CE

mase GENERATORS

MARINE

IS 8 50 Hz

IS 9.5 60 Hz

IS 9 50 Hz

IS 10.2 60 Hz

MANUALE USO E MANUTENZIONE
USAGE AND MAINTANCE MANUAL
MANUEL D'INSTRUCTIONS ET D'ENTRETIEN
GEBRAUCHSANWEISUNG UND WARTUNGSVORSCHRIFTEN
MANUAL USO Y MANTENIMENTO
GEBRUIKS- EN ONDERHOUDSHANDLEIDING

REV.4 M.C. 23-01-02 cod.41637

NR.000000

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mase
GENERATORS

DICHIARAZIONE CE DI CONFORMITA'
EC DECLARATION OF CONFORMITY

Fabbricante/Manufacturer: MASE GENERATORS S.p.A.

Indirizzo /Address : Via Tortona 345, Pievesestina (FO)

Il sottoscritto Luigi Foresti in qualità di direttore generale della MASE GENERATORS S.p.A., dichiara sotto la propria responsabilità che il gruppo elettrogeno modello ..... :

The undersigned Luigi Foresti as MASE GENERATORS S.p.A. general manager declares, under his sole responsability, that the generators model is.....:

Codice / Code	Descrizione / Model	Matricola / Serial N.

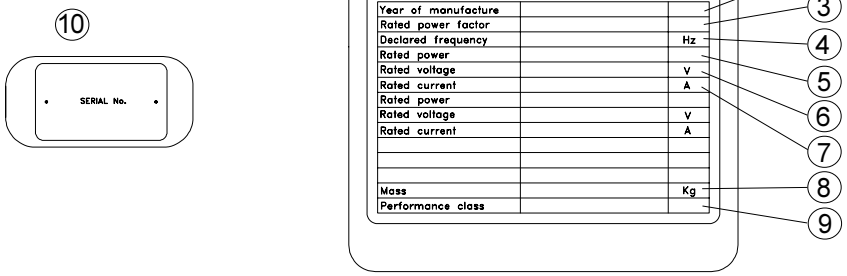
E' conforme alle disposizioni delle Direttive di seguito elencate :
CEE 89/392 (come emendata delle Direttive CEE 91/368 e CEE 93/44)
CEE 89/336 (come emendata delle Direttive CEE 92/31)
CEE 73/23 modificata da CEE 93/68.

Corresponds to the requirements of the following EEC Directives :
89/392/EEC (as amended by the Directive 91/368/EEC and 93/44/EEC)
89/336/EEC (as amended by the Directive 92/31/EEC)
73/23//EEC as amended by 93/68/EEC.

Cesena, / / .....

Direttore Tecnico
Technical Director


mase I.S.8
POWERED BY
YANMAR


10
SERIAL No.

Code
Year of manufacture
Rated power factor
Declared frequency
Hz
Rated power
Rated voltage
V
Rated current
A
Rated power
Rated voltage
V
Rated current
A
Mass
Kg
Performance class
1
2
3
4
5
6
7
8
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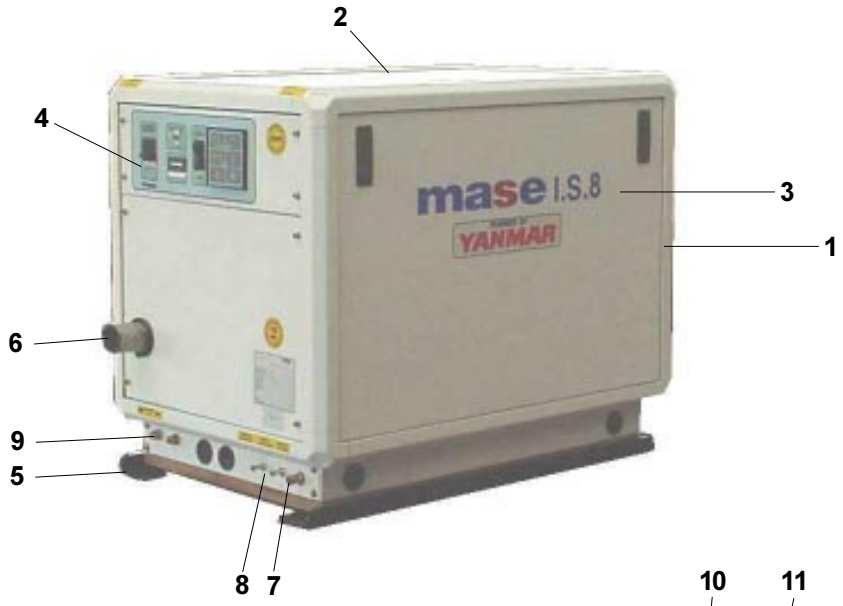
2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mase I.S.8
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3
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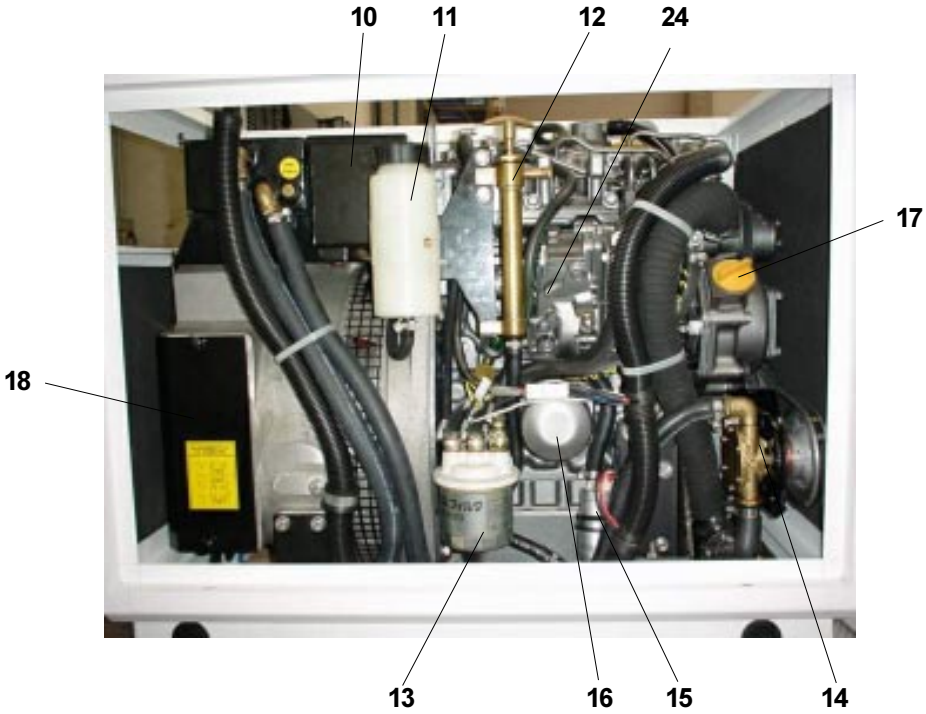
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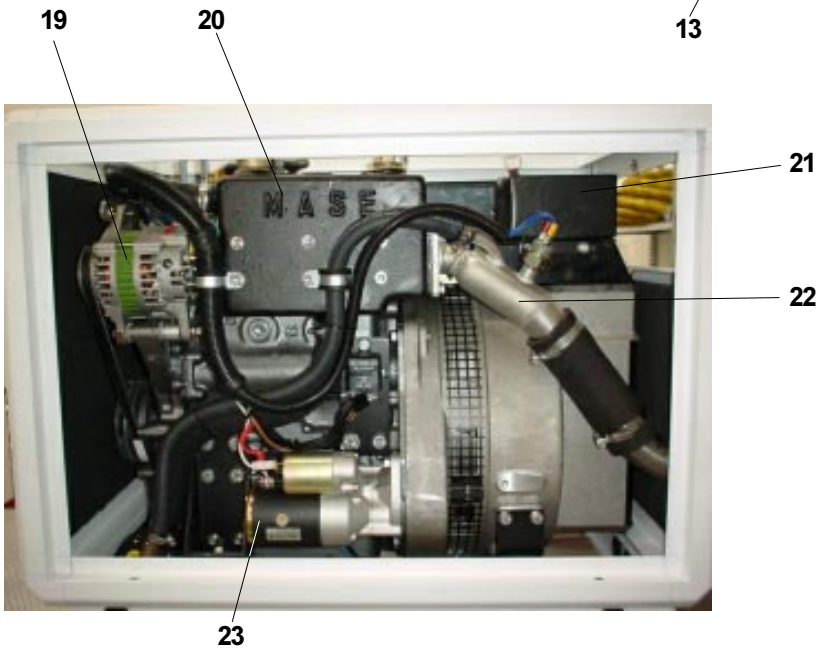
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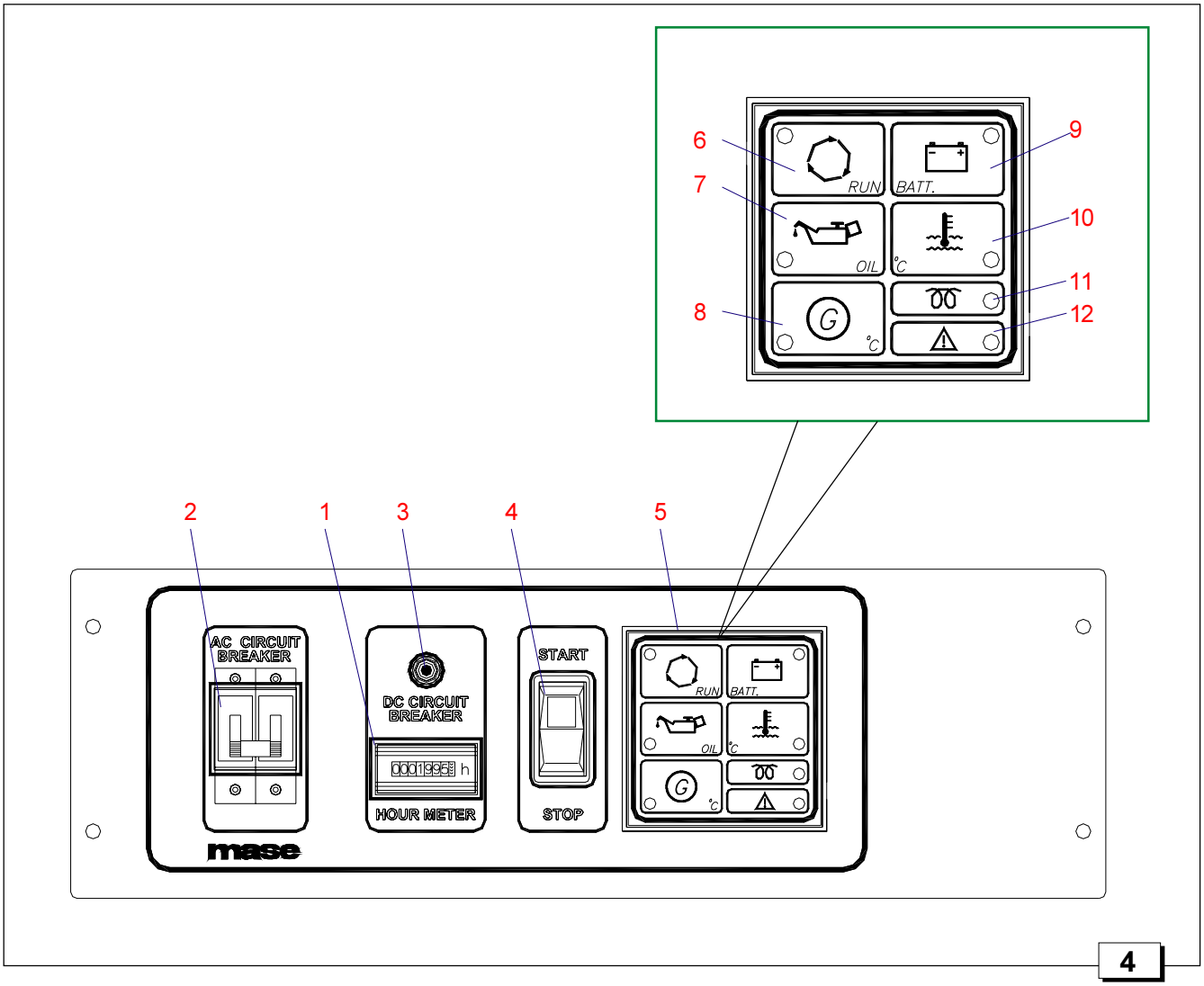
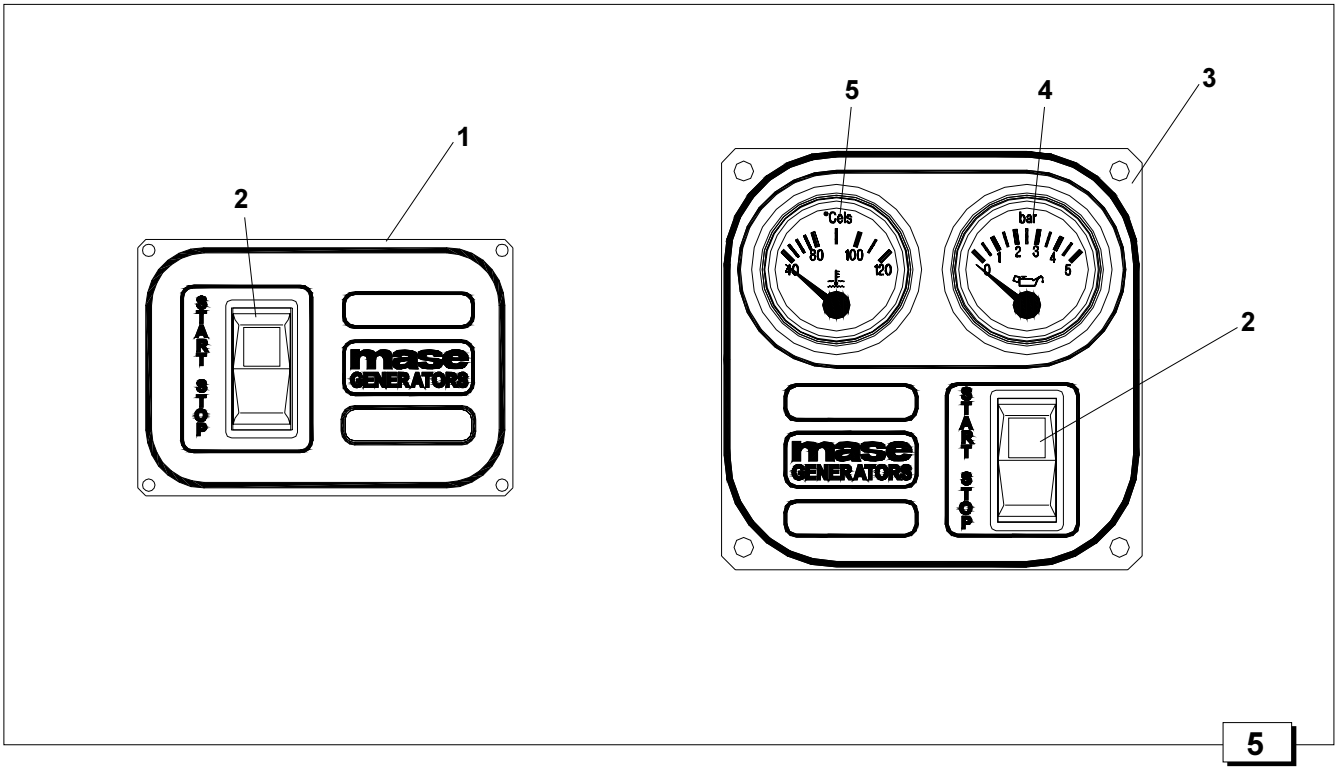
20
21
22
23

