INSTALLATION MANUAL FOR MOBILE APPLICATIONS

W-SQ12 / 16

- Three phase - 1500 RPM -

Mobile diesel generating set 230/400V-50Hz

Digital Diesel Control

Art.nr. 40200641

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1 INTRODUCTION

1.1 GENERAL

This installation manual applies to the installation of Whisper gensets in vehicles. This manual is valid for the following models:

Part number	Description
41107320	W-SQ12 230 / 400 Volt – Three phase / 1500rpm Mobile / keel cooling
41107326	W-SQ12 230 / 400 Volt – Three phase / 1500rpm Mobile / keel cooling -ungrounded
41108320	W-SQ16 230 / 400 Volt – Three phase / 1500rpm Mobile / keel cooling
41108326	W-SQ16 230 / 400 Volt – Three phase / 1500rpm Mobile / keel cooling -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. 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 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 of the W-SQ12 – three phase and W-SQ16 - three phase is cooled by a radiator with an electric (230V or 3x400V) driven fan. Note that the alternator of these generator sets 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 fibre glass nor plastic exhaust parts in a dry exhaust system as applied on vehicles.

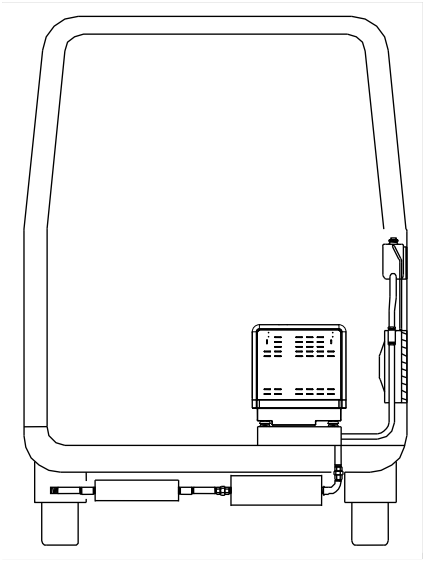


Figure 1: Typical vehicle application radiator side mounted

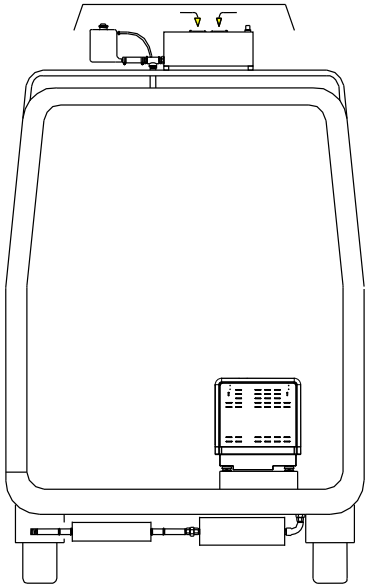


Figure 2: Typical vehicle application radiator top mounted

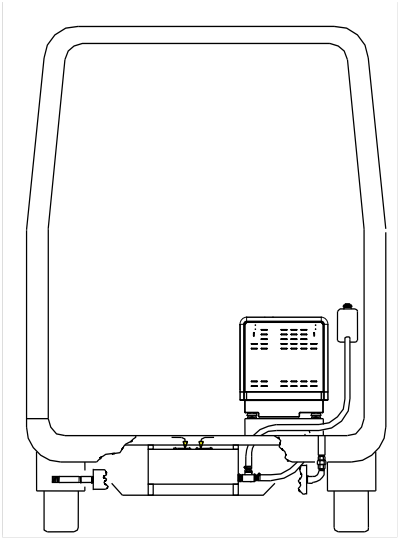


Figure 3: Typical vehicle application radiator bottom mounted

2 INSTALLATION

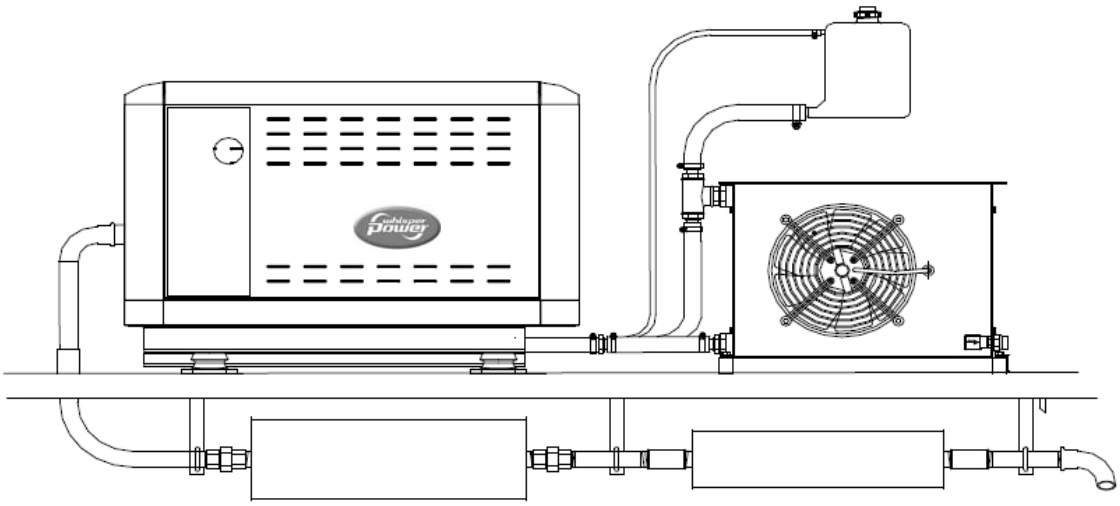


Figure 4: Schematic installation diagram

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. Oil filling can be done on the service side and on the top (except for W-SQ16 that has the oil filler cap only on top). Cooling liquid can be filled via the expansion tanks.
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 secured to the base frame by means of flexible engine mountings. This frame is mounted in the vehicle with additional vibration dampers.
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

The generating set normally draws air from the engine compartment. Engine compartment 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 100 cm2 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 40°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 15ºC 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. As an extra precaution, the fitting of a cowl ventilator with a cover box located as high as possible, is recommended.

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.

