

USE AND MAINTENANCE MANUAL

GE 7500 HBSL - AVR ***GE 7500 HBSLE - AVR***

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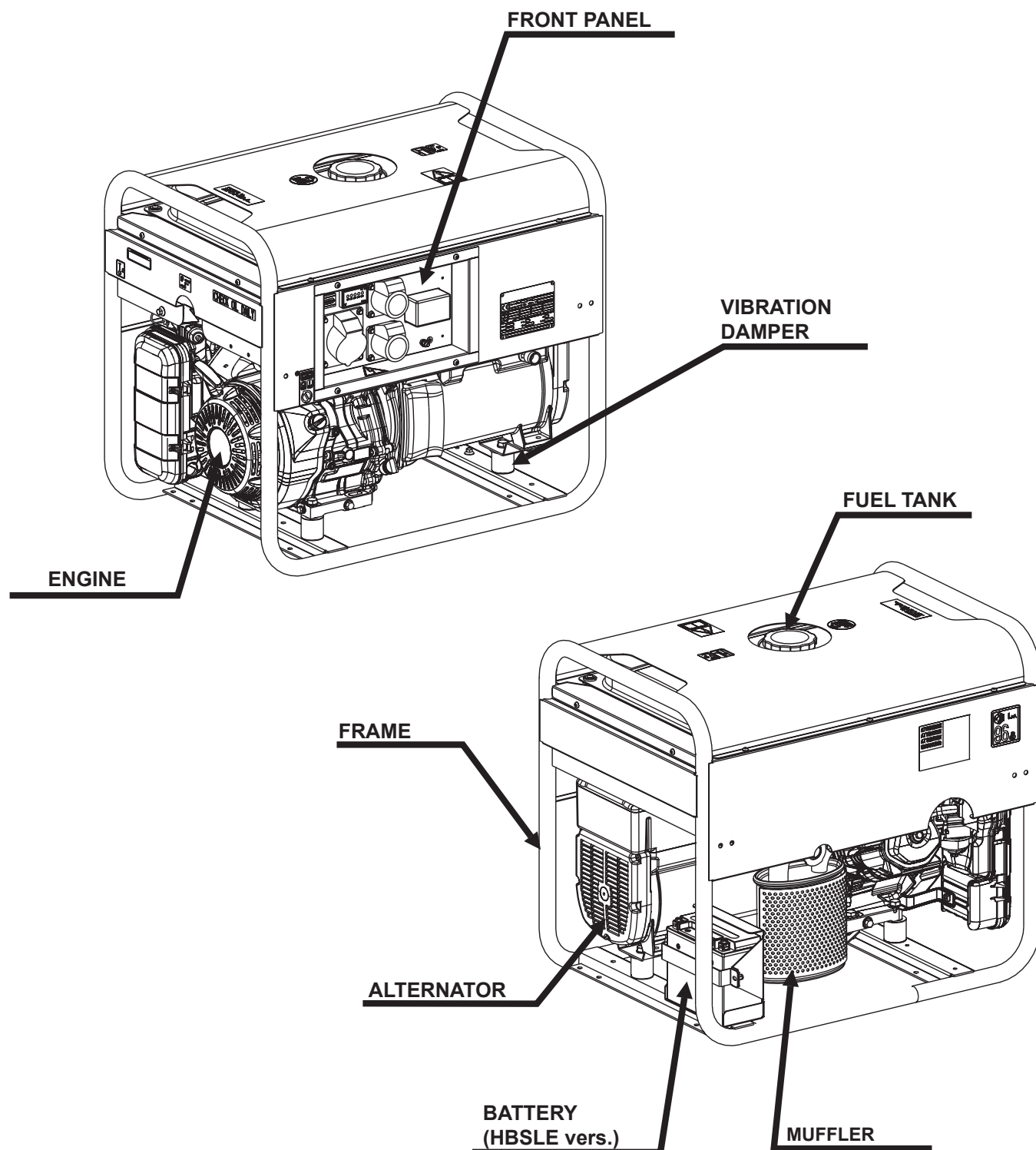
MADE IN ITALY

MOSA

The generating set is a unit which transforms the mechanical energy, generated by endothermic engine, into electric energy, through an alternator.

The assembling is made on a steel structure, on which are provided elastic support which must damp the vibrations and also eliminate sounds which would produce noise.

The unit has a protective closed frame which protects it against unintentional impacts during the handling and /or transport, the front panel is completely wrapped by the structure so that the components are protected. The fuel tank and battery starter complete the main parts of the machine.





UNI EN ISO 9001 : 2008

ISO 9001:2008 - Cert. 0192

MOSA has certified its quality system according to UNI EN ISO 9001:2008 to ensure a constant, highquality of its products. This certification covers the design, production and servicing of engine driven welders and generating sets.

The certifying institute, ICIM, which is a member of the International Certification Network IQNet, awarded the official approval to MOSA after an examination of its operations at the head office and plant in Cusago (MI), Italy.

This certification is not a point of arrival but a pledge on the part of the entire company to maintain a level of quality of both its products and services which will continue to satisfy the needs of its clients, as well as to improve the transparency and the communications regarding all the company's activities in accordance with the official procedures and in harmony with the MOSA Manual of Quality.

The advantages for MOSA clients are:

- Constant quality of products and services at the high level which the client expects;
- Continuous efforts to improve the products and their performance at competitive conditions;
- Competent support in the solution of problems;
- Information and training in the correct application and use of the products to assure the security of the operator and protect the environment;
- Regular inspections by ICIM to confirm that the requirements of the company's quality system and ISO 9001 are being respected.

All these advantages are guaranteed by the CERTIFICATE OF QUALITY SYSTEM No.0192 issued by ICIM S.p.A. - Milano (Italy) - www.icim.it

| | |
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ATTENTION

This use and maintenance manual is an important part of the machines in question.


The assistance and maintenance personnel 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).



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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 parts 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 applicable 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.

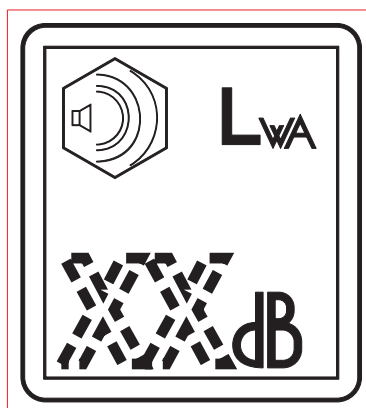
| | | | | | | | |
|---|---|--------------------|--|------|--|-------------------|--|
|  | | Made in UE-ITALY | | TYPE | | SERIAL N° | |
|  |  | X | | | | | |
| | | I ₂ (A) | | | | | |
|  |  | U ₀ | | | | | |
| | | U ₂ (V) | | | | | |
|  |  | I ₂ (A) | | | | | |
| | | U ₂ (V) | | | | | |
|  |  | Hz | | | | | |
| | | P.F. | | | | | |
|  |  | n | | RPM | | n _i | |
| | | n ₀ | | RPM | | P _{1max} | |
| | | | | KW | | I. CL. | |

| | | | | | | | |
|---|-------|------------------|-------|---------------------------------------|--|-----------|--|
|  | | Made in UE-ITALY | | TYPE | | SERIAL N° | |
| Generating Set ISO 8528 | | | | | | | |
| KVA | | | | | | | |
| V | | | | | | | |
| I | | | | | | | |
| Hz | | P.F. | | LTP POWER IN ACCORDANCE WITH ISO 8528 | | | |
| RPM | | I. CL. | | | | IP | |
| ALTIT. | 100 m | TEMP. | 25 °C | | | MASS | |

