



INSTALLATION MANUAL FOR MOBILE APPLICATIONS

W-SQ20

- 1500 RPM -

Mobile diesel generating set 230/400V / 50Hz
Digital Diesel Control



Art.nr. 40200616

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V1 April 2010

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1 INTRODUCTION

1.1 GENERAL

This installation manual applies to the installation of the Whisper Power W-SQ20 generator set in vehicles. This manual is valid for the following models:

Part number	Description
41101320	W-SQ20 230V/400V 1500rpm Mobile
41101326	W-SQ20 230V/400V 1500rpm Mobile -ungrounded

For other models see our website: www.whisperpower.eu.



WARNING

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



DANGER

This danger 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.



WARNING!

Before working (installation) on the system read the section safety instructions in the user's manual

1.2 GENERATING SETS FOR VEHICLES

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.

On vehicles the engine of the W-SQ20 is cooled by a radiator with an electric (230V or 3x400V) driven fan. Note that the alternator of the W-SQ20 is cooled by air. The radiator of the engine 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 fiberglass nor plastic exhaust parts in a dry exhaust system as applied on vehicles. Unless indicated otherwise.

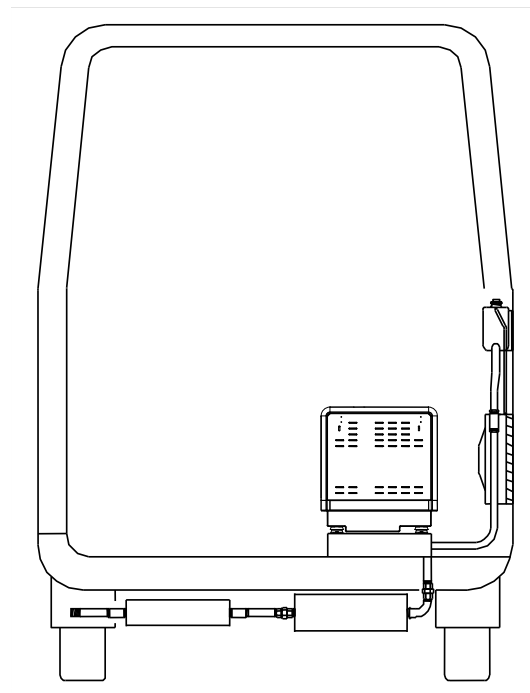


Figure 1: Typical vehicle application radiator side mounted

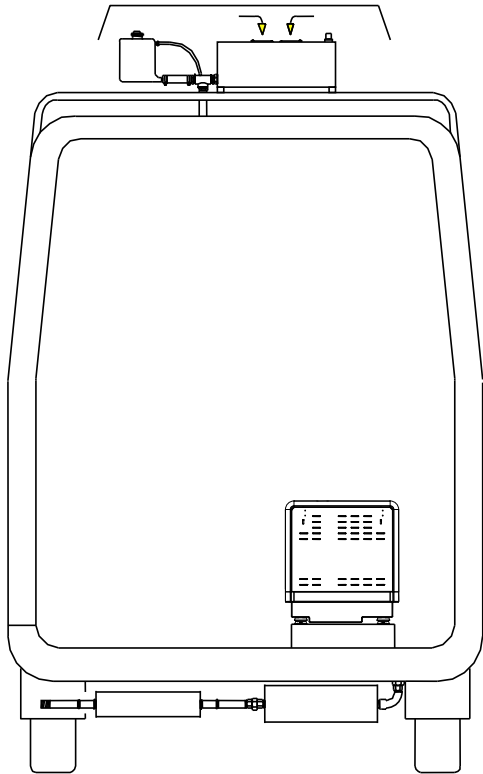


Figure 2: Typical vehicle application radiator top mounted

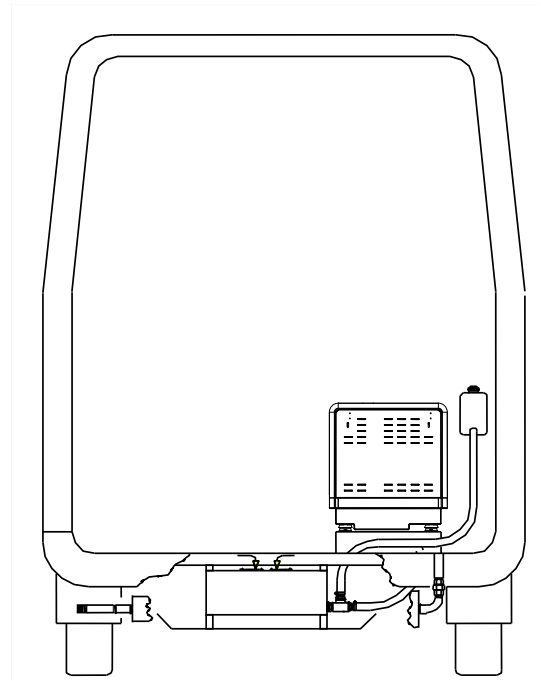


Figure 3:
Typical vehicle application radiator bottom mounted

2 INSTALLATION

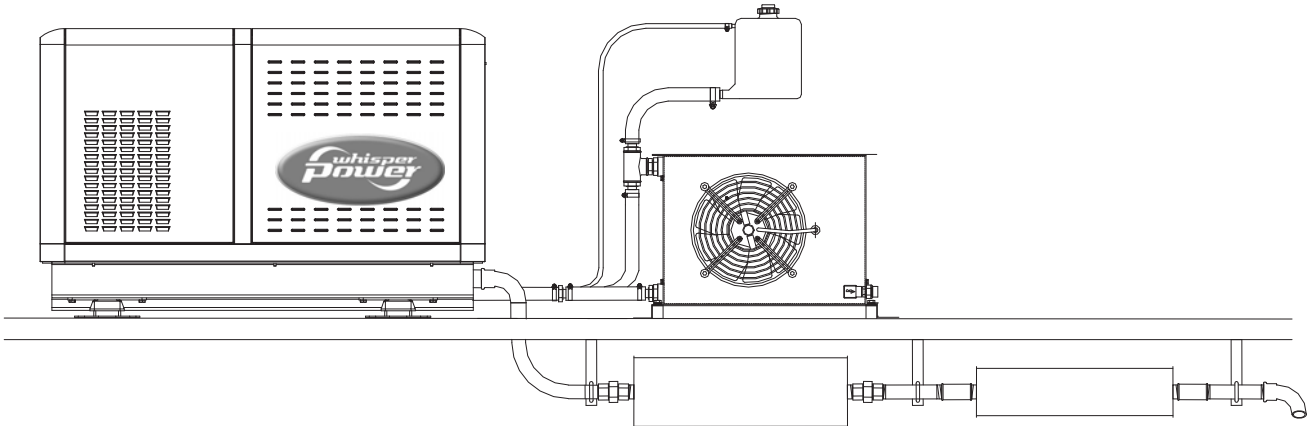


Figure 4: Schematic installation diagram

2.1 GENERAL

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.

2.2 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 radiators (Refer to par. 2.5.2)
- Space to mount the exhaust (Refer to par. 2.5.3)
- A way to fit the fuel lines

Since Whisper generating sets have extremely compact dimensions, they can be installed in tight locations. Please consider that even almost maintenance-free machinery must still remain accessible.

When selecting the location area in which to mount the generating set, make sure there is sufficient room to carry out any maintenance work. The unit must be easily accessible on the service side and on the distribution side to have access to the V-belt.

All models can be serviced from one side. Note that oil filling can be only done on the top side of the engine. Cooling liquid can be filled via the expansion tank.

The top of the engine (rocker cover) has to be accessible for adjustment of the valve clearance.

Please also note that in spite of the automatic oil pressure sensor it is still essential that the oil level is checked regularly.

2.3 INSTRUCTIONS FOR OPTIMAL SOUND AND VIBRATION INSULATION

Position the generating set as low as possible in the vehicle. The generating set is already secured to the base frame by means of flexible engine mountings. The base frame is mounted to the chassis of the vehicle on a second set of rubber mountings that is included in the delivery. Use the included mounting template to determine the mounting spots.

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

2.3.1 Further recommendations

Whisper generating sets are standard equipped with a sound cover. This sound cover has been designed to give effective sound insulation. For optimum sound and vibration dampening, the following factors should be considered.

- 1 Most important is the structure on which the generator is placed to be stiff. Directly below the rubber mountings the structure should be supported vertically to the chassis of the vehicle.
- 2 In larger vehicles a separate and insulated space for the generator will help to damp the noise even further
- 3 Avoid mounting the generating set in close proximity to thin walls or floors that may cause resonance.
- 4 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 be at least be reinforced with stiffening struts or ribbing. If possible, holes should be drilled 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.
- 5 Never connect the base of the generating set directly to walls or tanks.

2.4 VENTILATION

2.4.1 General

The generating set normally draws air from the engine compartment. Engine compartments with natural ventilation must have vent 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 a half square meter (0,5 m²) is required.

A "sealed" engine compartment must have a good extraction ventilator to maintain reasonable ambient temperatures. High temperature of intake air reduces engine performance and increases engine coolant temperatures. Air temperatures above 25°C reduce the engine power by 2% for each 5°C of rise. To minimise these effects the engine room temperature must not be more than 15°C above the outside ambient air temperature.

Apply a combination of ventilators, blowers and air intake ducting to meet the temperature limit. The air inlet ducts should run to the bottom of the engine compartment to clear fumes from the bilge and to circulate fresh air. Air outlets should be at the top of the engine compartment to remove the hottest air. An engine compartment blower should be used as an extraction ventilator to remove air from the engine room.

In cases where it is impossible to meet the above mentioned temperature limit by using engine compartment ventilation, connections are to be made for an air inlet directly to the generator enclosure. With these connections the generating set can be directly connected to an air duct. Air inlets should be louvered, where appropriate, to protect the engine room and to protect the generating set from rain and water spray.

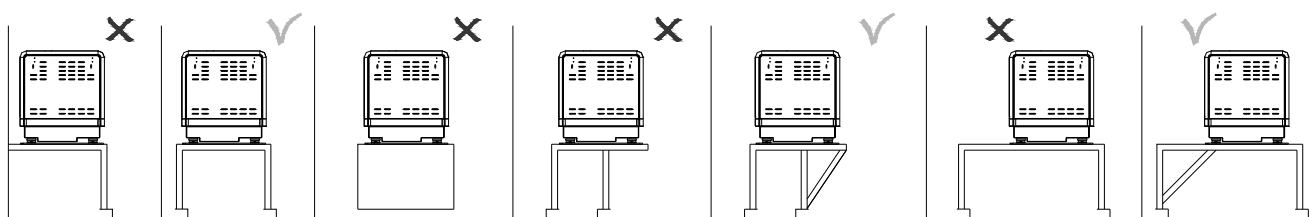


Figure 5: Mounting of the Whisper generating set. X = wrong, V = OK

2.5 CONNECTIONS

The generating set comes with all supply lines and output cables (i.e. electric cables, coolant connections, exhaust, fuel lines etc.) already connected to the engine and generator. The supply lines are fed through the capsule's front base. The connections are marked as shown in figures 7 till 10.

All electrical connections, cable types and sizes must comply with the appropriate national regulations. Supplied

cables are rated for ambient temperatures up to 70°C. If the cables are required to meet higher temperature requirements, they must be run through conduits.



ATTENTION!

