AXXX] *(*)* Generator Current measurement
[UXXX] The Voltage of the Generating Set
[rPM] [XXXX] Speed of the engine
[HXX.X] Frequency of the Generator
[bXX.X] Battery Voltage
[cXX.X] Charger Alternator Voltage
[h] [XXXX] HOUR METER (the message **[h]** appears for a moment, and then, the counter will be displayed continuously).

(*): the symbol "X" means a numerical field.

4.0 ALARM messages

The alarms are displayed by means of messages. In case of alarm consult your Generating Set manufacturer. To remove the message, turn OFF the KEY-SWITCH. The EP6 may show one of the following:

[OIL]	Low Oil Pressure
[°C]	High Temperature
[O.SPd.]	Over Speed of the engine
[U.SPd]	Under Speed of the engine
[bELt]	Failure of the belt
[ALAr]	External Emergency Stop
[FUEL](1)	Low Fuel in the tank
[FAIL]	Starting Failure Alarm
[E 04]	Alternator Failure
[E 05](2)	Generator Overload
[Hi H](2)	Generator Over Frequency
[Lo H](2)	Generator Under Frequency
[Hi U] (2)	Generator Under Voltage
[Lo U](2)	Generator Under Voltage
[XX.X]	Battery Voltage
[Err]	Memory error

(1) [FUEL] This message indicates Low Fuel in the tank . The engine stops if the contacts remain closed for 5 minutes continuously.

(2) To determine the value that caused the failure, push the [F1] pushbutton.

4.1 OPERATING messages

EP6 features messages to inform you about the following:

[uuuu] Glow-plugs timing
[U—] Voltage out of range
[StA-] Start prompt
[. . . .] Starting by key switch
[rESt] Rest timing
[tESt] Automatic Test
[CAL] Calibration
[ProG] Programming
[StOP] Stopping cycle

5.0 LEDs for visual indication

The EP6 features two LEDs **(see section 10.0)** to indicate the following conditions:

[ENGINE RUNNING]: this green led illuminates when the engine is running.
[AUTO]: this yellow LED blinks to indicate a standby mode. The EP6 monitors the REMOTE CONTROL and expects a command. The LED illuminates continuously when the REMOTE START is activated.

5.1 LEDs and Display Test

A test of the LEDs and DISPLAY is obtained automatically anytime the key switch is turned ON. The LEDs and DISPLAY light up for about 1 second.

6.0 Parameters and settings

The unit is programmed by the supplier of the Generating Set. Contact the Generator manufacturer in order to have the permission to program the module. It is possible to read the status of the internal programming at anytime. Follow the instructions:

A) - Turn the Key in OFF (if the display indicates [STOP], wait until it disappears)
B) - Push the pushbutton [F1] the display will show the first programmable parameter **[P.0]**.
C) - Push the pushbutton [F1] the display will indicate the value of the parameter ([1"]).
D) - Push the pushbutton [UP-DOWN] to select a parameter. Push [F1] to display the setting.
E) - The display returns to menu mode if you have not used the pushbuttons for 2 minutes.

The list of the parameters follows (['] means minutes and ["] means seconds). Some parameters may differ according to the programming done by the genset manufacturer.

Display	Parameter [Default]
[P.0]	**Remote Start Delay Timing (Input #7) [1"]** Range: 1-59 secs or 1-15 mins Seconds or minutes of continuous REMOTE START command to initiate the automatic engine start (see section 7.0 and [P20] in this section).
[P.1]	**Remote Stop Delay Timing (Input #7) [1"]** Range: 1-59 secs or 1-15 mins Seconds or minutes of continuous absence of the REMOTE START command to initiate the stop cycle (see section 7.0 and [P.20] in this section).
[P.2]	**Crank Timing (Output #10) [5"]** Range:1-20 seconds Maximum insertion time of the *Starter Motor*.
[P.3]	**Engine Running Trigger (Input #1) [8.0]** Range: 3V-24V, [inh]. If the voltage of the Charger Alternator rises above the [setting], the *Starter Motor* is disconnected.
[P.4]	**Rest Timing [3"]** Range: 3-20 secs. Time interval between starting attempts
[P. 5]	**Starting Attempts [3]** Range: 1-10 This parameter sets the number of attempts in the automatic start cycle
[P.6]	**Generator UnderVoltage, short-circuit [inh.]** Range: 80-400V. If the voltage drops under the [setting] for at least 6 secs, or under [setting]-20% for 1 sec, the Under-Voltage protection [Lo U] will shut down the engine.
[P.7]	**Generator Over-Voltage [500V]** Range: 110-550V or [inh.]. If the Generator voltage rises above the [setting] for at least 2 seconds, the EP6 will energize the over voltage protection [Hi U] (see section 4.0) to stop the engine. The [inh.] code inhibits the over voltage.
[P.8]	**Generator Under-Frequency [Inh.]** [inh.] 1 to 99Hz ([inh]=disables the under frequency) This protection is delayed by about 6 seconds. The EP6 shuts down the engine and the display will show the [Lo H] message.
[P.9]	**Generator Over-Frequency [55]** 45 Hz to [inh.] ([inh.] disables the over frequency) This protection is delayed by about 2 seconds. The EP6 shuts down the engine and displays [Hi H]
[P.10]	**Current Transformer Size [...]** The range is 10/5 up to 1000/5
[P.11]	**Generator Overload Setting [inh.]** Range: [inh.] to 1000 AThe EP6 shuts down the engine after a delay of 6 secs and shows the message [E05].
[P.12]	**Generator Failure Alarm [OFF]** selection: [on] or [OFF].The code [on] enables the *Generator* failure alarm. The EP6 shows the [E04] message and the engine will shut down.
[P.13]	**Glow Plugs/Choke Control (Output #11) [5"]** Range: 1 to 99 secs.The EP6 energizes the output #11 for the programmed time.
[P.14]	**Output Control [0]** The following options are available: **[0]** None - **[1]** Choke Control - **[2]** Glow Plugs Control - **[3]** Choke Control
[P.15]	**Belt Break Control [ON]** Selection: [on] or [OFF]. The Belt Break alarm is indicated by means of the message [bELt]
[P.16]	**Stop Solenoid Timing [2"]** Range: 2-99 secs. Duration of the Stop cycle.