| | | | | | | | |
|---|---|---------------------------------------|--|-----------|--|------------------|--|
|  | | TYPE | | SERIAL N° | | Made in UE-ITALY | |
|  |  | TYPE/N° | | | | | |
| | | VOLTAGE(V) | | | | | |
|  |  | POWER(W) | | | | | |
| | | | | | | | |
|  |  | Hz | | KVA | | | |
| | | P.F. | | V(V) | | | |
|  |  | I. CL. | | I(A) | | | |
| | | LTP POWER IN ACCORDANCE WITH ISO 8528 | | | | | |
|  |  | n | | RPM | | TEMP. | |
| | | P _{max} | | KW | | ALTIT. | |
| | | | | | | °C | |
| | | | | | | m | |
| | | | | | | IP | |
| | | | | | | Kg | |

| | | | | | | | |
|---|---|------------------|--|--------|--|-------------------|--|
|  | | Made in UE-ITALY | | I. CL. | | TYPE | |
| IEC 60974-1 | | | | IP | | | |
|  |  | n | | RPM | | n _i | |
| | | n ₀ | | RPM | | P _{1max} | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

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.

BCS S.p.A.

Sede legale:
 Via Marradi 1
 20123 Milano - Italia

Stabilimento di Cusago, 20090 (Mi) - Italia

V.le Europa 59
 Tel.: +39 02 903521
 Fax: +39 02 90390466



ISO 9001:2008 - Cert. 0192

DICHIARAZIONE DI CONFORMITA'



Déclaration de Conformité – Declaration of Conformity – Konformitätserklärung
 Conformiteitsverklaring – Declaración de Conformidad

BCS S.p.A. dichiara sotto la propria responsabilità che la macchina:
 BCS S.p.A. déclare, sous sa propre responsabilité, que la machine:
 BCS S.p.A. declares, under its own responsibility, that the machine:
 BCS S.p.A. erklärt, daß die Aggregate:
 BCS S.p.A. verklaard, onder haar eigen verantwoordelijkheid, dat de machine:
 BCS S.p.A. declara bajo su responsabilidad que la máquina:

GRUPPO ELETTROGENO DI SALDATURA / WELDING GENERATOR

GRUPPO ELETTROGENO / POWER GENERATOR

TORRE FARO / LIGHTING TOWER

Marchio / Brand :

Modello / Model :

Matricola / Serial number :

è conforme con quanto previsto dalle Direttive Comunitarie e relative modifiche:
 est en conformité avec ce qui est prévu par les Directives Communautaires et relatives modifications:
 conforms with the Community Directives and related modifications:
 mit den Vorschriften der Gemeinschaft und deren Ergänzungen übereinstimmt:
 in overeenkomst is met de inhoud van gemeenschapsrichtlijnen gerelateerde modificaties:
 cumple con los requisitos de la Directiva Comunitaria y sus anexos:

2006/42/CE - 2006/95/CE - 2004/108/CE

Nome e indirizzo della persona autorizzata a costituire il fascicolo tecnico :
 Nom et adresse de la personne autorisée à composer le Dossier Technique :
 Person authorized to compile the technical file and address :
 Name und Adresse der zur Ausfüllung der technischen Akten ermächtigten Person :
 Persoon bevoegd om het technische document , en bedrijf gegevens in te vullen
 Nombre y dirección de la persona autorizada a componer el expediente técnico :

ing. Benso Marelli - Consigliere Delegato / Managing Director ; V.le Europa 59, 20090 Cusago (MI) – Italy

Cusago,

Ing. Benso Marelli
 Consigliere Delegato
 Managing Director

| | | | |
|--------------|-----------------------|---|---|
| I GB F | TECHNICAL DATA | GE 7500 HBSL-AVR GE 7500 HBSLE-AVR | M 1.5 REV.0 - 05/14 |
|--------------|-----------------------|---|---|

Technical data

GE 7500 HBSL-AVR

GE 7500 HBSLE-AVR

GENERATOR

Stand-by three-phase power

8 kVA (6.4 kW) / 400V / 11.5 A

PRP three-phase power

7 kVA (5.8 kW) / 400V / 10.1 A

PRP single-phase power

3 kVA / 230V / 13 A

Frequency

50 Hz

Cos φ

0.8

* Output powers according to ISO 8528-1

ALTERNATOR

Type

self-excited, self-regulated

Insulation class

three-phase, synchronous

H

ENGINE

Make / Model

HONDA GX 390

Type / Cooling system

Gasoline 4-Stroke / air

Cylinder / Displacement

1 / 389 cm³

*Stand-by net power

8.2 kW (11.1 HP)

**PRP net power

6.4 kW (8.7 HP)

Speed

3000 rpm

Fuel consumption (75% of PRP)

2.4 l/h

Engine oil capacity

1.1 l

Starter

Recoil

Electric

* Powers according to ISO 3046-1

GENERAL SPECIFICATIONS

Tank capacity

25 l

Running time (75% of PRP)

10.4 h

Protection

IP 23

*Dimensions / max. on base Lxwxh

750x520x660

*Weight on base

93 Kg

104 Kg

Measured acoustic power Lwa (pression LpA)

96 dB(A) (71 dB(A) @ 7 m)

Garanteed acoustic power Lwa (pression LpA)

96 dB(A) (71 dB(A) @ 7 m)



* Dimensions and weight are inclusive of all parts.

OUTPUT

Declared power according to ISO 8528-1 (temperature 25°C, 30% relative humidity, altitude 100 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 100 m altitude and of 2.5% for every 5°C above 25°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 7 meters = 95 dB(A) - 25 dB(A) = 70 dB(A)

Lp a 4 meters = 95 dB(A) - 20 dB(A) = 75 dB(A)

Lp a 10 meters = 95 dB(A) - 28 dB(A) = 67 dB(A)

PLEASE NOTE: the symbol  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

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




ATTENTION



 **FIRST AID.** In case the operator should 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 dioxide) 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 inflammability 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 people.

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 No harm for persons and things

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.

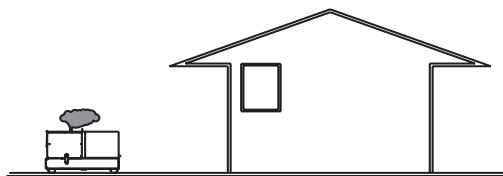
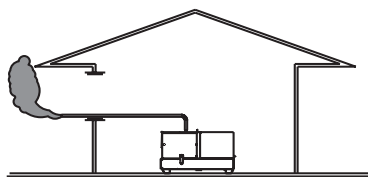
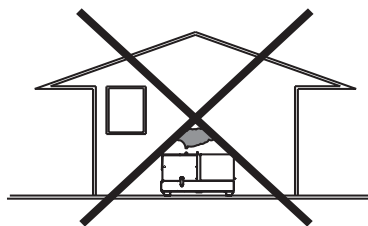
INSTALLATION AND ADVICE BEFORE USE

GASOLINE ENGINES

- Use in open space, air swept or vent exhaust gases, which contain the deadly carbone oxyde, far from the work area.