Before working (installation) on the system read the section safety instructions

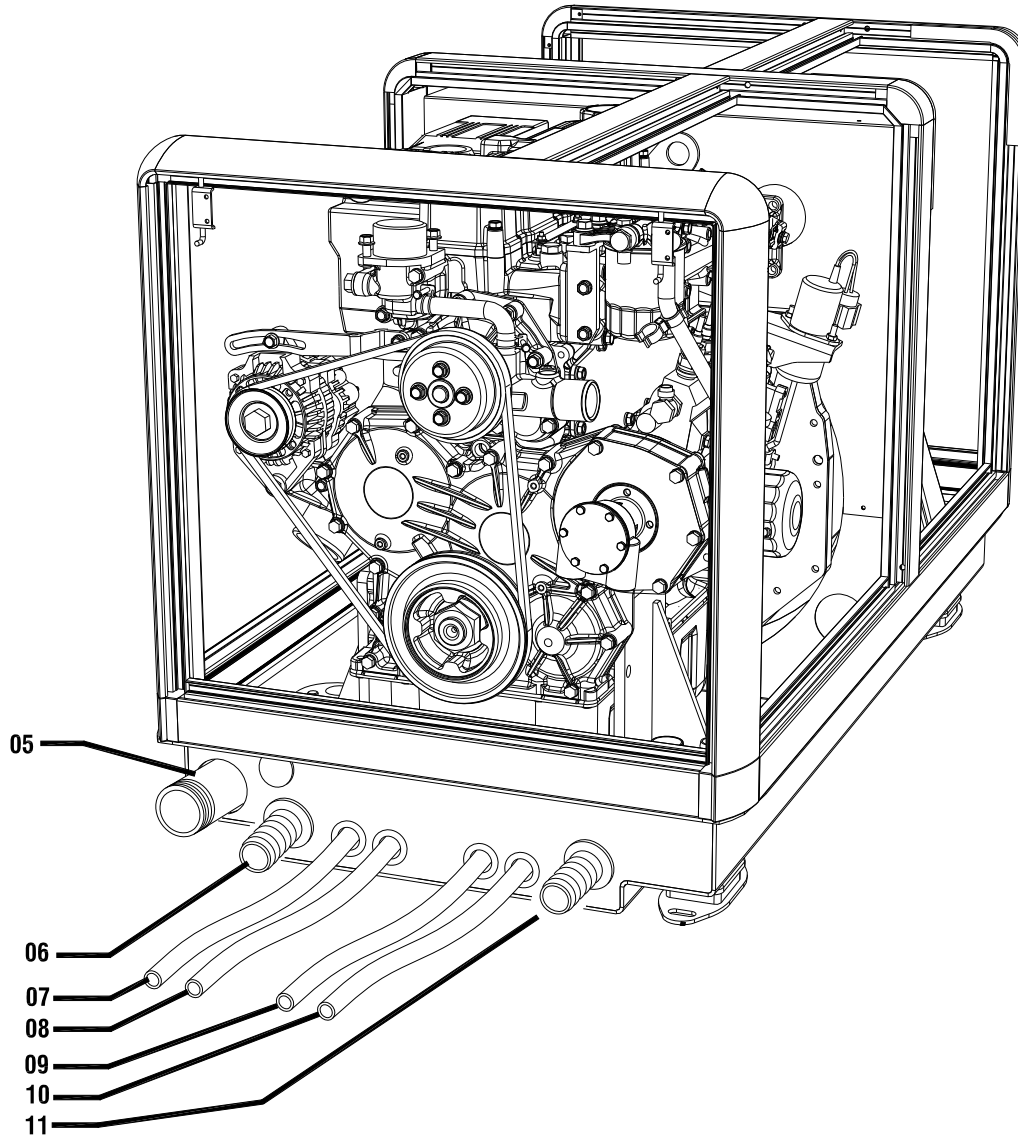


Figure 6: Mounting of the air strainer element

05	Exhaust connection 2"	09	Fuel out Ø8mm
06	Coolant Engine OUT Ø35mm	10	Fuel in Ø8mm
07	Battery positive (+) 35mm ²	11	Coolant Engine IN Ø35mm
08	Battery negative (-) 35mm ²		

Figure 7: Connections of the W-SQ20 for mobile applications:

2.5.1 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 carried out 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. See figure 8. The maximum suction height is 1 m. The W-SQ20 has a mechanical fuel lift pump that should be primed manually when the first time used.

If the pump has to lift the fuel higher than one meter an external fuel lift pump must be installed. (Art. No. 50201060) The control board is already prepared to connect an extra fuel pump. When using a second electric fuel supply pump, it is recommended to mount a 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 figure 9) The pump makes clicking noises and therefore could be mounted on rubber mountings. When the clicking noises of the pump are not acceptable an other noiseless pump is available as an option. (Art. No. 50202200)

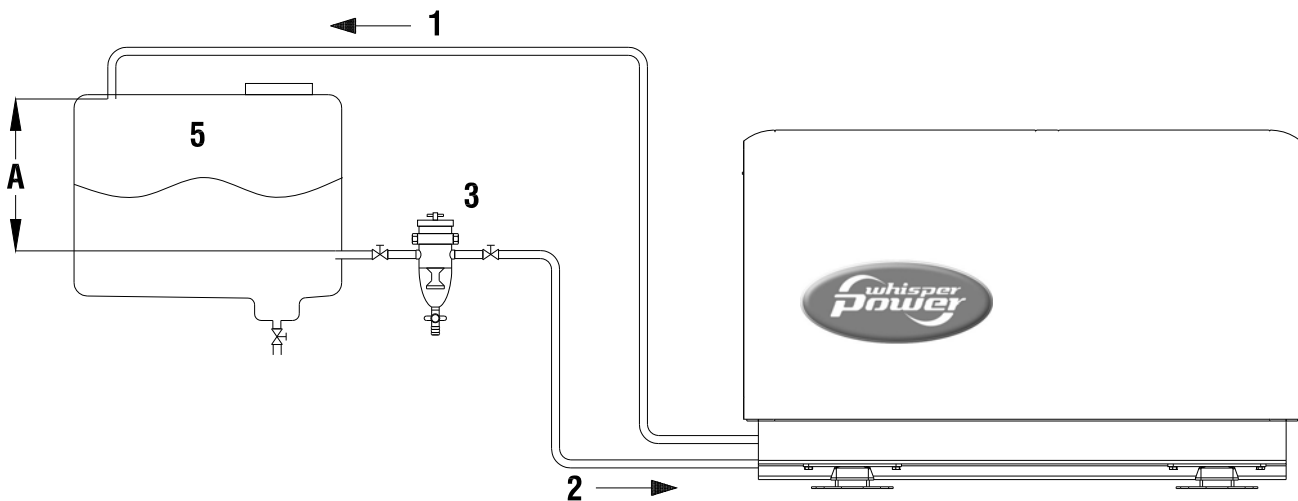


Figure 7 Fuel supply (fuel tank is above the generating set)

- 1 Fuel return
- 2 Fuel supply
- 3 Prefilter / Water separator (optional)
- 5 Fuel Tank

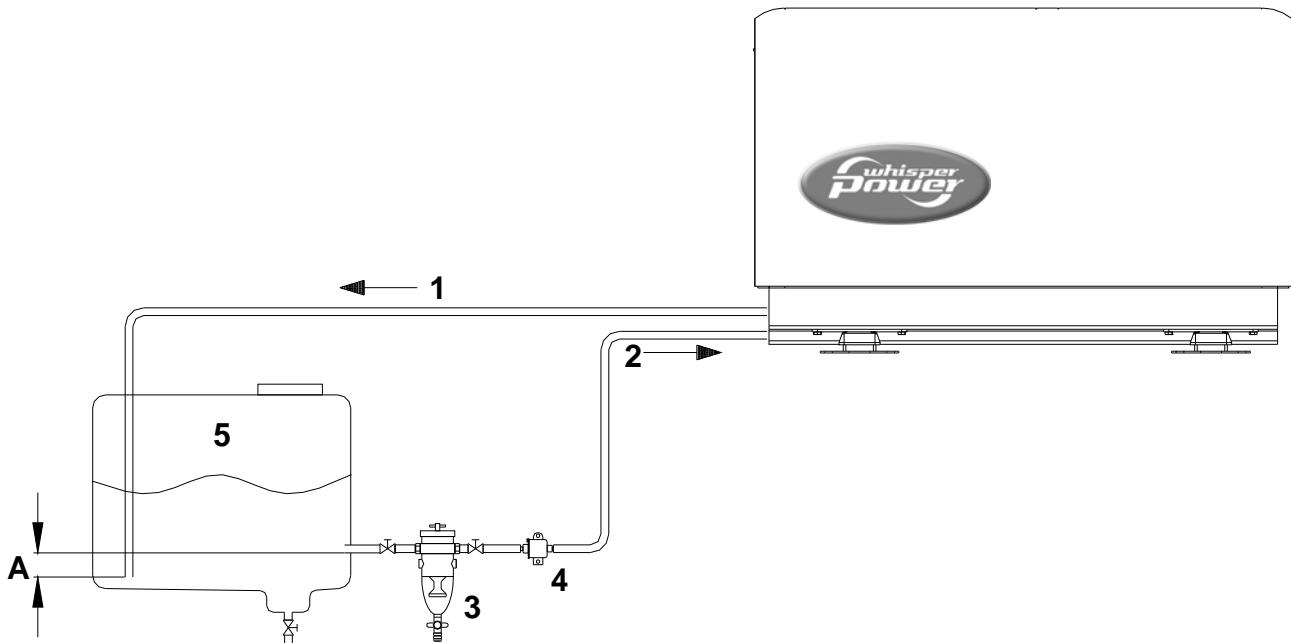


Figure 8 Fuel supply (fuel tank is below the generating set)

- 1 Fuel return
- 2 Fuel supply
- 3 Prefilter / Water separator (optional)
- 4 Extra fuel lift pump (optional)
- 5 Fuel tank

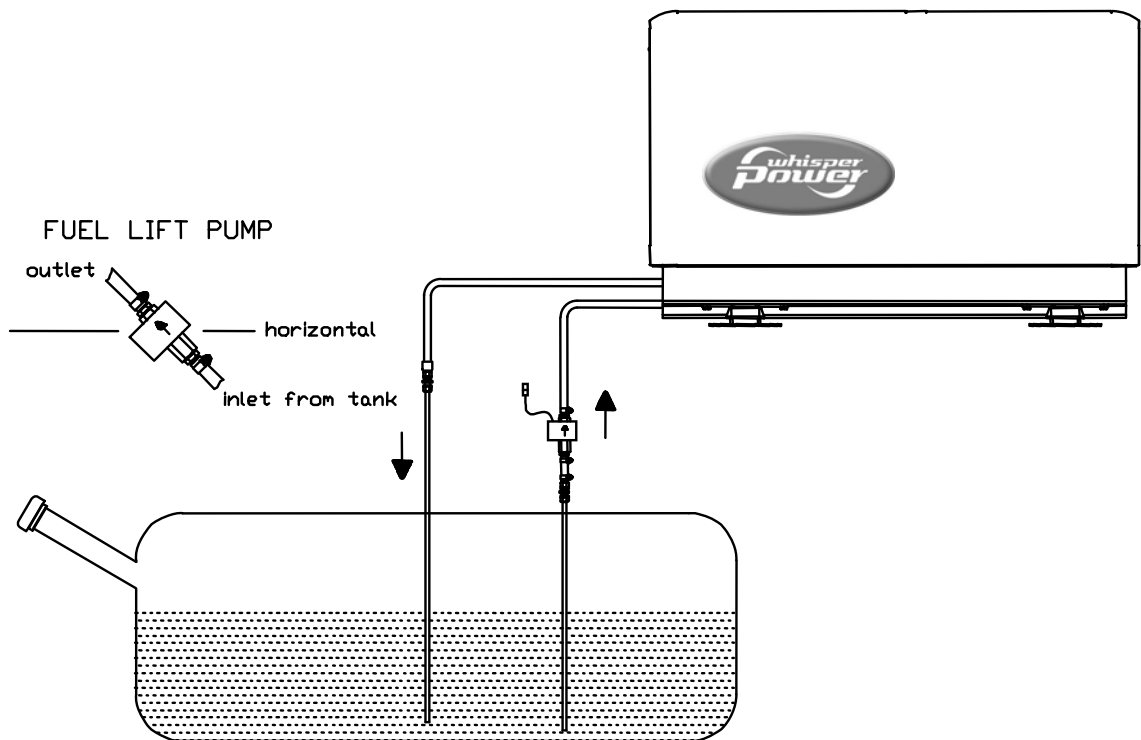


Figure 9: Fuel line assembly with vertical mounted additional pump and fuel lift pump mounted in an angle

3 FUEL PIPES

When the tank is above the generating set (figure 7) we recommend ending the return line on the top of the tank. 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. When the tank is below the generating set we recommend ending the return line on the bottom of the tank (A) below the inlet of the 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. This fuel lines fulfils CE standards and 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 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 in the supply line to increase the pressure.

