INSTALLATION MANUAL FOR MOBILE APPLICATIONS

W-SC3
- 3000 RPM -

Mobile diesel generating set 230V / 50Hz
Digital Diesel Control
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1 INTRODUCTION

1.1 GENERAL
This manual applies to the installation of Whisper Power W-SC3 generating set in vehicles.

Special attention has to be given to the chapter on safety that is in the users manual.

A warning symbol draws attention to warnings and instructions or procedures which, if not strictly observed, may result in damage or destruction of equipment, severe personal injury or loss of life.

This warning symbol refers to electric danger and draws attention to special warnings, instructions or procedures which, if not strictly observed, may result in electrical shock which will result in severe personal injury or loss of life.

1.2 GENERATING SETS FOR VEHICLES

1.2.1 Marine and mobile generators
Whisper Generators originate from the marine sector. But there are also specially designed Whispers available for mobile applications, suitable for supplying power on board of vehicles to use professional apparatus and equipment, strong lightning and air conditioning etc. The cooling system and exhaust system on vehicles is completely different from standard marine systems. Standard marine generators are cooled by seawater that nowhere exceeds 30° Celsius and is seldom warmer than 20° Celsius in the northern territories. Cold seawater is pumped through the alternator, through the heat exchanger and is injected in the exhaust. The exhaust gasses are therefore cooled and rubber exhaust hose can be used.

On vehicles the engine and alternator are individually cooled by radiator with an electric (12V/24V or 230V) driven fan. The radiators can be fitted below, on top or in the side of the vehicle.

The exhaust is of the dry type and includes a stainless flexible bellow and high quality mufflers.

Never use rubber exhaust hose, neither fibreglass nor plastic exhaust parts in a dry exhaust system as applied on vehicles.

Figure 1: Typical vehicle application radiator side mounted.

Figure 2: Typical vehicle application radiator top mounted.

Fig. 3: Typical vehicle application radiator bottom mounted

1.2.2 Why two radiators:
The W-SC3 engine is cooled by oil. The optimal engine operating temperature is 87° up to 92° Celsius. The radiator cools the temperature of the oil in the engine only 5° to 12° down. The returning “cold” oil therefore has a minimum temperature of 75° Celsius.
The alternator should be kept as cool as possible. In practice an alternator starts getting less efficient above 40°C Celsius. It is hardly possible to cool down the coolant of the alternator below 40°C using a radiator. When a vehicle is in the sun on a parking place the ambient temperature itself could be 40°C Celsius.

Because of the divergence in the working temperature of engine and alternator it will be clear that it is not possible to combine the cooling of the engine and alternator in one radiator system.

Furthermore it will be clear that it is very difficult to cool an alternator optimally with the aid of a radiator in conditions with high ambient temperatures.

The two radiators used to cool the engine and alternator of the W-SC3 are integrated in one housing and one electric driven fan blows the air through both radiators.

Why the alternator should be cooled by water:

2 INSTALLATION

To ensure reliability and durability of the equipment, it is very important that the installation is carried out with the utmost care and attention. To avoid problems, such as temperature problems, noise levels, vibration, etc. the instructions set out in this manual must be followed and all installation work must be carried out professionally.

2.1 LOCATION

When looking for a proper place for a generator in a vehicle all relevant aspects have to be taken into account

- Accessibility
- Solid foundation
- Space to mount the radiator (Refer to par. 2.4.3)
- Space to mount the exhaust (Refer to par. 2.4.2)
- A way to fit the fuel lines

Since Whisper generating sets have extremely compact dimensions, they can be installed in tight locations.

The W-SC3 has an unique engine being cooled by oil instead of water. The oil is used for both cooling and lubrication and has to be refreshed regularly. As the separate cooling system for the alternator is only for cooling it is better to use “water” or in fact special cooling liquid. For normal industrial use alternators are cooled by air. This requires a flow of air through the alternator of many m³ per minute. With the air, the noise comes out into the open. Generators on vehicles can only made silent by full enclosure in a sound shield canopy. The only opening in the Whisper canopy is the inlet for combustion air. For that reason the alternator is cooled by water. Although cooling the alternator by circulating water through a radiator is not ideal; it is much better than by air. Therefore air cooled alternators are rarely used in vehicles.

2.2 INSTRUCTIONS FOR OPTIMAL SOUND AND VIBRATION INSULATION

When it is possible to mount the unit directly on the chassis of the vehicle this has advantages in preventing vibrations by resonance.

2.2.1 Steel base plate

When it is not possible to fit the generator directly on the chassis and the unit is on a light floor or other light construction, Whisper Power recommends the use of an extra set of rubber mountings and a heavy steel base plate if the additional weight is no objection. To keep resonant vibrations at a minimum, it is possible to mount the generating set on a solid steel base plate, approx. 40 mm weighing approx. 50% of the weight of the generating set. A heavy base plate is available as an optional installation kit. (Ref. to fig. 24, item 62).
2.2.2 Further recommendations

Whisper generating sets are standard equipped with a "GRP" (Glass Reinforced Plastic) sound cover. The canopy has been designed to give effective sound insulation. For optimum sound and vibration dampening, the following factors should be considered.

1. In larger vehicles a separate and insulated space for the generator will help to damp the noise even further.

2. Avoid mounting the generating set in close proximity to thin walls or floors that may cause resonance.

3. Sound dampening is extremely poor if the generating set is mounted on a light weight flimsy surface such as plywood which will only amplify vibrations. If mounting on a thinner surface cannot be avoided, this should at least be reinforced with stiffening struts or ribbing. If possible, holes should be bored or cut through the surface to help reduce the resonance. Covering the surrounding walls and floors with a heavy coating plus foam will certainly improve the situation.