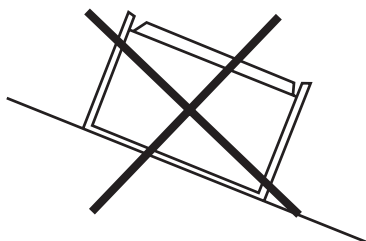
DIESEL ENGINES

- Use in open space, air swept or vent exhaust gases far from the work area.

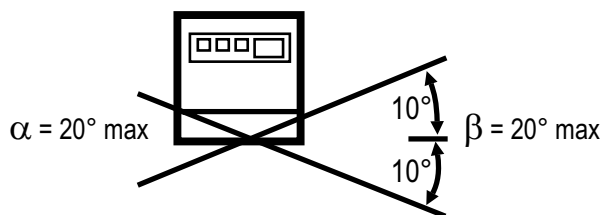
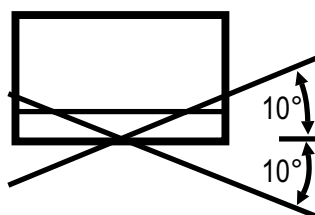


POSITION

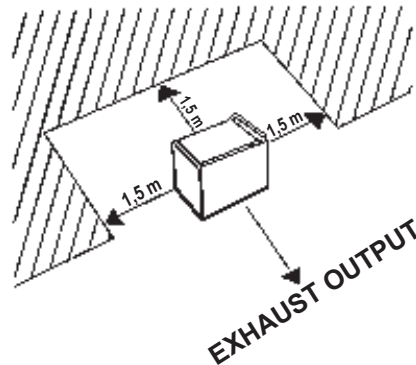
Place the machine on a level surface at a distance of at least 1,5 m from buildings or other plants.



Maximum leaning of the machine (in case of dislevel)



Check that the air gets changed completely and the hot air sent out does not come back inside the set so as to cause a dangerous increase of the temperature.



- Make sure that the machine does not move during the work: **block** it possibly with tools and/or devices made to this purpose.

MOVES OF THE MACHINE

- At any move check that the engine is **off**, that there are no connections with cables which impede the moves.