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 users manual.

2.5.2 Radiator cooling

1 GENERAL INSTRUCTIONS

The radiator 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. A roof mounted radiator brings the most risk for circulation problems, because air trapped in the radiator or a low level of the coolant, will immediately affect the cooling capacity of the radiator. It is recommended to keep the radiator as close as possible to the engine. The piping should be fitted as direct as possible.

When the radiator is above the engine, the piping should be fitted below the top of the radiator! (refer to figure 10). Bents in the piping, that can trap air bubbles, should be avoided or ventilated (refer to figure 11)

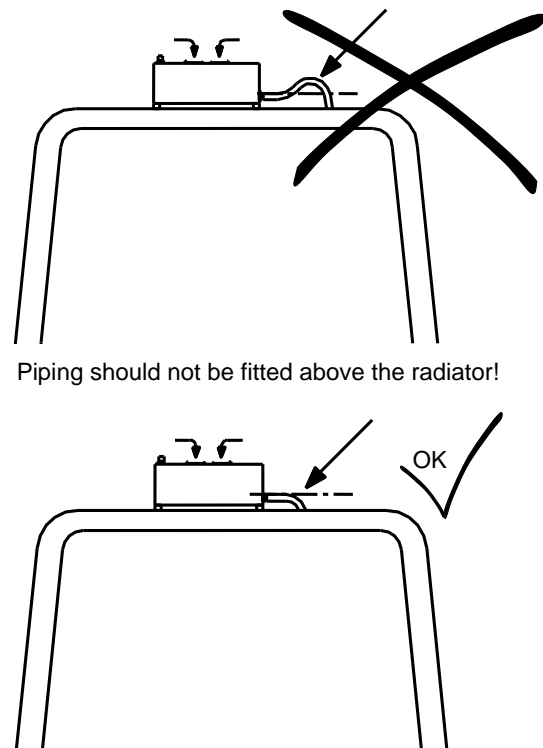


Figure 10: Air traps should be avoided

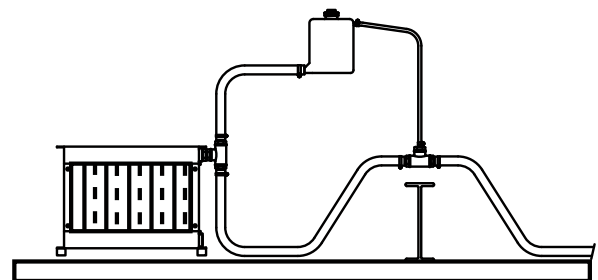


Figure 11: Ventilating an air trap

Special attention should be paid to the ventilation of the system. Each installation system 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.



Most cooling problems originate from air traps blocking the circulation of the engine coolant.

For the engine we use a pressurised system. The 12 mm connection on the top is closed. Wherever the radiator is mounted it is necessary to ventilate the exhaust manifold of the engine. The exhaust manifold has an 8 mm connection to ventilate the manifold. There is an 8 mm high pressure and high temperature resistant hose in the delivery to connect the hose connection on the side of the manifold with the expansion tank. (refer to figure 6).

Initially the engine cooling system can be filled via the cap on the exhaust manifold of the engine. However when the radiator is above the engine one can only fill the system to the level of the manifold. Additional filling has to be done via the expansion tank.

For large engine cooling systems with long pipes or for extra reserve there is an extra large expansion tank with a content of 7 litres and an alarm for low coolant level that can be supplied as an option (refer to figure 12).

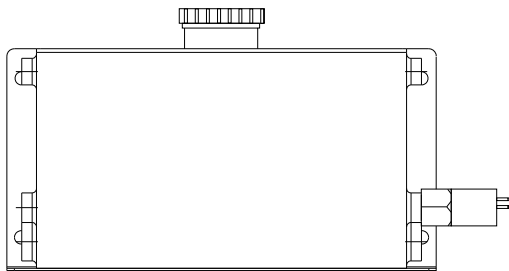


Figure 12:
7 litres optional expansion tank with low level alarm.

When mounting the radiator it is important to take care that the outgoing connection, which is the connection to the engine inlet, is on the top position (refer to figure 13 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.



The expansion tank must be fitted in the outlet of the radiator = the inlet pipe of the engine

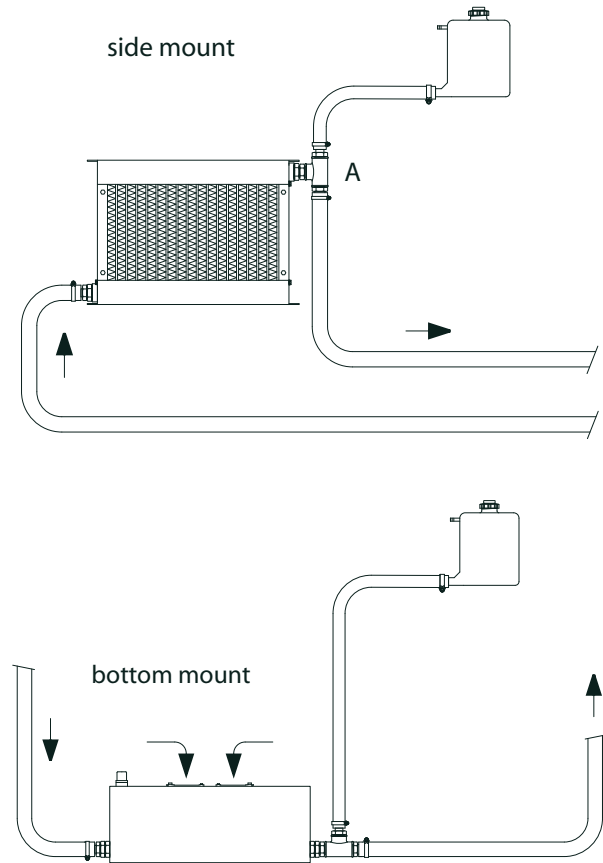


Figure 13:
Outgoing connection connected to the expansion tank

When both radiators are flat mounted on the roof, the expansion tanks should be mounted a little higher. (refer to figure 14 detail B).

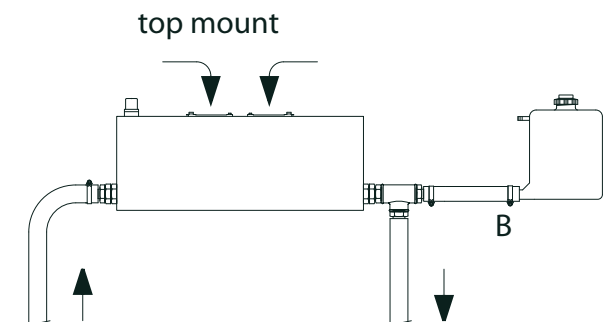


Figure 14:
Low profile radiator assembly on the roof



Most cooling problems originate from air traps blocking the circulation of the engine coolant.



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

2 HOW AND WHERE TO MOUNT THE RADIATOR

The radiator kit includes rubber mountings to prevent vibrations to be transferred to the body of the vehicle (figure 15). 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.

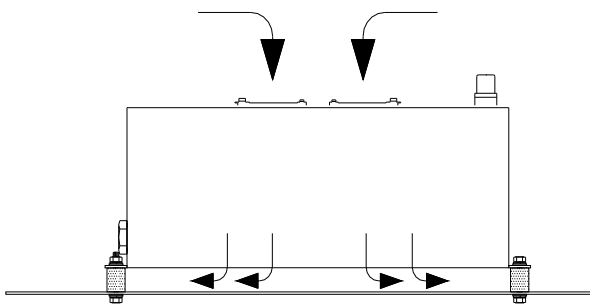


Figure 15. Radiator on rubber mountings

Bottom mounted radiators

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, which 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.



Measures have to be taken to prevent the hot air circulating and reducing the capacity of the radiators. Refer to figure 16

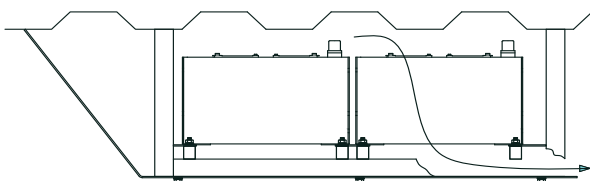


Figure 16: Bottom mounted radiators with shield

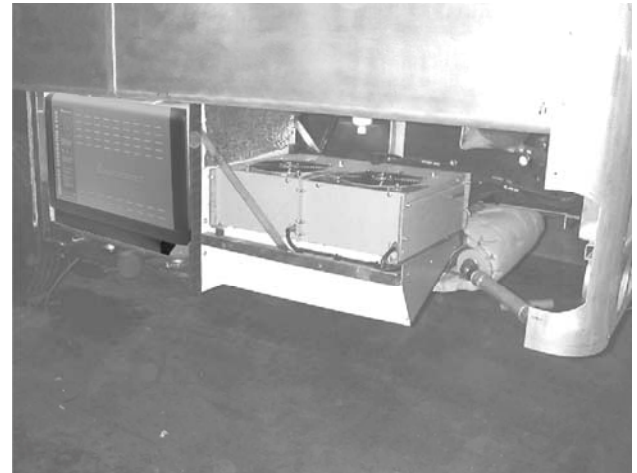


Figure 17. Making use of the space below the floor to get an optimal flow of air through the radiators.

Side mounted radiators

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 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.

A free flow of air should be guaranteed. The ventilation connection of the cooling system that goes to the expansion tank, should be in the outgoing coolant flow on top of the radiator.

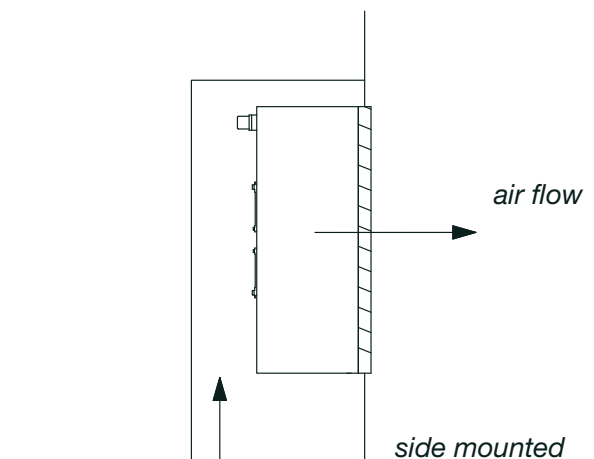


Figure 18: Side mounted radiator

Roof mounted radiators

The radiator on the roof is often the best option from the point of view of keeping the noise of the fans away from people and it will 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.

An other disadvantage is that the piping has to go through the roof which requires provisions to be waterproof. Also negative is that a roof mounted radiator is more sensitive for air traps (see figure 10). When having enough space it would be ideal to have the radiator vertically mounted on the roof. Note that the expansion tank should be above the radiator.