4. Never connect the base of the generating set directly to bulkheads or tanks.

2.3 VENTILATION

The generating set normally draws combustion air from the engine room. A full enclosure with natural ventilation must have ventilation openings of adequate size and location to enable the generating set to operate without overheating. To allow an ample supply of air within the temperature limits of the generating set an opening of at least 100 cm² is required. The radiator need its own airflow. (Refer to par. 2.4.2 - 4).

Air inlets should be louvered, where appropriate, to protect the generating set from water spray.

2.4 CONNECTIONS

The generating set comes with all supply lines and output cables (i.e. electric cables, cooling water and oil connections, exhaust, fuel lines etc.) already connected to the engine and alternator. The supply lines are led through the capsule’s base. The connections are marked as shown in fig. 5.

ATTENTION!

Before working (installation) on the system read the section safety instructions.
All electrical connections, cable types and sizes must comply with the appropriate national regulations. Supplied electric cables are rated for ambient temperatures up to 70°C. If the cables are required to meet higher temperature, they must be run through conduits.

2.4.1 Fuel supply

1 FUEL TANK
Fuel tanks should be made of appropriate material such as (stainless) steel or plastic. Steel tanks should not be galvanised or painted inside. Condensation can occur in metal tanks when temperature changes. Therefore, water accumulates at the bottom of the tank and provisions should be made for the drainage of this water.

The tank will need a filling connection, a return connection and an air ventilation connection which will require protection against water entry.

Some official regulations do not allow connection points at the base of the fuel tank; connections are to be made at the top of the tank with internal tubing down to a few cm above the bottom of the tank. Using the existing fuel tank of the car-engine the fitting should be executed with extra care. Both a supply line and a return line should be installed and go into the tank from the top. Interference of the two systems (car engine and generator engine) should be avoided.

Do NOT connect the fuel lines to the lines of the vehicles engine fuel supply. Driving the tank empty below the level of the suction pipe of the generator could make it necessary to bleed the fuel system.

2 FUEL LIFT PUMP
The generating set itself is equipped with a fuel lift pump; therefore the tank can be installed at a lower level than the generating set. The maximum suction height is 1 m. If the pump has to lift the fuel higher than one meter an external fuel lift pump must be installed. The control board is already prepared to connect an extra fuel pump. It is recommended to mount the loose supplied pump close to the tank and mount it in an angle or vertical to prevent air bubbles to block the system. The pump will become quite hot and should be mounted out of touch. (Refer to fig. 6)

The pump makes clicking noises and therefore could be mounted on rubber mountings. When the clicking noises of the pump are not acceptable another noiseless pump is available as an option.

3 FUEL PIPES

When the tank is above the generating set we recommend to end the return line on the top of the tank (A).

When the return is on the top - in case of a leakage the return line cannot overflow because of siphoning. One will only need a fuel cock in the fuel supply line.

Both supply and return fuel pipe lines should be appropriate material and 8 mm outer diameter tubing.

The quality of the tubing of fuel pipes could be submitted to local regulations depending on the application of the vehicle.

The fuel pipes can be plumbed to the flexible hoses which are on the generating set and have a connection to fit to 8 mm pipe. The fuel lines Whisper Power supplies are according to ISO 7840 A2

It is important to avoid bends in the pipes, as they could trap air bubbles. The return pipe should never be connected to the suction pipe. The return line should be of 8 mm diameter and go straight back via the top to the bottom of the tank. When the return is too narrow, has too many bents and goes back to the bottom of the fuel tank, the back-pressure could be too high. This results in irregular running of the engine.

When the engine runs irregular, one can check if back-pressure is the problem by disconnecting the return line just outside the canopy and draining it in a canister. When the engine runs smooth now, the return piping has to be changed. It could also help to install a second (electrical 12V) fuel lift pump.
4 Fuel Filters
A fine fuel filter is installed which requires maintenance. Whisper Power advises to install an extra fuel filter/water fuel separator near the fuel tank. Before starting your generating set for the first time follow the fuel system bleeding procedure in the user manual.
2.4.2 Radiator cooling

1 GENERAL INSTRUCTIONS
The radiator unit can be mounted below the floor, in the side or on the roof of the vehicle. Wherever the radiator is mounted the well functioning of the system depends on the well circulation of the coolant. Roof mounted radiators bring the most risk for circulation problems because air trapped in the radiators or a low level of the coolant, will immediately affect the cooling capacity of the radiators.

It is recommended to keep the radiators as close as possible to the unit. The piping should be fitted as direct as possible.

When the radiators are above the engine, the piping should be fitted below the top of the radiators! (refer to figure 9). Bents in the piping, that can trap air bubbles, should be avoided.

2 ALTERNATOR COOLING SYSTEM
Special attention should be paid to the ventilation of the alternator cooling system. The installation kit is standard supplied with an expansion tank for the coolant, which is also used to release air bubbles and makes it possible to add coolant into the system in an easy way. This expansion tank should be at the highest point of the system and mounted as high as possible.

Different from marine seawater-cooling installations, radiator systems use an open -non pressurised- system. Therefore the 12 mm overflow pillar on the expansion tank should stay open. A piece of hose can be used to drain redundant liquid that is thrown out because of the expansion of the liquid in the system. When open the expansion tanks can easily release air that is ventilated by the different connections.