PLACE OF THE MACHINE



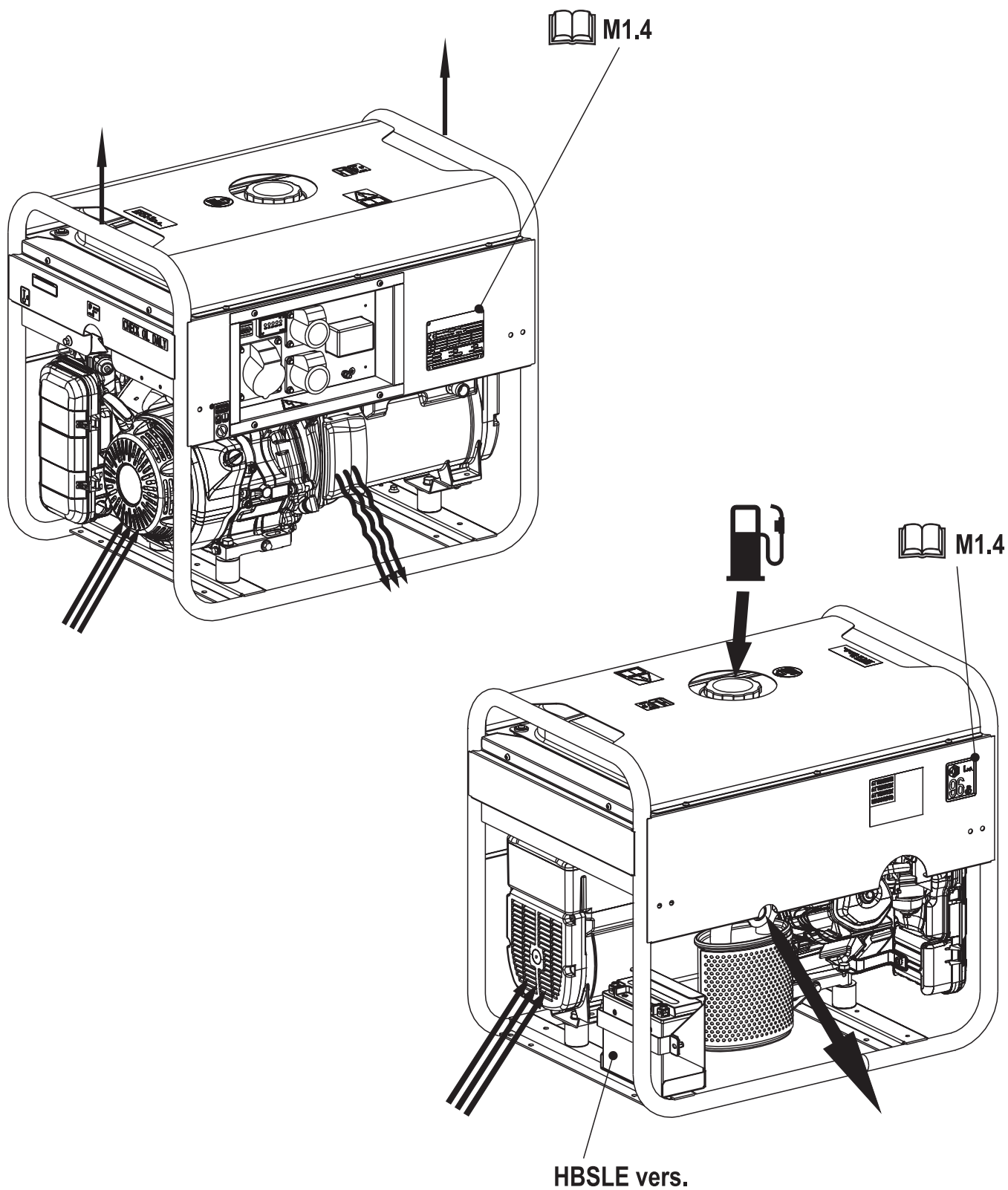
ATTENTION



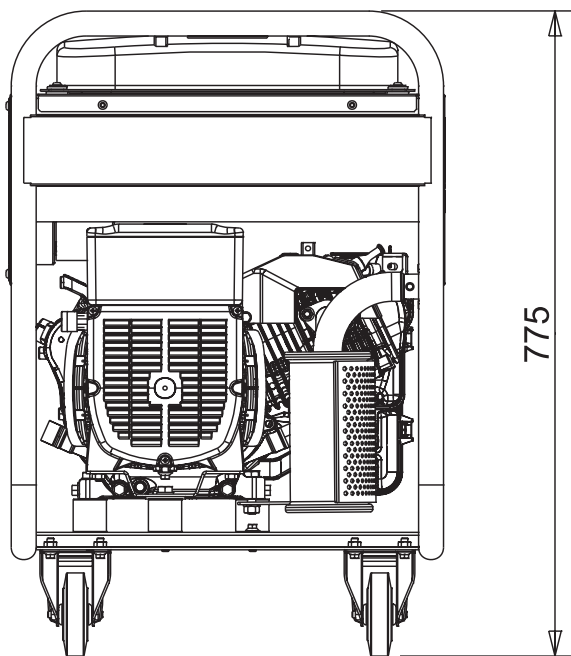
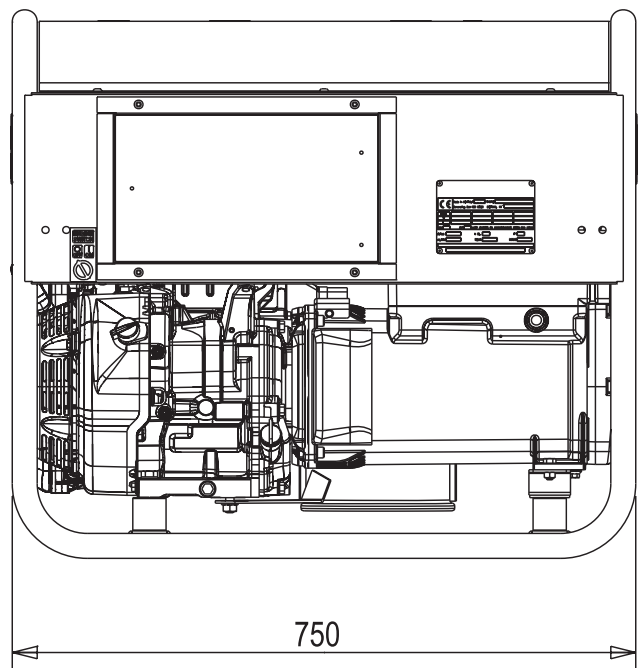
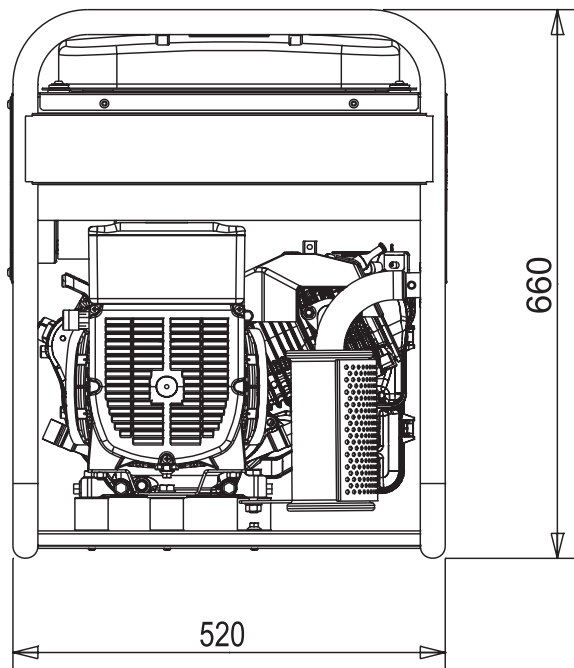
For a safer use from the operator **DO NOT** fit the machine in locations with high risk of flood.

Please do not use the machine in weather conditions which are beyond IP protection shown both in the data plate and on page named "technical data" in this same manual.

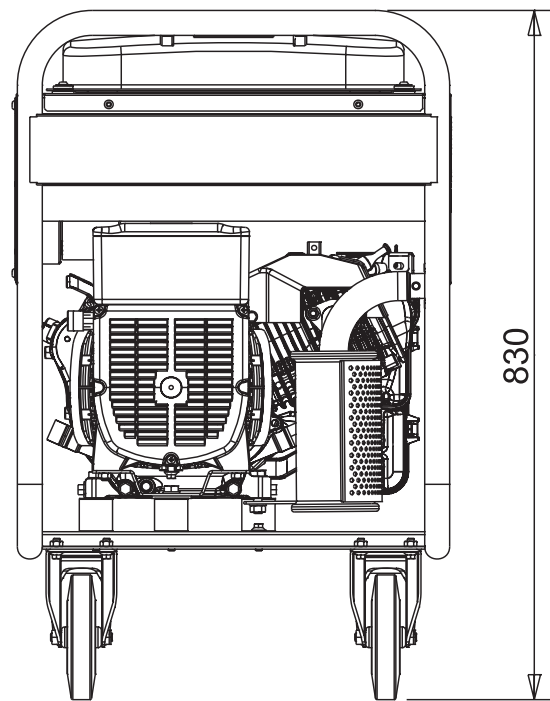




STANDARD



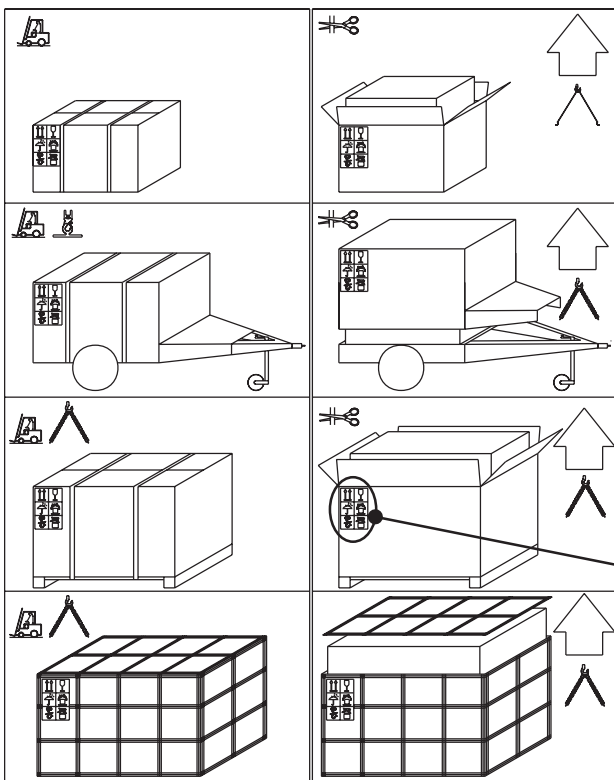
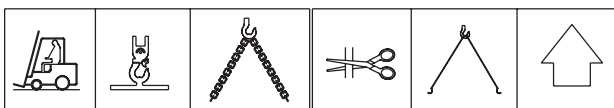
STD + CTM7/1



STD + CTM7/2

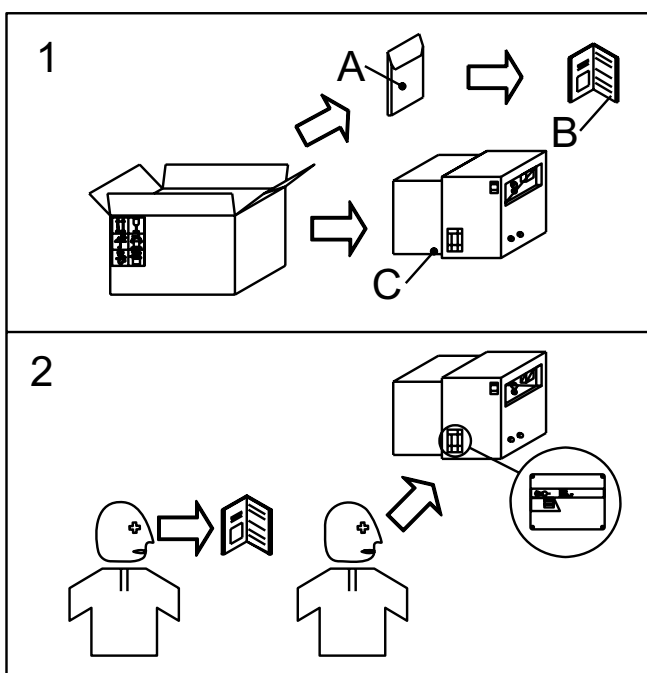
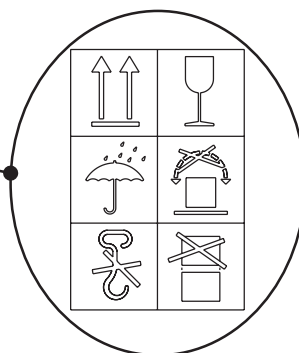


NOTE



Be sure that the lifting devices are: correctly mounted, adequate for the weight of the machine with its 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.