When having the radiator horizontally mounted on the roof (refer to figure 19) enough space (50 mm) should be between the roof and the radiator fan to have a free flow of air. When the radiator is roof mounted there should be protection against weather conditions. To avoid damage while the vehicle is driving at high speed, the use of a spoiler could be necessary.

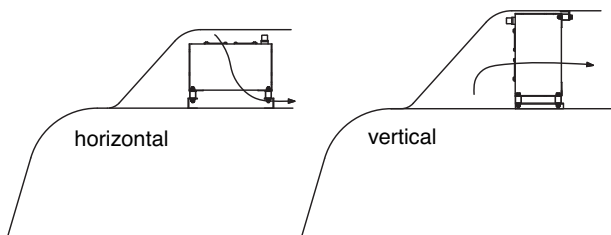


Figure 19: Two examples of a top mount radiator

3 TWO SPEEDS FAN (OPTIONAL)

To keep the noise as low as possible the fan of the radiator can run at two different speeds. As option a control box is available which can be used to drive the fan with two speeds, depending on the load of the generator. In normal mode the electric motor of the fan is powered by a low voltage and runs at low speed. This is achieved by means of a transformer. In this mode the fan almost produces no noise. Only when necessary - this is controlled by thermostat switches - the fan is switched to a higher voltage and will blow at full speed (refer to the connection diagrams in paragraph 4.5).

However, when not strictly necessary, we recommend using the standard fan control instead of the two speeds fan control, in order to keep the system as simple as possible.

2.5.3 Dry exhaust system

1 GENERAL REMARKS

A dry exhaust muffler system should be very effective in silencing the exhaust 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 cause the noise to be amplified. It is very difficult to take these factors into account.

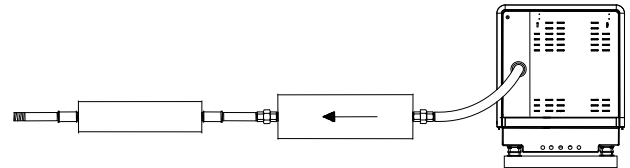


Figure 20: Dry exhaust systems on vehicles

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 through 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.

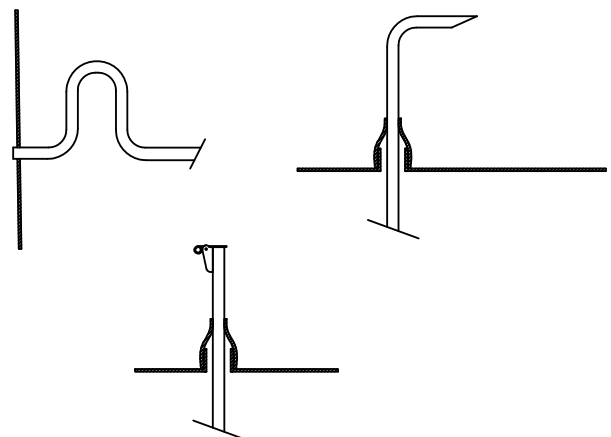


Figure 21. Ways to prevent water to get in

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 Rockwool around the pipes and seal it with aluminium tape.

2 THE STANDARD DRY EXHAUST SYSTEM

The standard exhaust system contains:

On the generator set:

- An insulated 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.

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

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 22 how to mount the rubber in a safe way. When any doubt an extra safe guard could be constructed from steel wire or chain.

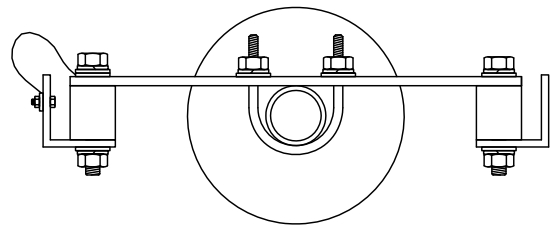


Figure 22: Mounting bracket in rubber with safe guard

2.5.4 Electrical 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 to the control panel prior to despatch from the factory. The engine is controlled by a very advanced microprocessor based system: Digital Diesel Control. The "black box" containing the microprocessor is located on top of the alternator.

A local control panel is on the generating set.

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 as well (refer to figure 23). If necessary an optional longer (up to 30m / 100ft) intermediate cable can be connected if the standard length does not suit the required distance. When a longer distance than 30m / 100ft is required, consult the Whisper Power service department for advice.

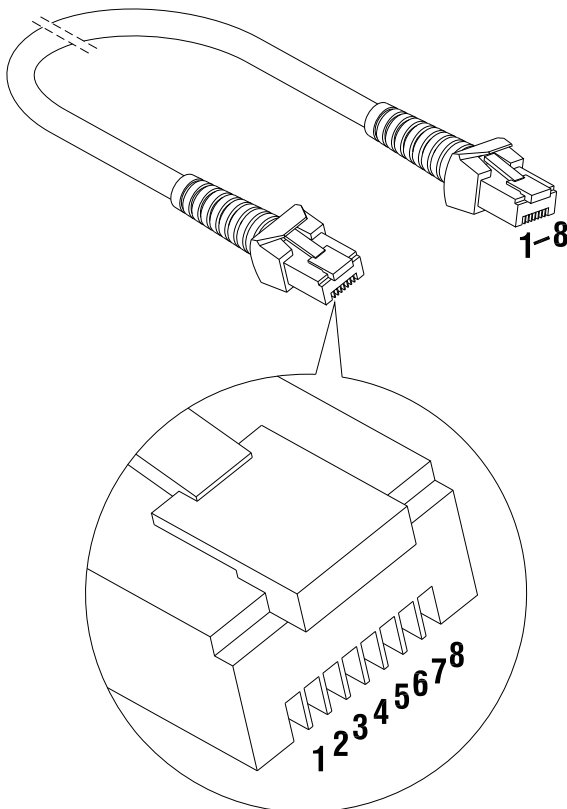


Figure 23 Remote control cable

One can mount the control panel after drilling a hole in the dashboard using the plastic cover. Refer to the dimensional drawings in chapter 4. The panel without the plastic cover fits the Mastervision modular panel system.

More remote control panels (slave panels) can be put in parallel by using the modular connectors on the back of the units. As a slave one can use the same panel offering all functions again. It is also possible to use an old or new type slave panel only to start and stop the generator. Old type remote panels and system panels can be connected by means of the green connector.

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 figure 24.

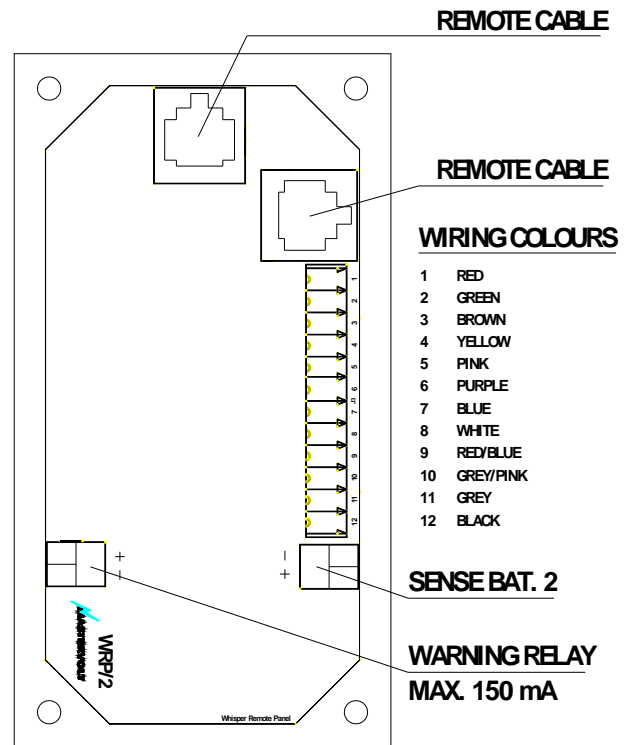


Figure 24 Remote box terminals

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 figure. 24.

Connection for emergency stop / fire alarm switch

To connect an emergency stop button or to stop the generator automatically in case of a fire alarm, you can use the bypass connection between fastons J7 and J18 on the backside of the local control panel. See figure 25. To do so, remove this bypass connection and then replace it

by an emergency switch or a potential free fire alarm switch with normally closed contacts

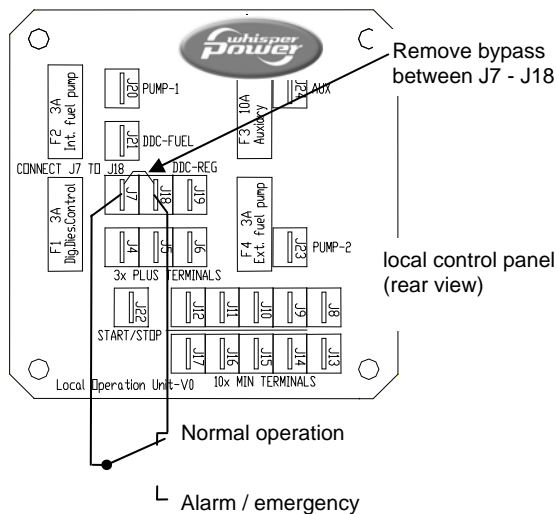


Fig. 25: Connection for emergency stop / fire alarm switch

Automatic starting and stopping



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 de-blocking and setting up this options refer to the APPENDIX of the DDC user's 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 figure 24. 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 Whisper generator set requires a 12V starter battery with the following capacity:

Model	Minimum capacity
W-SQ20	120Ah

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 vehicle engine and the domestic DC supply system completely separate and individually connected to separate batteries.

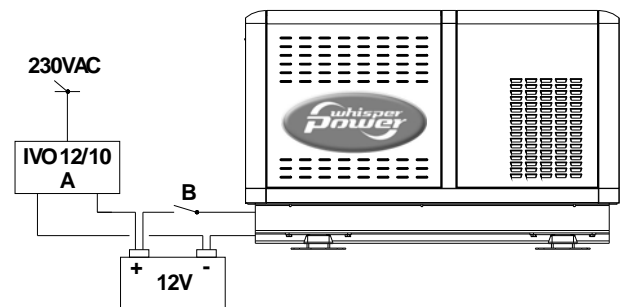


Figure 26 Starter battery

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

The above recommendation is not valid for vehicles having the starter battery of the vehicle engine or other auxiliary equipment positive grounded. When this is the case an expert should be consulted.

A battery switch may be used to interrupt the positive connection.

The starter battery is charged by the alternator on the engine. An additional battery charger will help to keep the battery in good condition when the generating set is not used.

A battery charger is not included in the standard supply. A high efficiency battery charging unit can be ordered from Whisper Power which is able to charge both the vehicles's main battery and the starter battery. Also a small charger can be used to charge the starter battery only, such as the

IVO SMART 12/10. A battery switch and a charger are included in the battery installation kits, art. no. 40230220 (160Ah)

3 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, fibreglas 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.



When two batteries are used in series to provide a 24 Volt supply system, never take off 12 Volt (starting) power from one of these batteries. This will result in severe damage to both batteries within a 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 may be 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.

2.5.5 AC power system (230 / 400 Volt)



The electric power supplied by the generator is of a high voltage and dangerous to people. Before working (installation) on the system read the sections on safety in the users manual.



Realise that people are not used to have 230/400 Volt 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 fulfill 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 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.

It is absolutely essential that each and every circuit in the electrical system is properly installed by a qualified electrician.

The W-SQ20 can be connected as a single phase 230 Volt generator by an arrangement of the wiring in double DELTA. When the wires are arranged in STAR the output will be 230/400Volt.

Connected as a three phase 230/400 Volt generator, 3x 400 Volt is available between the phases. At the same time 230 Volt is available between every phase and neutral.