[P.17] **Alarm Output Timing [1']**
[inh.] 1-59 secs 1-15 mins and [cont]. Time-out of the alarm output. The code [cont] disables the time-out, and the alarm remains energized until the OFF operating mode is selected. The [inh.] mode enables the use of the external contactor

[P.18] **Temperature Switch [n.o.]**
Selection: [n.o.] or [n.c.]
[n.o.] the engine shuts down if the contact closes
[n.c.] the engine shuts down if the contact opens

[P.19] **ALARM Control [n.c.]**
Selection: [n.o.] or [n.c.]
[n.o.] the engine shuts down if the contact closes
[n.c.] the engine shuts down if the contact opens

[P.20] **Remote Start [n.o.]**
Selection: [n.o.] or [n.c.]
[n.o.] the engine starts if the contact closes
[n.c.] the engine starts if the contact opens

[P.21] **Under Speed setting [1200]**
[Inh.] or 100-4000 r.p.m. The [Inh.] code disables the Under Speed shut down.

[P.22] **Over Speed setting [1700]**
100-4000 rpm or [Inh.]. The EP6 provides one second bypass delay. The [Inh.] code (>4000 r.p.m.) disables the Over Speed shut down.

[P.23] **Number of Teeth of the Flywheel [Inh.]**
[Inh.] or 1-500 teeth.
The [Inh.] code disables the reading of the Speed (section 3.0), the Over/Under Speed alarms, and the Crank termination (see [P.24]).

[P.24] **Crank OFF [Inh.]**
Crank Termination setting: 100-800 rpm
If the speed rises above the setting, the EP6 terminates the crank cycle. One second delay avoids false termination.The code [Inh.] inhibits the crank termination

[P.25] **Low Oil Pressure Alarm By-Pass [6"]**
Range: 0-99 secs. By-Pass Delay to ignore the Oil Pressure (input #3) during the engine starting cycle. This input requires normally closed contact

[P.26] **Automatic Periodic Test Cycle [inh.]**
Range: [inh.], 1-99 days
This is the interval time between the automatic periodic tests of the engine. The code [inh.] disables the Automatic Periodic Test (see section 19.0)

[P.27] **Automatic Engine Test Duration [10']**
Range: 1-99 minutes.
This is the duration of the automatic engine test.

[P.28] **Generator warm-up timing [20"]**
Range [inh.] 1-59 secs or 1-15 mins ([inh.]=No warm-up)
Active only when [P17]= [inh.] and the ALARM output is used to drive the contactor

[P.29] **Generator cooling timing [30"]**
Range [inh.] 1-59 secs or 1-15 mins ([inh.]=No cooling)
Active only when [P28]= [inh.] and the ALARM output is used to drive the GEN-SET contactor

[P.30] **N° poles of the alternator [...]**
Range [inh.] - [2] = 2 pole alternator - [4] = 4 pole alternator

[P.31] **Engine shut-down delay for low fuel [5']**
Range [inh.] = provides only optical - acoustical warning - 1 - 99 min.

7.0 REMOTE START

The EP6 features REMOTE START only in AUTO operating mode.
To operate the REMOTE START, follow the instructions.

A) - Turn the KEY-SWITCH to the ON position; the Display and LEDs illuminate for 1 sec.
B) - Wait until the end of the LEDs test.
C) - Push the AUTO pushbutton as soon as possible (otherwise, after 20 seconds the EP6 enters the STARTING FAILURE); the [AUTO] yellow LED will illuminate as described in the section 4.

REMOTE START SWITCH:

If the REMOTE START input is activated, the [AUTO] yellow LED illuminates continuously and the display will indicate the count down of the internal ***start delay*** timer. The engine will start after the programmed ***start delay*** time. If the REMOTE START is deactivated, the EP6 drives the ***stop delay time***. The display will indicate the count down and the [AUTO] yellow LED will flash. The engine will stop after the programmed ***stop delay*** time.

8.0 SAFETY

NOTE

High voltage is present inside the EP6. To avoid electric-shock hazard, operating personnel must not remove the protective cover. Do not disconnect the grounding connection. Any interruption of the grounding connection can create an electric shock hazard. Before making external connections, always ground the PANEL first by connecting the control panel to ground.

9.0 Automatic periodic TEST

The EP6 does not use a clock to count the programmed days ([P.26] setting, section 6.0). The maximum error and drift of the counter is +/-0,5%. The user may experiment with shifting the periodic tests. To avoid error accumulation, and in case your unit is programmed to allow Automatic Periodic Test, we recommend the following procedures.
- disconnect the power supply of the EP6 *(consult your genset supplier)*
- wait for the desired start time (external clock reference)
- apply the power supply to the EP6 *(consult your genset supplier)*
- select the "AUTO" operating mode

The EP6 will start the engine after the programmed number of days and the engine will run for the programmed time. To determine how the Automatic Periodic Test is programmed enter the Reading Mode (section 6.0 parameter [P.26] and [P.27]).

IMPORTANT NOTES

If the supply (battery voltage) is removed, the EP6 loses the counts and timings. If the supply restores, the EP6 starts to count the A.P.T. according to the programmed parameters [P.26] and [P.27]. It is important to synchronize the power on sequence with the desired Automatic Periodic Test.