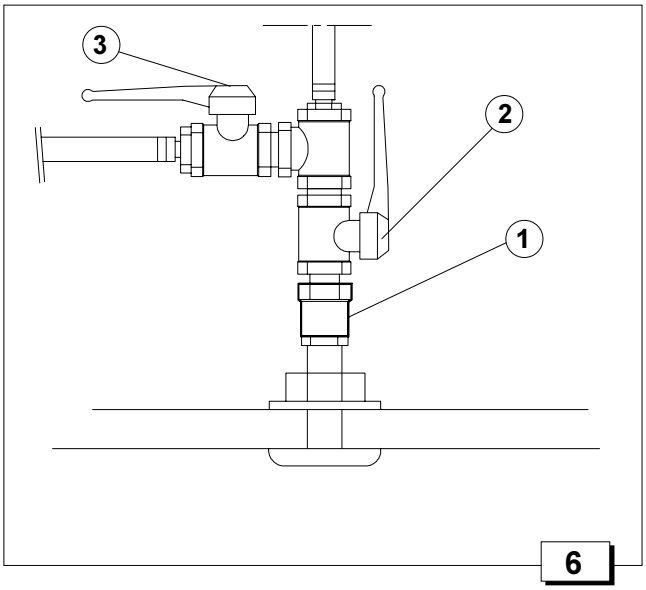
3


6
7
8
9
10
11
12
RUN
BATT.
OIL
°C
G
2
1
3
4
5
AC CIRCUIT BREAKER
DC CIRCUIT BREAKER
HOUR METER
START
STOP
mase

4


1
2
START
STOP
mase
GENERATORS
5
4
3
2
°Cels
bar
40
80
100
120
0
1
2
3
4
5

5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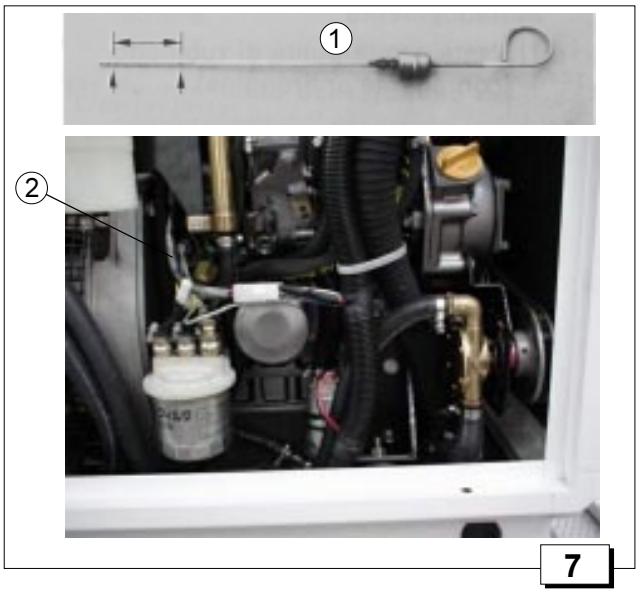
1

6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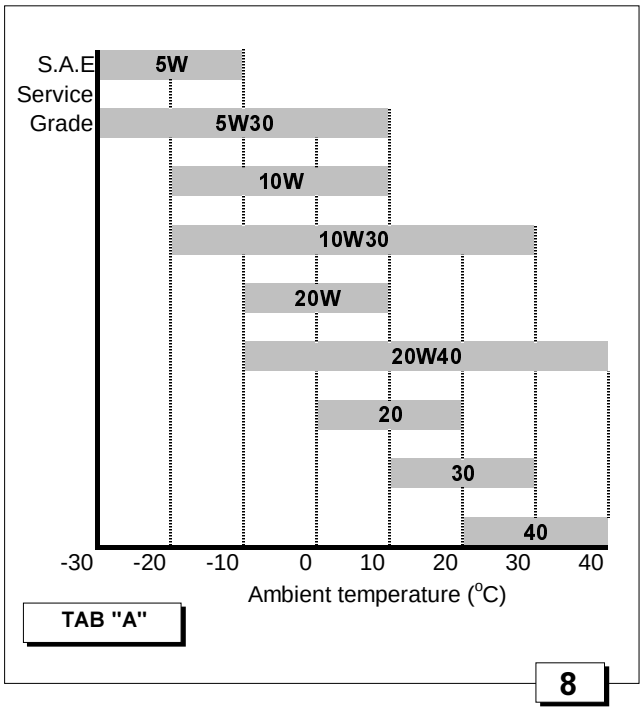
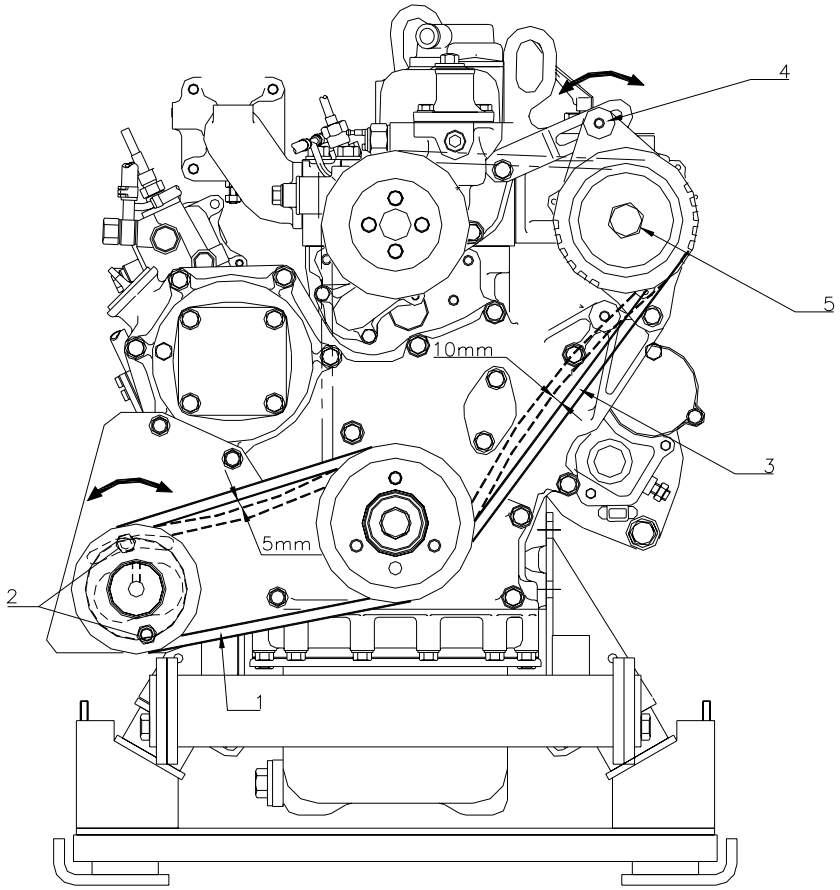

S.A.E
Service
Grade
5W
5W30
10W
10W30
20W
20W40
20
30
40
-30
-20
-10
0
10
20
30
40
Ambient temperature (°C)
TAB "A"

8



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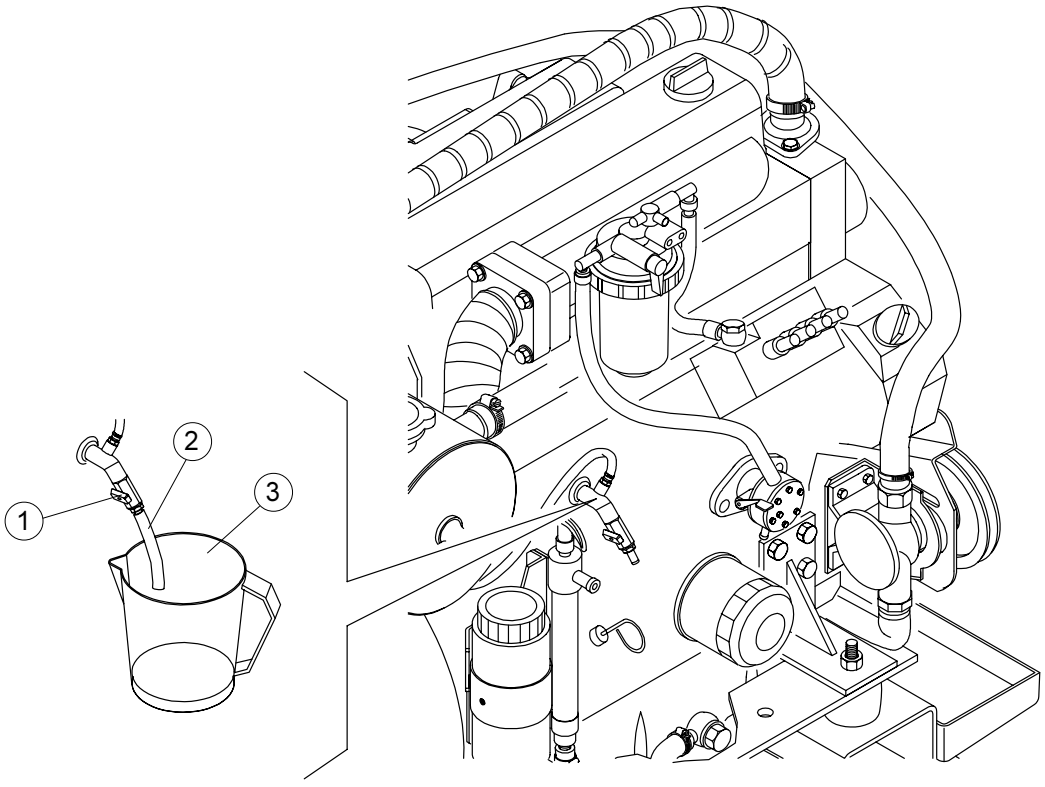