When applying 3 phases the installation should be laid out in such a way that there is a reasonable balance of load between the three phases.

To avoid problems with unbalanced loads one could apply a 400V 3 phase to 230 Volt single phase transformer.

1 FUSE

An output fuse (between the generating set and the electrical installation) should be installed to protect the installed electrical system.

For the W-SQ20 the maximum single phase current at 230V is 108 Amps. Using three phases the fuses should be three times 36 Amps and mechanically connected. The fuses must be of the slow reacting type. For electrical motors connected to the system, a motor protection switch must be installed

2 GROUNDING

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" is 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.

Experts in this field should be consulted

3 CABLE

For the power cable we recommend the use of 3 wire single phase or 5 wire tri-phase oil resistant cable with a sufficient cross sectional area. One wire for earth is included. For long cables it is recommended to apply cables with a larger cross section (refer to ISO 13297 annex A)

4 TRANSFER SWITCH

A power source selector switch must be installed between the generating set and the vehicle'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 a land line to vehicle 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 clattering.

3 INSTALLATION SPECIFICATIONS

3.1 GENERAL

- 1 Install the generating set on the 4 anti vibration mounts. Use the template included in the shipment to drill the 8 mounting holes.

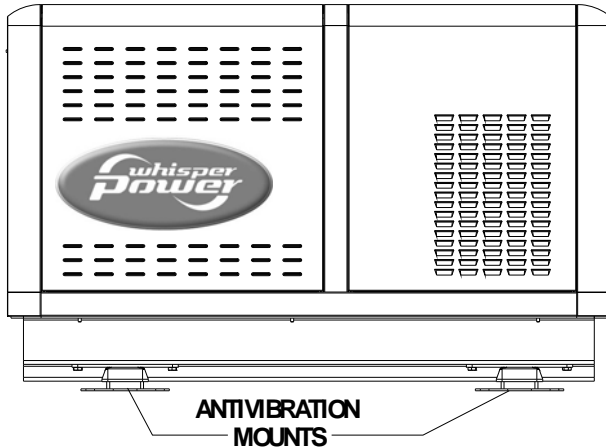


Figure 27: Anti-vibration mounts

- 2 Mount the cooling system for the engine
- 3 Connect exhaust system.
- 4 Connect 'fuel supply line' to the water separator/ fuel filter.
- 5 Connect 'fuel return line' to the fuel tank.
- 6 Connect remote panel (just plug in).
- 7 Connect the AC cable from the AC box to the power source selector.
- 8 Connect plus and minus from the 12V starter battery to the battery cables.
- 9 Connect the power supply of the radiators
- 10 Install a Whisper Power battery charger (optional).

3.2 COMMISSIONING TABLE

- 1 Check if the cooling system for the engine is properly installed. Note that air traps must be avoided.
- 2 Check if the exhaust system is properly installed. Check maximum length of exhaust hose, diameter of exhaust piping.

- 3 Check all coolant connections.
- 4 Check the AC cables and the grounding.
- 5 Check if an AC breaker is installed before or after the power source selector. When there is only a circuit breaker, use it to disconnect the generating set from the grid.
- 6 Check all DC connections, check if the battery switch/ circuit breaker is closed.
- 7 Open the fuel valve. Check if there are no air leaks in the fuel supply line, and check if the lift of the fuel is less than 1 meter. Check if there is no air in the water fuel separator.
- 8 Check if the air intake in the canopy is not blocked.
- 9 Check the oil level and colour of the oil. Check the coolant level of both the alternator cooling and the engine cooling.
- 10 To bleed the fuel system use the manual pump by turning the cap loose and pumping as long as necessary to bleed the system. See chapter 4.2.2 of the user's manual.
- 11 Start the engine by pushing the start button
- 12 Check when the generating set is running, the delay of 5 to 10 seconds in the power source selector transfer.
- 13 Check voltage and frequency under 'no load' conditions.
- 14 Check voltage and frequency under 'full load' conditions.
- 15 Check if the battery charger of the generating set is working (max. 14.5 Volt).
- 16 Close the sound shield and check the noise level.
- 17 Stop the generating set and check the engine again for leakages of oil, fuel or coolant.

Installation checklist available on our website: www.whisperpower.eu.

Commissioning form available on our website: www.whisperpower.eu.

3.3 TECHNICAL DATA

W-SQ20

Dimensions incl. sound shield.	126 x 68 x 80 cm (L x W x H)
Dimensions w/o. sound shield.	115 x 60 x 75 cm (L x W x H)
Weight incl. sound shield	580 kg
Weight w/o. sound shield	480 kg
Max. operation angle	25°
Remote panel 15 m cable	Digital Diesel Control System
Battery capacity min.	120 Ah
Fuel consumption	1 – 6 l/hr, load dependent
Lift fuel pump	Mechanical driven; manually priming
Max lift fuel pump	1m
Cooling	Radiator cooling
Minimum water supply	20-25 l/min
Alternator	synchronous brushless, maintenance free, air cooled
Voltage regulation	AVR
Output power at power factor $\cos \phi = 1$	25kW*, 230V or 230/400V 50Hz
Battery charger	alternator including regulator (50 Amps)

* Note that this value must be reduced by the power to drive the cooling fans of the radiators.

3.4 INSTALLATION MATERIALS

BATTERY INSTALLATION KIT 160 Ah

no	qty	article no	description	dimensions
51	1	42001600	Whisper Power AGM Battery 12V/160Ah	160Ah
52	1	43011000	battery charger IVO SMART 12/10	
53	1	48060100	battery terminal +	M8
54	1	48060200	battery terminal -	M8
55	1	48456902	isolation cap	
56	1	48456914	isolation cap	
57	1	49009005	battery switch	250 Amp
58	4	4503003508	cable connectors	M8x35
TOTAL		40230220	BATTERY INSTALLATION KIT 160 Ah	

FUEL KIT

no	qty	article no	description	dimensions
41	2	50221203	Straight coupling	8 mm
42	1	50230090	Fuel strainer/water separator	M14x1.5 mm
43	2	50221618	Parallel male stud coupling	M14 - 8 mm
44	2	50221644	Reducing male nipple	M14-M16 60 gr.
45	2	50221615	Hose connection	8 mm
46	2	50221616	Nut coupling	M16x1.5 mm
47	1	50221252	Nipple hose pipe	8 mm
48	4	50221522	Hose clamps	10-16 mm
49	2	50221632	Gasket ring	14x20x1.5 mm
TOTAL		40230205	FUEL KIT	

OPTIONAL INSTALLATION MATERIALS

no	qty	article no	description	dimensions
50	1	50222020	copper fuel pipe	6x8 mm
51	1	50220063	fuel hose	8x16 mm

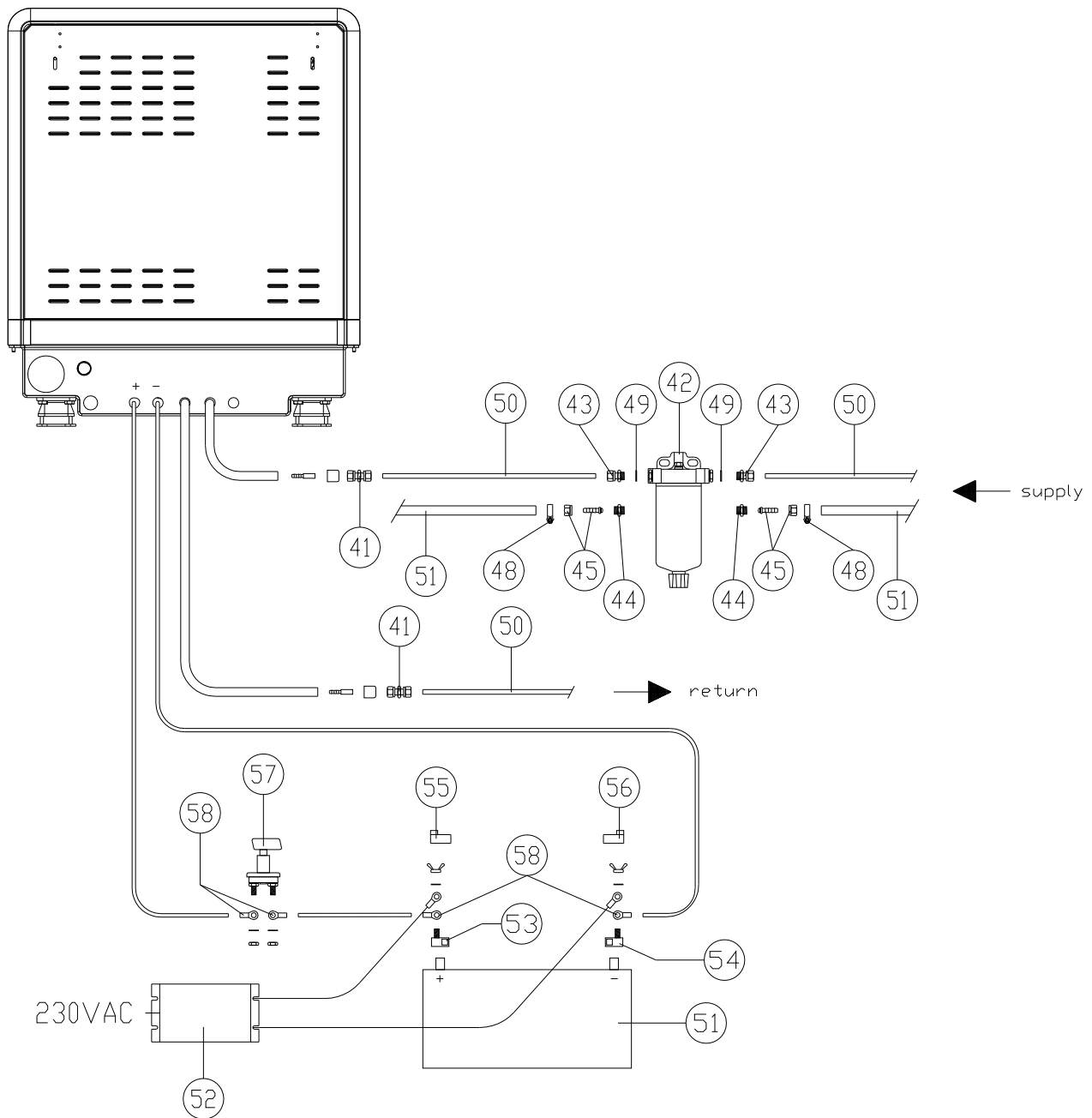


Figure 28. Installation materials battery and fuel kit

Included are all fittings to fit copper pipes 8 mm outer diameter or rubber fuel hoses 8 mm inner diameter, or both

RADIATOR COOLER KIT ENGINE 230VAC W-SQ20

no	qty	article no	description
1	1	50230511	Radiator AP 130EB 230 VAC
2	2	50221502	Hose clamp stainless 22-30
3	1	50221064	"Male nipple 1"
4	1	50221044	TEE-fitting-1"
5	2	50221014	Male hose connection 1"x35
6	1	50221103	"Straight reducer m/f 1"-3/4"
7	1	50221004	Male hose connection 3/4x20
8	1	50212409	Temperature switch 87-82 degr
14	6m	50220013	Cooling water hose smooth (1 1/4") 32x41mm
15	4	50221504	Hose clamp stainless 35-50mm
16	8	50221597	Hose support SP 45x20 mm galvanised
17	1	50230529	Bracket expansion tank for 50230531
17	1	50230531	Expansion tank 20 mm
17	1	50230532	Cap tank 0502 30531
18	1.5m	50220011	Cooling water hose smooth (3/4") 18x27mm
19	2	50221142	Straight reducer m/f 1 1/2"-1"
20	4m	50220005	Hose hydraulic 7.5x15mm
21	2	50221522	Hose clamp stainless 10-16mm
TOTAL		40201897	Radiator cooler kit engine 230VAC W-SQ20