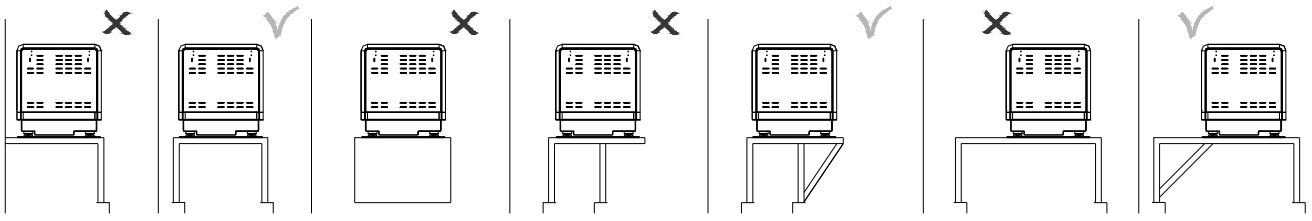
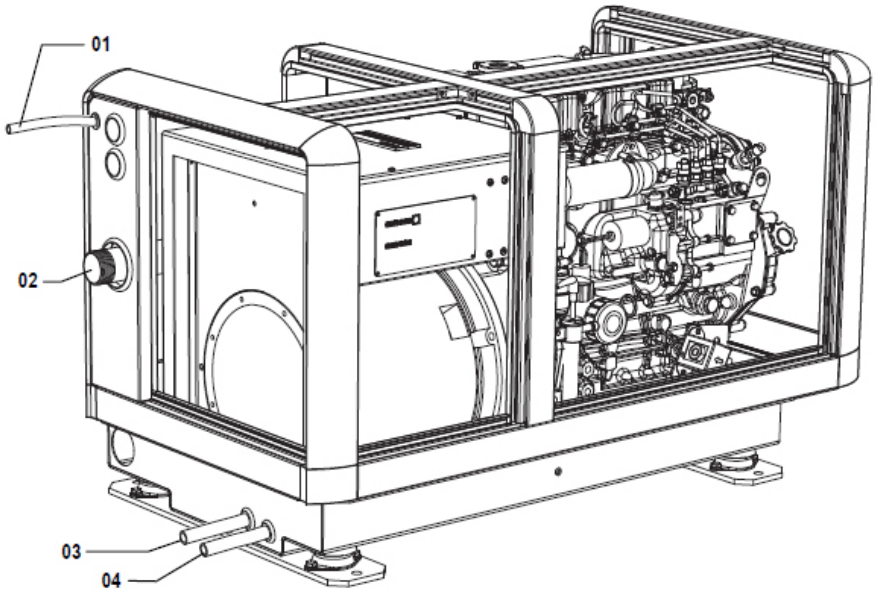
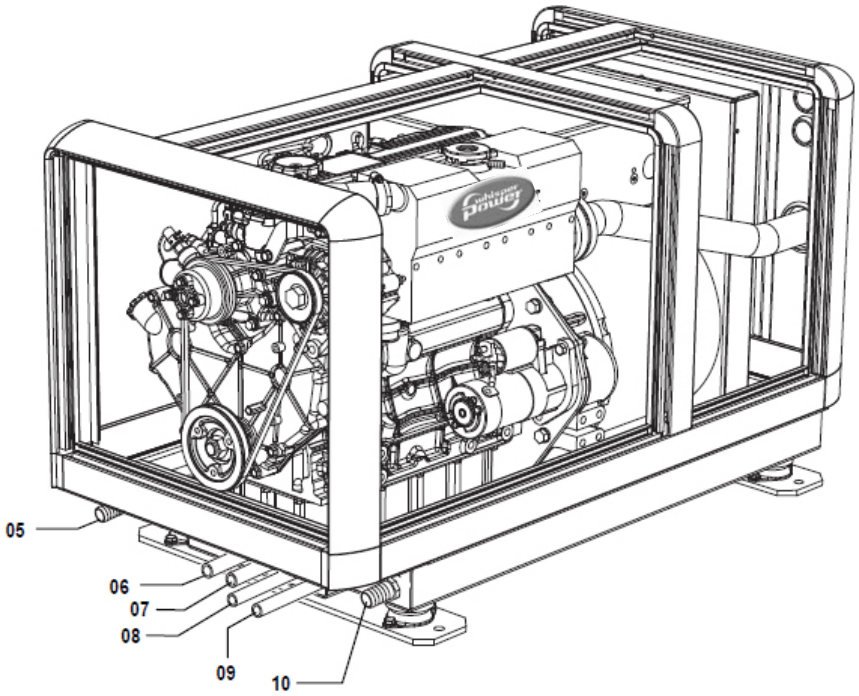


Figure 5: Mounting of the Whisper generating set. X = wrong, V = OK



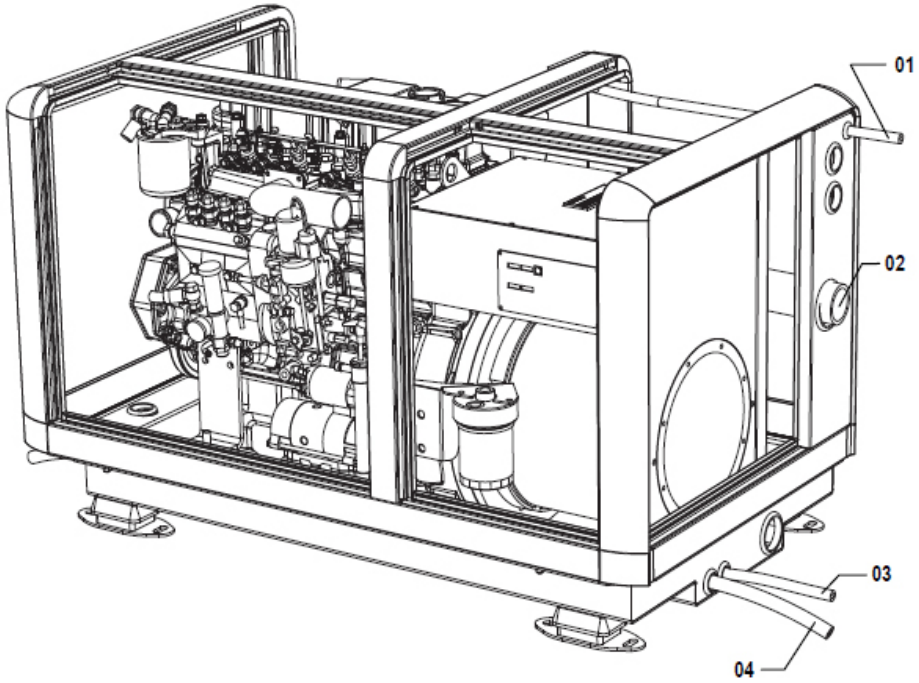
01 Expansion tank Ø8mm
02 Exhaust 1½”
03 Remote control
04 AC power output

Figure 6a: Connections W-SQ12 Three Phase



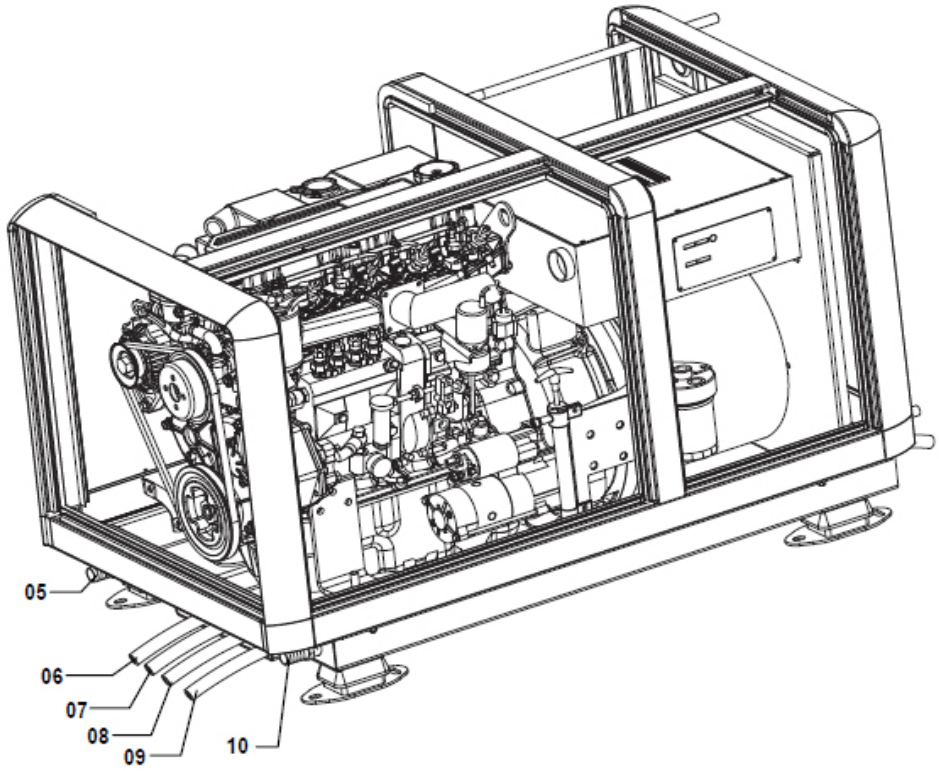
05 Coolant engine in
06 Battery positive (+) 25mm2
07 Battery negative (–) 25mm2
08 Fuel in Ø8mm
09 Fuel out Ø8mm
10 Coolant engine out

Figure 6b: Connections W-SQ12 Three Phase



01 Expansion tank Ø8mm
02 Exhaust 1½”
03 Remote control
04 AC power output

Figure 7a: Connections W-SQ16 Three Phase



05 Coolant engine out
06 Fuel in Ø8mm
07 Fuel out Ø8mm
08 Battery positive (+) 35mm2
09 Battery negative (–) 35mm2
10 Coolant engine in

Figure 7b: Connections W-SQ16 Three Phase

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 9. The maximum suction height is 1 m. The W-SQ16 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. 50201062). 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 fig. 10) 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 (Art. No. 50202200).