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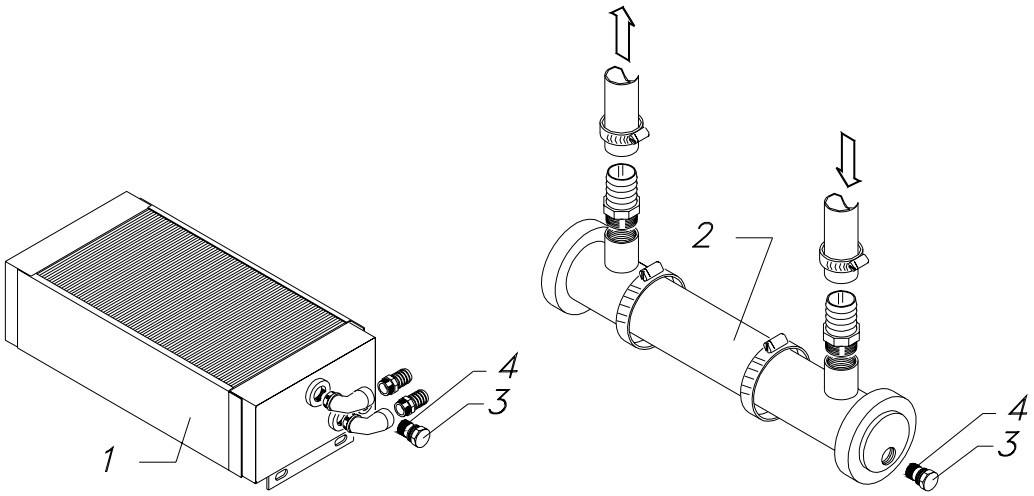

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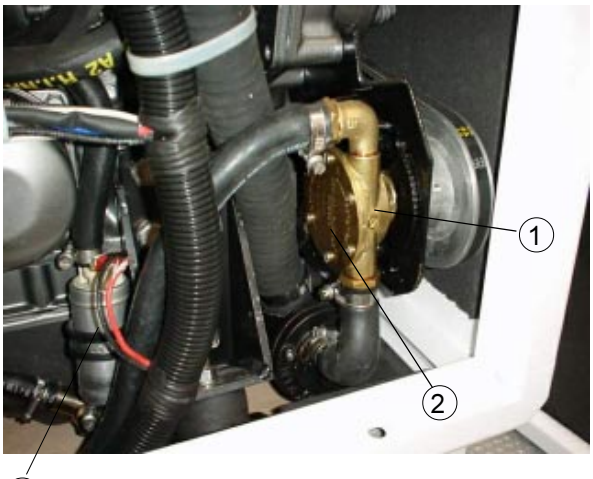

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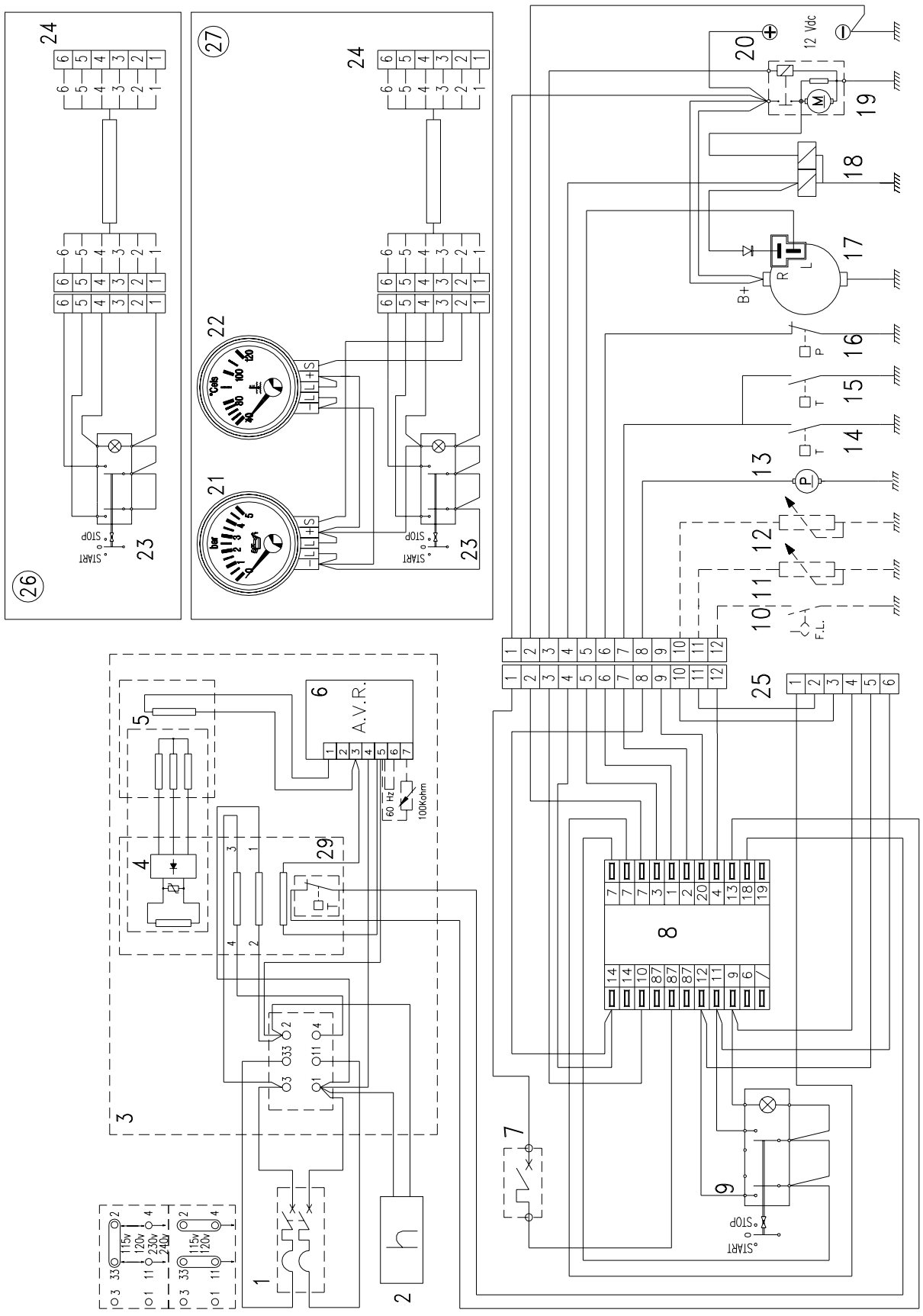
IS 8-9.5
IS 9.2-10.2



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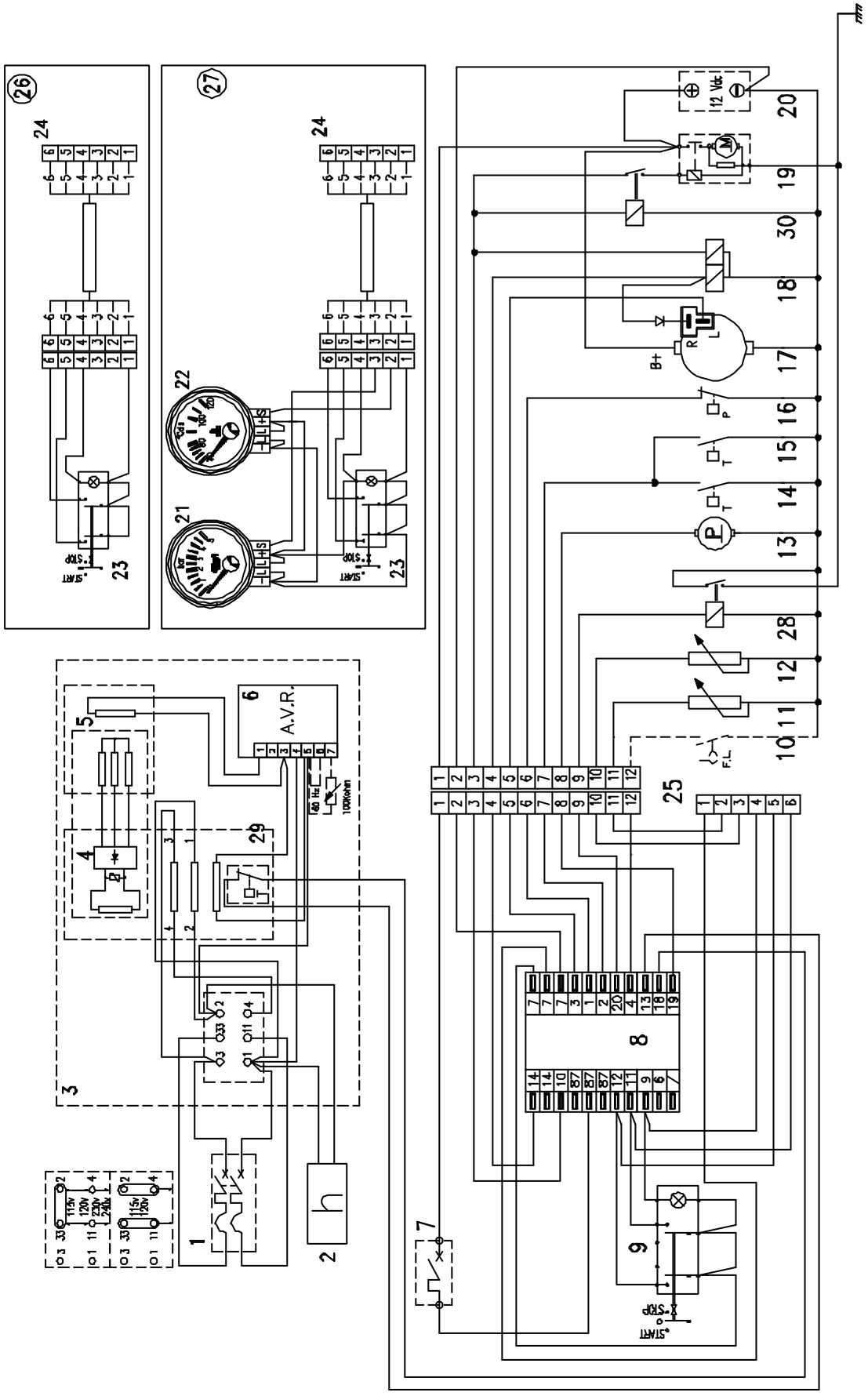
IS 8-9.5 P.I
IS 9.2-10.2 P.I



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INDEX

THE GUARANTEE OF THE PRODUCT BECOMES VOID IF THE SPECIFICATIONS CONTAINED IN THE FOLLOWING INSTALLATION MANUAL ARE NOT RESPECTED

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1. GENERAL INFORMATION

Carefully consult this manual before proceeding with any operation on the generator.

1.1 PURPOSE OF THE MANUAL

Thank you for choosing a **MASE** product.
This manual has been drawn up by the manufacturer and constitutes an integral part of the generator equipment. It must be kept safely, protected from humidity and from any agent which might damage it, and must accompany the generator if transferred to another user or to a new owner.
The information contained in the manual is addressed to all those persons involved in the operating life cycle of the generator, and is useful for information for both those who effectively carry out the different operations and those who coordinate the activities, arrange the necessary logistics and regulate access to the place of installation.
The manual defines the purpose for which the generator was constructed and contains all the information necessary to guarantee safe and proper use.
Constant observance of the instructions contained in this manual guarantees the safety of the operator, operating economy and a longer life of the generator.
To facilitate consultation, it has been divided into sections identifying the main concepts. For a quick look at the topics, consult the index on Page 23.

Symbols

Those parts of the text not to be ignored are highlighted in bold type preceded by a symbol, as illustrated and defined below:

DANGER Indicates that particular attention must be paid in order to prevent running into serious danger which could lead to death of personnel or possible hazards to health.

WARNING A condition which may occur during the lifetime of a product, system or plant considered at risk regarding damage to persons, property, the environment or economic loss.

CAUTION Indicates that particular attention must be paid in order to prevent serious consequences which could result in damage to tangible goods, such as the resources or the product.

INFORMATION Instructions of particular importance.

The drawings are provided by way of example. Even if the generator in your possession differs considerably from the illustrations contained in this manual, the safety of the generator and the information provided are nevertheless guaranteed.

The manufacturer in his pursuit of a policy of constant development and upgrading of the product may make any modifications without prior notice.

1.2 Attached documentation

The following documentation forms an integral part of this manual:
- EEC declaration of conformity (Fig. 1)
- Engine use and maintenance manual
- Service logbook
- Certificate of guarantee
- Guarantee card

1.3 Machine identification

See Fig. 2

1 – Machine code
2 – Year of construction
3 – Power factor
4 - Declared frequency
5 - Continuous power
6 – Rated voltage
7 – Current
8 – Weight
9 – Performance class
10 – Serial number

The data identifying the machine code number, the serial number and the year of construction must always be specified when contacting the manufacturer for information or for requests for spare parts.

See Fig. 3

1- Soundproof casing
2- Top access door
3- Side access door
4- Instrument panel
5- Anchoring brackets
6- Exhaust and cooling water pipe fitting
7- Seawater intake connection pipe fitting
8- Connection pipe fittings to fuel tank
9- Connection terminals to battery
10- Engine air filter
11- Coolant expansion tank
12- Engine oil extraction pump
13- Diesel fuel filter cartridge
14- Seawater pump
15- Fuel pump
16- Oil filter cartridge
17- Oil fillercap
18- Electric line connection box
19- Battery charger alternator
20- Coolant tank
21- Water/air heat exchanger
22- Exhaust manifold
23- Starter motor

1.4 Instrument panel

Legend Fig. 4

1- Hour counter
2- Magnetothermal switch
3- DC current thermal switch
4- START/STOP button
5- Engine protection module
6- "RUN" light – engine running
7- "OIL" light – low oil pressure
8- "ºC" light – high engine temperature
9- "BATT" light – battery charger operating
10- "ºC" light – high alternator temperature
11- Glow plugs (not present)
12- Fuel leak (version "RINA")

1.5 Safety regulations

Carefully read all the information contained in this manual and the installation manual as it is fundamental for proper installation and use of the generator and for timely intervention in case of necessity.
The manufacturer declines all responsibility for damage to persons or things deriving from inobservance of the safety regulations.
Carefully examine the safety warning plates on the machine and respect the relevant instructions.
- Do not permit incompetent persons or without adequate training to use the generator.
- Do not permit children or animals to approach the generator when it is in operation.
- Do not access the generator or the control panel with wet hands, since it is a potential source of electric shock if improperly used.
- Any inspections of the generator must be carried out with the engine off. Inspections with the engine on are to be carried out by specialised personnel only.
- Do not inhale the combustion smoke since it contains substances hazardous to health.
- Use the generator with the access doors closed.
- Never touch the engine or alternator body with the hands when the generator is running or still hot.