RADIATOR COOLER KIT ENGINE 3x400VAC W-SQ20, Same as article no. 40201897, except:

no	qty	article no	description
1	1	50230512	Radiator AP 130EB 3x400 VAC
TOTAL		40201898	Radiator cooling kit engine 3x400VAC W-SQ20

OPTIONAL INSTALLATION MATERIALS

no	qty	article no	description
22	1	50230535	Expansion tank 7L + low level alarm switch

DRY EXHAUST KIT 2" for W-SQ20

no	qty	article no	description
61	1	50220067	Exhaust hose SS 500mm fem./male 2"
62	1	50220042	Insulation blanket 42x26 exhaust hose 2"
63	1	50230574	Absorption muffler steel 2"
64	1	50230575	Resonance muffler steel 2"
65	1	50230576	Insulation blanket muffler HD 2"
66	2	50221404	"Pipe nipple 2"x300mm galvanised"
67	2	50221424	Parallel male coupling 1 1/2" galvanised
68	2	50221414	Straight coupling f/f 2"galvanised
69	3	50221668	U-clamp 73 mm M10
70	3	50221664	Bracket U-clamp 25cm 48-60mm passivated
71	6	50211406	Washer SP M10
72	6	50211448	Washer spring SP M10
73	6	50211466	Nut hexogonal SP M10
75	1	50221476	Elbow 90 degr m/f gavalvanised 2"
76	2	50230577	End cover insulation blanket HD 2"
77	1	50230578	Insulation blanket muffler SDHD 2"
78	2	50230579	End cover insulation blanket SDHD 2"
TOTAL		40201889	DRY EXHAUST KIT 2" for W-SQ20