As the capacity of the alternator cooling system is very small, the filling can be done via the expansion tank. It could be necessary to refill the tank a few times. The pump of the alternator cooling system is self-priming and this makes the system less sensitive for air traps.

When mounting the radiator unit it is important to take care that the outgoing connection, which is the connection to the alternator inlet, is on the top position (refer to figure 10 detail A) and is connected to the expansion tank. Also when the radiator is mounted flat at the bottom of the vehicle the outgoing connection is connected to the expansion tank. This is the best way to have the system release air and to add liquid when necessary.

ATTENTION!
The expansion tank must be fitted in the outlet of the radiator = the inlet pipe of the engine
When the radiator is flat mounted on the roof, the expansion tanks should be mounted a little higher. (refer to figure 11 detail B).

![Diagram of radiator assembly on the roof](image)

**Figure 11. Low profile radiator assembly on the roof**

### 3 ENGINE RADIATOR SYSTEM

The oil cooling system of the W-SC3 is ventilated in the engine itself and no expansion tank is applied. To prevent the oil in the radiator - when mounted higher than the engine - to flow to the engine after stopping the engine (overflow the engine), a pressure valve has to be fitted (refer to figure 8).

![Diagram of pressure valve](image)

**Figure 12. Pressure valve in the return line to prevent the engine to overflow as a result of siphoning. Only when radiator higher than engine.**

When it is not possible to drain the oil from the radiator every time the oil is changed, one should pump out the engine oil as good as possible from the engine sump and increase the oil change intervals to every 50 running hours.

![Warning symbol](image)

It is very important to use good quality heat resistant hose and fittings. Therefore it is strongly advised to use Whisper Power installation kits.

### 4 HOW AND WHERE TO MOUNT THE RADIATORS

The radiator kit includes rubber mountings to prevent vibrations to be transferred to the body of the vehicle (fig. 13). Due to the difference between vehicles general instructions are not available. One has to find out where the best place for mounting is. For OEM customers Whisper Power can supply a special customised installation kit.

![Diagram of radiator mounted on rubber mountings](image)

**Figure 13. Radiator on rubber mountings**

When bottom mounted the radiator should not be the lowest point of the vehicle to avoid damage. A free flow of air should be guaranteed. When horizontal mounted the fan should be on top, so that it causes a flow of air downwards. Often it is possible to find a place where extra space above the fan helps to create a free flow of air. It is recommended to make a shield below the radiator to catch stones and dirt and operates as a spoiler. The distance between the radiator and the shield should be at least 50 mm. Sometimes it is possible to build the radiators and shield on a sub frame that is mounted below the vehicle as a module.

![Warning symbol](image)

Measures have to be taken to prevent the hot air circulating and reducing the capacity of the radiators. Refer to figure 14.

![Diagram of bottom mounted radiator with shield](image)

**Figure 14. Bottom mounted with shield**
Most effective and easy is to mount the radiator in the side of the vehicle. (If possible below the level of the top of the engine.) A louvered grid should protect the radiator from rain and objects, but must not block the airflow. The fan should be inwards which causes the air to blow outwards. A free flow of air should be guaranteed. The ventilation (connection to the expansion tank) should be in the outgoing flow on top of the radiator.

A disadvantage of having the radiator in the side is possibly more noise of the electric fan and a flow of air that could be felt by people passing by. The radiator on the roof is often the best option from the point of view of keeping the noise of the fan away from people and it give the best result in dissipating the heat. However often this option conflicts with the possible need to keep the vehicle as low as possible. Another disadvantage is that the piping has to go through the roof that requires provisions to be waterproof.

Also negative is that roof mounted radiators are more sensitive for air traps. When having enough space it would be ideal to have the radiators vertically mounted on the roof. The expansion tank should be above the radiator.

When having the radiator horizontally mounted on the roof (refer to figure 17) enough space (50 mm) should be between the roof and the fan to have a free flow of air. When the radiator is roof mounted there should be protection against the weather. To avoid damage while the vehicle is driving at high speed a spoiler could be needed.

2.4.3 Dry exhaust system

1 GENERAL REMARKS

A dry exhaust muffler system should be as effective in silencing the exhaust as a wet marine exhaust system when applying the right mufflers. However noise could be generated by vibrations in the mufflers and be transferred to the chassis. Tacit factors like the length of specific pipe sections could be important. It is very difficult to take these factors into account.

The standard Whisper Power exhaust kit contains the materials to perform a professional installation. In the kit is a stainless steel flexible bellow (hose) to allow for expansion and to prevent vibrations to be transferred. Rubbers are supplied to mount the mufflers flexible. The insulation blanket for the flexible bellow and the resonance muffler are also very effective in damping vibrations. Still it could be that additional measures has to be taken like an extra clamp in a vibrating section of pipe, insulation blankets on other parts of the system and possibly even additional mufflers.

When the exhaust is led to the roof of a vehicle, measures has to be taken to prevent rainwater to enter the system. Special rain caps are available as an option.
A negative feature of a dry exhaust system is the heat radiated by its components. Measures are taken to overcome the heat problem: The exhaust bent to bring the exhaust out of the canopy is cooled by water. Insulation blankets are included in the exhaust kit to insulate the flexible bellow and the first muffler. When a dry exhaust has its outlet on the roof, all the pipes inside the vehicle has to be insulated. The exhaust pipes will be very hot and all accessible pipes and mufflers are dangerous to people when not insulated.

There are companies that are specialised in insulating hot pipes and fancy systems are available to make it good looking. However it is also possible to do it yourself by winding fibreglass or rock wool around the pipes and seal it with aluminium tape.