NOTE

Transportation must always take place with the engine off, electrical cables and starting battery disconnected and fuel tank empty.

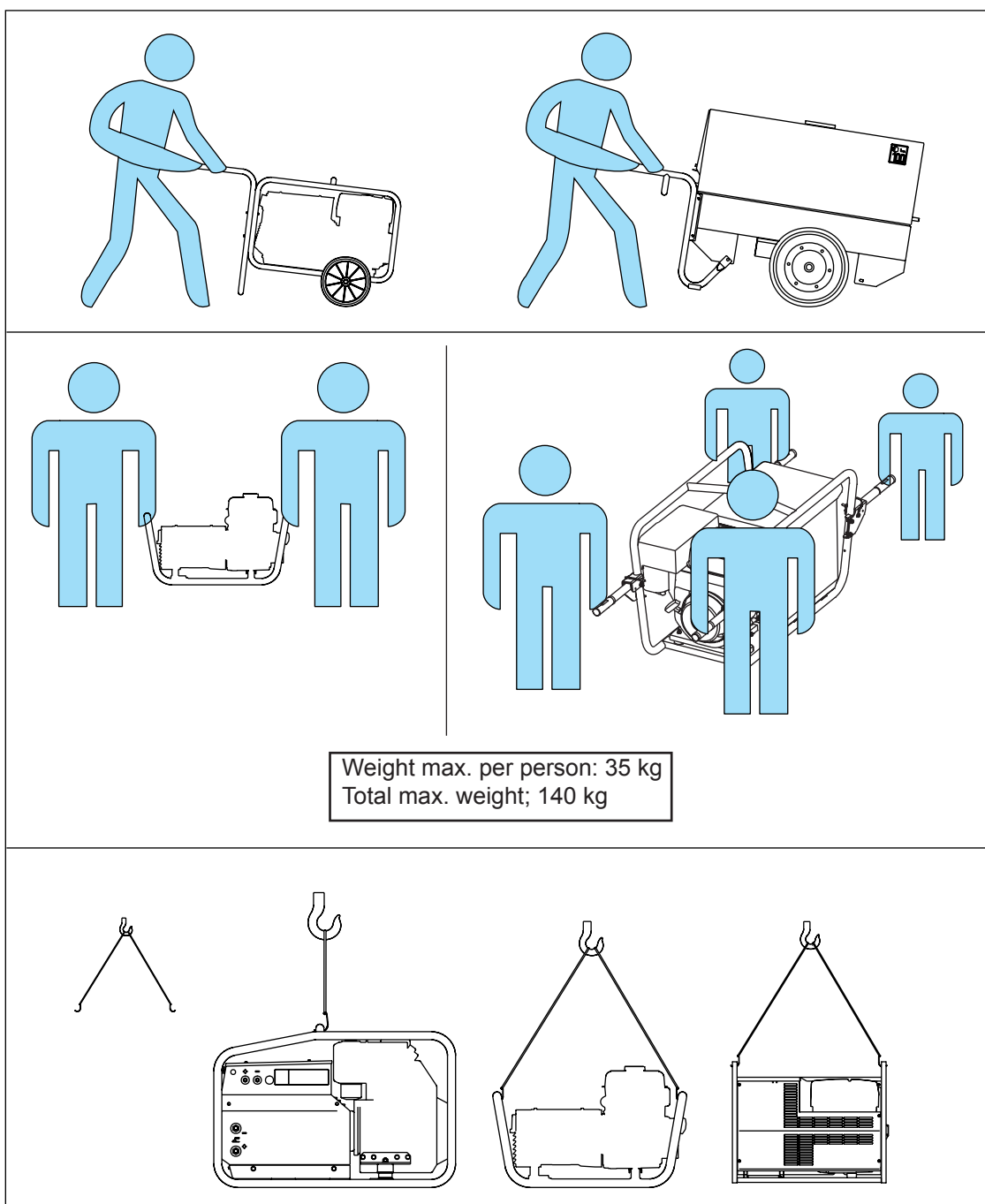
Be sure that the lifting devices are: correctly mounted, adequate for the weight of the machine with its packaging, and conform to local rules and regulations.

Only authorized persons involved in the transport of the machine should be in the area of movement.

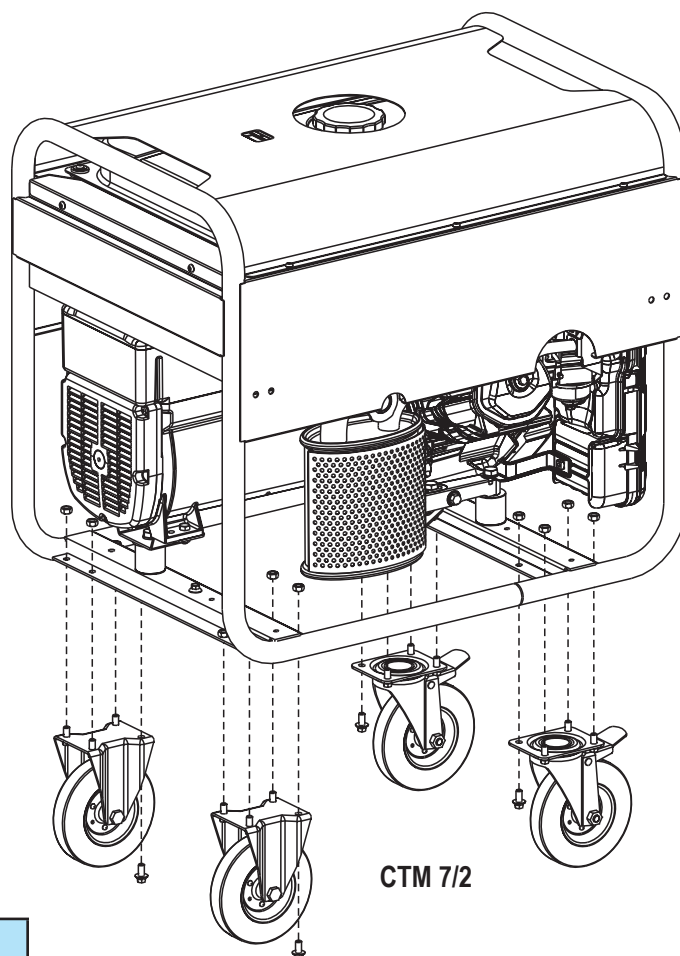
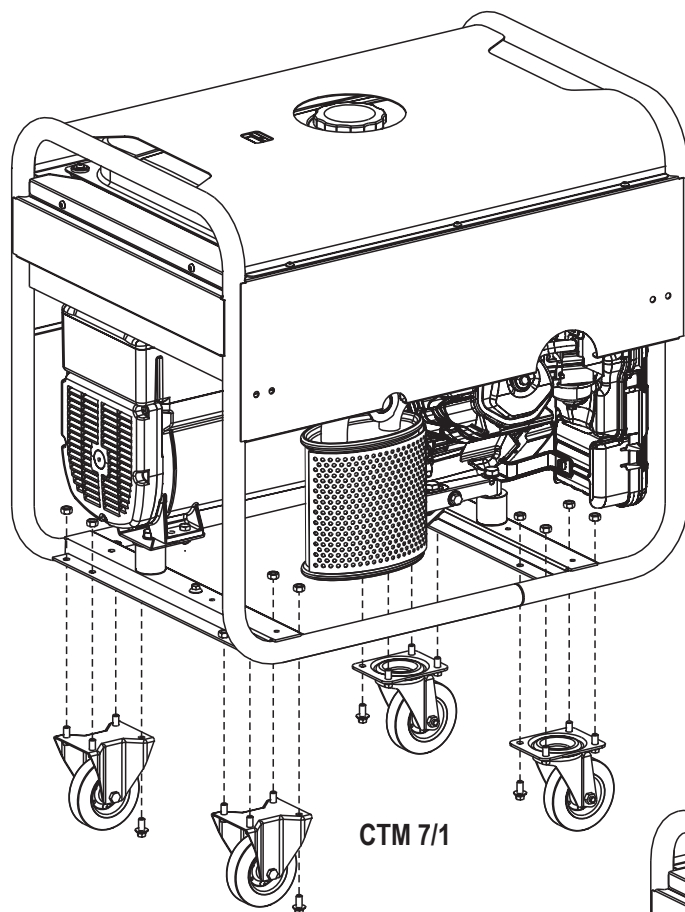
DO NOT LOAD OTHER PARTS WHICH CAN MODIFY WEIGHT AND BARICENTER POSITION.