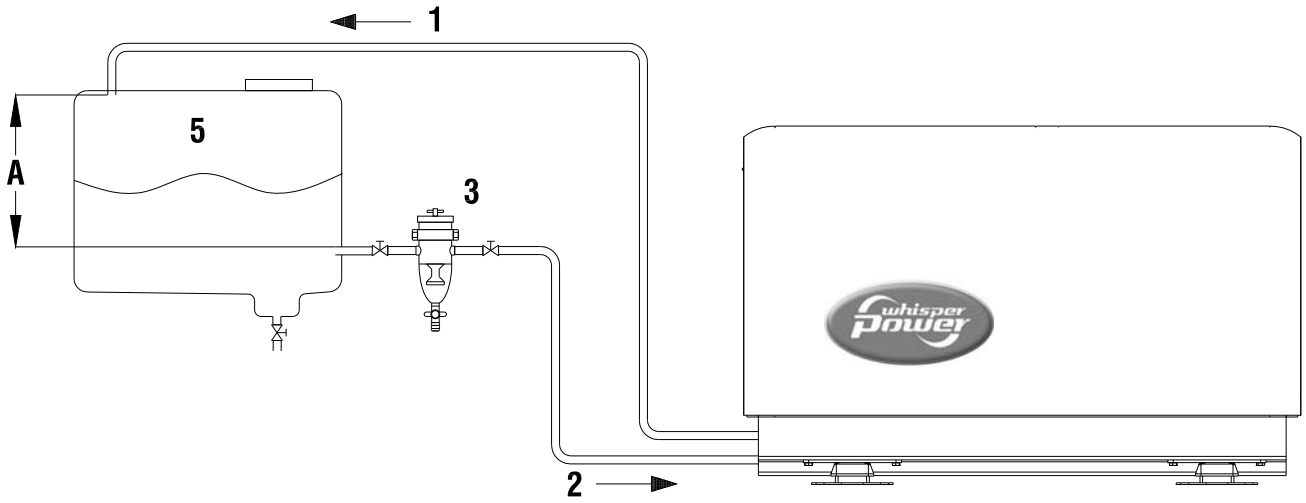


Fig. 8: Fuel supply (fuel tank is above the generating set)

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

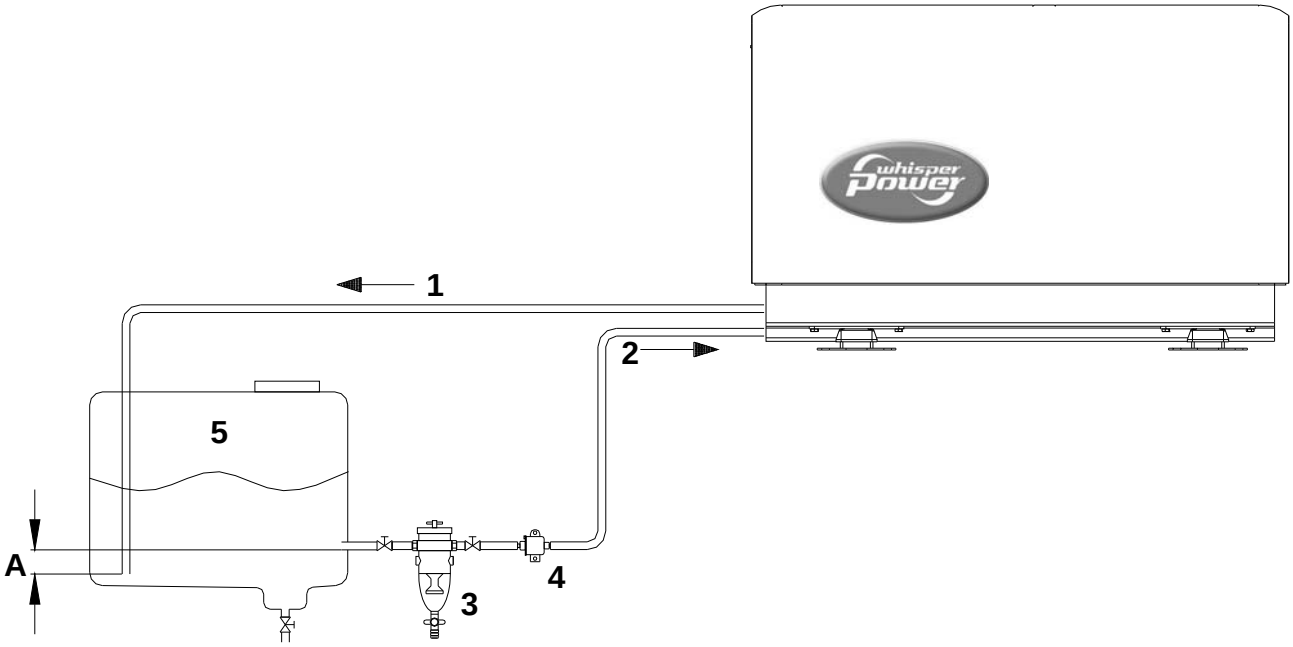


Fig. 9: Fuel supply (fuel tank is below the generating set)

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

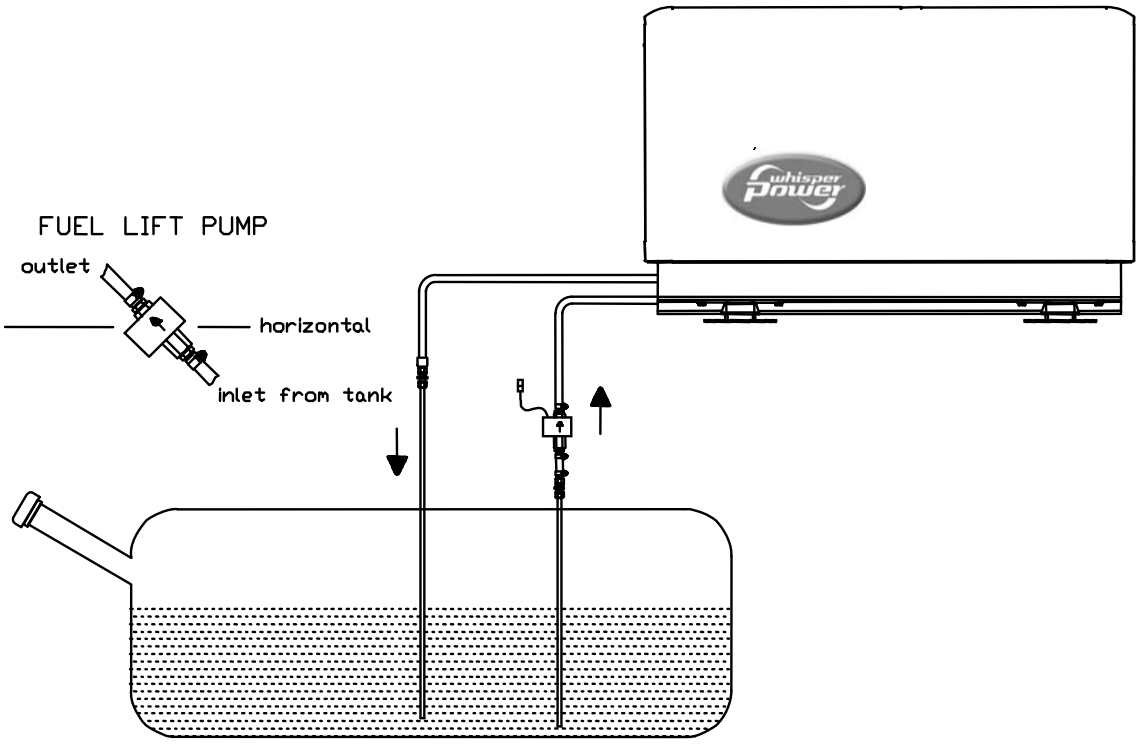


Figure 10: Fuel line assembly with vertical mounted pump and fuel lift pump mounted in an angle

3 FUEL PIPES

When the tank is above the generating set (figure 8) 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 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.