The mufflers are high quality industrial mufflers that are much more effective, robust and durable than mufflers made for automotive use.

2 THE STANDARD DRY EXHAUST SYSTEM
The standard exhaust system contains:
- On the generator set:
  - A water-cooled exhaust bent
- In the exhaust installation kit:
  - A stainless steel shielded flexible bellow.
  - One resonance muffler
  - One absorption muffler
  - Clamps and rubbers to mount the system flexible
  - Fittings, bents and pipes to make the different connections
  - Blankets for thermal and sound insulation.

3 INSTALLATION OF THE EXHAUST
Before determining the location of the generator set one has to consider how to get away with the exhaust. Often one can find space below the vehicle between the chassis to mount the mufflers. The outlet should blow the fumes away from the doors to avoid a nasty smell. When the gasses are in the flow of air blowing from the radiators this will help to avoid the fumes to be noticed. Under no condition the fumes should be sucked into the flow of air into the radiators. In wind still conditions a light smell of exhaust fumes around the vehicle will not be avoidable.

To bring the exhaust to the top of the vehicle gives the best results on noise and smell. However, when the pipes go through the vehicle they should be insulated and around the hole in the roof should be a collar to prevent rainwater to leak in. Both mufflers could be on the roof or one of them or both could be below the vehicle.

In general it is better to have the mufflers wide apart: the resonance muffler close to the generator and the absorption muffler on the end of the line. A short pipe (30cm) should be on the far end after the absorption muffler. The absorption muffler has no flow direction and could be mounted both ways. The resonance muffler should be mounted according to the indication on the muffler itself.

The resonance muffler should be fitted according to direction of the gas flow indicated.

In the kit are clamps to mount the exhaust pipes to stainless steel bars. These bars should be mounted to the chassis of the vehicle. It is recommend to use rubber mountings whenever possible. However take care that the heat conducted through the brackets will not affect the rubber. Refer to figure 20 how to mount the rubber in a safe way. When any doubt an extra safe guard could be constructed from steel wire or chain.

The exhaust pipes will be very hot and all accessible pipes and mufflers are dangerous to people when not insulated.

The resonance muffler should be fitted according to direction of the gas flow indicated.

In the kit are clamps to mount the exhaust pipes to stainless steel bars. These bars should be mounted to the chassis of the vehicle. It is recommend to use rubber mountings whenever possible. However take care that the heat conducted through the brackets will not affect the rubber. Refer to figure 20 how to mount the rubber in a safe way. When any doubt an extra safe guard could be constructed from steel wire or chain.

Figure 19. Ways to prevent water to get in.
Figure 20. Mounting bracket in rubber with safe guard
2.4.4 Electric installation (12 Volt)

1 DIGITAL DIESEL CONTROL SYSTEM

The electrical control system is standard in 12 Volt with negative earth. Non-earth return is available as an option. All electrical wiring has been prepared on the generating set and to the control panel prior to despatch from the factory.

Remote control

A remote control panel also containing a microprocessor is in the delivery. A 15 m intermediate 8-pole communication cable is in the standard supply too. If necessary an optional longer (max 30 m) intermediate cable can be connected if the standard length does not suit the required distance. When a longer distance than 30 m is required, consult the Whisper Power service department for advice. Refer to fig. 21.

Consult to the Whisper Power service department for advice.

When using the factory settings, installation is very simple: just plug the remote cable into the remote and the generator is ready to use. Refer to fig. 22.

Acoustic alarm or warning lamp

One can connect an external max. 150 mA relay to generate an acoustic warning or applying a warning lamp etc. Be aware of polarity as some relays has a diode inside and should be connected plus to plus en minus to minus as indicated. Refer to fig. 22.

Automatic start/stop

Whisper Power cannot be held responsible for damage caused by the unattended running generator using the auto-start/stop mode or interval mode.

Using the auto-start/stop (interval) mode the generator can start unexpectedly. When working on the electrical system, the 3 Amp fuse must be removed from the control panel and the battery plus cable must be removed from the battery.

The Whisper Power Digital Diesel Control system offers several options for automatic starting and stopping. Access to this menu and other menus could be blocked. For blocking and setting up this options refer to the APPENDIX of the DDC users manual.

One of these options is to monitor a second battery (Not being the starter battery) to start the generator automatically when the voltage of this battery drops below a certain setting.
Other names for this second battery are “auxiliary battery”, “service battery”, “users battery” or “consumers battery”. We will refer to this battery as “the second battery” (BAT2). In some menus the starter battery could be indicated as “the first battery” (BAT1).

A sense wire to monitor the second battery should be connected (Attention polarity!) to the connector on the back of the remote panel. Refer to fig. 22. The sense wires must be connected directly on the second battery before a main switch and be protected by a 3 Amps fuse.

(Monitoring the generator starter battery does not require an extra sense connection)

Settings
When one want to apply other settings than the factory settings refer to the DDC users manual, especially to the APPENDIX.

2 STARTER BATTERY
For starting, the W-SC3 requires a battery with a capacity of at least 55 Ah. The generating set can be connected with the main engine battery or have its own battery. We strongly recommend the use of a separate battery for the generating set and to keep the wiring system for the propulsion engine and the domestic DC supply system completely separate and individually connected to separate batteries.

However, the negative of all the batteries on the vessel should be interconnected (when on earth) to avoid difference in the voltage level of the earth on different places causing trouble to electronic devices which might be in the system.

A battery switch is recommended to be used to interrupt the positive connection.