IT IS STRICTLY FORBIDDEN TO DRAG THE MACHINE MANUALLY OR TOW IT BY ANY VEHICLE (model with no CTM accessory).

If you did not keep to the instructions, you could damage the structure of the machine.



Note: Lift the machine and assemble the parts as shown in the drawing



ATTENTION

The CTM 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.





BATTERY WITHOUT MAINTENANCE

The included battery must be activated.

To activate it (fill the included acid) please follow the instructions shown on the manual attached to the battery. When battery is activated, **DON'T** add any other liquid.



LUBRICANT

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

RECOMMENDED OIL

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



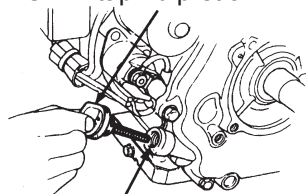
| PRODOTTI RACCOMANDATI RECOMMENDED PRODUCTS | |
|--|---|
| AGIP SIGMA TURBO PLUS 15W/40 API CG-4 - ACEA E3 | OLIO MOTORE DIESEL DIESEL ENGINE OIL |
| AGIP SUPERMOTOR OIL 20W/50 API CC-SF | OLIO MOTORE BENZINA GASOLINE ENGINE OIL |
| AGIP ANTIFREEZE EXTRA INIBITE ETHYLENE GLYCOL (50% + 50% + H ₂ O) | CIRCUITO DI RAFFREDDAMENTO COOLING CIRCUIT (CUNA NC 956-16 ED 97) |

Check the level of the engine oil using the (appropriate oil dipstick: the level should be between the minimum and maximum marks.

To check the oil level:

1. Remove the oil-fill tap (24) and clean the dip-stick (23).
2. Insert the dip-stick into the oil filler without screwing it in.
3. If necessary, add more oil through the appropriate inlet.

Oil fill tap / dip-stick



Upper oil level



ATTENTION

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

NOTE: before starting and switching off, see instructions in the engine owner's manual herewith attached.

ENGINE WITH OIL ALERT DEVICE

The OIL ALERT device will stop the engine in case of no oil or insufficient amount of oil in the engine. In case one tries to start the engine with oil below the minimum level, the warning light (when assembled) will light and the device will not allow starting.



CLEANING OF DRY AIR FILTER

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

FUEL

Check the level of fuel in the tank and, if necessary, add unleaded gasoline. For further information regarding the fuel which has to be used, see instructions in the engine owner's manual herewith attached.

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.



ATTENTION



Gasoline is highly flammable. Refuel with motor shut off in a flat surfaced well-ventilated area. Do not refuel in the presence of flames. Avoid spilling fuel. Any eventual spilled fuel and fumes are flammable. Clean any dispersions of fuel before starting up the motor.



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.



to check before every starting

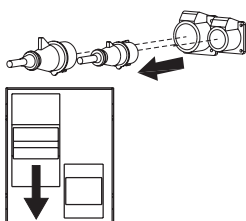


NOTE

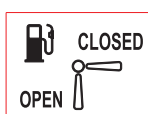
Do not alter the primary conditions of regulation and do not touch the sealed parts.

STARTING THE ENGINE

- 1) make sure the load plugs are disconnected or that the main switch of machine is open (lever facing down), so as to ensure the motor's start-up without any loads inserted.



- 2) Open the gasoline cock



3) Easy Start

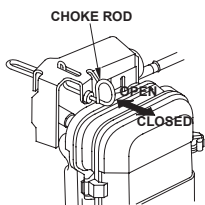
The engine is equipped with a pneumatic air system (choke) called Easy Start that allows you to start the engine without choke adjustment when the ambient temperature is between 10° C and 25° C.

In these conditions leave the choke rod in its mid-position, work position.

At temperatures below the indicated pull the rod in the CLOSED position, start the engine and gradually push the rod in the position of work while the engine warms up.

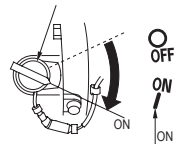
To start a warm engine, push the rod choke in the OPEN position.

Once the engine is started up move the rod in the work position.



MANUAL RECOIL

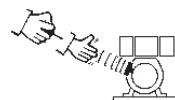
ENGINE SWITCH



- 4) Turn the engine switch to the ON position.



- 5) hold the starting handle properly and pull slowly until you feel resistance



- 6) then return it slowly

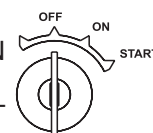


- 7) pull the rope hard and fast. Pull it all the way out. Use two hands if necessary.

Electric start

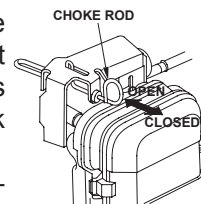
- 4) Turn the start-up key (Q1) to the ON position.

- 5) Turn the start-up key (Q1) to the START position, once the engine is started up leave the key, it will reposition itself in "ON".



In case of unsuccessful start-up, do not insist for longer than 5 seconds. Wait 10 seconds before attempting another start-up.

- 6) If the choke rod was moved to the CLOSED or OPEN position to start the engine, once the engine is started up move the rod in the work position.



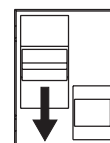
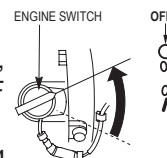
- 7) Warm up the engine for 2 or 3 minutes.

STOPPING THE ENGINE

To stop the engine in an emergency, simply turn the engine switch to the OFF position.

Under normal conditions, use the following procedure:

- 1) stop the power source, turning off the connected equipment, if they do not have a power switch, open the main switch of the machine (lever facing down)
- 2) allow the engine to run without any load for a few minutes
- 3) Turn the engine switch or the starter key to the OFF position
- 4) Shut the gasoline cock.