Problem	Possible cause	Solution
ENGINE		
The motor does not start up	1) Start-up switch (I6) (where it is assembled) in incorrect position	1) Check position
	2) Emergency button (L5) pressed	2) Unblock
	3) Preheating (where it is assembled)	3) Lacking or insufficient preheating phase for sparkplugs. Malfunction in circuit: repair.
	4) Engine control unit or starting key faulty.	4) Replace
	5) Battery low	5) Recharge or replace. Check the battery charge circuit on motor and automatic panel.
	6) Battery cable terminals loose or corroded	6) Tighten and clean. Replace if corroded.
	7) Start-up motor defective	7) Repair or replace.
	8) No fuel or air in feed circuit	8) Refill tank, un-aerate the circuit.
	9) Malfunction on feed circuit: defective pump, injector blocked, etc.	9) Ask for intervention of Service Department.
	10) Air filter or fuel filter clogged	10) Clean or replace
	11) Air in the gasoil filter.	11) Take the air out filling the filter with gasoil.
	12) Motor stopping device defective	12) Replace.
	13) Malfunction on electrical power circuit on generator control panel	13) Check and repair.
The motor does not accelerate. Inconstant speed.	1) Air filter or fuel filter clogged.	1) Clean or replace.
	2) Malfunction on feed circuit: defective pump, injector blocked, etc.	2) Ask for intervention of Service Department.
	3) Oil level too high.	3) Eliminate excess oil.
	4) Motor speed regulator defective.	4) Ask for intervention of Service Department
Black smoke	1) Air filter clogged.	1) Clean or replace
	2) Overload.	2) Check the load connected and diminish.
	3) Injectors defective. Injection pump requires calibration.	3) Ask for intervention of Service Department.
White smoke	1) Oil level too high.	1) Eliminate excess oil.
	2) Motor cold or in prolonged operation with little or no load.	2) Insert load only with motor sufficiently hot
	3) Segments and/or cylinders worn out.	3) Ask for intervention of Service Department.
Too little power provided by motor.	1) Air filter clogged.	1) Clean or replace.
	2) Insufficient fuel distribution, impurities or water in feed circuit.	2) Check the feed circuit, clean and refill once again.
	3) Injectors dirty or defective.	3) Ask for intervention of Service Department.
Low oil pressure	1) Oil level insufficient	1) Reset level. Check for leaks.
	2) Air filter clogged.	2) Replace filter.
	3) Oil pump defective.	3) Ask for intervention of Service Department.
	4) Alarm malfunction.	4) Check the sensor and electrical circuit.
High temperature	1) Overload	1) Check the load connected and diminish.
	2) Insufficient ventilation.	2) Check the cooling vent and relative transmission belts
	3) Insufficient coolant liquid (Only for water cooled motors)	3) Restore level. Check for leaks or breakage in the entire cooling circuit, pipes, couplings, etc.
	4) Water radiator or oil clogged (where it is assembled)	4) Clean cooling fins on radiator
	5) Water circulating pump defective (Only for water cooled motors)	5) Ask for intervention of Service Department
	6) Injectors defective. Injection pump requires calibration	6) Ask for intervention of Service Department
	7) Alarm malfunction	7) Check the sensor and electrical circuit

Problem	Possible cause	Solution
GENERATOR		
Absence of output voltage	1) Voltage switch in position 0 2) Voltage switch faulty 3) Protection tripped due to overload 4) Differential protection device tripped. (Differential switch, differential relay) 5) Protection devices defective 6) Alternator not sparked 7) Alternator defective	1) Check position 2) Check connections and working of the switch, repair or replace 3) Check the load connected and diminish 4) Check on the entire installation: cables, connections, utilities connected have no defective sheathing which may cause incorrect currents to ground 5) Replace 6) Carry out external spark test as indicated in alternator manual. Ask for intervention of Service Department 7) Check winding, diodes, etc. on alternator (Refer to alternator manual) Repair or replace. Ask for intervention of Service Department
No-load voltage too low or too high	1) Incorrect motor running speed 2) Voltage regulating device (where it is assembled) defective or requires calibration 3) Alternator defective	1) Regulate speed to its nominal no-load value 2) Adjust regulator device as indicated in alternator manual, or replace. For generators with double voltage control AVR and COMPOUND, act on the excitation circuit as shown in the alternator manual. 3) Check winding, diodes, etc. on alternator (Refer to alternator manual) Repair or replace Ask for intervention of Service Department
Corrected no-load voltage too low with load	1) Incorrect motor running speed due to overload 2) Load with cos φ less than 0.8 3) Alternator defective	1) Check the load connected and diminish 2) Reduce or rephase load 3) Check winding, diodes, etc. on alternator (Refer to alternator manual) Repair or replace Ask for intervention of Service Department
Unstable tension	1) Contacts malfunctioning 2) Irregular rotation of motor 3) Alternator defective	1) Check electrical connections and tighten 2) Ask for intervention of Service Department 3) Check winding, diodes, etc. on alternator (Refer to alternator manual) Repair or replace Ask for intervention of Service Department

WARNING

MOVING PARTS can injure

- Have **qualified** personnel do maintenance and troubleshooting work.
- Stop the engine before doing any work inside the machine. If for any reason the machine must be operated while working inside, **pay attention** moving parts, hot parts (exhaust manifold and muffler, etc.) electrical parts which may be unprotected when the machine is open.
- Remove guards only when necessary to perform maintenance, and replace them when the maintenance requiring their removal is complete.
- Please wear the appropriate clothing and make use of the PPE (Personal Protective Equipment), according to the type of intervention (protective gloves, insulated gloves, glasses).
- Do not modify the components if not authorized.

- See pag. M1.1 -

HOT surface can hurt you

NOTE

By maintenance at care of the utilizer we intend all the operatios concerning the verification of mechanical parts, electrical parts and of the fluids subject to use or consumption during the normal operation of the machine.

For what concerns the fluids we must consider as maintenance even the periodical change and or the refills eventually necessary.

Maintenance operations also include machine cleaning operations when carried out on a periodic basis outside of the normal work cycle.

The repairs **cannot be considered** among the maintenance activities, i.e. the replacement of parts subject to occasional damages and the replacement of electric and mechanic components consumed in normal use, by the Assistance Authorized Center as well as by manufacturer.