The starter battery is charged by the alternator of the generator. An additional battery charger will help to keep the battery in good condition when the generating set is not used.
3 12V OR 24V DC TO DRIVE THE FAN
When applying 12V or 24V DC to drive the fan of the radiators the fan should be wired with minimum 4 mm² cable according to the wiring diagram. The negative return wire should be of the same diameter. The return current should never be lead over the chassis.
The consumption of power by the 12V DC powered fan makes it necessary to install an additional 30 Amps battery charger to prevent the starter battery to be drained. A much larger battery (120 Ah) is required. The battery charging winding in the generating set is not capable of公元 the fan.
Neither is the small charger that is included in the battery kit. Whisper Power supplies high quality battery chargers that continuously supply the rated power. Chargers of other suppliers are often rated to other standards and give the rated current (Amps) only for a short period if at all. Using 24V separate batteries to power the fan also require a large battery capacity and 24V/25 Amp charger.
To avoid the need of an extra heavy battery charger a 230 Volt fan on the radiator is recommended. One should realize that the power for the fan is to the cost of the output power. (Refer to paragraph 4.2)

4 OTHER RECOMMENDATIONS AND WARNINGS
The battery should be secured for poor road conditions and the terminals should be insulated. For extra safety the battery can be enclosed in a wooden, plastic, Fiberglas etc. (non metal) box. Even when the earth return system is applied a negative battery cable should be used and the vehicle should not to be used as a conductor.
The battery cables are supplied in a standard length of 1.5 m, if longer cables are required a larger cross sectional area should be considered to compensate for voltage reduction.

Never take off 12 Volt from one battery off a 24-Volt battery bank (12-Volt batteries that are in series). This will cause serious damage to the batteries in short time.

Disconnect the battery leads if electrical welding is to be carried out, otherwise damage will be caused to the diodes of the alternator.

As explosive hydrogen gases are discharged during charging, the battery should be located in a well ventilated room. Ensure that the supplied battery cable connectors are properly fitted and never remove during or shortly after charging as sparking can occur, which may ignite the hydrogen gasses.

2.4.5 AC power system (230 Volt)
The electric power supplied by the generator is of a high voltage and dangerous to people.
Realise hat people are not used to have 230V available on a vehicle. Put warning signs on wall sockets and on junction boxes. Instruct non-regular users of the vehicle. Warn maintenance personal of garages that do service on the vehicle.
Generators used on vehicles that are operated in a hazardous environment have often to fulfil special regulations and additional measures have to be taken accordingly.

Be sure that all electrical installations (including all safety systems) comply with all required regulations of the local authorities. All electrical safety/shutdown and circuit breaking systems have to be installed onboard as the generating set itself cannot be equipped with such equipment for every possible variation.
The vehicle’s power supply system (grid) should be suitable and safe for the AC voltage which is applied and the power that will be generated. Special attention has to be paid on dividing the system in branches which are fused individually. Wire colours should comply with AC standards. It is absolutely essential that each and every circuit in the on-board electrical system is properly installed by a qualified electrician.

1 FUSE
An input fuse (from the generating set to the system) should be installed to protect the installed electrical system.
For the W-SC3 the maximum single phase current at 230V is 13A.
The fuses must be of the slow reacting type. For electrical motors connected to the system, a motor protection switch must be installed.

2 INSULATION FAILURES
The AC alternator windings are not grounded.
The housing of the alternator and all other metal parts are grounded.
To make a connection between “neutral” and “ground” could be necessary as part of a specific insulation failure protection system.
It is possible that the electric installation in the vehicle must be protected against insulation failures. Methods of protection are subjected to rules that can be different depending on the use of the vehicle and local standards.
In the standard marine manual is more information, but this is according CE regulations for boats. Vehicles are subject to different regulations depending on the application of the vehicle. Experts in this field should be consulted.

3 CABLE
For the power cable in single phase installations we recommend the use of flexible 3 wire oil resistant cable with a sufficient cross sectional area 3 x 2,5 mm². One wire for earth is included. For very long cables it is recommended to apply cables with a larger cross section.

4 TRANSFER SWITCH
A power source selector switch must be installed between the generating set and the car’s electrical supply system. This switch must ensure that all AC consumers can be switched off at once. This switch should also be installed to keep the generating set and shore (grid) power systems separate.
Transfer switches - to switch over from shore to ship or from generating set to inverter - should be well designed to switch over all wires including neutral (and not only phases or line) and there should be provisions with the aid of timers to prevent relays from chattering.
Whisper Power advises the installation of a MASTERSWITCH as the power source selector. This works automatically when the generating set is not running the input remains in the shore position and as soon as the generating set is running the MASTERSWITCH switches automatically after 10 seconds delay time over to the generating set position.