DANGER

In the event of oil or fuel leaks, clean off thoroughly to prevent creating fire hazard conditions.

DANGER

In the event of fire, do not use water, but fire extinguishers.

INFORMATION

Should any problem arise or should you have any questions, please contact the Mase SERVICE department.

2. GENERATOR DESCRIPTION

2.1 General

The IS 8 and IS 9.5 generators were designed for easy installation on boats.
The soundproof casing, obtained with insulated, painted marine aluminium panels, allows easy access to the engine and the alternator for maintenance and inspection operations, and at the same time strongly reduces noise.

The 4-stroke, direct-injection, diesel engine, built by Yanmar, is extremely reliable and robust. Exhaust emission is in conformity with CARB regulations.

The synchronous-type, 4-pole, brushless alternator has an electronic voltage regulator (SR7) which guarantees stability to ± 5% with respect to the nominal value. The high pickup capacity of the alternator makes the generator particularly suitable for the power supply of electric motors of air conditioners, desalination plants, compressors, etc.
The generator has a local control panel [Fig. 3 Ref. 4] on which the controls and control instruments are housed.

2.2 Cooling system

The generator engine is cooled by closed-circuit circulation of coolant which yields heat to the seawater by means of a heat exchanger [Fig. 3, Ref. 20].
This heat exchanger built of cupronickel was specially designed by **mase** to make the engine suitable for use at sea.
A second heat exchanger cools the air inside the soundproof casing and the air necessary for alternator ventilation.
At the time of installation a seawater feed circuit for cooling must be installed and an exhaust system to convey the combustion gas and the water used for cooling to the outside.

2.3 Control panel

A control panel is positioned on the generator for running checks and to start and stop the generator. An engine protection module [Fig. 4 Ref. 5] controls the generator protections, stopping the engine in case of a fault and signalling the fault detected by means of special warning lights.

- Green “RUN” pilot light [Fig. 4 Ref. 6], when on, indicates that the generator is running and no operating fault has been detected.
- Red “BATT” pilot light [Fig. 4 Ref. 9), when on, indicates that the alternator battery charger is faulty.
- Red “OIL” pilot light [Fig. 4 Ref. 7], when on, indicates that the engine oil pressure is insufficient.
- Red [Fig. 4 Ref. 10] pilot light, when on, indicates that the temperature of the coolant or the water circulating in the heat exchangers is too high.
- Red [Fig. 4 Ref. 8] pilot light, when on, indicates that the alternator windings have reached too high temperatures.

The following may also be found on the control panel:

- A bipolar magnetothermal switch [Fig. 4 Ref. 2] which cuts the power in case of an overload or short-circuit.
- A thermal switch (Fig. 4 Ref. 3] to protect the low-voltage electric system against short-circuit.
- An hour counter (Fig. 4 Ref. 1].
- The generator start/stop button [Fig. 4 Ref. 4].

The generator can be connected with a connector to the remote starting panel, supplied by **mase** as an optional, and can be installed on the dashboard.
Two different remote starting panels are available as shown in Fig. 5.
The most simple version has a start/stop button [Fig. 5 Ref. 1] and a green pilot light [Fig. 5 Ref. 2] which, when on, indicates that the generator is running.
The second version of the remote starting panel [Fig. 5 Ref. 3] has, in addition to the start/stop button, an instrument which indicates the engine oil pressure value (Fig. 5 Ref. 4] and an instrument which indicates the coolant temperature value [Fig. 5, Ref. 5].

DANGER

When carrying out maintenance operations on the generator, disconnect the negative pole of the starter battery to prevent accidental starting.

3. USING THE GENERATOR

3.1 Preliminary checks

At first starting of the generator, or after having done any type of maintenance work, it is always good practice to check:

- the oil level by means of the dipstick [Fig. 7 Ref. 2] (see table “A” for recommended oils [Fig. 8]).
- that all the anchoring points of the generator are properly tightened.
- that all the electrical utilities are off to prevent starting the generator on load
- that the water and fuel pipes are properly connected
- that all the electrical connections have properly been carried out and that there are no electrical connections in a bad state.
- that the water cock is open [Fig. 6 Ref. 2]
- that the section of the water circuit from the pump to the valves has been filled manually if a non-return valve has been mounted on the sea intake (as recommended in the installation manual) [Fig. 4 Ref. 1].

3.2 Bleeding the fuel system

The presence of air bubbles in the fuel system is caused by irregular functioning of the engine or the incapacity to reach the nominal number of revolutions. Air might enter the fuel circuit through a not perfectly tight seal (pipes, filters, tank) or when the fuel in the tank is at minimum level. The fuel system has been designed in such a way as to autonomously eliminate air bubbles that have penetrated the circuit. Automatic bleeding is obtained by activating the fuel pump for a few minutes before starting the engine.
The fuel pump is activated by pressing the START button for a second.
Should the engine still function irregularly after this operation, consult a technician for a thorough inspection of the fuel system.

3.3 Starting

Before starting the generator, ensure that the preliminary checks described in paragraph 3.1 have been carried out. Start the generator by pressing the START button located on the control panel [Fig. 4 Ref. 4] and release it only when the generator has started, taking care not to exceed 15 sec. for each attempt and respecting an interval of at least 30 sec. All the warning lights of the engine protection module [Fig. 4, Ref. 5] will come on for a few seconds, and if there are no engine or generator faults, only the green RUN light [Fig. 4 Ref. 6] will remain on to indicate that the generator has been started and that functioning is regular.

CAUTION

Repeated attempts at starting with negative outcome may cause excess accumulation of water in the exhaust system with possible serious damage to the engine.
If it is difficult to start the engine, do not insist for too long without first having closed the sea intake cock [Fig. 6 Ref. 2].

3.4 Stopping

The generator is stopped by pressing the "OFF" button on the control panel.

WARNING

Before stopping the generator it is recommended to let it run for a few minutes without drawing electric current, in order to allow the engine and the alternator to cool down.

4. PROTECTIONS

The IS 8 and IS 9.5 generators are equipped with a series of protections which safeguard them against improper use and operating problems.
When the generator stops because a protection has intervened, on the engine protection module [Fig. 5, Ref. 5] of the control panel the warning light relative to the fault will come on.

4.1 Low oil pressure protection

Intervenes switching off the generator when the engine oil pressure is insufficient. Its intervention is signalled by the "OIL" light [Fig., 4, Ref. 7] coming on. Normally it is sufficient to top up with the lacking quantity of oil to be able to restart the generator.

CAUTION

The low oil pressure protection does not give an indication of the level of engine oil in the sump. Therefore, check this level daily.

CAUTION

The engine functions properly if it does not exceed an inclination of maximum 30° for less than 3 minutes, 25° without time limit, both on the longitudinal and the transverse axis. If the engine is operated at a greater inclination, the risk is insufficient lubrication or aspiration of engine oil through the air filter.

4.2 High water temperature protection

Intervenes switching off the generator when the engine coolant temperature is too high or there is no circulation of seawater.
Its intervention is signalled by the "°C" light [Fig. 4, Ref. 10] coming on.
Only restart the generator after the cause of the fault has been identified and removed.

4.3 Alternator overheating protection

Intervenes switching off the generator when there is a thermal overload on the alternator.
Its intervention is signalled by the "°C" light [Fig. 4, Ref. 8] coming on. The generator can be restarted after a few minutes when the temperature of the alternator windings has returned to normal values. It is, however, recommended to find and remove the causes of the intervention.

INFORMATION

In the event of one of the above described protections intervening, after ascertaining and removing the cause of the intervention, press the "STOP" button to reset the control panel (otherwise the signal would remain in memory preventing the engine from starting).

4.4 Protection against short-circuit and overload

The generator is protected against short-circuit and overload. A bipolar magnetothermal switch [Fig. 4 Ref. 2] cuts the supply of electric current when a short-circuit occurs or when the electric current delivered exceeds the nominal value.
Before restoring the contact by lifting the lever of the magnetothermal switch, disconnect the utilities.

4.5 Protection against short-circuit of the low-voltage electric system

In the event of a short-circuit in the low-voltage electric system, a thermal switch [Fig. 4, Ref. 3] breaks the circuit stopping the generator. In this case the warning lights of the engine protection module will all be off and it will not be possible to re-attempt starting.
Before restoring the electric circuit by pressing the button located on the thermal switch [Fig. 4 Ref. 3], have a specialised technician find and remove the cause of the short-circuit.

5. MAINTENANCE

DANGER

Any maintenance operation on the generator must be carried out with the engine off after letting it cool down sufficiently, and must be carried out by authorised personnel.

CAUTION

Before accessing the generator, disconnect one pole of the starter battery in order to prevent accidental starting.

5.1 Ordinary engine maintenance

The periodic maintenance to be carried out on the engine is listed in TABLE “B”.
For more detailed information consult the manual provided with each generator by the engine manufacturer.

INFORMATION

Check the oil level by means of the graduated dipstick [Fig. 7, Ref. 2]. The level must always be between the MAX and MIN notches on the dipstick [Fig. 7 Ref. 1].

5.2 Engine oil and oil filter change

The engine oil sump capacity is 3.6 litres.
Top-ups and filling with engine oil is carried out through the hole [Fig. 3, Ref. 17].
To change the oil in the oil sump, remove the dipstick [Fig. 7, Ref. 2] and operate the special extraction pump [Fig. 3, Ref. 12] after having removed the screw which functions as plug.
It is recommended to drain the oil when it is still sufficiently warm to flow easily.
For recommended oils see table “A”, Fig. 8.

INFORMATION

The first engine oil change must be carried out after 50 hours of generator operation. For the second and subsequent oil changes, every 200 hours is sufficient.

INFORMATION

For more detailed information on engine lubrication, consult the engine use and maintenance manual attached to the generator.

INFORMATION

Dispose of the used oil or fuel in an appropriate manner as they are polluting products.
Take the used engine oil to special collection centres responsible for disposal.

CAUTION

Avoid contact of engine oil with the skin. During maintenance operations use gloves and protective glasses.
In case of contact with engine oil, immediately and thoroughly wash the affected part with soap and water.

To replace the engine oil filter cartridge [Fig. 3, Ref. ?], unscrew it from its support, using suitable tools normally found on the market. Reposition the new cartridge, taking care to lubricate the rubber ring gasket.
The first replacement must be carried out after 50 hours of generator operation. For the second and subsequent replacements, respect an interval of 400 hours.
For further information consult the engine use and maintenance manual.

INFORMATION

For the safety of the engine, use only original spare parts.

CAUTION

When the operation has been completed, thoroughly wipe off all oil and fuel from the engine parts.

5.3 Air filter cleaning

The generators of the IS series have a dry air filter which prevents foreign bodies from entering the combustion chamber. For its maintenance it is sufficient to clean the filtering mass with diesel fuel once a year to remove nay impurities.

CAUTION

Dispose of the liquids used for air filter washing in an appropriate manner. Take them to special collection centres.

CAUTION

Any maintenance operation on the generator must be carried out with the engine off after letting it cool down sufficiently, and must be carried out by authorised personnel.

DANGER

Before accessing the generator, disconnect the negative pole of the starter battery to prevent accidental starting of the generator.

5.4 Fuel filter replacement

To guarantee long life and proper functioning of the engine, it is extremely important to periodically replace the fuel filter cartridge, respecting the frequency indicated by the engine manufacturer as listed in the table in Paragraph 5.12.
This operation is carried out in the following steps:

- Close the fuel cock [Fig. 3, Ref. 24]
- Completely unscrew the ring nut of the support [Fig. 3, Ref. 13]
- Remove the old cartridge and position the new one.
- For remounting repeat the operations in reverse order.

When the filter has been replaced, bleed the fuel system carrying out the operations described in Paragraph 3.2.

CAUTION

Avoid contact of the fuel oil with the skin. During maintenance operations use gloves and protective glasses.
In case of contact with fuel, immediately and thoroughly wash the affected part with soap and water.

CAUTION

When the operation has been completed, thoroughly wipe off all traces of fuel and take the used cloths to special collection centres.

5.5 Coolant check

Periodically check the coolant level in the closed-circuit cooling system. The reference index for this check is printed on the expansion tank [Fig. 3, Ref. 11]. If the level is insufficient, pour coolant into the expansion tank, taking care not to exceed the maximum level index.