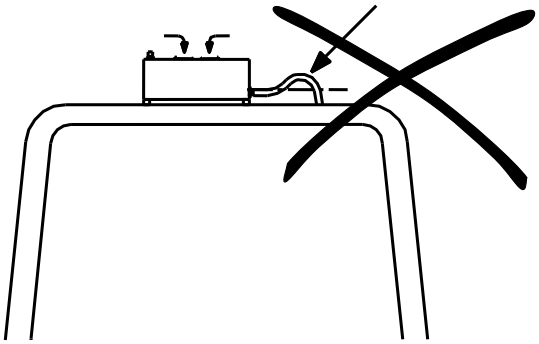
4 FUEL FILTERS

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 radiators can be mounted below the floor, in the side or on the roof of the vehicle. Wherever the radiators are 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 11). Bents in the piping, that can trap air bubbles, should be avoided or ventilated (refer to figure 12).



Piping should not be fitted above the radiator!

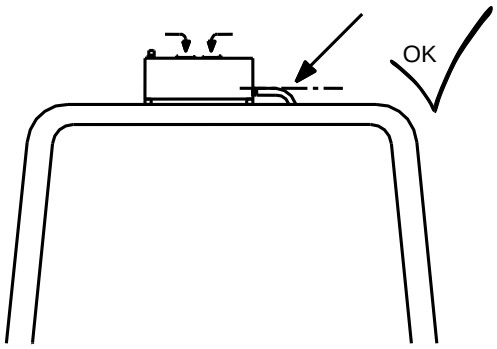


Figure 11: Air traps should be avoided

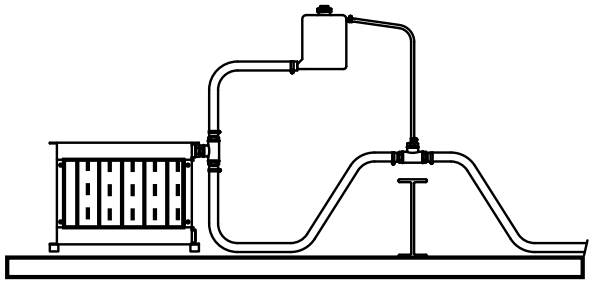


Figure 12: Ventilating an air trap

Special attention should be paid to the ventilation of the systems. 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 radiators are mounted it is necessary to ventilate the exhaust manifold of the engine. The exhaust manifold has a 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 6a and 7a).

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 13).

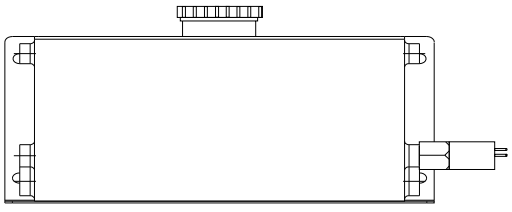


Figure 13:
7 litres optional expansion tank with low level alarm.

When mounting the radiators 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 14 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.

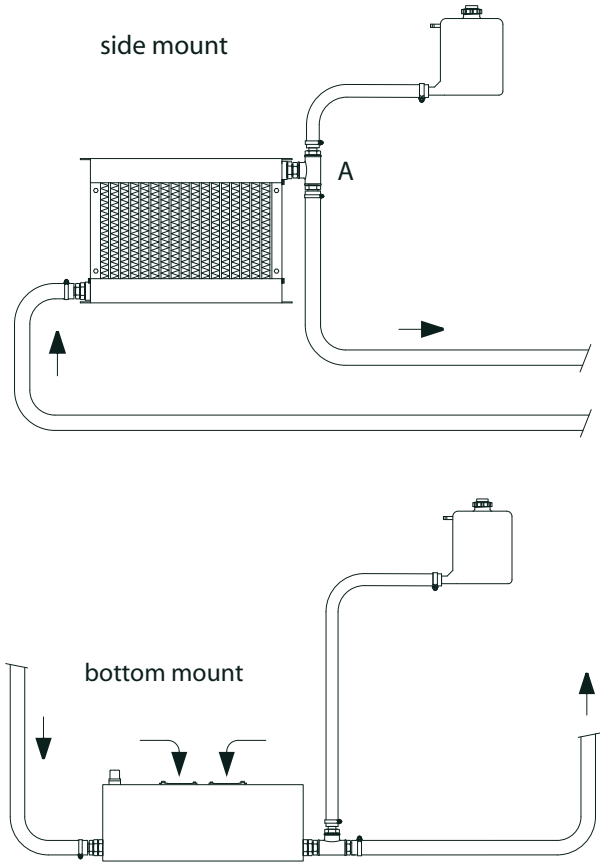


Figure 14:
Outgoing connection connected to the expansion tank

When the radiator is flat mounted on the roof, the expansion tank should be mounted a little higher. (refer to figure 15 detail B).

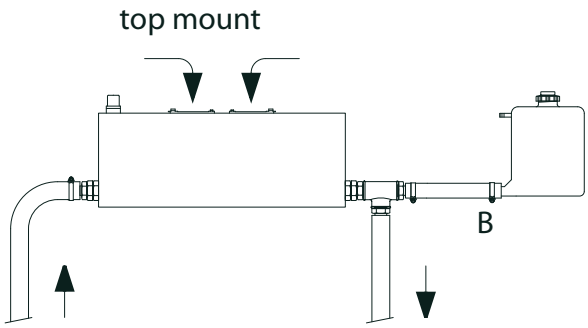


Figure 15:
Low profile radiator assembly on the roof

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 from Whisper Power.

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 (fig. 16). 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.

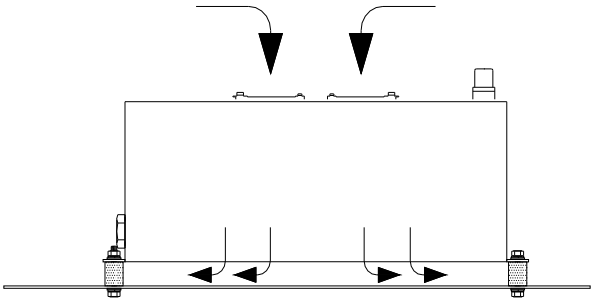


Figure 16: Radiator on rubber mountings

Bottom mounted radiator

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 17.

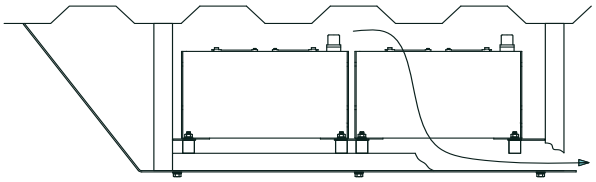


Figure 17: Bottom mounted radiators with shield

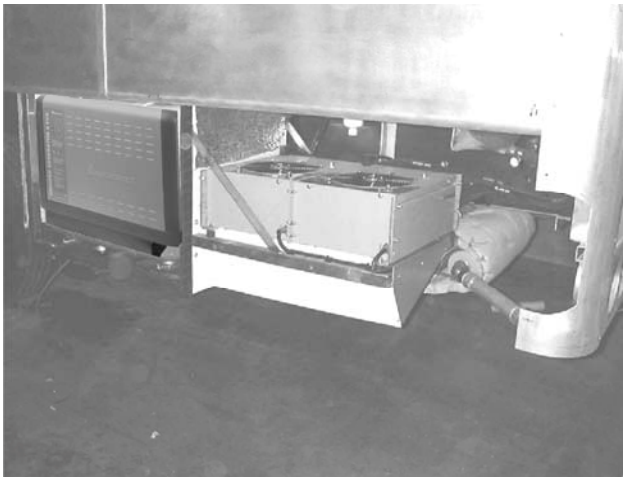


Figure 18: Making use of the space below the floor to get an optimal flow of air through the radiator.