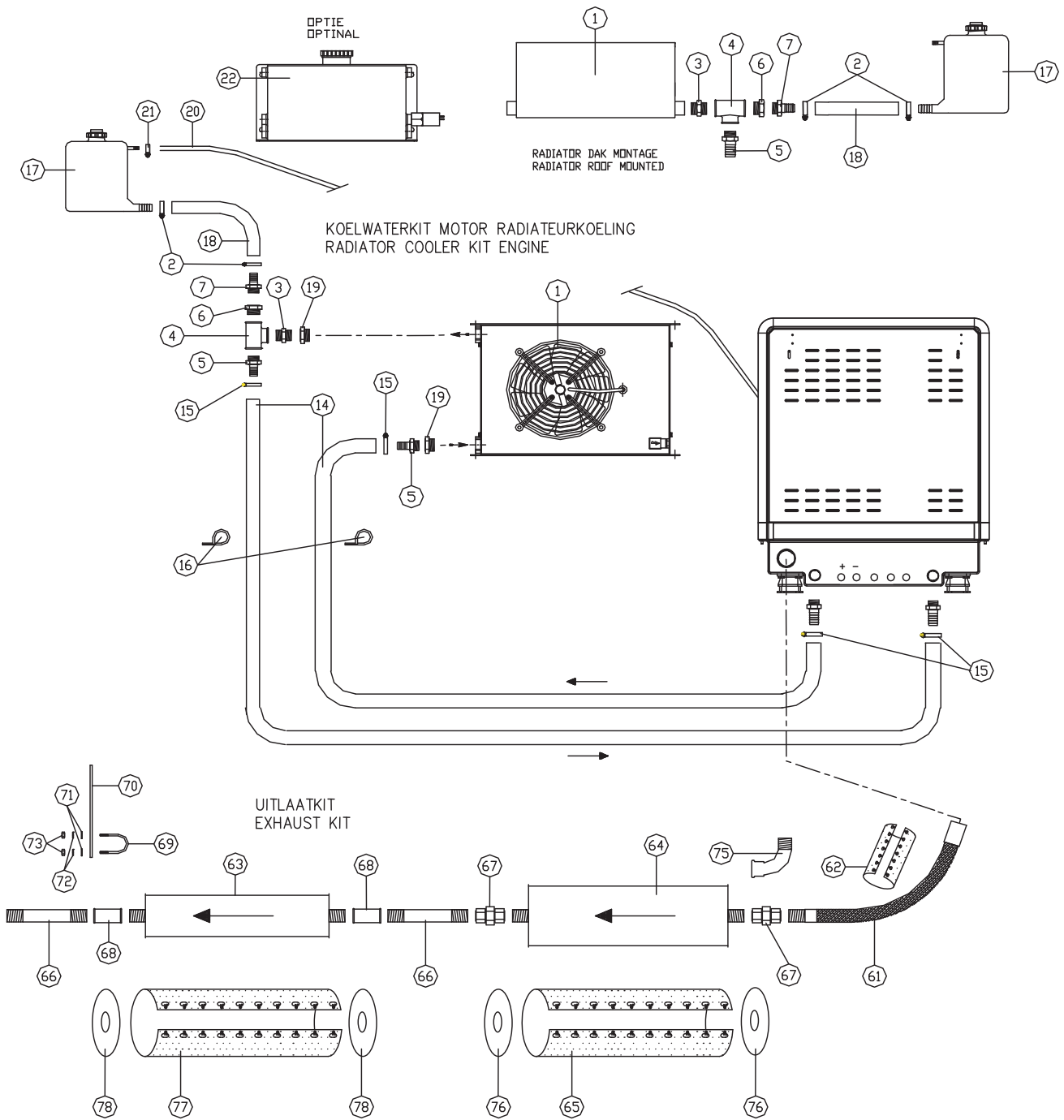


Figure 29: radiator cooling kit engine and exhaust kit

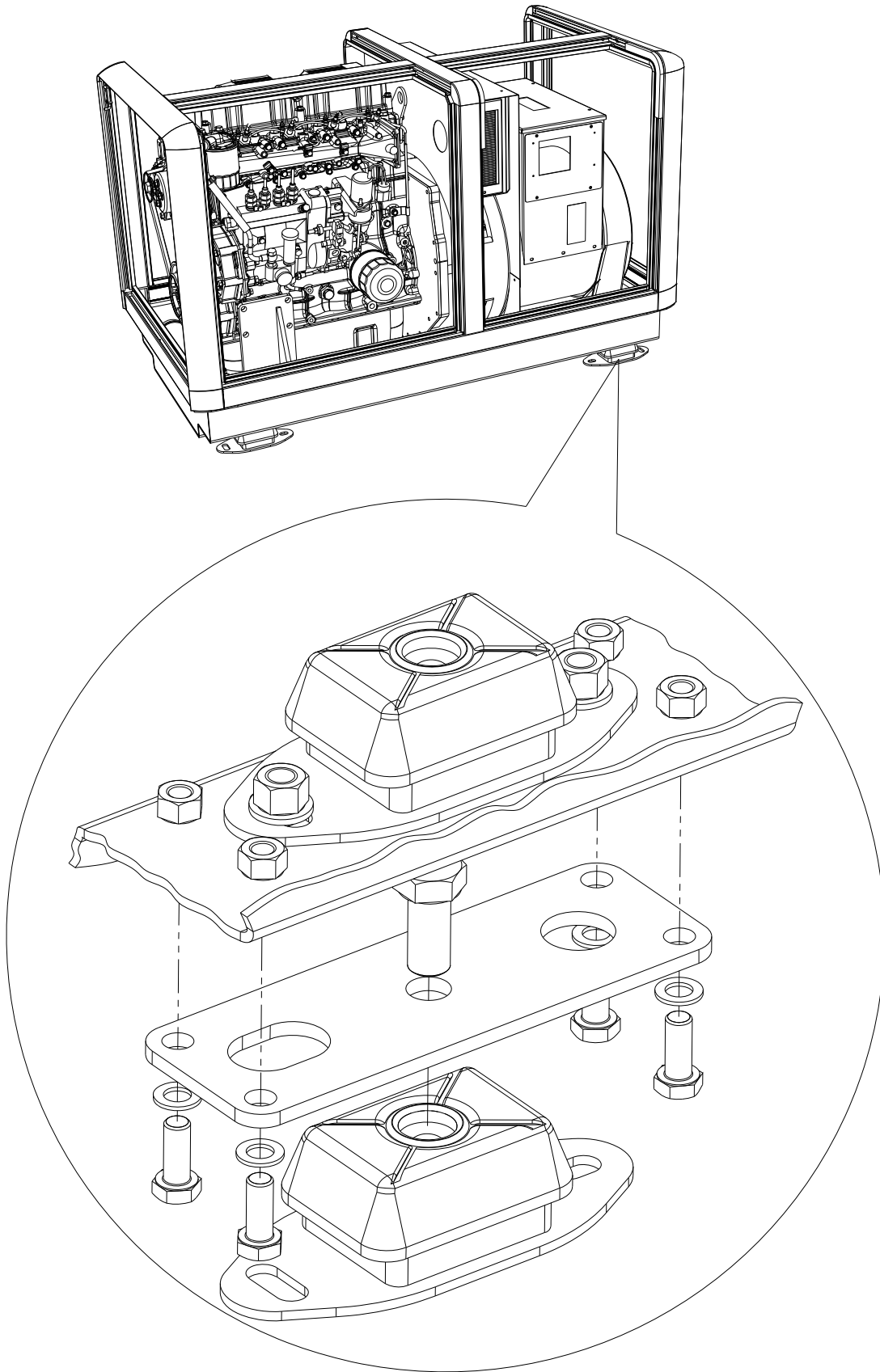


Figure 30: Installation materials rubber mounting kit

4 DIAGRAMS & DRAWINGS

4.1 LAYOUT GENERATOR CONTROL FOR W-SQ20 WITH 230VAC FAN

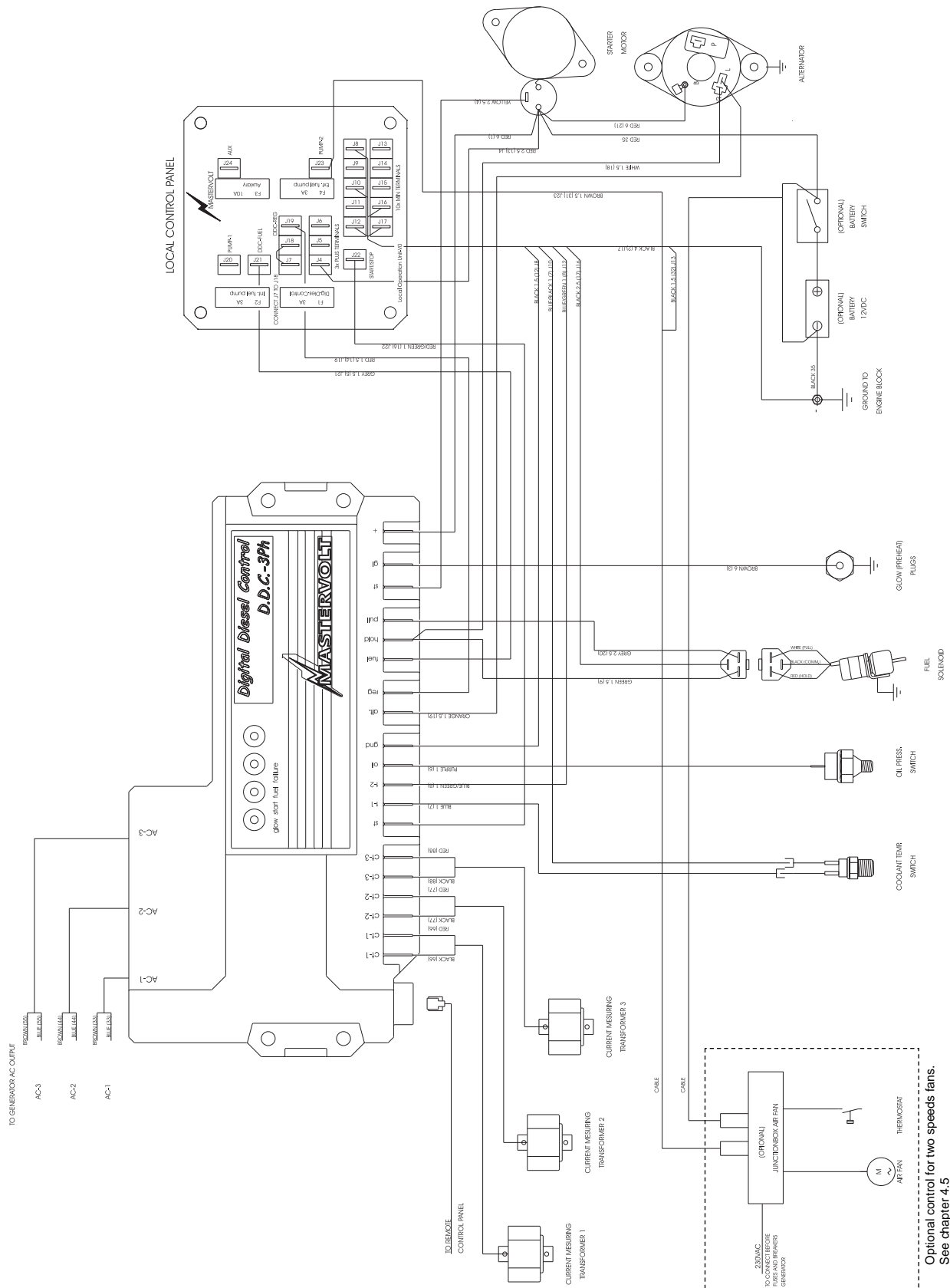


Figure 31: Layout generator control for W-SQ20 230VAC radiator fan

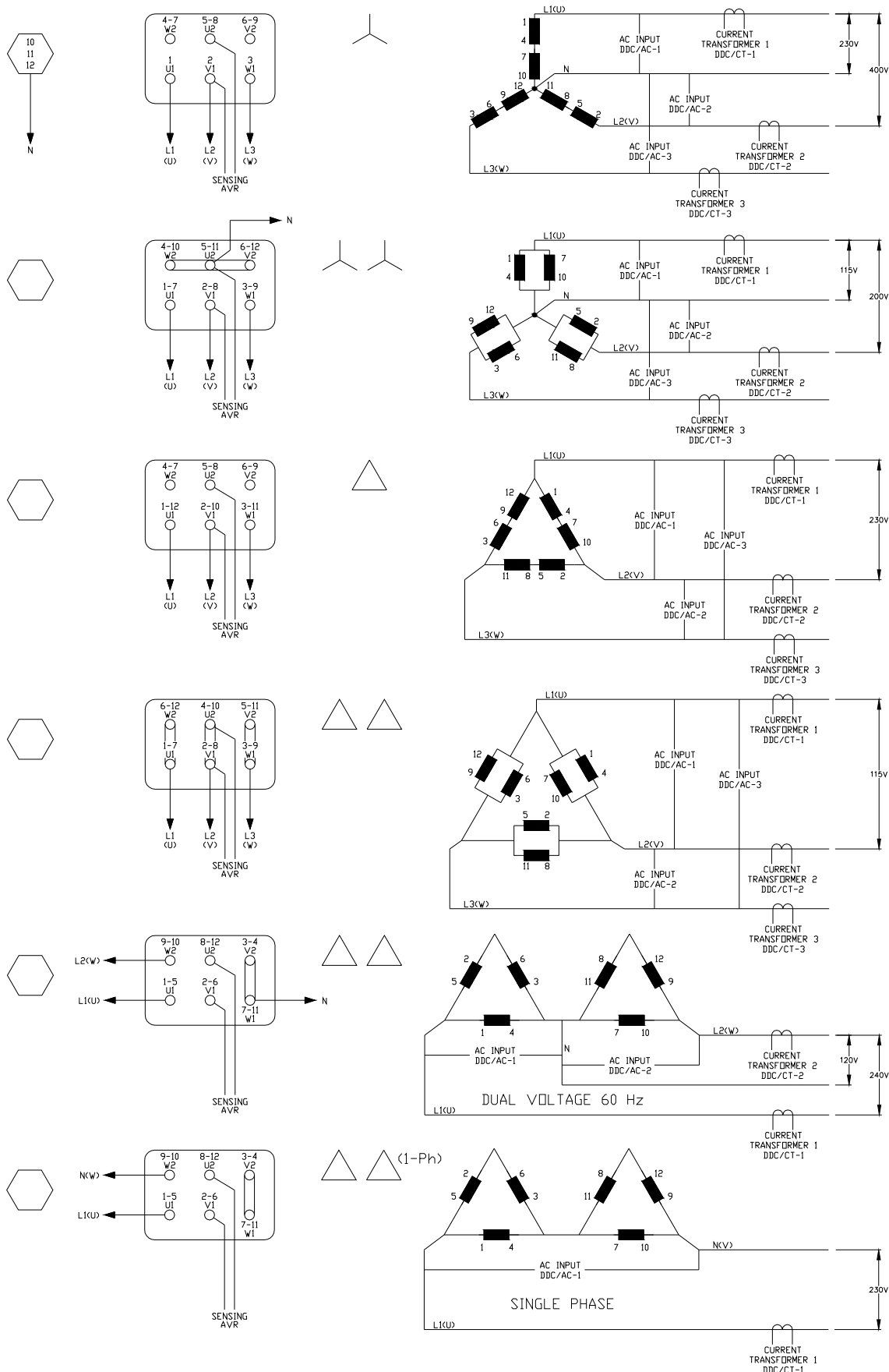
4.2 TERMINAL MODES 115VAC – 230VAC - 400VAC 50HZ


Figure 32 Terminal modes W-SQ20

4.4 AC WIRING DIAGRAM SINGLE PHASE WITH AVR 230V HZ (DOUBLE DELTA)

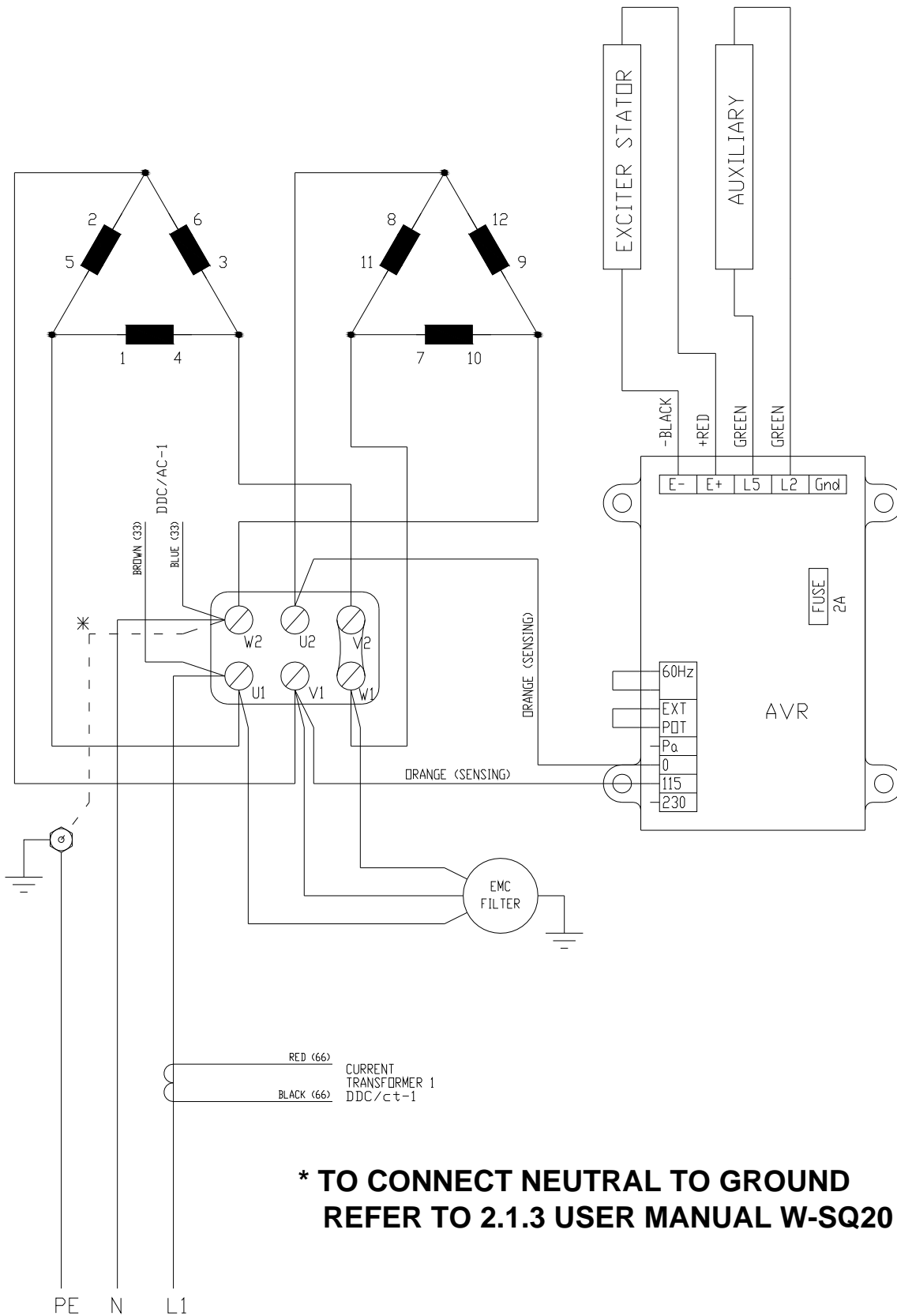


Figure 34: AC Wiring Diagram single phase with AVR 230V Hz (Double Delta)

4.5 ELECTRICAL DIAGRAM RADIATOR FAN CONTROL 230VAC

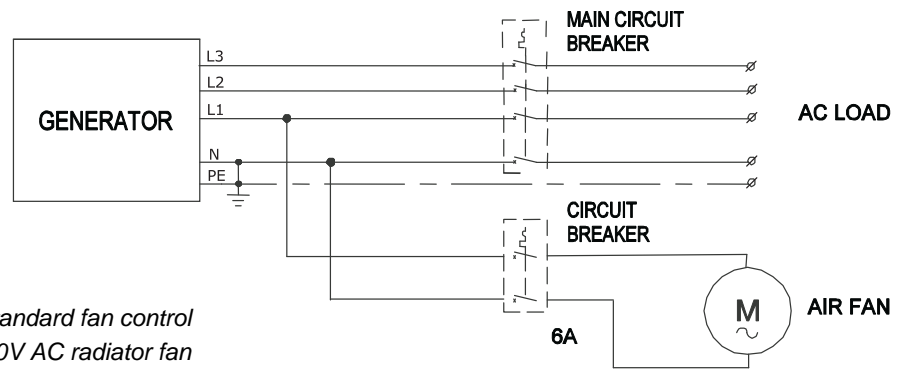


Fig. 35: Electrical diagram for standard fan control using a 230V AC radiator fan