DANGER

Never open the cap of the expansion tank [Fig. 3, Ref. 11] or coolant tank [Fig. 3, Ref. 20] when the engine is hot to prevent dangerous coolant leaks.

5.6 V-belt tension check

A V-belt is used to transmit the rotary motion from the drive shaft pulley to that of the seawater pump [Fig. 9 Ref. 1].
Excessive belt tension accelerates wear, while a slack belt makes the pulleys idle and does not allow sufficient water circulation.
Adjust the belt tension as follows:
Loosen the two adjusting screws [Fig. 9, Ref. 2] and move the seawater pump outwards to increase the tension or inwards to decrease it. Lock the screws and check the tension.
The correct belt tension is such as to allow a yield of about 5 mm [Fig. 9] under a thrust force of 8 kg.

A second belt is used to transmit the rotary motion from the drive shaft pulley to that of the closed-circuit coolant pump and the battery charger DC alternator [Fig. 9 Ref. 3].
Adjust the belt tension as follows:
Loosen the adjusting screw [Fig. 9 Ref. 4] and move the battery charger DC alternator [Fig. 9, Ref. 5] outwards to increase the tension and inwards to decrease it.
The correct belt tension is such as to allow a yield of about 10 mm [Fig. 9] under a thrust force of 8 kg.

INFORMATION

To prevent the belt from slipping, do not dirty it with oil. Clean the belt with petrol if any oil is spilled.

DANGER

Keep hands away from the V-belt or the pulleys when the engine is running.

5.7 Emptying the cooling system

To carry out maintenance on the water/air exchanger or on the cooling system the seawater must be drained from the intake circuit. This operation is carried out as follows:

- Close the sea intake cock [Fig. 6, Ref. 2]
- Open the drain tap [Fig. 6, Ref. 3] until all the water has run out
- Close the drain tap.

CAUTION

Reopen the seawater intake cock before starting the generator.

5.8 Coolant replacement

Yearly change the coolant in the closed-circuit cooling system.
Connect a 20-30 cm long rubber tube [Fig. 10, Ref. 2] to the drain tap [Fig. 10, Ref. 1] located on the engine base to facilitate collection of the used coolant in a collection receptacle [Fig. 10, Ref. 3]. Open the tap and completely drain the closed-circuit cooling system.
When the operation has been completed, close the tap and fill the circuit with new coolant.

INFORMATION

Dispose of the used coolant in an appropriate manner as it is a polluting product.
Take the used coolant to special collection centres responsible for disposal.

5.9 Zinc anode replacement

To protect the water/air heat exchanger [Fig. 11, Ref. 1] and the water/coolant heat exchanger [Fig. 11, Ref. 2] against galvanic current, two sacrificial zinc anodes [Fig. 11, Ref. 4] have been inserted inside them. Periodically check their state of wear and, if necessary, replace them in order to prevent that the galvanic current irreparably corrodes the heat exchanger. It is recommended to check the zinc anodes at least once a month when the generator is new to check how fast consumption is, to then be able to act accordingly.
It is, however, opportune to replace the zinc anodes at least once a year.
Fig. 11 shows the points where the zinc anodes are positioned.

5.10 Seawater pump maintenance

At least once a year check the integrity of the rubber rotor of the seawater pump [Fig. 12, Ref. 1].
Before opening the seawater pump to inspect the rotor, drain the seawater from the cooling system as described in Paragraph 5.7.
To access the rotor, remove the cover [Fig. 12, Ref. 2] and with the aid of a pair of pliers extract the rotor pulling it out with force. To remount a new rotor, repeat the operations described above in reverse order.

5.11 Alternator maintenance

The alternator used on this model of generator is type synchronous, self-energised, with electronic voltage regulation. This model alternator, without manifold and brushes, does not require particular maintenance operations. The periodic checks and maintenance are limited to removing any traces of damp and oxidation which might damage it.

5.12 Battery maintenance

For starting all the generator models, it is recommended to use an 80 A/h battery for ambient temperatures exceeding 0ºC, and 100 A/h for lower temperatures. Before installing a new battery it is important that it undergoes a full charging cycle.
At least once a month check the level of the electrolyte and, if necessary, top up with distilled water. If the generator is not to be used for a long period, it is recommended to disconnect the battery and store it in a dry place at a temperature over 10ºC and to carry out a full charging cycle once a month.

CAUTION

If the battery is left completely flat for long periods, there is a risk of irreparably damaging it.

The positive terminal of the battery must be protected with Vaseline to prevent corrosion and the formation of oxide.

WARNING

For top-ups with sulphuric acid, ready solutions must be used.

CAUTION

The battery top-up operations with distilled water or with acid must be carried out with rubber gloves and protective glasses to prevent accidental contact of the sulphuric acid with the skin.
In the event of accidental contact, thoroughly wash the part affected with soap and water and consult a doctor.

INFORMATION

Before recharging the battery check the level of the electrolyte and, if necessary, fill up with distilled water. This operation must be repeated when the recharging cycle has been completed.

5.13 Periods of inactivity

Start up the generator at least once a month. If the generator is not to be used for a long time, the following operations must be carried out:
- Change the engine oil
- Replace the oil filter cartridge (see par. 5.2)
- Replace the fuel filter cartridge (see par. 5.4)
- Remove the injectors and pour 2 cc engine oil into each cylinder and let the engine turn over a few times, manually operating the drive shaft pulley. Remount the injectors.
- Replace the zinc anodes (see par. 5.9)
- Through the seawater intake pipe aspirate some anti-freeze whose function is to protect the heat exchangers against low temperatures and to lubricate

the seawater pump rotor and the metallic parts in the cooling system.
- Disconnect the starter battery and store it in a dry place (see par. 5.12)
- Disconnect the sea exhaust pipe from the engine manifold.
- Clean the seawater filter.
- Close the seawater intake cock.
- Drain the seawater from the exhaust.
- Clean and lubricate the antisiphon valve, if installed (siphon break).

5.14 Summary table of scheduled maintenance

OPERATION	HOURS
Check engine oil level	10
Check coolant	10
Check for oil leaks	20
Check for fuel leaks	20
Check for coolant leaks	20
Adjust V-belt tension	100
Check battery charger	100
Clean fuel filter	200
Adjust belt tension	200
*Change engine oil	200
Check seawater pump rotor	400
Check engine rpm	400
Check integrity of electrical connections	400
Replace fuel filter	400
* Replace oil filter	400
Check injectors	400
Check injector timing	400
Adjust play on intake/exhaust valve	400
Check the fuel injection pump	1000
Check battery electrolyte level	monthly
Clean and deoxidise the metallic parts	yearly
Clean air filter	yearly
Replace coolant completely	yearly
Replace zinc anodes	yearly

Carry out the first maintenance operation after 50 hours, subsequently according the required intervals.

TABLE "B"

5.15 Troubleshooting

The starter motor turns but the main engine does not start
- Check that there is fuel in the tank (fill up)
- Check if the stop electromagnet is in the firing position (consult Service Centre)
- Bleed the air bubbles from the fuel circuit (see par. 3.2)

The engine protection module is not activated when the START button is pressed
- battery, and the electrical connections (reconnect).
- Check integrity of the battery (recharge or replace).

The generator switches off during the operating period
- Check if a protection has been activated with the relevant light coming on (remove the cause and retry starting).
- Check if there is fuel in the tank (fill up).

There is a high grade of smoke at the engine exhaust
- Check that the oil level in the sump does not exceed the MAX index (restore level).
- Check that the generator is not in overload.
- Check calibration of the injectors (consult Service Centre).

The engine runs irregularly
- Check the fuel filters (replace).
- Bleed the air bubbles from the fuel circuit (see par. 3.2).

The alternator voltage is too low
- Correct the voltage value acting on the electronic regulator.
- Check the engine rpm (1560 rpm without utilities connected).
- Voltage regulator broken (replace).

Starter battery flat
- Check the electrolyte level in the battery (restore the level).
- Check functioning of the DC alternator.
- Check integrity of the battery.

The generator does not deliver power
- Check that the magnetothermal switch [Fig. 4, Ref. 2] is in the "ON" position. If not, contact an authorised Service Centre.

6. TECHNICAL CHARACTERISTICS

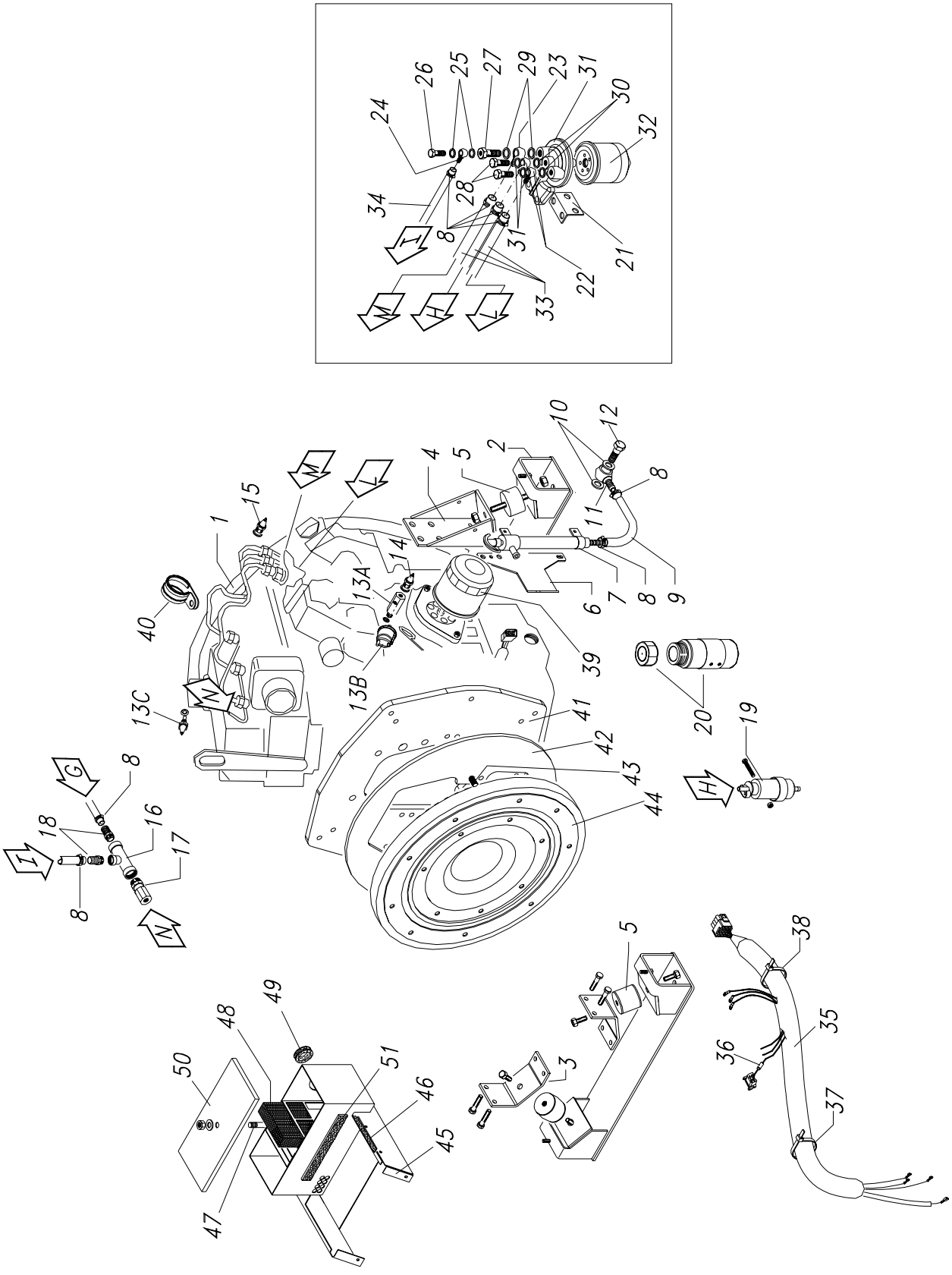
	,6 8 50 Hz	,6 9,5 60Hz	,6 9.0 50 Hz	,6 10.2 60Hz
Model	Yanmar 3TNE78A		Yanmar 3TNE82	
Type	Diesel 4 stroke			
Cylinders (nr.)	3			
Cylinder block material	Cast iron			
Bore (mm. - in.)	78 - 3.7		82 - 3.2	
Stroke (mm.- in.)	84 - 3.4		84 - 3.4	
Displacement (cc. - CID)	1204 - 73.45		1331 - 89.8	
Power (hp)	11.5	16.2	14.8	17.8
RPM	1500	1800	1500	1800
Compression ratio	18:1			
Combustion system	Direct injection			
Engine head material	Cast iron			
Speed governor	Centrifugal mechanical			
Lubrication system	Forced			
Oil sump capacity with filter(l -gl)	5.2 - 1.2			
Engine stop system	Stop solenoid			
Fuel pump	Electric			
Fuel pump discharge (cm. - ft)	70 - 2.3			
Fuel consumption (l/h - gl/h)	2.9 - 0.64	3.4 - 0.75	3.2 - 0.7	3.6 - 0.75
Air intake (l/min. - gl/min.)	730 - 193	876 - 231	730 - 208	876 - 231
Starting battery (Ah-V)	70 - 12			
Battery charger (Ah-V)	40 - 12			
Starter (KW-V)	1.2 - 12			
Max. inclination	30°			
Water pump flow (l/min. - gl/min.)	25 - 6.6	28 - 6.1	25 - 6.6	28 - 6.1