Side mounted radiator

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.

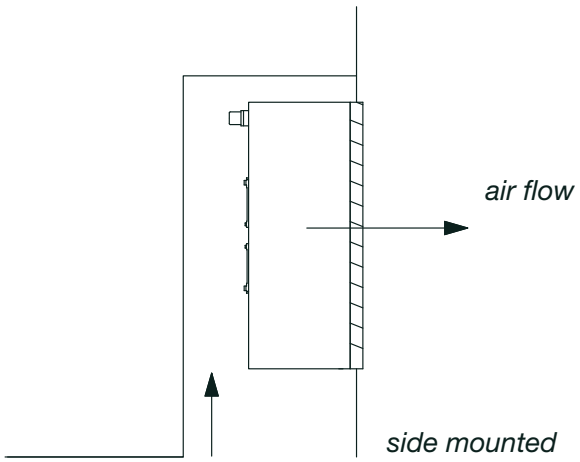


Figure 19: Side mounted radiator

Roof mounted radiator

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 roof mounted radiators are more sensitive for air traps (see figure 11). When having enough space it would be ideal to have the radiators 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 20) enough space (50 mm) should be between the roof and the radiator fan to have a free flow of air. When the radiators are 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.

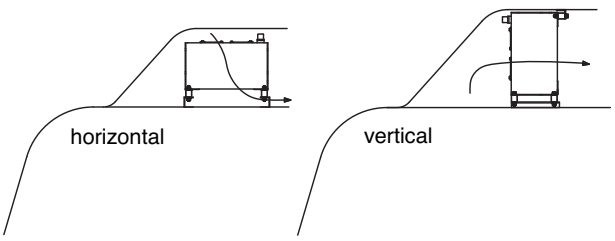


Figure 20: Two examples of top mount radiators

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.

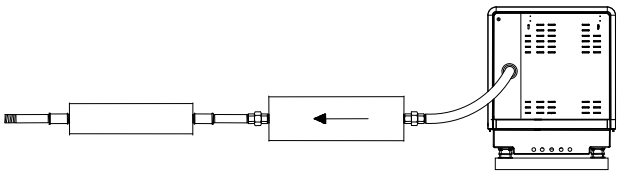


Figure 21: Dry exhaust systems on vehicles

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.

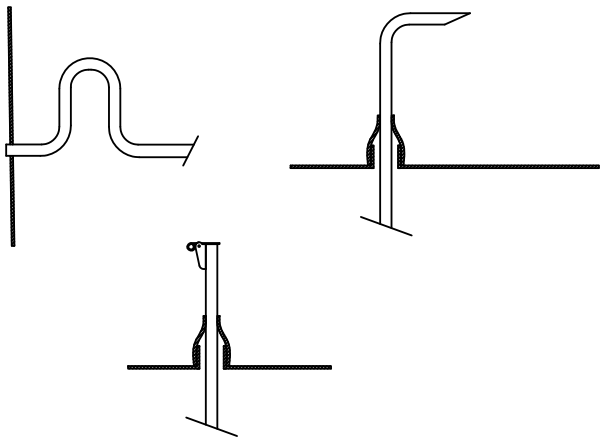


Figure 22: Ways to prevent water to get in

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

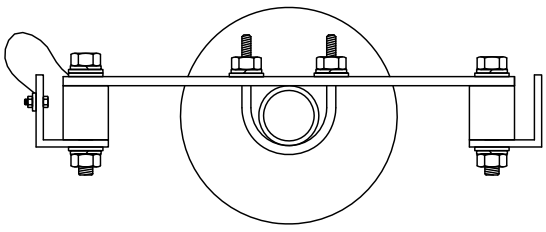


Figure 23: Mounting bracket in rubber with safe guard

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 fig. 24). 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.

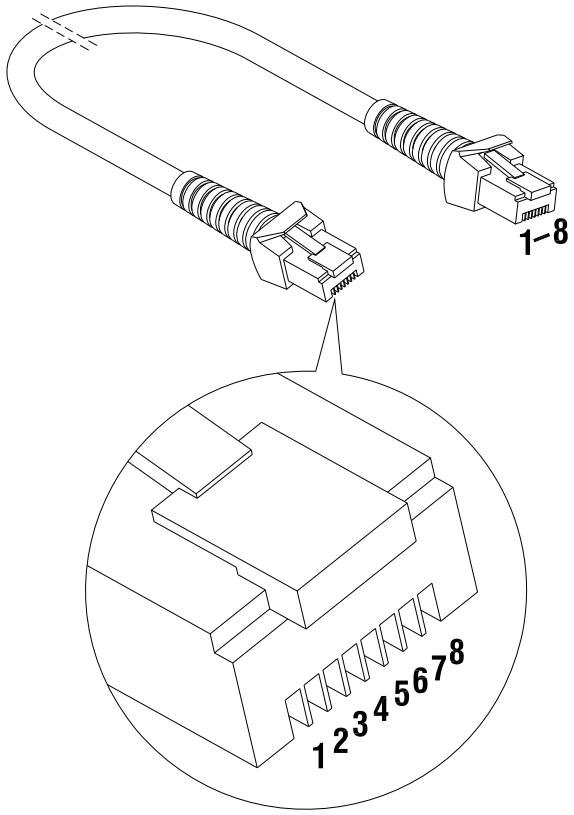


Fig. 24: Remote control cable

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 fig. 25.

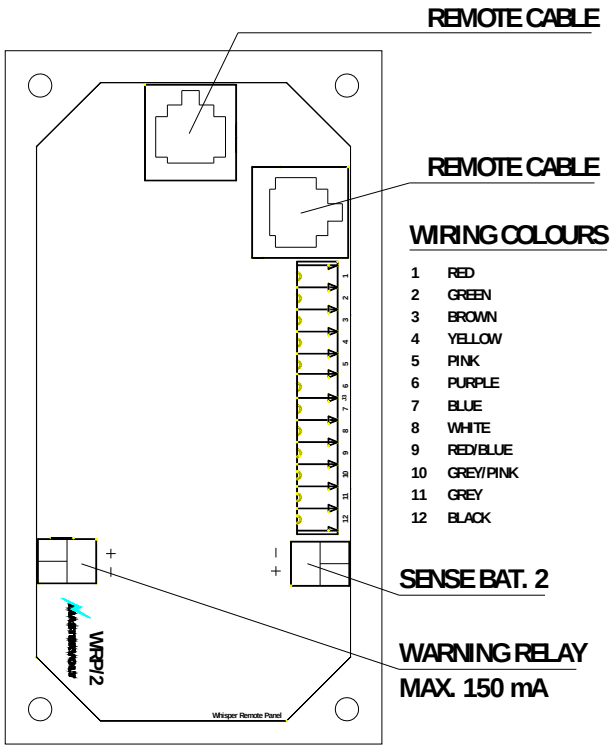


Fig. 25: Remote box terminals

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 fig. 25.

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 fig. 26. 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.

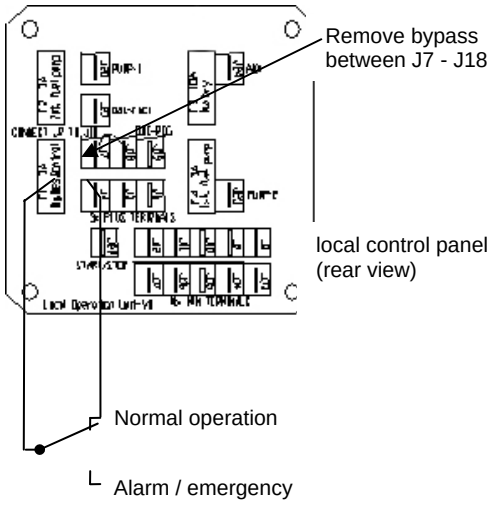


Fig. 26: Connection for emergency stop / fire alarm switch

Automatic starting and stopping

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.