The replacement of tires (for machines equipped with trolleys) must be considered as repair since it is not delivered as standard equipment any lifting system.

The periodic maintenance should be performed according to the schedule shown in the engine manual. An optional hour counter (M) is available to simplify the determination of the working hours.

IMPORTANT

In the maintenance operations avoid that polluting substances, liquids, exhausted oils, etc. bring damage to people or things or can cause negative effects to surroindings, health or safety respecting completely the laws and/or dispositions in force in the place.

ENGINE and ALTERNATOR

PLEASE REFER TO THE SPECIFIC MANUALS PROVIDED.

Every engine and alternator manufacturer has maintenance intervals and specific checks for each model: it is necessary to consult the specific engine or alternator USER AND MAINTENANCE manual.

VENTILATION

Make certain there are no obstructions (rags, leaves or other) in the air inlet and outlet openings on the machine, alternator and motor.

ELECTRICAL PANELS

Check condition of cables and connections daily.
Clean periodically using a vacuum cleaner, **DO NOT USE COMPRESSED AIR.**

DECALS AND LABELS

*All warning and decals should be checked once a year and **replaced** if missing or unreadable.*

STRENUOUS OPERATING CONDITIONS

Under extreme operating conditions (frequent stops and starts, dusty environment, cold weather,extended periods of no load operation, fuel with over 0.5% sulphur content) do maintenance more frequently.

BATTERY WITHOUT MAINTENANCE
DO NOT OPEN THE BATTERY

The battery is charged automatically from the battery charger circuit suppplied with the engine.

Check the state of the battery from the colour of the warning light which is in the upper part.

- Green colour: battery OK
- Black colour: battery to be recharged
- White colour: battery to be replaced

NOTE

THE ENGINE PROTECTION NOT WORK WHEN THE OIL IS OF LOW QUALITY BECAUSE NOT CHARGED REGULARLY AT INTERVALS AS PRESCRIBED IN THE OWNER'S ENGINE MANUAL.

ATTENTION

- Maintenance operations on the electricity-generating group prearranged for automatic operation must be carried out with the panel in RESET mode.
- Maintenance operations on the installation's electrical panels must be carried out in complete safety by cutting off all external power sources: ELECTRICAL POWER, GROUP and BATTERY.

For the electricity-generating groups prearranged for automatic operation, in addition to carrying out all periodic maintenance operations foreseen for normal usage, various operations must be carried out that are necessary in relation to the specific type of use. The electricity-generating group in fact must be continuously prepared for operation, even after prolonged periods of inactivity.

MAINTENANCE GENERATING SET WITH AUTOMATIC BOARD

	EVERY WEEK	EVERY MONTH AND/OR AFTER INTERVENTION ON LOAD	EVERY YEAR
1. TEST or AUTOMATIC TEST cycle to keep the generating set constantly operative	NO-LOAD X	WITH LOAD X	
2. Check all levels: engine oil, fuel level, battery electrolyte,, if necessary top it up.	X	X	
3. Control of electrical connections and cleaning of control panel		X	X

● **Carry out motor oil change at least once a year, even if the requested number of hours has not been attained.**

In case the machine should not be used for more than 30 days, make sure that the room in which it is stored presents a suitable shelter from heat sources, weather changes or anything which can cause rust, corrosion or damages to the machine.

☞ Have **qualified** personnel prepare the machine for storage.

GASOLINE ENGINE

Start the engine: It will run until it stops due to the lack of fuel.

Drain the oil from the engine sump and fill it with new oil (see page M25).

Pour about 10 cc of oil into the spark plug hole and screw the spark plug, after having rotated the crankshaft several times.

Rotate the crankshaft slowly until you feel a certain compression, then leave it.

In case the battery, for the electric start, is assembled, disconnect it.

Clean the covers and all the other parts of the machine carefully.

Protect the machine with a plastic hood and store it in o dry place.

DIESEL ENGINE

For short periods of time it is advisable, about every 10 days, to make the machine work with load for 15-30 minutes, for a correct distribution of the lubricant, to recharge the battery and to prevent any possible bloking of the injection system.

For long periods of inactivity, turn to the after soles service of the engine manufacturer.

Clean the covers and all the other parts of the machine carefully.

Protect the machine with a plastic hood and store it in a dry place.

In case of necessity for first aid and of fire prevention, see page. M2.5.

IMPORTANT

In the storage operations avoid that polluting substances, liquids, exhausted oils, etc. bring damage to people or things or can cause negative effects to surroindings, health or safety respecting completely the laws and/or dispositions in force in the place.

☞ Have **qualified** personnel disassemble the machine and dispose of the parts, including the oil, fuel, etc., in a correct manner when it is to be taken out of service.

As cust off we intend all operations to be made, at utilizer's care, at the end of the use of the machine. This comprises the dismantling of the machine, the subdivision of the several components for a further reutilization or for getting rid of them, the eventual packing and transportation of the eliminated parts up to their delivery to the store, or to the bureau encharged to the cust off or to the storage office, etc.

The several operations concerning the cust off, involve the manipulation of fluids potentially dangerous such as: lubricating oil and battery electrolyte.

The dismantling of metallic parts liable to cause injuries or wounds, must be made wearing heavy gloves and using suitable tools.

The getting rid of the various components of the machine must be made accordingly to rules in force of law a/o local rules.
Particular attention must be paid when getting rid of:
lubricating oils, battery electrolyte, and inflammable liquids such as fuel, cooling liquid.

The machine user is responsible for the observance of the norms concerning the environment conditions with regard to the elimination of the machine being cust off and of all its components.