	50 Hz	60Hz	50 Hz	60Hz
Type	Synchronous, 4-poles, brush less self-excited electronic voltage regulation (AVR)			
Cooling	Air/water (Intercooler W/A)			
Voltage (V)	115 - 230	120 - 240	115 - 230	120 - 240
Frequency (Hz)	50	60	50	60
Amps	67.8 - 33.9	73.3 - 36.6	78.2 - 39.1	83.3 - 41.6
Max. power (KW)	7.8	8.8	9	10
Continuous power (KW)	7.2	8.5	8.2	9.5
Power factor (cos ø)	1			
Insulating class	H			
Voltage stability	±2%			
Frequency stability	±5%			

References for the wiring diagram
(Page 9 - Pict. 13 standard connection
Page 10 - Pict. 14 isolated poles connection)

1	Magnetothermal switch
2	Hour counter
3	Alternator
4	Stator
5	Exciter
6	Electronic voltage regulator
7	Thermal switch
8	Engine protection module
9	START/STOP button
10	Fuel level gauge
11	Oil pressure gauge
12	Water temperature gauge
13	Fuel pump
14	High water temperature sensor
15	High coolant temperature sensor
16	Oil pressure switch
17	DC alternator
18	Stop electromagnet
19	Starter motor
20	Battery connection terminals
21	Oil pressure gauge instrument
22	Coolant temperature gauge instrument
23	START/STOP button
24	Remote control panel connection cable
25	Connector for remote control panel connection
26	Remote control panel
27	Remote control panel
28	Earth relais
29	Stator
30	Starting Relay

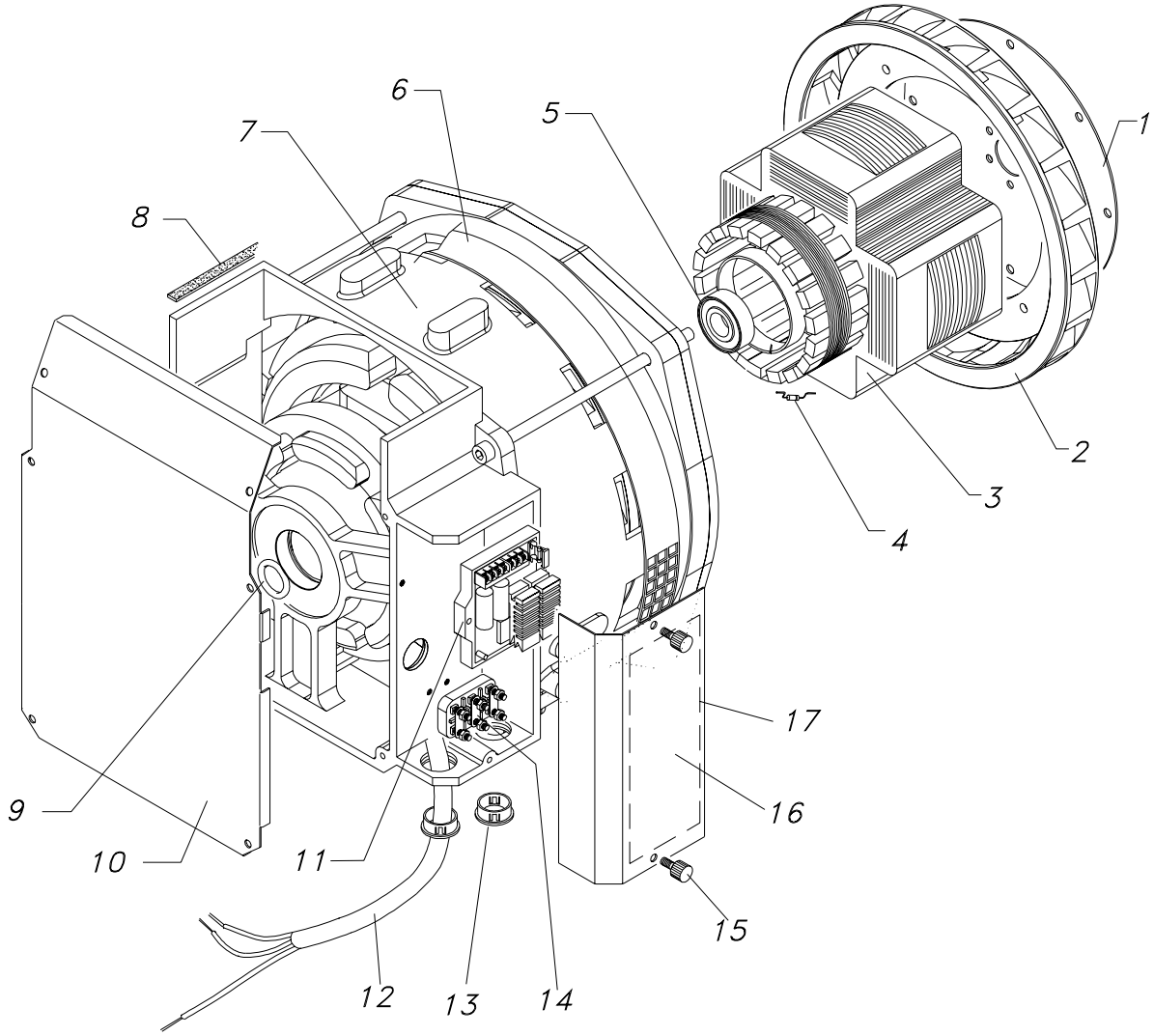
IS 8 - 9.5/ 9 - 10.2	MOTORE *ENGINE*	FIG. 1 / 7	Rev. / *Rel.*



IS 8 - 9.5/ 9 - 10.2 | **MOTORE** *ENGINE* | **FIG. 1 / 7** | **Rev.** */ Rel.*

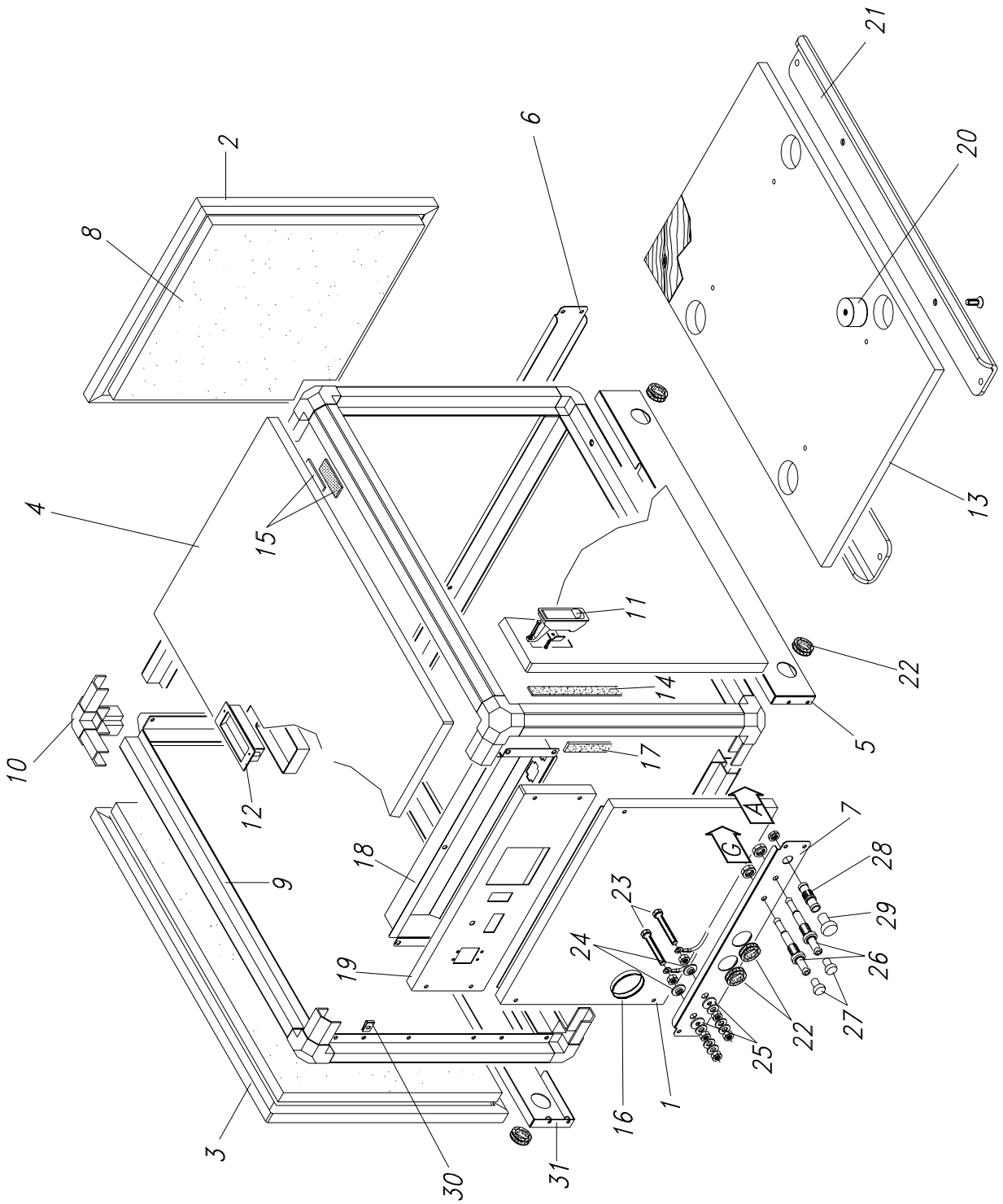
Rif.	Cod.	Q.ty	Descrizione	Description
1	81078	1	MOTORE YANMAR 3TNE78A MG **IS8.0**	ENGINE YANMAR 3TNE78A MG 50Hz **IS8.0**
1	81127	1	MOTORE YANMAR 3TNE78 MG EPA **IS9.5**	ENGINE YANMAR 3TNE78A MG 60Hz EPA **IS9.5**
1	81214	1	MOTORE YANMAR 3TNE 82A MG **IS 9.0**	ENGINE YANMAR 3TNE82A MG 50Hz **IS9.0**
1	81215	1	MOTORE YANMAR 3TNE 82A-EMG EPA **IS 10.2**	ENGINE YANMAR 3TNE82A EMG 60Hz EPA - **IS10.2**
2	62319	2	STAFFA FISSAGGIO GRUPPO	BRACKET
3	62317	2	STAFFA DX/SX SUPPORTO ALTERNATORE	RH/LH BRACKET ALTERNATOR SUPPORT
4	62318	2	STAFFA SX/DX SUPPORTO MOTORE	RH/LH BRACKET ENGINE SUPPORT
5	70309	4	ANTIVIBRANTE D50X30	SHOCK ABSORBER
6	010952	1	STAFFA SUPPORTO POMPA OLIO	BRACKET OIL PUMP SUPPORT
7	20250	1	POMPA RICAMBIO OLIO 3/4"	OIL DRAINAGE PUMP
8	10791	9	FASCETTA D.8/16 H9	CLAMP D.8/16 H9
9	70198	mt.0,35	TUBO CARBURANTE D.10X17	FUEL PIPE D.10X17
10	10785	2	RONDELLA D22	WASHER D.22
11	11203	1	RACC. AD OCCHIO D.22 PORTAGOM.D.13	UNION D.22
12	10581	1	VITE FORATA M22X1,5	HOLLOW SCREW M22X1,5
13	011084	1	KIT TRASMETTITORI OLIO ACQUA	OIL WATER TRANSMITTER KIT
13A	11290	1	RACC.3VIE TRASMETTITORI PRESS.OLIO	OIL WATER TRANSMITTER UNION
13B	32235	1	TRASMETTITORE VDO 1/8" 5 BAR	TRANSMITTER VDO 1/8" 5 BAR
13C	32234	1	TRASMETTITORE VDO 16X1,5 120°	TRANSMITTER VDO 16X1,5 120°
14	92682	1	PRESSOSTATO OLIO	LOW OIL PRESSURE SWITCH
15	92640	1	TERMOCONTATTO	THERMOSTAT
16	11286	1	RACCORDO 3 VIE 1/8" F.	UNION
17	11278	1	RACCORDO D.5 X 1/8" M.	UNION
18	11285	2	RACCORDO PORTAGOMMA 1/8" D.7	UNION
19	31004	1	POMPA PIERBURG 7.21440.03	PIERBURG PUMP
20	71059	1	VASO ESPANSIONE + TAPPO	SUB-TANK + PLUG
21	010664	1	STAFFA SUPPORTO FILTRO NAFTA	FUEL FILTER BRACKET SUPPORT
22	11280	2	RACC. OCCHIO D.12 PORTAGOM. D.8	UNION
23	10817	1	RACC. OCCHIO D.14 PORTAGOM. D.8	UNION
24	11282	1	RACC. OCCHIO D.8 PORTAGOM. D.6	UNION
25	910280	2	RONDELLA	WASHER
26	910281	1	VITE FORATA	HOLLOW SCREW
27	910282	1	VITE FORATA	HOLLOW SCREW
28	910283	2	VITE FORATA	HOLLOW SCREW
29	910284	2	RONDELLA	WASHER
30	910232	4	RONDELLA	WASHER
31	910296	1	SUPPORTO FILTRO NAFTA	FUEL FILTER SUPPORT
32	910076	1	FILTRO NAFTA	FUEL FILTER
33	71169	mt.1,8	TUBO CARBURANTE A1 D.8 ISO7840	FUEL PIPE A1 D.8 ISO7840
34	71185	mt.1,5	TUBO CARBURANTE A1 D.6 ISO7840	FUEL PIPE A1 D.6 ISO7840
35	10294	1	CABLAGGIO MOTORE	ENGINE HARNESS
36	20104	1	DIODO BY 255	DIODE BY 255
37	10561	8	FASCETTA CABLAGGI 300X7,8	HARNESS CLAMP
38	40307	4	FASCETTA CABLAGGI 130X2,9	HARNESS CLAMP
39	92891	1	FILTRO OLIO	OIL FILTER
40	11281	3	FASCETTA D.30 GOMMATA	RUBBERIZED CLAMP
41	910306	1	FLANGIA MOTORE YANMAR 3TNE78A	ENGINE FLANGE
42	010541	1	FLANGIA ACCOPPIAMENTO MOTORE	ENGINE ASSEMBLING FLANGE
43	11284	2	SPINA ELASTICA D.8X16	SPRING PIN
44	910319	1	VOLANO MOTORE	MOTOR FLYWHEEL
45	010668	1	CASSA FILTRO ARIA	AIR FILTER BOX
46	70229	cm.60	GUARNIZIONE ADESIVA 10X3	ADHESIVE GASKET
47	10703	1	TIRANTE M 6X145	ROD
48	71062	0,012	ELEMENTO FILTRANTE 10PPI	AIR FILTER ELEMENT
49	10567	1	PASSACAVO DG.48	GROMMET
50	010670	1	COPERCHIO FILTRO ARIA	AIR FILTER COVER
51	70211	cm.27	GUARNIZIONE ADESIVA 50X6	ADHESIVE GASKET
L			INGRESSO POMPA INIEZIONE MOTORE	ENGINE INJECTION PUMP ENTRANCE
M			INGRESSO POMPA INIEZIONE MOTORE	ENGINE INJECTION PUMP ENTRANCE
N			RITORNO INIETTORI	INJECTOR RETURN