In the delivery are warning stickers to stick on several parts of the electric installation (transfer switch, distribution box, etc.) to warn for automatic start).

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 fig. 29. 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 requires a 12V starter battery with the following capacity:

Model	Minimum capacity
W-SQ12	70Ah
W-SQ16	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.

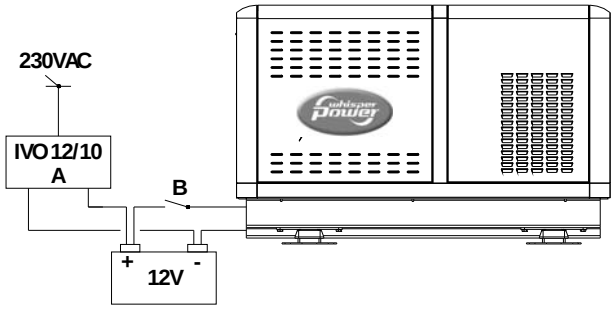


Fig. 27: Starter battery

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. 40230210 (70Ah) or 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, 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.

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 hat people are not used to have 230/400Volt 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 AC wiring of the W-SQ12 – three phase and the W-SQ16 – three phase can be arranged as STAR configuration (230 / 400 V AC / 50 Hz) or a DELTA configuration (230 V AC / 50 Hz)
When connected as a STAR configuration, 3x 400 Volt is available between the phases. At the same time 230 Volt is available between every phase and neutral. When connected as a DELTA configuration 3x 230 Volt is available between the phases. See chapter 4 for electrical wiring diagrams.
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.

1 FUSE

Output fuses (between the generating set and the electrical installation) should be installed to protect the installed electrical system. The following maximum output current applies for each separate phase:

Model	Maximum output current
W-SQ12 Three Phase	3 x 14 Amp
W-SQ16 Three Phase	3 x 17 Amp

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 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 much 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.

WARNING

In all situations the transfer switches between shore, inverter and generator should switch all connections, the phase lines (L1, L2, L3) as well as neutral (N).

3 INSTALLATION SPECIFICATIONS

3.1 GENERAL

1 Make a hole for combustion air in the sound shield. Mount an air inlet filter (if required)
2 Mount the generating set directly, without additional vibration dampers, on a solid surface.
3 Mount the cooling system for the engine
4 Connect exhaust system.
5 Connect 'fuel supply line' to the water separator/ fuel filter.
6 Connect 'fuel return line' to the fuel tank.
7 Connect remote panel (just plug in).
8 Connect the AC cable from the AC box to the power source selector.
9 Connect plus and minus from the 12V starter battery to the battery cables.
10 Connect the power supply of the radiators.
11 Install a Whisper Power battery charger. (optional)

3.2 COMMISSION TABLE

1 Check if a hole for combustion air intake is in the sound shield. Also check if an air inlet filter for combustion air is necessary and has been installed
2 Check if the cooling system for the engine is properly installed. Note that air traps must be avoided.
3 Check if the exhaust system is properly installed. Check maximum length of exhaust hose, diameter of exhaust piping.
4 Check all coolant connections.
5 Check the AC cables and the grounding.
6 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.
7 Check all DC connections, check if the battery switch/ circuit breaker is closed.
8 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.
9 Check if the air intake in the canopy is not blocked.
10 Check the oil level and colour of the oil. Check the coolant level of both the alternator cooling and the engine cooling.
11 To bleed the fuel system:
- W-SQ12 Three Phase: push the "Start" button on the local control (not on the remote panel) and hold at least 5 seconds and as long as necessary to bleed the system.
- W-SQ16 Three Phase: 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.

12 Start the engine by pushing the start button
13 Check when the generating set is running, the delay of 5 to 10 seconds in the power source selector transfer.
14 Check voltage and frequency under 'no load' conditions.
15 Check voltage and frequency under 'full load' conditions.
16 Check if the battery charger of the generating set is working (max. 14.5 Volt).
17 Close the sound shield and check the noise level.
18 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

Model	W-SQ12 Three Phase for mobile applications	W-SQ16 Three Phase for mobile applications
Dimensions (l x w x h)	106 x 58 x 63 cm	116 x 58 x 70 cm
Weight including sound shield	380 kg	440kg
Max. operation angle	25°	25°
Remote panel 15 m cable	Digital Diesel Control System	
Battery capacity min.	12V / 70Ah	12V / 120Ah
Fuel consumption	1,5 – 4 l/hr, load dependent	
Model fuel pump	Electrical driven 12V	Mechanical driven, manual priming
Max lift fuel pump	1m	1m
Cooling	Radiator cooling	Radiator cooling
Cooling pump	Whisper Power self priming raw water impeller pump, PTO driven	
Model cooling pump	M12	M16
Minimum water supply	18-22 l/min	20-25 l/min
Alternator	Air cooled, brushless, four pole, 6 or 12 wire, synchronous	
Voltage regulation	Automatic Voltage Regulator (AVR)	
Output power at 50Hz, power factor cos phi = 1	12 kW*	16 kW*
Battery charger (alternator including regulator):	50 Amps	50 Amps

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

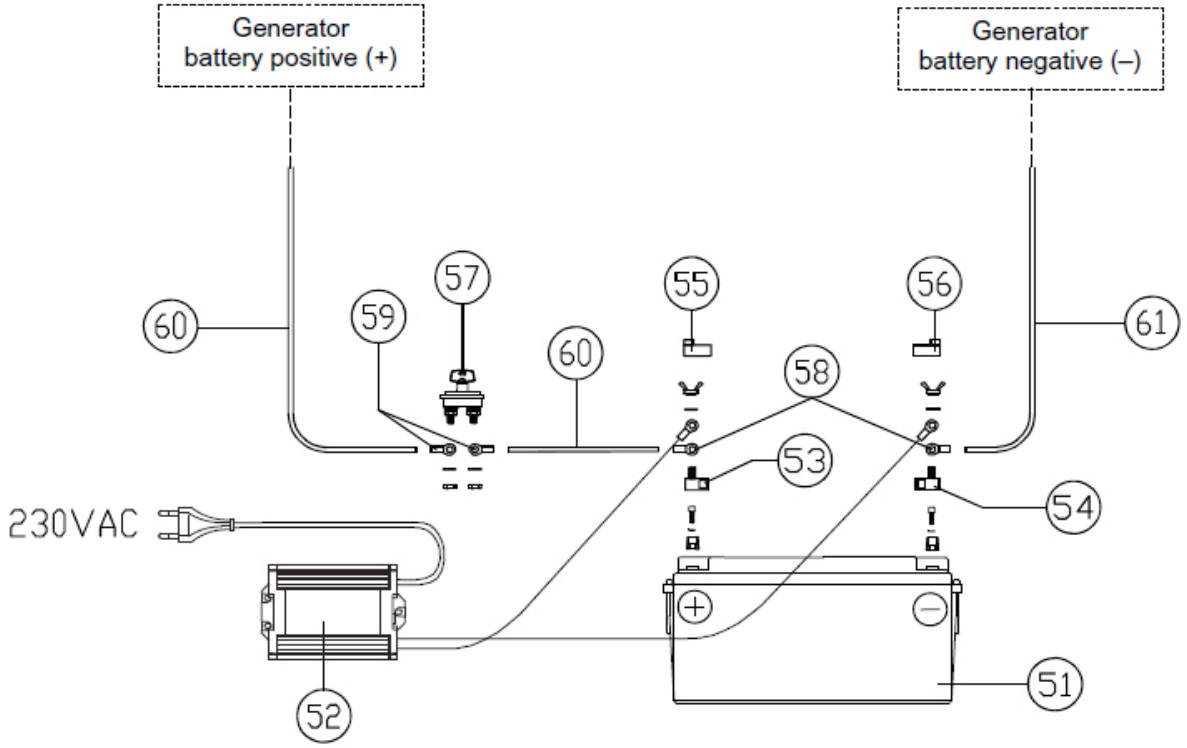


Fig. 28: Installation materials battery installation kit

3.4 INSTALLATION MATERIALS

BATTERY INSTALLATION KIT 70 Ah for W-SQ12 Three Phase

no	qty	article no	description
51	1	42000700	Whisper Power 12/70 Ah AGM Battery
52	1	43011000	IVO Smart 12/10 230V/50-60Hz IP65 charger
53	1	48060100	Battery terminal with nut M8 PLUS
54	1	48060200	Battery terminal with nut M8 MINUS
55	1	48456902	Terminal Cover RED 456N9V02
56	1	48456914	Terminal Cover BLACK 456N9V14
57	1	49009005	Batteryswitch ON/OFF with key 250A
58	2	4503002508	Cable lug 25mm² / M8
59	2	4503002510	Cable lug 25mm² / M10
TOTAL		**40230210**	**BATTERY INSTALLATION KIT 70 Ah**