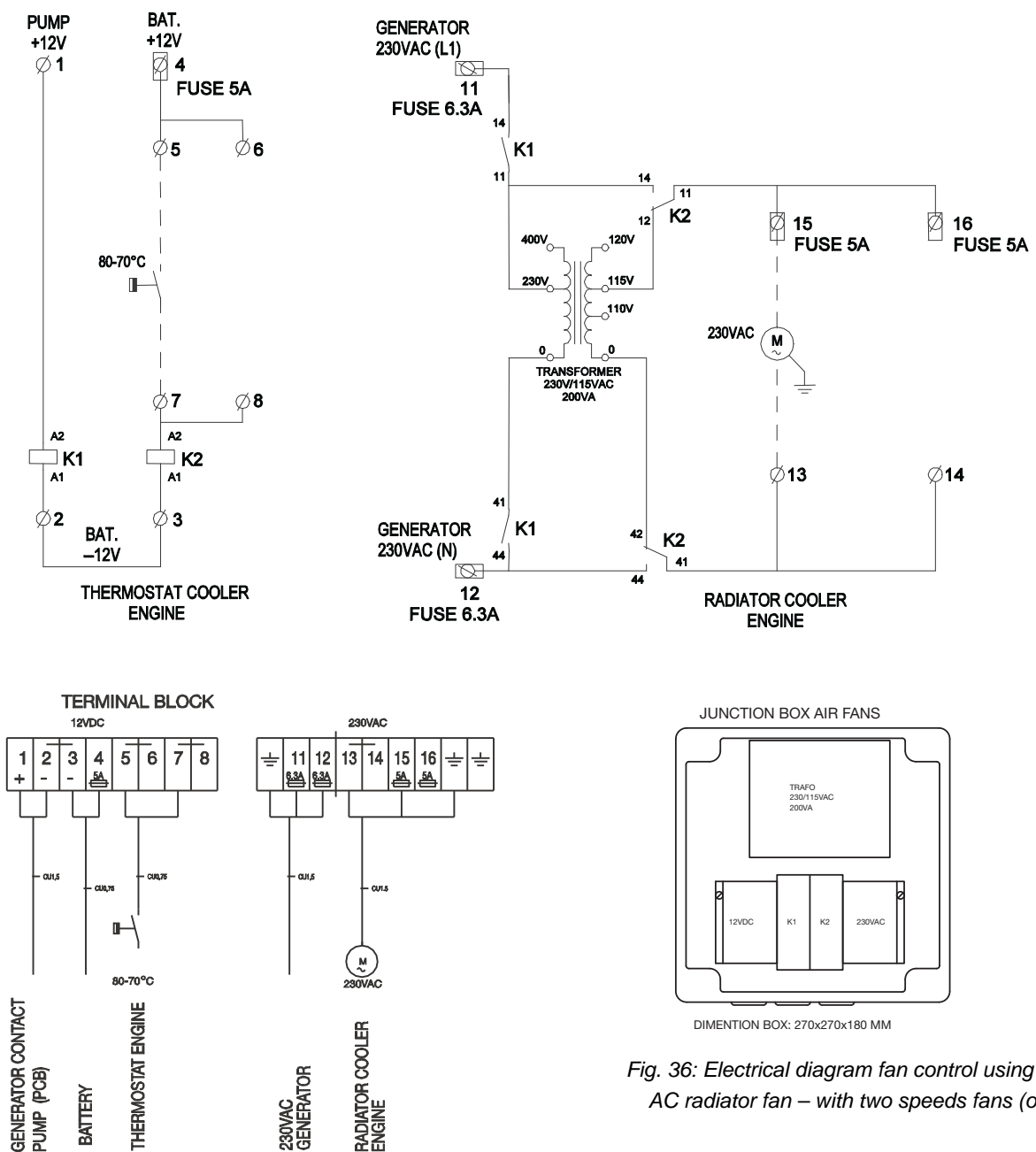


Fig. 36: Electrical diagram fan control using a 230V AC radiator fan – with two speeds fans (optional)

4.6 REMOTE CONTROL PANEL DRAWINGS

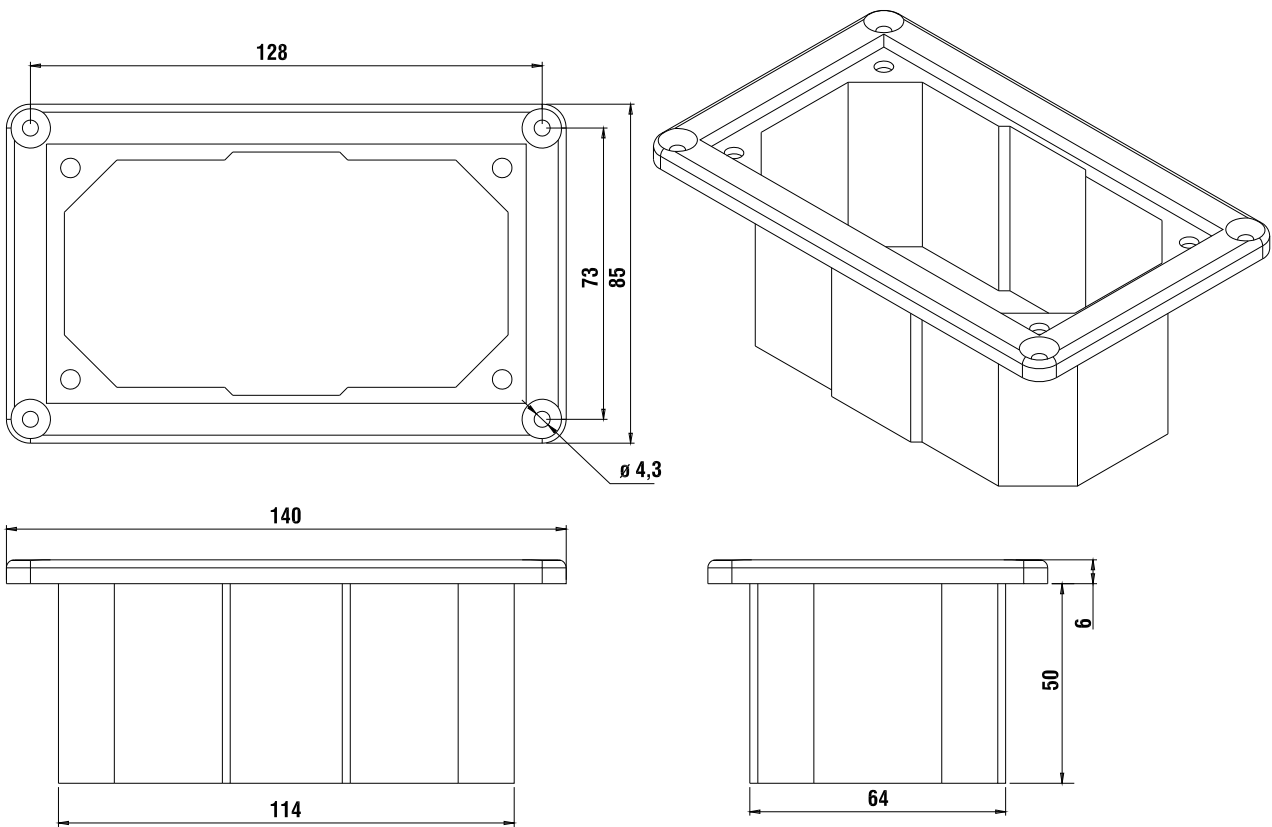


Fig. 37: Whisper remote panel

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

4.7 W-SQ20 DIMENSIONS AND FOOTPRINT

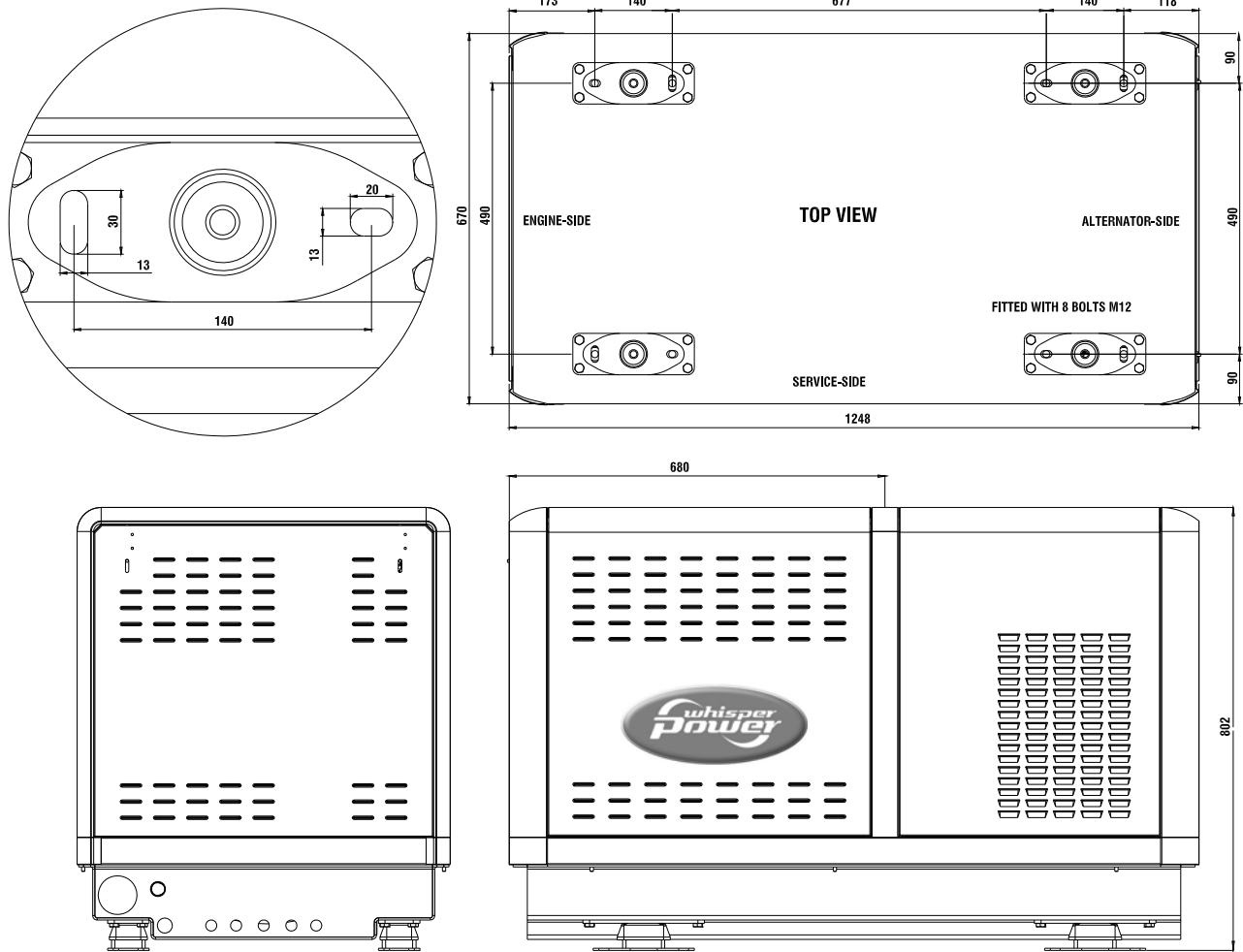


Fig. 38 W-SQ20 dimensions and footprint

CONNECTIONS W-SQ20:

• exhaust:	2"
• fuel hose:	8 mm
• coolant in/out:	Ø 35 mm
• battery +:	35 mm ²
• battery -:	35 mm ²

POWERCABLES

• W-SQ20 230V single phase (108 Amps)	3x25 mm ² (not included)
• W-SQ20 230/400V 3 phases (3x 36Amps)	5x6 mm ² (not included)

REMOTE CABLE (ALL MODELS)

- 8 wire communication cable, 15 meter (included).
- For longer lengths (max. 30 m), refer to Whisper Power service department

DIMENSIONS W-SQ20

	Incl. sound canopy	Without sound canopy
• length	126 cm	115 cm
• width	68 cm	60 cm
• height	80 cm	75 cm
• weight	580 kg	480 kg



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