In case the machine should be cust off without any previous disassembly it is however compulsory to remove:
- tank fuel
- engine lubricating oil
- cooling liquid from the engine
- battery

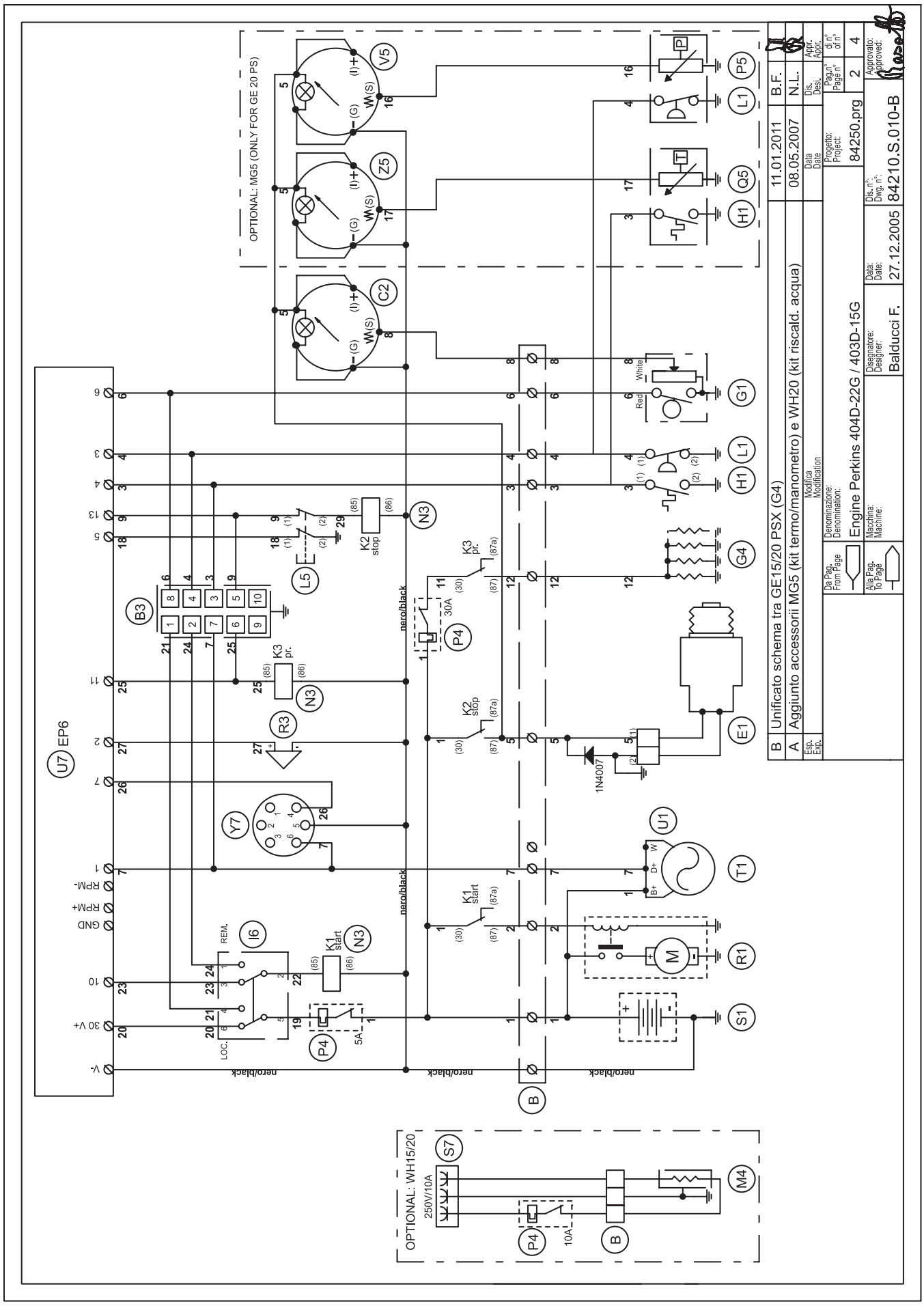
NOTE: The manufacturer is involved with custing off the machine **only** for the second hand ones, when not reparable.
This, of course, after authorization.

In case of necessity for first aid and fire prevention, see page M2.5.

IMPORTANT

In the cust-off operations avoid that polluting substances, liquids, exhausted oils, etc. bring damage to people or things or can cause negative effects to surroindings, health or safety respecting completely the laws and/or dispositions in force in the place.