BATTERY INSTALLATION KIT 160 Ah for W-SQ16 Three Phase

no	qty	article no	description
51	1	42001600	Whisper Power AGM Battery 12V/160Ah
52	1	43011000	IVO Smart 12/10 230V/50-60Hz IP65 charger
53	1	48060100	Battery terminal with nut M8 PLUS
54	1	48060200	Battery terminal with nut M8 MINUS
55	1	48456902	Terminal Cover RED 456N9V02
56	1	48456914	Terminal Cover BLACK 456N9V14
57	1	49009005	Batteryswitch ON/OFF with key 250A
58	2	4503003508	Cable lug 25mm² / M8
59	2	4503003510	Cable lug 25mm² / M10
TOTAL		**40230220**	**BATTERY INSTALLATION KIT 160 Ah**

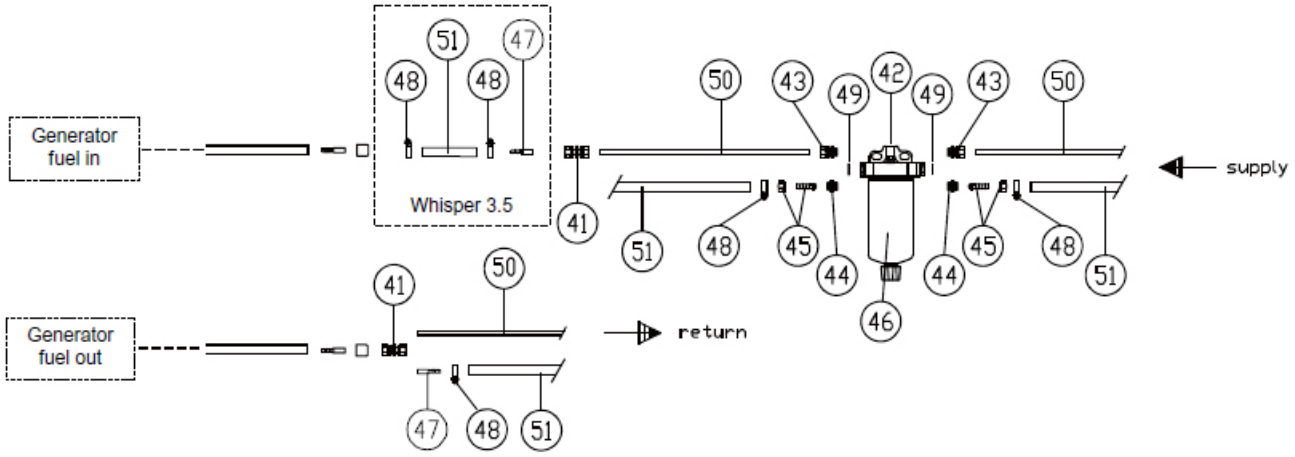


Fig. 29: Installation materials fuel supply kit

FUEL SUPPLY KIT

no	qty	article no	description
41	2	50221203	Straight coupling 8 mm
42	1	50230091	Filter head strainer fuel/water separator
43	2	50221618	Parallel male coupling M14- 8 mm
44	2	50221619	Parallel male coupling M14- 10 mm
45	2	50221620	Hose connection 8 mm outer cone
46	1	50230092	Filter for strainer fuel/water separator
47	2	50221252	Nipple hose pipe 8-8
48	4	50221522	Hose clamp stainless 10-16
49	2	50221632	Copper gasket ring 18x14x1,5 mm
TOTAL		**40230205**	**FUEL SUPPLY KIT**

Note: fuel pipes / fuel hoses are not included in the delivery of the fuel supply kit.

OPTIONAL INSTALLATION MATERIALS

- Additional installation parts

no	qty	article no	description	
48		50221522	Hose clamp stainless 10-16	
50		50222020	copper fuel pipe	per meter
51		50220063	fuel hose	per meter

- Spare parts

no	qty	article no	description
46		50230092	Filter for strainer fuel/water separator

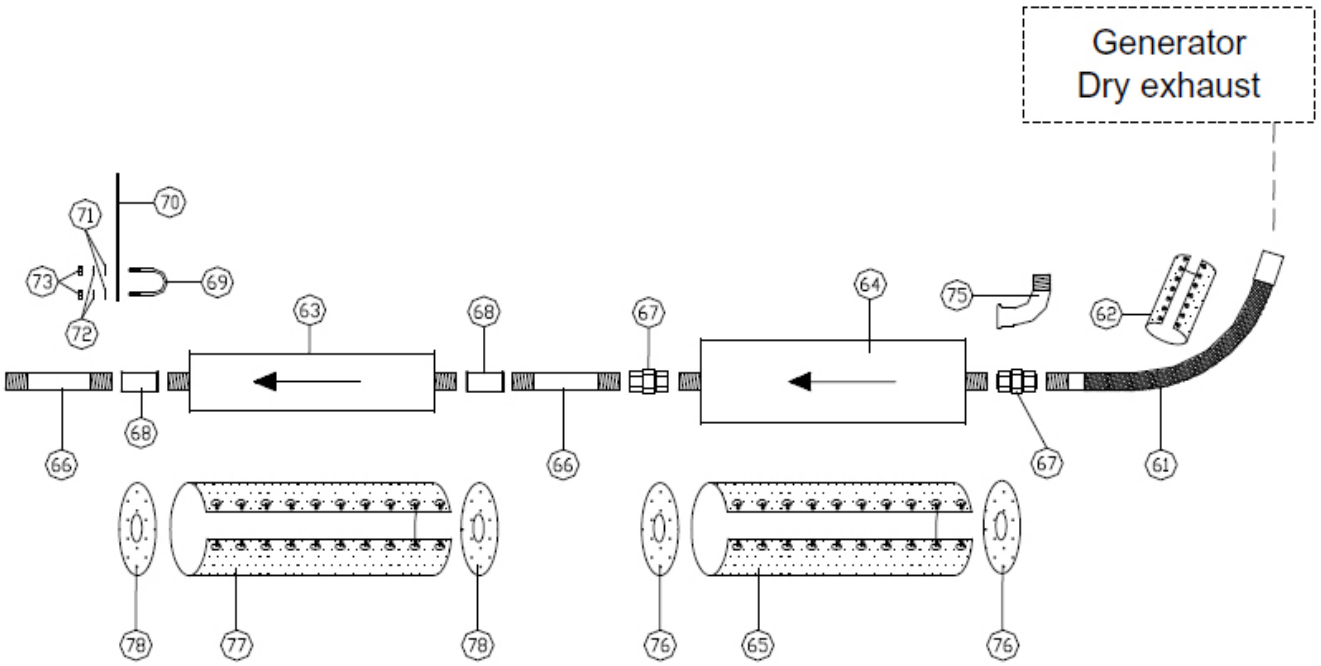


Fig. 30: Dry exhaust kit 1½"