IS 8 - 9.5/ 9 - 10.2	ALTERNATORE *ALTERNATOR*	FIG. 2 / 7	Rev. / *Rel.*



Rif.	Cod.	Q.ty	Descrizione	Description
	010526	1	ALTERNATORE ECM032 50Hz **IS 8 - IS 9**	ALTERNATOR ECM032 50Hz **IS 8 - IS 9**
	012408-0	1	ALTERNATORE ECM032 60Hz **IS 9.5 - IS 10.2**	ALTERNATOR ECM032 60Hz **IS 9.5 - IS 10.2**
1	910285	2	DISCO ACCOPPIAMENTO	ASSEMBLING DISK
2	010540	1	VENTOLA ALTERNATORE	ALTERNATOR FAN
3	910316	1	ROTORE	ROTOR
4	910313	6	DIODO ROTORE	ROTOR DIODE
5	80158	1	CUSCINETTO ROTORE	ROTOR BALL BEARING
6	010758	1	FASCIA PROTEZIONE ALTERNATORE	ALTERNATOR PROTECTION BAND
7	910317	1	STATORE	STATOR
8	70229	cm.60	GUARNIZIONE ADESIVA 10X3	ADHESIVE GASKET 10X3
9	71197	1	O-RING D. 52,07X 2,62	O-RING D.52,07X 2,62
10	010674	1	COPERCHIO ALTERNATORE	ALTERNATOR COVER
11	97724	1	REGOLATORE DI TENSIONE	VOLTAGE REGULATOR
12	010293	1	CABLAGGIO MOTORE	ENGINE HARNESS
13	71195	2	BOCCOLA PASSACAVO	CORE HITCH
14	32421	1	MORSETTIERA	MAIN TERMINAL BOARDS
15	70522	2	MANOPOLA	HANDLE
16	010676	1	COPERCHIO MORSETTIERA	MAIN TERMINAL BOARDS COVER
17	41668	1	ADESIVO SCHEMA ELETTRICO	WIRING DIAGRAM ADHESIVE

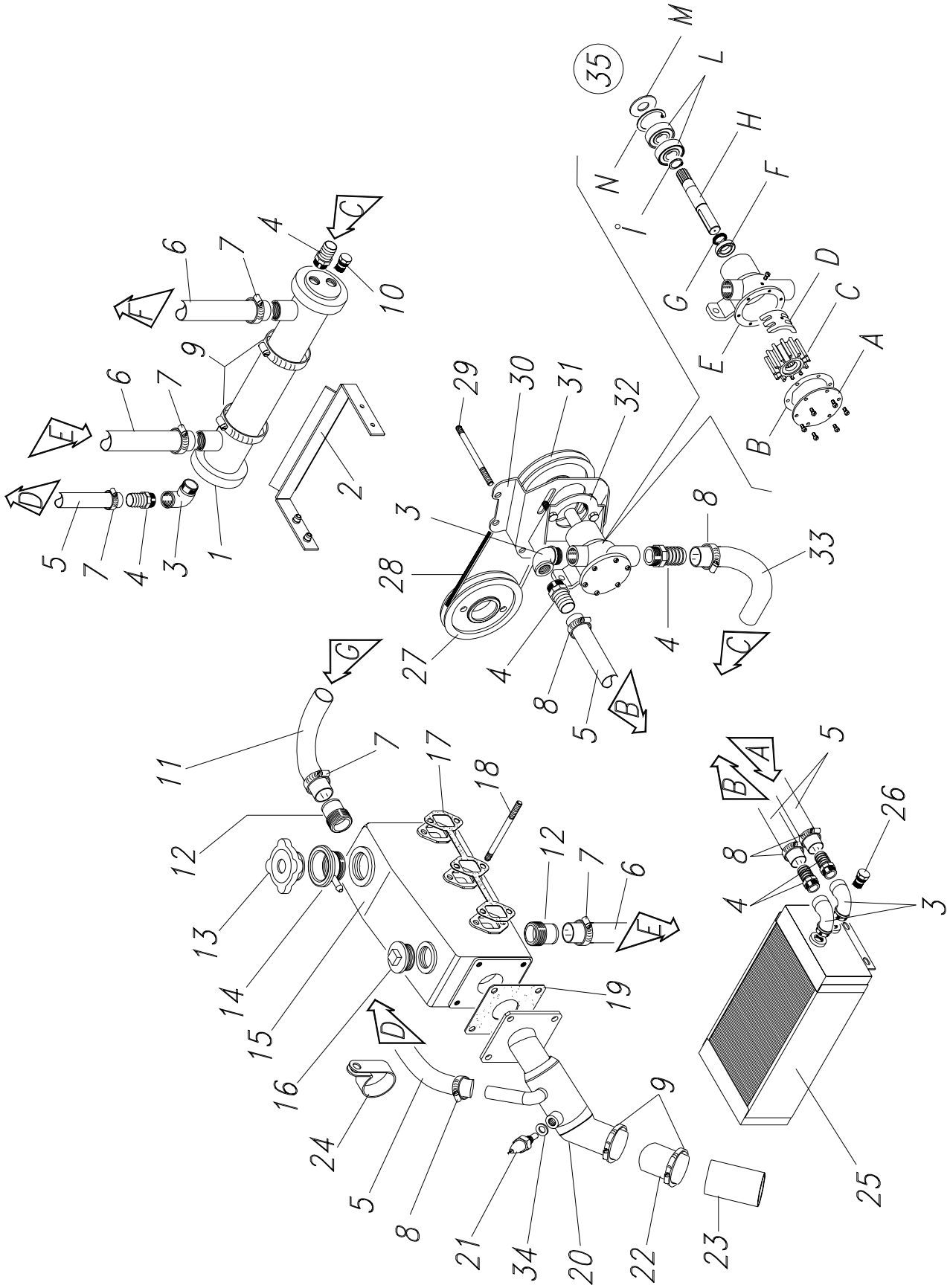
IS 8 - 9.5/ 9 - 10.2	CASSA *FRAME*	FIG. 3 / 7	Rev. / *Rel.*



IS 8 - 9.5/ 9 - 10.2	CASSA *FRAME*	FIG. 3 / 7	Rev. / *Rel.*

Rif.	Cod.	Q.ty	Descrizione	Description
1	010532	1	PANNELLO FISSO ALTERNATORE	ALTERNATOR FIX PANEL
2	010533	1	PANNELLO FISSO MOTORE	ENGINE FIX PANEL
3	010534	2	SPORTELLO LATERALE	LATERAL DOOR
4	010535	1	SPORTELLO SUPERIORE	UPPER DOOR
5	010536	2	CHIUSURA DX/SX FONDO	BOTTOM RH/LH CLOSURE
6	010537	1	CHIUSURA POSTERIORE FONDO	BOTTOM REAR CLOSURE
7	010538	1	CHIUSURA ANTERIORE FONDO	BOTTOM FRONT CLOSURE
8	71172	1	KIT FONOASSORBENTE	SOUNDPROOFING KIT
9	011066	1	KIT PROFILATI	DRAW PIECES KIT
10	011067	8	ANGOLO 3 VIE	CORNER
11	62334	4	CHIUSURA REGOLABILE	ADJUSTING CLOSURE
12	71078	1	MANIGLIA POCKET PULL	HANDLE
13	41628	1	PIANALE COMPENSATO	WOODEN BASE
14	70210	cm.4	GUARNIZIONE ADESIVA 20X3	ADHESIVE GASKET
15	71182	cm.20	CHIUSURA A STRAPPO	TUG CLOSING
16	71105	mt.0,21	TRAFILATO AD "U" EPDM	EPDM DRAFT
17	71139	mt.6	GUARNIZIONE ADESIVA 20X5	ADHESIVE GASKET
18	010663	1	PROTEZIONE CRUSCOTTO	CONTROL PANEL PROTECTION
19	010754	1	PANNELLO STRUMENTI	INSTRUMENTS PANEL
20	071171	4	ANTIVIBRANTE D50X30	SHOCK ABSORBER
21	62331	2	STAFFA FISS.DOPPIO ANTIVIBRANTE	BRACKET
22	10566	6	PASSACAVO DG. 29	CORE HITCH
23	10299	2	VITE M8x35	SCREW
24	70415	2	BOCCOLA D.20/12/ H 8	BUSHING
25	70416	2	BOCCOLA D.20X12 H 4	BUSHING
26	11277	2	PORTAGOMMA NAFTA	FUEL NIPPLE
27	71170	2	TAPPO	PLUG
28	10782	1	RACC.P.P.ACQUA D17/16,3 L60	UNION
29	70958	1	TAPPO	PLUG
30	10823	13	ATTACCO RAPID M6 NUT 986	UNION

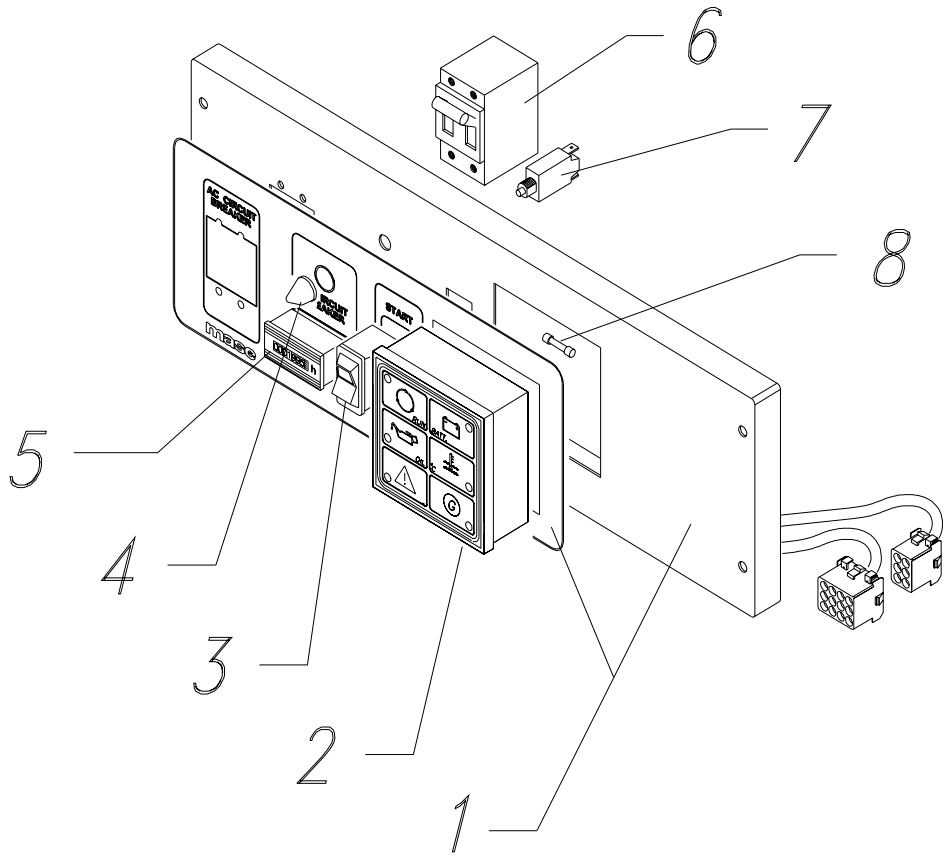
IS 8 - 9.5/ 9 - 10.2	GRUPPO MARINIZZAZIONE *SEA WATER*	FIG. 4 / 7	Rev. / *Rel.*