A : Alternator
B : Wire connection unit
C : Capacitor
D : G.F.I.
E : Welding PCB transformer
F : Fuse
G : 400V 3-phase socket
H : 230V 1phase socket
I : 110V 1-phase socket
L : Socket warning light
M : Hour-counter
N : Voltmeter
P : Welding arc regulator
Q : 230V 3-phase socket
R : Welding control PCB
S : Welding current ammeter
T : Welding current regulator
U : Current transformer
V : Welding voltage voltmeter
Z : Welding sockets
X : Shunt
W : D.C. inductor
Y : Welding diode bridge
A1 : Arc striking resistor
B1 : Arc striking circuit
C1 : 110V D.C./48V D.C. diode bridge
D1 : E.P.1 engine protection
E1 : Engine stop solenoid
F1 : Acceleration solenoid
G1 : Fuel level transmitter
H1 : Oil or water thermostat
I1 : 48V D.C. socket
L1 : Oil pressure switch
M1 : Fuel warning light
N1 : Battery charge warning light
O1 : Oil pressure warning light
P1 : Fuse
Q1 : Starter key
R1 : Starter motor
S1 : Battery
T1 : Battery charge alternator
U1 : Battery charge voltage regulator
V1 : Solenoid valve control PCBT
Z1 : Solenoid valve
W1 : Remote control switch
X1 : Remote control and/or wire feeder socket
Y1 : Remote control plug
A2 : Remote control welding regulator
B2 : E.P.2 engine protection
C2 : Fuel level gauge
D2 : Ammeter
E2 : Frequency meter
F2 : Battery charge trasformer
G2 : Battery charge PCB
H2 : Voltage selector switch
I2 : 48V a.c. socket
L2 : Thermal relay
M2 : Contactor
N2 : G.F.I. and circuit breaker
O2 : 42V EEC socket
P2 : G.F.I. resistor
Q2 : T.E.P. engine protection
R2 : Solenoid control PCBT
S2 : Oil level transmitter
T2 : Engine stop push-button T.C.1
U2 : Engine start push-buttonT.C.1
V2 : 24V c.a. socket
Z2 : Thermal magnetic circuit breaker
W2 : S.C.R. protection unit
X2 : Remote control socket
Y2 : Remote control plug
A3 : Insulation moitoring
B3 : E.A.S. connector
C3 : E.A.S. PCB
D3 : Booster socket
E3 : Open circuit voltage switch
F3 : Stop push-button
G3 : Ignition coil
H3 : Spark plug
I3 : Range switch
L3 : Oil shut-down button
M3 : Battery charge diode
N3 : Relay
O3 : Resistor
P3 : Sparkler reactor
Q3 : Output power unit
R3 : Electric siren
S3 : E.P.4 engine protection
T3 : Engine control PCB
U3 : R.P.M. electronic regulator
V3 : PTO HI control PCB
Z3 : PTO HI 20 l/min push-button
W3 : PTO HI 30 l/min push-button
X3 : PTO HI reset push-button
Y3 : PTO HI 20 l/min indicator
A4 : PTO HI 30 l/min indicator
B4 : PTO HI reset indicator
C4 : PTO HI 20 l/min solenoid valve
D4 : PTO HI 30 l/ min solenoid valve
E4 : Hydraulic oil pressure switch
F4 : Hycraulic oil level gauge
G4 : Preheating glow plugs
H4 : Preheating gearbox
I4 : Preheating indicator
L4 : R.C. filter
M4 : Heater with thermostat
N4 : Choke solenoid
O4 : Step relay
P4 : Circuit breaker
Q4 : Battery charge sockets
R4 : Sensor, cooling liquid temperature
S4 : Sensor, air filter clogging
T4 : Warning light, air filter clogging
U4 : Polarity inverter remote control
V4 : Polarity inverter switch
Z4 : Transformer 230/48V
W4 : Diode bridge, polarity change
X4 : Base current diode bridge
Y4 : PCB control unit, polarity inverter
A5 : Base current switch
B5 : Auxiliary push-button ON/OFF
C5 : Accelerator electronic control
D5 : Actuator
E5 : Pick-up
F5 : Warning light, high temperature
G5 : Commutator auxiliary power
H5 : 24V diode bridge
I5 : Y/▲ commutator
L5 : Emergency stop button
M5 : Engine protection EP5
N5 : Pre-heat push-button
O5 : Accelerator solenoid PCB
P5 : Oil pressure switch
Q5 : Water temperature switch
R5 : Water heater
S5 : Engine connector 24 poles
T5 : Electronic GFI relais
U5 : Release coil, circuit breaker
V5 : Oil pressure indicator
Z5 : Water temperature indicator
W5 : Battery voltmeter
X5 : Contactor, polarity change
Y5 : Commutator/switch, series/parallel
A6 : Commutator/switch
B6 : Key switch, on/off
C6 : QEA control unit
D6 : Connector, PAC
E6 : Frequency rpm regulator
F6 : Arc-Force selector
G6 : Device starting motor
H6 : Fuel electro pump 12V c.c.
I6 : Start Local/Remote selector
L6 : Choke button
M6 : Switch CC/CV
N6 : Connector – wire feeder
O6 : 420V/110V 3-phase transformer
P6 : Switch IDLE/RUN
Q6 : Hz/V/A analogic instrument
R6 : EMC filter
S6 : Wire feeder supply switch
T6 : Wire feeder socket
U6 : DSP chopper PCB
V6 : Power chopper supply PCB
Z6 : Switch and leds PCB
W6 : Hall sensor
X6 : Water heather indicator
Y6 : Battery charge indicator
A7 : Transfer pump selector AUT-0-MAN
B7 : Fuel transfer pump
C7 : "GECO" generating set test
D7 : Flooting with level switches
E7 : Voltmeter regulator
F7 : WELD/AUX switch
G7 : Reactor, 3-phase
H7 : Switch disconnector
I7 : Solenoid stop timer
L7 : "VODIA" connector
M7 : "F" EDC4 connector
N7 : OFF-ON-DIAGN. selector
O7 : DIAGNOSTIC push-button
P7 : DIAGNOSTIC indicator
Q7 : Welding selector mode
R7 : VRD load
S7 : 230V 1-phase plug
T7 : V/Hz analogic instrument
U7 : Engine protection EP6
V7 : G.F.I. relay supply switch
Z7 : Radio remote control receiver
W7 : Radio remote control trasnsmitter
X7 : Isometer test push-button
Y7 : Remote start socket
A8 : Transfer fuel pump control
B8 : Ammeter selector switch
C8 : 400V/230V/115V commutator
D8 : 50/60 Hz switch
E8 : Cold start advance with temp. switch
F8 : START/STOP switch
G8 : Polarity inverter two way switch
H8 : Engine protection EP7
I8 : AUTOIDLE switch
L8 : AUTOIDLE PCB
M8 : A4E2 ECM engine PCB
N8 : Remote emergency stop connector
O8 : V/A digital instruments and led VRD PCB
P8 : Water in fuel
Q8 : Battery disconnect switch
R8 : Inverter
S8 : Overload led
T8 : Main IT/TN selector
U8 : NATO socket 12V
V8 : Diesel pressure switch
Z8 : Remote control PCB
W8 : Pressure turbo protection
X8 : Water in fuel sender
Y8 : EDC7-UC31 engine PCB
A9 : Low water level sender
B9 : Interface card
C9 : Limit switch
D9 : Starter timing card
E9 : Luquid pouring level float
F9 : Under voltage coil
G9 : Low water level warning light
H9 : Chopper driver PCB
I9 : Fuel filter heater
L9 : Air heater
M9 : ON/OFF switch lamp
N9 : UP/DOWN button mast
O9 : Hydraulic unit solenoid valve
P9 : Hydraulic unit engine
Q9 : Ignitor
R9 : Lamp
S9 : Power system
T9 : 48Vdc power system
U9 : LED projector
V9 :
Z9 :
W9 :
X9 :
Y9 :