Warnings:

In all situations the transfer switches between shore, inverter and generator should switch both neutral and L1. Of course this is the case when using a Whisper Power Masterswitch.
3 INSTALLATION SPECIFICATIONS

3.1 TECHNICAL DATA

<table>
<thead>
<tr>
<th>Article no</th>
<th>40900620</th>
</tr>
</thead>
<tbody>
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<td>Dimensions wxdxh.</td>
<td>505x400x500 mm</td>
</tr>
<tr>
<td>Weight</td>
<td>97 kg including sound shield</td>
</tr>
<tr>
<td>Max. operation angle</td>
<td>25°</td>
</tr>
<tr>
<td>Remote panel 10 m cable</td>
<td>Digital Diesel Control System</td>
</tr>
<tr>
<td>Battery capacity min.</td>
<td>12V, 55 Ah</td>
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<td>Fuel consumption</td>
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<td>electric driven 12 V DC, max. lift 1 m</td>
</tr>
<tr>
<td>Cooling</td>
<td>radiator cooling</td>
</tr>
<tr>
<td>Cooling pump</td>
<td>Whisper Power self priming impeller pump, PTO driven, type K</td>
</tr>
<tr>
<td>Crank case lube oil capacity</td>
<td>1.3 litre + 0.7 oil cooler, total 2 litre</td>
</tr>
<tr>
<td>Alternator</td>
<td>synchronous brushless, maintenance free water cooled</td>
</tr>
<tr>
<td>Voltage regulation</td>
<td>capacitor</td>
</tr>
<tr>
<td>Output power</td>
<td>2.5 kW, 230V/50 Hz at power factor cos phi =1 including the power to drive the electric radiator cooling fan</td>
</tr>
<tr>
<td>Battery charger</td>
<td>additional 12V winding including regulator (6 Amps)</td>
</tr>
</tbody>
</table>
3.2 INSTALLATION MATERIALS

Fuel kit
Battery installation kit
Base plate kit

230V AC
### FUEL KIT

<table>
<thead>
<tr>
<th>no</th>
<th>qty</th>
<th>article no</th>
<th>description</th>
<th>dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td>41</td>
<td>2</td>
<td>50221203</td>
<td>straight coupling</td>
<td>8 mm</td>
</tr>
<tr>
<td>42</td>
<td>1</td>
<td>50230090</td>
<td>fuel strainer/water separator</td>
<td>M14x1,5 mm</td>
</tr>
<tr>
<td>43</td>
<td>2</td>
<td>50221618</td>
<td>parallel male stud coupling</td>
<td>M14 - 8 mm</td>
</tr>
<tr>
<td>44</td>
<td>2</td>
<td>50221644</td>
<td>reducing male nipple</td>
<td>M14-M16 60 gr.</td>
</tr>
<tr>
<td>45</td>
<td>2</td>
<td>50221615</td>
<td>hose connection</td>
<td>8 mm</td>
</tr>
<tr>
<td>46</td>
<td>2</td>
<td>50221616</td>
<td>nut coupling</td>
<td>M16x1,5 mm</td>
</tr>
<tr>
<td>47</td>
<td>1</td>
<td>50221352</td>
<td>nipple hose pipe</td>
<td>8 mm</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td></td>
<td><strong>40230205</strong></td>
<td></td>
<td></td>
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### OPTIONAL INSTALLATION MATERIALS

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<th>description</th>
<th>dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td>48</td>
<td>1</td>
<td>50222020</td>
<td>copper fuel pipe</td>
<td>6x8 mm</td>
</tr>
<tr>
<td>49</td>
<td>1</td>
<td>50220063</td>
<td>fuel hose</td>
<td>8x16 mm</td>
</tr>
</tbody>
</table>

### BASE PLATE KIT

<table>
<thead>
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<th>qty</th>
<th>article no</th>
<th>description</th>
<th>dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td>61</td>
<td>4</td>
<td>50230052</td>
<td>rubber mountings</td>
<td>M12</td>
</tr>
<tr>
<td>62</td>
<td>1</td>
<td>50230012</td>
<td>base plate W-SC3</td>
<td></td>
</tr>
<tr>
<td>63</td>
<td>1</td>
<td>50230011</td>
<td>fastener kit base plate</td>
<td></td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td></td>
<td><strong>40230207</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
It is one combined radiator that is showed twice.