IS 8 - 9.5/ 9 - 10.2 | **GRUPPO MARINIZZAZIONE** *SEA WATER* | **FIG. 4 / 7** | **Rev.** */ Rel.*

Rif.	Cod.	Q.ty	Descrizione	Description
1	62320	1	SCAMBIATORE ACQUA/ACQUA	WATER/WATER EXCHANGER
2	010666	1	STAFFA SUPPORTO SCAMBIATORE	EXCHANGER SUPPORT BRACKET
3	10814	4	GOMITO A 90° M/F 3/8"	ELBOW
4	10614	6	PORTAGOMMA D.15	NIPPLE
5	70442	cm.320	TUBO D.15X23	PIPE
6	70969	mt.1,07	TUBO RADIATORE	RADIATOR PIPE
7	11164	6	FASCETTA D.32/ 44	CLAMP
8	10825	10	FASCETTA D.16/ 25 H 9	CLAMP
9	10872	4	FASCETTA D.50/ 70 H13	CLAMP
10	910200	1	ZINCO SCAMBIATORE ACQUA/ACQUA	WATER/WATER EXCHANGER ZINC
11	71167	1	MANICOTTO	SLEEVE
12	11276	2	PORTAGOMMA FIL.1"GAS	NIPPLE
13	011273	1	TAPPO SCAMBIATORE	EXCHANGER PLUG
14	010525	1	RACCORDO M40X 2 + BOCCHETTONE	NIPPLE + HUB
15	010296	1	COLLETTORE SCARICO ACQUA	WATER EXHAUST MANIFOLD
16	11279	1	TAPPO 1"GAS	PLUG
17	910287	1	GUARNIZIONE COLL.SCARICO MOTORE	GASKET
18	11196	6	TIRANTE M8X130	ROD
19	71164	1	GUARNIZIONE COLL. MISCELATORE	MIXER GASKET
20	011388	1	MISCELATORE	MIXER
21	30253	1	TERMOCONTATTO VDO 70° RIF.867	THERMAL SWITCH
22	70873	mt.0,2	TUBO SPIRALBENZ D. 50	PIPE
23	011390	1	CURVA SCARICO D.50/60°	D.50/90° EXHAUST BEND
24	11281	1	FASCETTA D.30 GOMMATA	RUBBERIZED CLAMP
25	62323	1	SCAMBIATORE ACQUA/ARIA	WATER/AIR EXCANGER
26	80162	1	ZINCO SCAMBIATORE ACQUA/ARIA	WATER/AIR EXCANGER ZINC
27	50282	1	PULEGGIA MOTORE	ENGINE PULLEY
28	71166	1	CINGHIA	V-BELT
29	11199	2	TIRANTE M 8X115	ROD
30	08886	1	STAFFA SUPP.POMPA	PUMP SUPPORT BRACKET
31	50292	1	PULEGGIA POMPA ACQUA	WATER PUMP PULLEY
32	010735	1	STAFFA FISSAGGIO POMPA	PUMP FASTENING BRACKET
33	71168	1	MANICOTTO D.16/90°	SLEEVE
34	10342	1	RONDELLA D14X20X1,5	WASHER
35	20639	1	POMPA JOHNSON F4B-8 3/8" - NEOPRENE	JOHNSON PUMP
35A	910320	1	COPERCHIO	END COVER
35B	910321	1	GUARNIZIONE COLL.SCARICO MOTORE	GASKET
35C	80163	1	GIRANTE	IMPELLER
35D	910322	1	CAMMA	CAM
35E	910323	1	CORPO	BOBY
35F	910324	1	TENUTA A LABBRO	LIP SEAL
35G	910325	1	O-RING	O-RING
35H	910326	1	ALBERO	SHAFT
35I	910327	1	ANELLO ELASTICO	RETAINING RING
35L	910328	1	CUSCINETTO	BALL BEARING
35M	910329	1	RONDELLA	WASHER
35N	910330	1	ANELLO ELASTICO	RETAINING RING

IS 8 - 9.5/ 9 - 10.2	CRUSCOTTO COMANDI *CONTROL PANEL*	FIG. 5 / 7	Rev. / *Rel.*



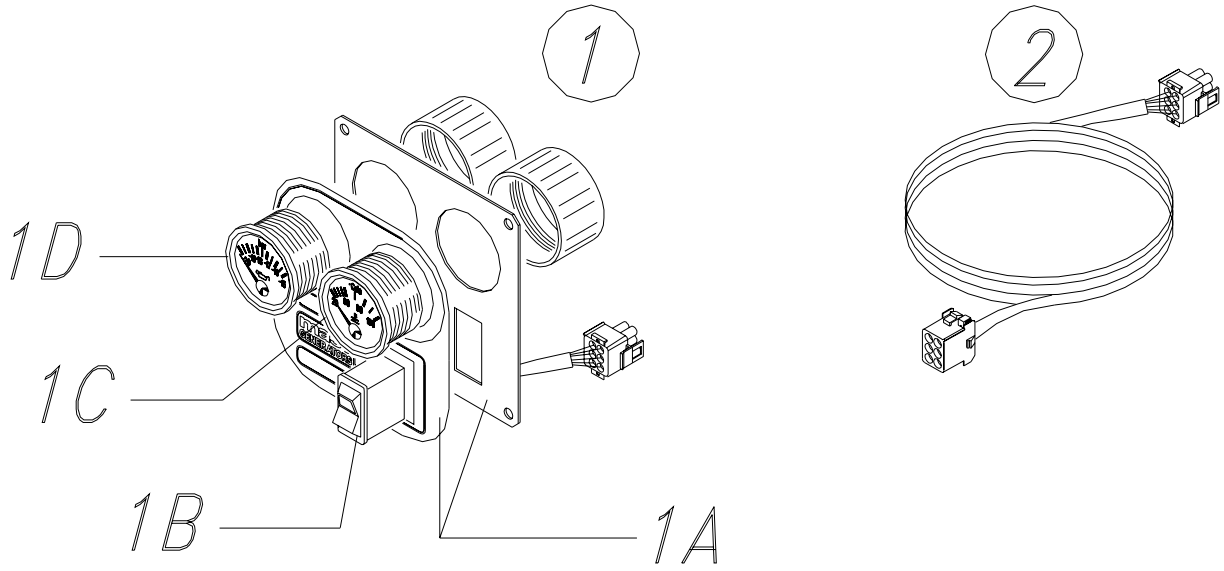
Rif.	Cod.	Q.ty	Descrizione	Description
	010291	1	QUADRO DI COMANDO **IS 8** 50.115/230	CONTROL PANEL
	011266	1	QUADRO DI COMANDO **IS 9.5** 60.120/240	CONTROL PANEL
	012977	1	QUADRO DI COMANDO **IS 9** 50.115/230	CONTROL PANEL
	012978	1	QUADRO DI COMANDO **IS 10.2** 60.120/240	CONTROL PANEL
1	012397	1	PANNELLO + ADESIVO	PANEL + LABEL
2	32393	1	MODULO PROTEZIONE MOTORE	ENGINE PROTECTION MODULE
3	32402	1	INTERRUTTORE START/0/STOP	START/0/STOP BUTTON
4	30270	1	CALOTTA PER T11-211 TIPO H	THERMAL SWITCH PROTECTION
5	30474	1	CONTAORE 110V 50Hz **IS 8 - IS 9**	HOURSMETER 50Hz **IS 8 - IS 9**
5	30475	1	CONTAORE 110V 60Hz **IS 9.5 - IS 10.2**	HOURSMETER 60Hz **IS 9.5 - IS 10.2**
6	32375	1	INT.AM2S 35A 250V BIPOLARE **IS 8 - IS 9**	CIRCUIT BREAKER 35A 250V **IS 8 - IS 9**
6	32689	1	INT.AM2S 38A 250V BIPOLARE **IS 9.5**	CIRCUIT BREAKER 38A 250V **IS 9.5**
6	32223	1	INT.AM2S 45A 250V BIPOLARE **IS10.2**	CIRCUIT BREAKER 45A 250V **IS 10.2**
7	31029	1	DISGIUNTORE TERMICO 12A	THERMAL SWITCH 12A
8	30356	1	FUSIBILE 6A 5x20	FUSE 6A

IS 8 - 9.5/ 9 - 10.2

CRUSCOTTO COMANDI A DISTANZA CON STRUMENTI
REMOTE CONTROL PANEL WITH INSTRUMENTS

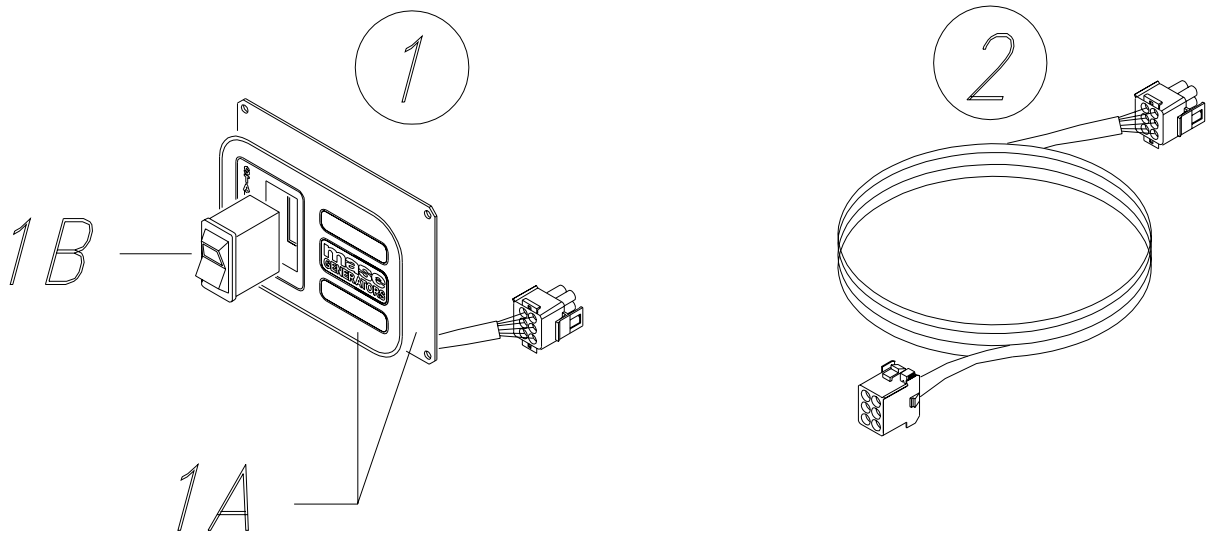
FIG. 6 / 7

Rev. */ Rel.*



Rif.	Cod.	Q.ty	Descrizione	Description
	010878	1	KIT COMANDO A DIST. CON STRUMENTI	REMOTE CONTROL PANEL KIT WITH INSTRUMENTS
1	010879	1	QUADRO COMANDO A DISTANZA	REMOTE CONTROL PANEL WITH INSTRUMENTS
1a	012396	1	PANNELLO	PANEL
1b	41669	1	ADESIVO	LABEL
1c	32402	1	INTERRUTTORE START/0/STOP	START/0/STOP BUTTON
1d	32412	1	TERMOMETRO 12V 120°C	WATER THEMPERATURE GAUGE
1e	32413	1	MANOMETRO 12V 5BAR	OIL PRESSURE GAUGE
2	011083	1	CAVO COMPLETO 20MT	20m CABLE

IS 8 - 9.5/ 9 - 10.2	CRUSCOTTO COMANDI A DISTANZA SENZA STRUMENTI *REMOTE CONTROL PANEL WITHOUT INSTRUMENTS*	FIG. 7 / 7	Rev. / *Rel.*



Rif.	Cod.	Q.ty	Descrizione	Description
	010881	1	KIT COMANDO A DISTANZA	REMOTE CONTROL PANEL KIT
1	010882	1	QUADRO COMANDO A DISTANZA	REMOTE CONTROL PANEL
1a	012395	1	PANNELLO	PANEL
1b	41675	1	ADESIVO	LABEL
1c	32402	1	INTERRUTTORE START/0/STOP	START/0/STOP BUTTON
2	011083	1	CAVO COMPLETO 20MT	20m CABLE

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