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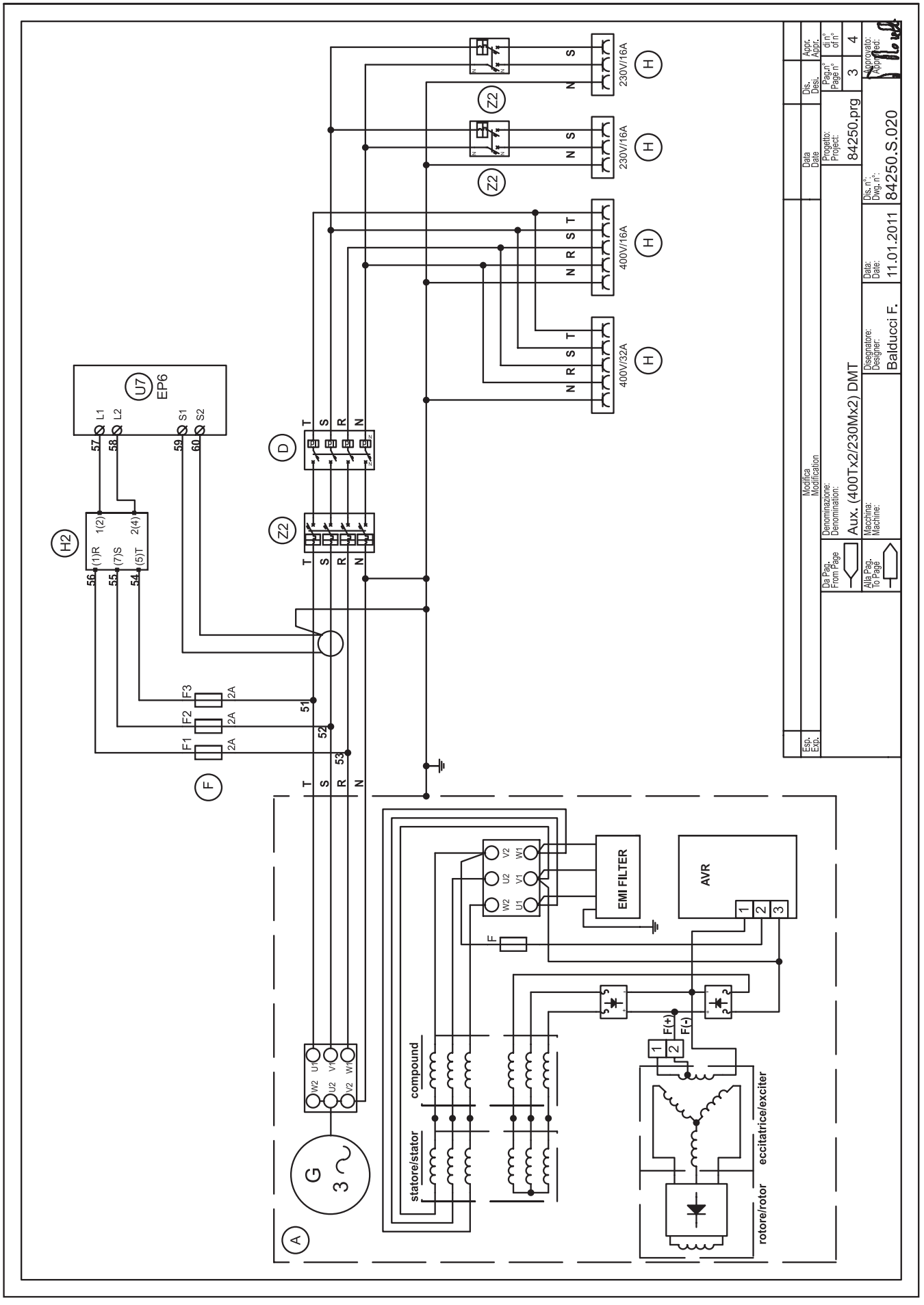