**RADIATOR OIL COOLER KIT ENGINE**

**EXHAUST KIT**

**RADIATOR COOLER KIT ALTERNATOR**

Fig. 25
## COMBINED RADIATOR COOLER KIT W-SC3 230VAC

<table>
<thead>
<tr>
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<th>qty</th>
<th>article no</th>
<th>description</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>2</td>
<td>ST 50221106</td>
<td>Straight reducer m/f 1-1/2</td>
</tr>
<tr>
<td>3</td>
<td>1</td>
<td>ST 50221062</td>
<td>Mal nipple 1/2&quot;</td>
</tr>
<tr>
<td>5</td>
<td>2</td>
<td>ST 50221003</td>
<td>Male hose connection 1/2x13</td>
</tr>
<tr>
<td>6</td>
<td>1</td>
<td>ST 50221007</td>
<td>Male hose connection 1/2x20</td>
</tr>
<tr>
<td>14</td>
<td>6</td>
<td>M 50220057</td>
<td>Cooling water hose warm water 13x21 mm</td>
</tr>
<tr>
<td>15</td>
<td>12</td>
<td>ST 50221521</td>
<td>Hose clamp stainless 12-20</td>
</tr>
<tr>
<td>16</td>
<td>16</td>
<td>ST 50221595</td>
<td>Hose support stainless 22x20 mm</td>
</tr>
<tr>
<td>17</td>
<td>1</td>
<td>ST 50230529</td>
<td>Bracket expansion tank for 50230531</td>
</tr>
<tr>
<td>17</td>
<td>1</td>
<td>ST 50230531</td>
<td>Expansion tank 20 mm</td>
</tr>
<tr>
<td>17</td>
<td>1</td>
<td>ST 50230532</td>
<td>Cap tank 050230531</td>
</tr>
<tr>
<td>20</td>
<td>2</td>
<td>M 50220011</td>
<td>Hose vacuum SAE100R4 (3/4&quot;) 19x31,5 mm</td>
</tr>
<tr>
<td>21</td>
<td>2</td>
<td>ST 50221502</td>
<td>Hose clamp stainless 19-29</td>
</tr>
<tr>
<td>31</td>
<td>1</td>
<td>ST 50201319</td>
<td>Combined radiator cooler W3,5 230V</td>
</tr>
<tr>
<td>32</td>
<td>2</td>
<td>ST 50221648</td>
<td>Adapter BSP 3/8</td>
</tr>
<tr>
<td>33</td>
<td>2</td>
<td>ST 50221107</td>
<td>Straight reducer m/f 1-3/8</td>
</tr>
<tr>
<td>36</td>
<td>4</td>
<td>ST 50201121</td>
<td>Vibration mounting 30x25</td>
</tr>
<tr>
<td>37</td>
<td>4</td>
<td>ST 50211152</td>
<td>Bolt hexagonal ZP M8x16</td>
</tr>
<tr>
<td>38</td>
<td>4</td>
<td>ST 50211465</td>
<td>Nut hexagonal SP M8</td>
</tr>
<tr>
<td>39</td>
<td>8</td>
<td>ST 50211405</td>
<td>Washer SPM8</td>
</tr>
<tr>
<td>40</td>
<td>8</td>
<td>ST 50211445</td>
<td>Washer spring SP M8</td>
</tr>
<tr>
<td>41</td>
<td>6</td>
<td>M 50220001</td>
<td>Hose hydraulic 9,5x17,4 mm</td>
</tr>
<tr>
<td>42</td>
<td>1</td>
<td>ST 50221042</td>
<td>TEE fitting 1/2&quot;</td>
</tr>
<tr>
<td>43</td>
<td>1</td>
<td>ST 50209203</td>
<td>Temperature failure switch</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>no</th>
<th>qty</th>
<th>article no</th>
<th>description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>ST 50201300</td>
<td>Combined radiator cooler W3,5 12VDC</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>ST 50201305</td>
<td>Combined radiator cooler kit W3,5 12VDC</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>ST 50201310</td>
<td>Combined radiator cooler W3,5 24VDC</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>ST 50201312</td>
<td>Combined radiator cooler kit W3,5 24VDC</td>
<td></td>
</tr>
</tbody>
</table>

## DRY EXHAUST KIT 1"

<table>
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<th>article no</th>
<th>description</th>
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</thead>
<tbody>
<tr>
<td>61</td>
<td>1</td>
<td>ST 50220041</td>
<td>Exhaust hose 500mm SS male/female 1&quot;</td>
</tr>
<tr>
<td>62</td>
<td>1</td>
<td>ST 50220042</td>
<td>Insul. blanket 35x60 exhaust hose 1 1/2</td>
</tr>
<tr>
<td>63</td>
<td>1</td>
<td>ST 50230520</td>
<td>Absorption muffler steel 1&quot;</td>
</tr>
<tr>
<td>64</td>
<td>1</td>
<td>ST 50230521</td>
<td>Resonance muffler steel 1&quot;</td>
</tr>
<tr>
<td>65</td>
<td>1</td>
<td>ST 50230522</td>
<td>Insulation blanket R-muffler 1&quot;</td>
</tr>
<tr>
<td>66</td>
<td>2</td>
<td>ST 50221401</td>
<td>Pipe nipple 1&quot;x300mm galvanised</td>
</tr>
<tr>
<td>67</td>
<td>2</td>
<td>ST 50221421</td>
<td>Parallel male coupling 1&quot; galvanised</td>
</tr>
<tr>
<td>68</td>
<td>2</td>
<td>ST 50221411</td>
<td>Straight coupling ff 1&quot;galvanised</td>
</tr>
<tr>
<td>69</td>
<td>3</td>
<td>ST 50221661</td>
<td>U-clamp 42mm M10</td>
</tr>
<tr>
<td>70</td>
<td>3</td>
<td>ST 50221664</td>
<td>Bracket U-clamp 25cm M10/48mm passivated</td>
</tr>
<tr>
<td>71</td>
<td>6</td>
<td>ST 50211406</td>
<td>Washer SP M10</td>
</tr>
<tr>
<td>72</td>
<td>6</td>
<td>ST 50211447</td>
<td>Washer spring SP M10</td>
</tr>
<tr>
<td>73</td>
<td>6</td>
<td>ST 50211466</td>
<td>Nut hexagonal SP M10</td>
</tr>
<tr>
<td>75</td>
<td>1</td>
<td>ST 50221471</td>
<td>Elbow 90 degr m/f galvanised 1&quot;</td>
</tr>
</tbody>
</table>
4 DIAGRAMS & DRAWINGS

4.1.1 Lay out DDC control wiring W-SC3

Fig.26
4.1.2 Lay out control DC control system 12V radiator fan W-SC3

Fig. 27
4.1.3 Lay out control DC control system 24V radiator fan W-SC3
4.2 CONNECTION DIAGRAM RADIATOR FAN 230VAC

![Connection Diagram](image-url)