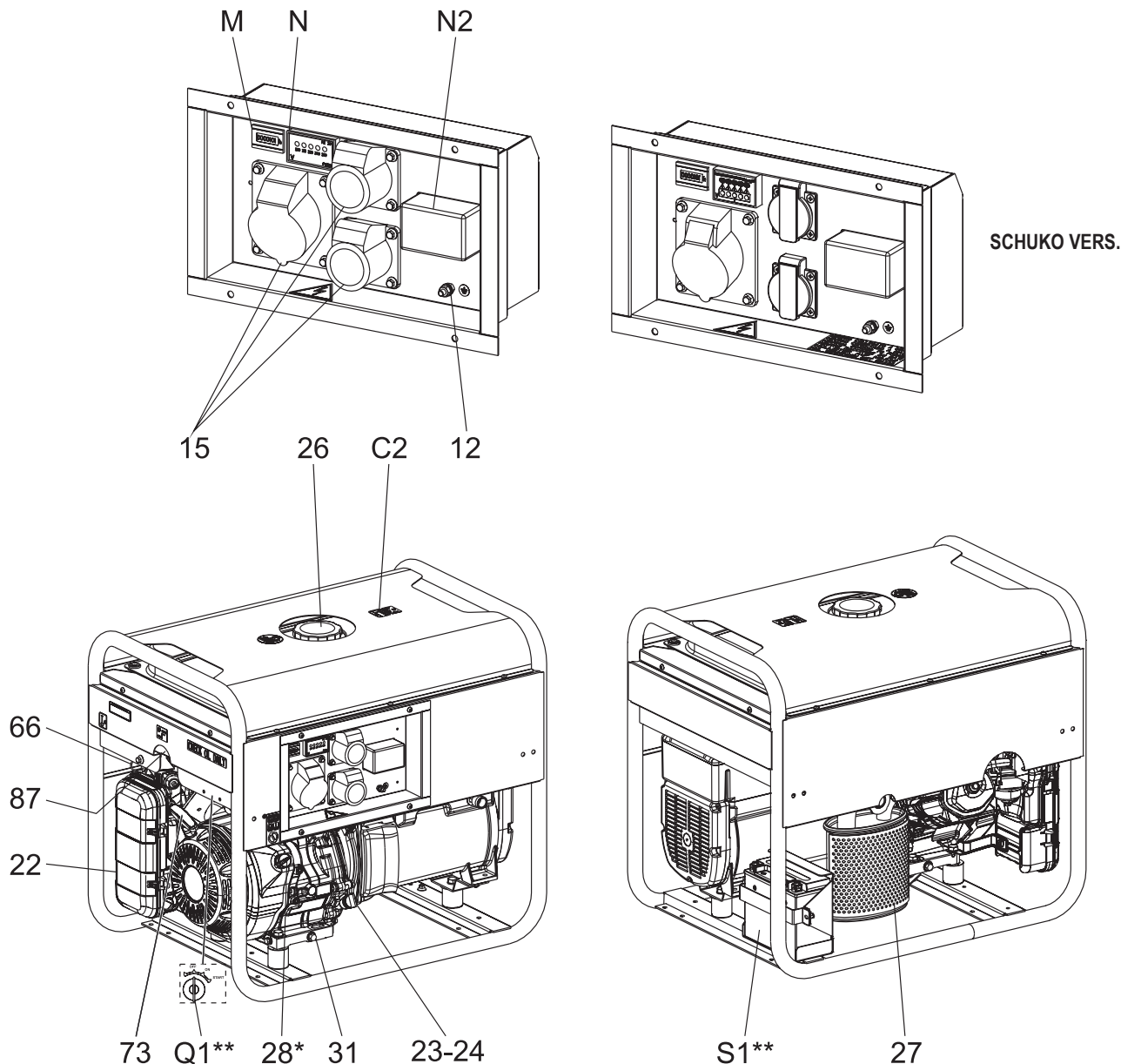


CAUTION

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.





* HBSL vers. - ** HBSLE vers.

| Pos. | Descrizione | Description | Description | Descripción |
|------|---|---------------------------------|--|--|
| 12 | Morsetto di terra PE | Earth terminal | Prise de mise à terre | Toma de puesta a tierra |
| 15 | Presa di corrente in c.a. | A.C. socket | Prises de courant en c.a. | Toma de corriente en c.a |
| 22 | Filtro aria motore | Engine air filter | Filtre air moteur | Filtro aire motor |
| 23 | Asta livello olio motore | Oil level dipstick | Jauge niveau huile moteur | Aguja nivel aceite motor |
| 24 | Tappo caricamento olio motore | Engine oil filler reservoir cap | Bouchon remplissage huile moteur | Tapón llenado aceite motor |
| 26 | Tappo serbatoio carburante | Fuel tank cap | Bouchon réservoir | Tapón depósito |
| 27 | Silenziatore di scarico | Muffler | Silencieux d'échappement | Silenciador de descarga |
| 28* | Interruttore motore | Engine switch | Interrupteur moteur | Interruptor motor |
| 31 | Tappo scarico olio motore | Oil drain tap | Bouchon décharge huile moteur | Tapón vaciado aceite motor |
| 66 | Leva/asta choke | Lever/rod choke | Commande Choke | Mando Choke |
| 73 | Maniglia per avviamento | Starter handle | Commande manuelle démarrage | Mando manual arranque |
| 87 | Rubinetto carburante | Fuel valve | Robinet de l'essence | Válvula carburante |
| C2 | Indicatore livello combustibile | Fuel level light | Indicateur niveau carburant | Indicador nivel combustible |
| M | Contaore | Hour counter | Compte-heures | Cuentahoras |
| N | Voltmetro | Voltmeter | Voltmètre | Voltímetro |
| N2 | Interruttore magnetotermico / differenziale | G.F.I.- Circuit breaker | Interrupteur magnétothermique / différentiel | Interruptor magnetotérmico / diferencial |
| Q1** | Chiave di avviamento | Starter key | Clé de démarrage | Llave de arranque |
| S1** | Batteria | Battery | Batterie | Batería |



WARNING

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



Access forbidden 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

POWER

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 ($\cos \varphi$).

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.

VOLTAGE

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 $\pm 5\%$ with balanced loads and with a rotation speed variation of 4%. Particularly, with resistive loads ($\cos \varphi = 1$), 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 $\pm 1,5\%$, 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.

FREQUENCY

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 $\pm 1\%$. 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 $\pm 0.25\%$, and the frequency is maintained constant in operation from no-load to load (isochronal operation).

POWER FACTOR - $\cos \varphi$

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 $\cos \varphi = 0.8$; 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 $\cos \varphi$.

For $\cos \varphi$ 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 I_n). 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

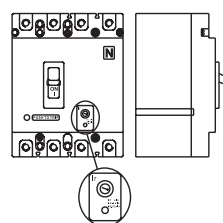
Power to monophase utilities by means of three-phase generators requires some operating limitations.

- 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.

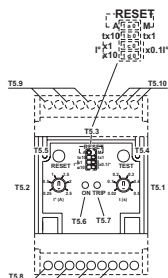
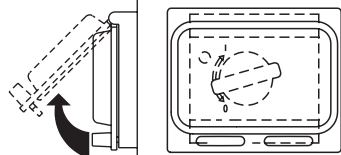
In case of an intervention on the part of the thermal magnetic protection device, check that the total absorption does not exceed the electricity-generating group's nominal current.