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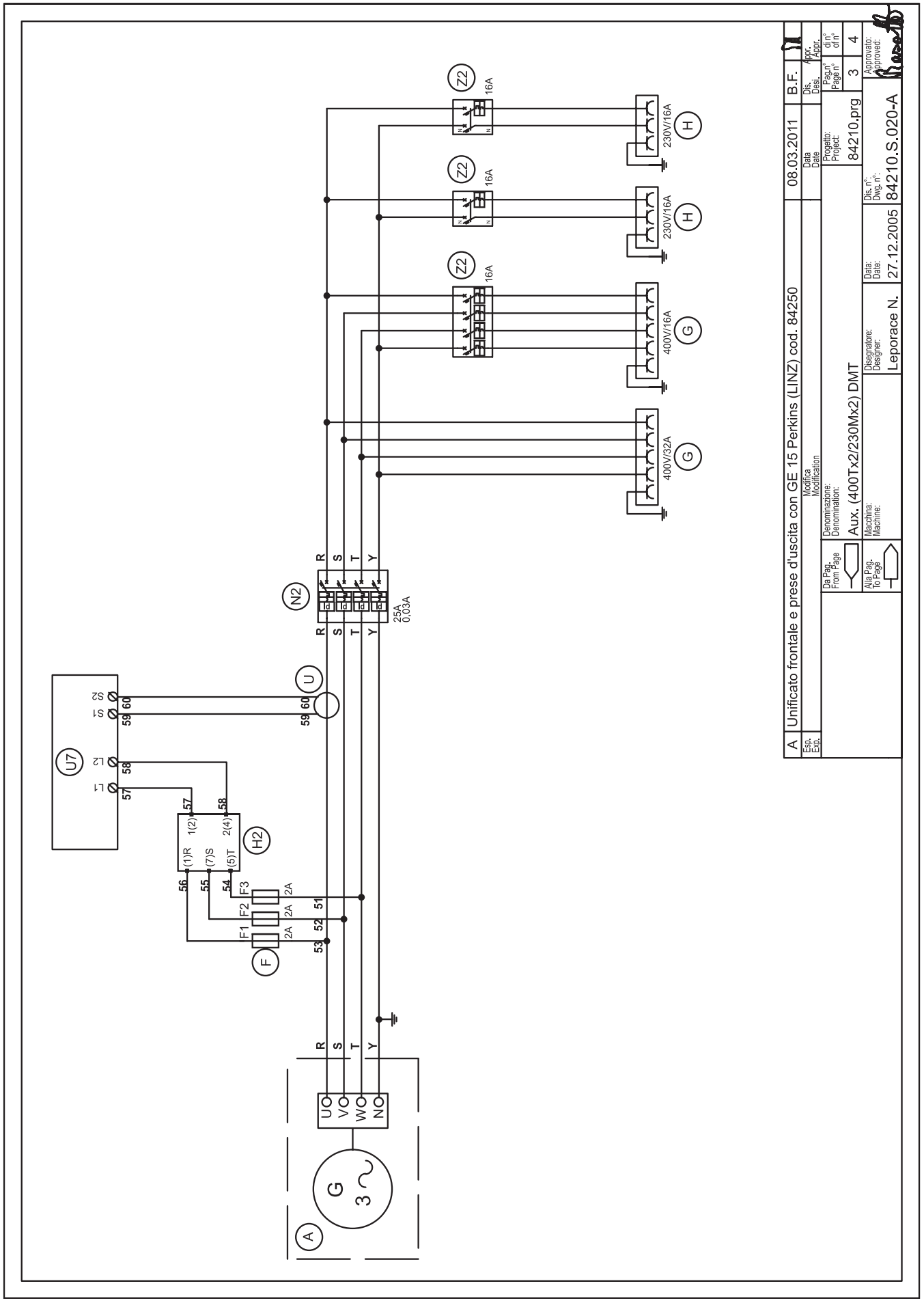
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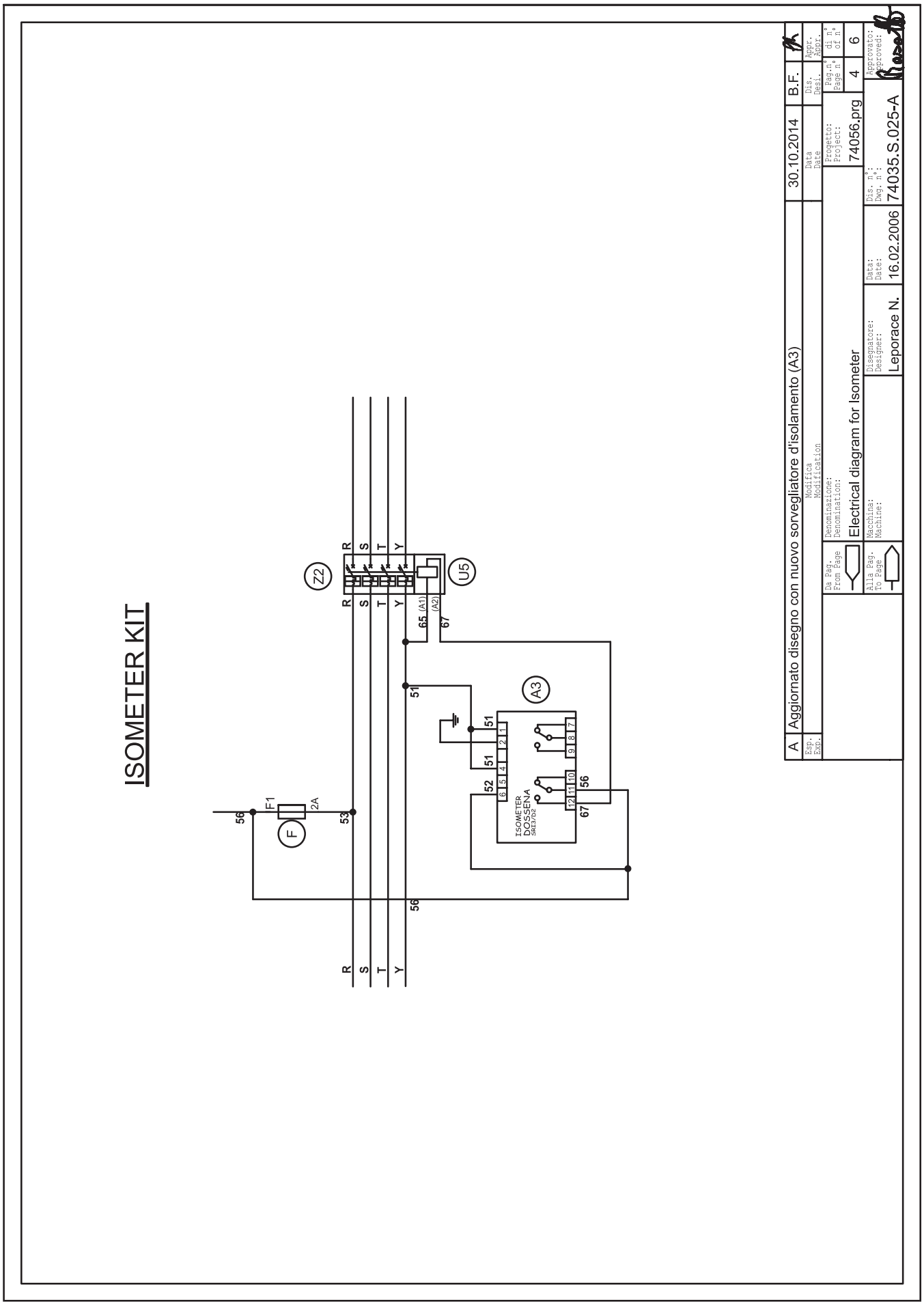
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