**Fig. 29**

- GENERATOR
- L1
- N
- AIR FAN 230 VAC
### 4.3 WIRING CODES AND COLOURS

<table>
<thead>
<tr>
<th>Connection</th>
<th>Cable code number</th>
<th>Colour</th>
<th>Cross section</th>
</tr>
</thead>
<tbody>
<tr>
<td>Battery &gt; Starter Motor</td>
<td></td>
<td>Red</td>
<td>16 mm²</td>
</tr>
<tr>
<td>Starter Motor &gt; DDC</td>
<td>1</td>
<td>Red</td>
<td>6 mm²</td>
</tr>
<tr>
<td>Starter Motor &gt; LCP</td>
<td>13</td>
<td>Red</td>
<td>2.5 mm²</td>
</tr>
<tr>
<td>Battery &gt; Ground</td>
<td></td>
<td>Black</td>
<td>16 mm²</td>
</tr>
<tr>
<td>Ground &gt; LCP Ground (GND)</td>
<td>2</td>
<td>Black</td>
<td>2.5 mm²</td>
</tr>
<tr>
<td>DDC &gt; Glow Plug</td>
<td>3</td>
<td>Brown</td>
<td>4 mm²</td>
</tr>
<tr>
<td>DDC &gt; Starter Solenoid</td>
<td>4</td>
<td>Yellow</td>
<td>2.5 mm²</td>
</tr>
<tr>
<td>LCP &gt; Fuel Lift Pump +</td>
<td>5</td>
<td>Brown</td>
<td>1.5 mm²</td>
</tr>
<tr>
<td>LCP &gt; Fuel Lift Pump –</td>
<td>15</td>
<td>Black</td>
<td>1.5 mm²</td>
</tr>
<tr>
<td>DDC &gt; LCP</td>
<td>5</td>
<td>Grey</td>
<td>1.5 mm²</td>
</tr>
<tr>
<td>DDC &gt; Oil Pressure Switch</td>
<td>6</td>
<td>Purple</td>
<td>1 mm²</td>
</tr>
<tr>
<td>LCP &gt; Oil Pressure Switch</td>
<td>6</td>
<td>Purple/Black</td>
<td>1 mm²</td>
</tr>
<tr>
<td>DDC &gt; Oil Temperature Switch</td>
<td>7</td>
<td>Blue</td>
<td>1 mm²</td>
</tr>
<tr>
<td>LCP &gt; Oil Temperature Switch</td>
<td>7</td>
<td>Blue/Black</td>
<td>1 mm²</td>
</tr>
<tr>
<td>DDC &gt; Exhaust Temperature Switch</td>
<td>8</td>
<td>Blue/Green</td>
<td>1 mm²</td>
</tr>
<tr>
<td>LCP &gt; Exhaust Temperature Switch</td>
<td>8</td>
<td>Blue/Rose</td>
<td>1 mm²</td>
</tr>
<tr>
<td>DDC &gt; Fuel Valve Solenoid</td>
<td>9</td>
<td>Green</td>
<td>1.5 mm²</td>
</tr>
<tr>
<td>DDC &gt; Stop Solenoid</td>
<td>20</td>
<td>Pink</td>
<td>2.5 mm²</td>
</tr>
<tr>
<td>DDC &gt; Current Measuring Transformer</td>
<td>11</td>
<td>Black</td>
<td>1 mm²</td>
</tr>
<tr>
<td>DDC &gt; Current Measuring Transformer</td>
<td>11</td>
<td>Red</td>
<td>1 mm²</td>
</tr>
<tr>
<td>DDC &gt; LCP</td>
<td>19</td>
<td>Orange</td>
<td>1.5 mm²</td>
</tr>
<tr>
<td>DDC &gt; LCP</td>
<td>12</td>
<td>Black</td>
<td>1.5 mm²</td>
</tr>
<tr>
<td>DDC &gt; LCP</td>
<td>14</td>
<td>Red</td>
<td>1.5 mm²</td>
</tr>
<tr>
<td>DDC &gt; LCP</td>
<td>16</td>
<td>Red/Green</td>
<td>1.5 mm²</td>
</tr>
<tr>
<td>DDC &gt; Generator AC Output</td>
<td>33</td>
<td>Brown</td>
<td>1 mm²</td>
</tr>
<tr>
<td>DDC &gt; Generator AC Output</td>
<td>33</td>
<td>Blue</td>
<td>1 mm²</td>
</tr>
<tr>
<td>LCP &gt; Battery Charger Winding Generator</td>
<td>10</td>
<td>Red</td>
<td>1 mm²</td>
</tr>
<tr>
<td>LCP &gt; Battery Charger Winding Generator</td>
<td>10</td>
<td>Red</td>
<td>1 mm²</td>
</tr>
</tbody>
</table>

DDC = Digital Diesel Control Unit  
LCP = Local Control Panel
4.4 AC WIRING DIAGRAM 230V / 50HZ

Fig. 30

STATOR

RROTOR

STATOR

EARTH AND NEUTRAL CONNECTED

Fig. 30

EARTH AND NEUTRAL NOT CONNECTED

CURRENT TRANSFORMER

MAIN WINDING

MAIN WINDING

MAIN WINDING

MAIN WINDING

CURRENT TRANSFORMER

MAIN WINDING

MAIN WINDING

MAIN WINDING

CURRENT TRANSFORMER

MAIN WINDING

MAIN WINDING
The remote panel comes in a carton that can be used as a template to drill the mounting hole.

Fig. 31
4.6 W-SC3 DIMENSIONS

Top view

Box dimensions:
- width: 505 mm
- depth: 400 mm
- height: 500 mm
- weight: 97 kg

Service side

W-SC3 / 3000RPM

1. Fuel lift pump cable
2. Battery connection (positive)
3. Remote control cable
4. Oil pipe out (RED)
5. Cooling water out
6. Battery connection (negative)
7. Exhaust connection
8. Oil pipe in (BLACK)
9. Cooling water in
10. Fuel pipe return
11. AC 230V wiring
12. --
13. Fuel pipe inlet

Figure 32