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.

|  WARNING | | |
|--|---|---|
|  | <ul style="list-style-type: none"> 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. <p>- See pag. M1.1 -</p> |  |
| MOVING PARTS can injure | | 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 | |
|--|--|
|  | <p>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.</p> |

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 supplied 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 |
|---|
| <p>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.</p> |



WARNING

- 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 -

| Problem | Possible cause | Solution |
|---|--|--|
| ENGINE | | |
| The motor does not start up, or starts up and then stops immediately | 1) Key / engine switch in the wrong positions 2) Lack of or insufficient oil in the motor 3) Faulty motor stopping device (oil-alert) 4) Lack of fuel in tank or fuel tap closed 5) Fuel filter clogged 6) Bad gasoline. Gasoline oxidizes and deteriorates over time, causing hard starting 7) Dirty or faulty spark plug 8) Battery not activated, low or faulty 9) Battery cable terminals loose or corroded 10) Cold motor 11)Other causes | 1) Verify start-up procedure 2) Refill or top off 3) Replace 4) Refill the tank. Open the fuel tap 5) Clean or replace 6) Drain fuel tank and carburetor. Refuel with fresh gasoline. 7) Clean or check and eventually replace 8) Activate, recharge, or replace the battery 9) Tighten and clean. Replace if corroded 10) Hold the command CHOKE, after starting, for a time longer 11) Consult the motor Operating Manual. |
| The motor does not accelerate. Inconstant speed. Too little power provided by motor | 1) Air or fuel filter clogged 2) Bad gasoline 3) Overload | 1) Check the air filter 2) Drain fuel tank and carburetor. Refuel with fresh gasoline 3) Check the connected loads and if necessary reduce |
| Other problems or inconveniences on the engine | Consult the motor Operating Manual. | |
| GENERATOR | | |
| Absence of output voltage | 1) Protection tripped due to overload 2) Differential protection device tripped 3) Protection devices defective 4) Alternator not exited 6) Faulty AVR 7) AVR fuse faulty | 1) Check the load connected and decrease 2) Check the insulation of the whole system: wiring, connections, connected load and check that there are no insulation fault that cause leakage currents to earth 3) Replace 4) Carry out external excitation test as indicated in alternator manual. Ask for intervention of Service Department 6) Replace 7) Replace |
| No-load output voltage too low or too high | 1) Incorrect engine running speed 2) Alternator fault 3) AVR with setting wrong or fault | 1) Regulate speed to its nominal no-load value 2) Check winding, diodes, etc. on alternator (See to alternator manual). Repair or replace. Ask for intervention of Service Department. 3) Adjust the Volt trimmer of AVR or replace |
| Corrected no-load voltage too low with load | 1) Incorrect engine running speed due to overload 2) Load with cos φ less than the nominal one 3) Alternator fault 4) Faulty AVR | 1) Check the load connected and decrease 2) Reduce or rephase load 3) Check winding, diodes, etc. on alternator (See to alternator manual). Repair or replace. Ask for intervention of Service Department. 4) Replace |
| Unstable tension | 1) Contacts malfunctioning 2) irregular engine revolution 3) Alternator fault | 1) Check electrical connections and tighten 2) Ask for intervention of Service Department 3) Check winding, diodes, etc. on alternator (See to alternator manual). Repair or replace. Ask for intervention of Service Department. |

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 a 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 blocking of the injection system.

For long periods of inactivity, turn to the after sales 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 surroundings, 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.

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

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.



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 surroundings, health or safety respecting completely the laws and/or dispositions in force in the place.

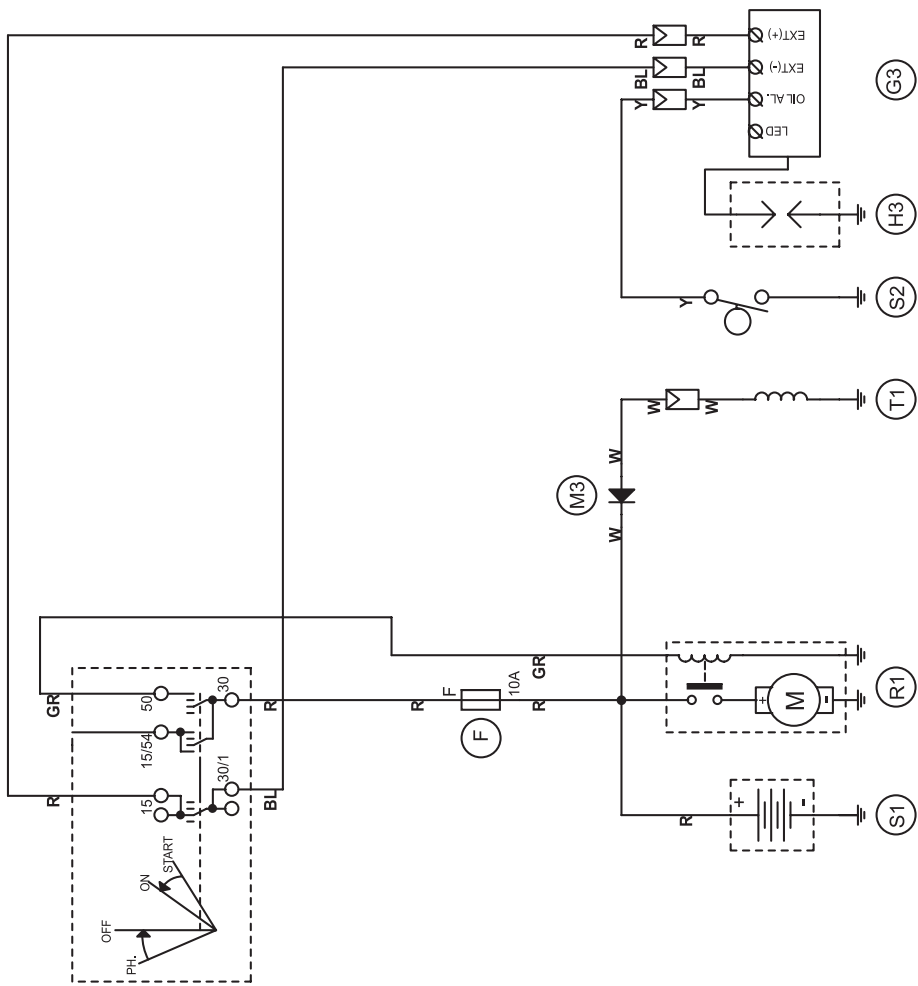


ELECTRICAL SYSTEM LEGENDE

M
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REV.10-05/13

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



| STARTER KEY | | | | |
|-------------|----|----|-------|----|
| 30/1 | 15 | 30 | 15/64 | 50 |
| PR | | | | |
| OFF | | | | |
| ON | | | | |
| ST | | | | |

| LEGENDA COLORI KEY COLOR | |
|-----------------------------|----------------------------|
| R | ROSSO/RED |
| BL | NERO/BLACK |
| W | BIANCO/WHITE |
| Y | GIALLO/YELLOW |
| GR | GRIGIO/GREY |
| BL/W | NERO-BIANCO BLACK-WHITE |

| Exp. Exp. | Modifica Modification | Data Date | Appr. Appr. |
|----------------------|---------------------------------|-----------------------|-----------------------|
| Da Pag. From Page | Denominazione: Denomination: | Progetto: Project: | Dis. Desi. |
| Alla Pag. To Page | Macchina: Machine: | Dis. n°: Dwg. n°: | Appr. n°: Page n°: |
| | Engine Honda GX390 RT2 (VPE9) | 25780.prg | 2 3 |
| | Disegnatore: Designer: | 15.05.2014 | 25780.S.010 |
| | Balducci F. | | Grassi R. |

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