DRY EXHAUST KIT 1½" for W-SQ12 and 16

no	qtt	article no	description
61	1	50220043	Exhaust hose SS 1½" 500mm m/f
62	1	50220042	Insul. blanket 52X26 exhaust hose
63	1	50230523	Absorbtion muffler steel 1½"
64	1	50230524	Resonance muffler steel 1½"
65	1	50230525	Insulation blanket 70X55 muffler SDHC 1½"
66	2	50221403	Pipe nipple 1½"x300mm galvanised
67	2	50221423	Parallel male coupling 1½" galvanised
68	2	50221413	Straight coupling f/f 1½" galvanised
69	3	50221663	U-clamp 48 mm M10
70	3	50221664	Bracket U-clamp 25cm 48-60 mm passivated
71	6	50211406	Washer SP M10
72	6	50211447	Washer spring SP M10
73	6	50211466	Nut hexogonal SP M10
75	1	50221473	Elbow 90 degr m/f galvanised 1½"
76	2	50230518	Final cap insulation blanket 20x1½" for 50230525
77	1	50230526	Insulation blanket 76x45 ABSORB 1½"
78	2	50230513	Final cap insulation blanket 12x1½" for 50230526
TOTAL		**40201875**	**DRY EXHAUST KIT 1½"**

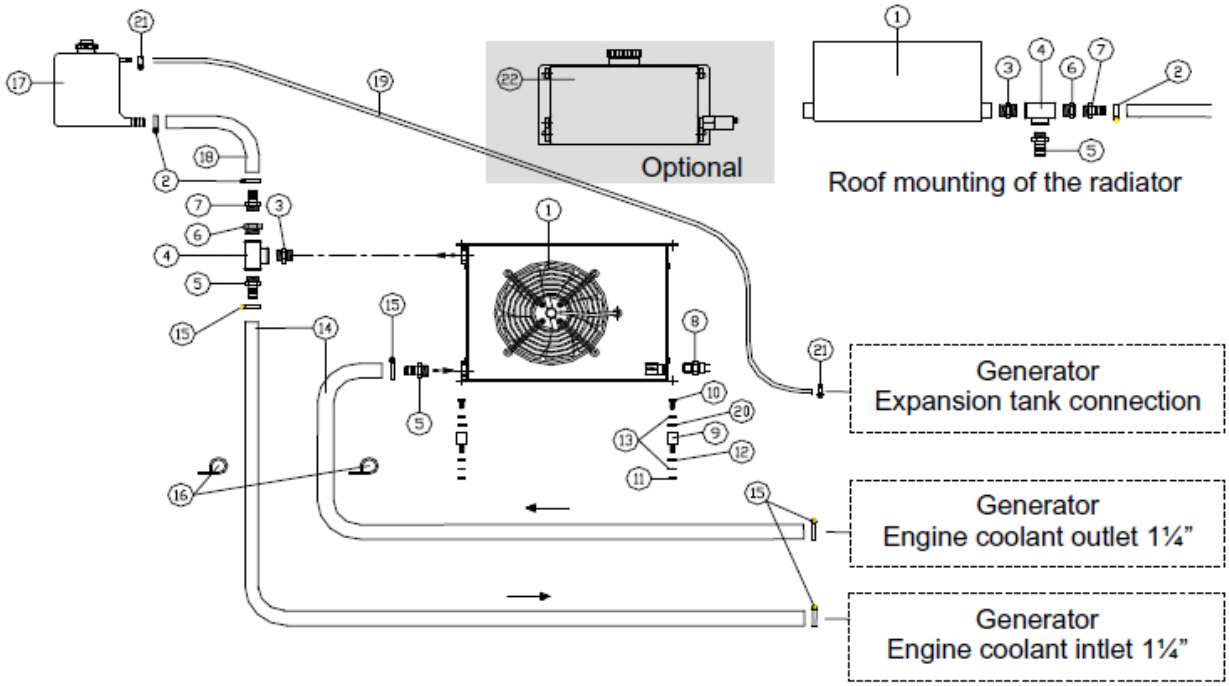


Figure 31: radiator cooling kit engine and exhaust kit

RADIATOR COOLER KIT ENGINE 1¼" (AP430/2-230V)

no	qtt	article no	description
1	1	50230311	Radiator AP 430/2 230V
2	2	50221502	Hose clamp stainless 22-30 mm
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"-¾"
7	1	50221004	Male hose connection ¾"x20mm
8	1	50212409	Temperature switch 87-82 degr
9	4	50201121	Vibration mounting 30x25mm
10	4	50211152	Bolt hexagonal ZP M8x16
11	4	50211465	Nut hexogonal SP M8
12	4	50211405	Washer SP M8
13	8	50211445	Washer spring SP M8
14	6m	50220013	Cooling water hose smooth (1¼") 32x41mm
15	4	50221504	Hose clamp stainless 38-50 mm
16	8	50221597	Hose support stainless 45x20 mm
17	1	50230529	Bracket expansion tank for 50230531 pass
17	1	50230531	Expansion tank 20 mm
17	1	50230532	Cap for expansion tank 50230531
18	1.5m	50220011	Cooling water hose smooth (¾")18x27
19	4m	50220005	Hose hydraulic 7,5x15mm
20	4	50211436	Washer mudguard SP 8x30x1,5
21	2	50221532	Hose clamp stainless 10-16 mm
TOTAL		**40201877**	**RADIATOR COOLER KIT ENGINE 1¼" (AP430/2-230V)**

OPTIONAL INSTALLATION MATERIALS

- Additional installation parts

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

4 DIAGRAMS & DRAWINGS

4.1 WIRING COLOURS W-SQ12 THREE PHASE - MOBILE

	number	colour	cross section
battery > starter motor		red	25 mm2
starter motor > DDC	1	red	6 mm2
starter motor > LCP	13	red	2,5 mm2
battery > ground		black	25 mm2
ground > LCP ground (GND)	2	black	4 mm2
DDC > glow plug	3	brown	4 mm2
DDC > starter solenoid	4	yellow	2,5 mm2
LCP > fuel lift pump +	5	brown	1,5 mm2
LCP > fuel lift pump -	15	black	1,5 mm2
DDC > LCD	5	grey	1,5 mm2
DDC > oil pressure switch	6	purple	1 mm2
LCP > oil pressure switch	6	purple/black	1 mm2
DDC > water temperature switch	7	blue	1 mm2
LCP >water temperature switch	7	blue/black	1 mm2
DDC > generator temperature switch	8	blue/green	1 mm2
LCP > generator temperature switch	8	blue/pink	1 mm2
DDC > fuel solenoid (hold)	9	green	1,5 mm2
DDC > fuel solenoid (pull)	20	pink	2,5 mm2
DDC > fuel solenoid (com.)	17	black	2,5 mm2
B+ terminal alternator > starter motor	21	red	6 mm2
DDC >R terminal alternator	18	white	1,5 mm2
DDC > L terminal alternator	19	orange	1,5 mm2
DDC > current measuring transformer AC1	66	black	1 mm2
DDC > current measuring transformer AC1	66	red	1 mm2
DDC > current measuring transformer AC2	77	black	1 mm2
DDC > current measuring transformer AC2	77	red	1 mm2
DDC > current measuring transformer AC3	88	black	1 mm2
DDC > current measuring transformer AC3	88	red	1 mm2
DDC > LCP	12	black	1,5 mm2
DDC > LCP	14	red	1,5 mm2
DDC > LCP	16	red/green	1,5 mm2
DDC > generator AC output AC1	33	brown	1 mm2
DDC > generator AC output AC1	33	blue	1 mm2
DDC > generator AC output AC2	44	brown	1 mm2
DDC > generator AC output AC2	44	blue	1 mm2
DDC > generator AC output AC3	55	brown	1 mm2
DDC > generator AC output AC3	55	blue	1 mm2

DDC=Digital Diesel Control Unit
LCP=Local Control Panel

4.2 LAYOUT GENERATOR CONTROL W-SQ12 THREE PHASE - MOBILE

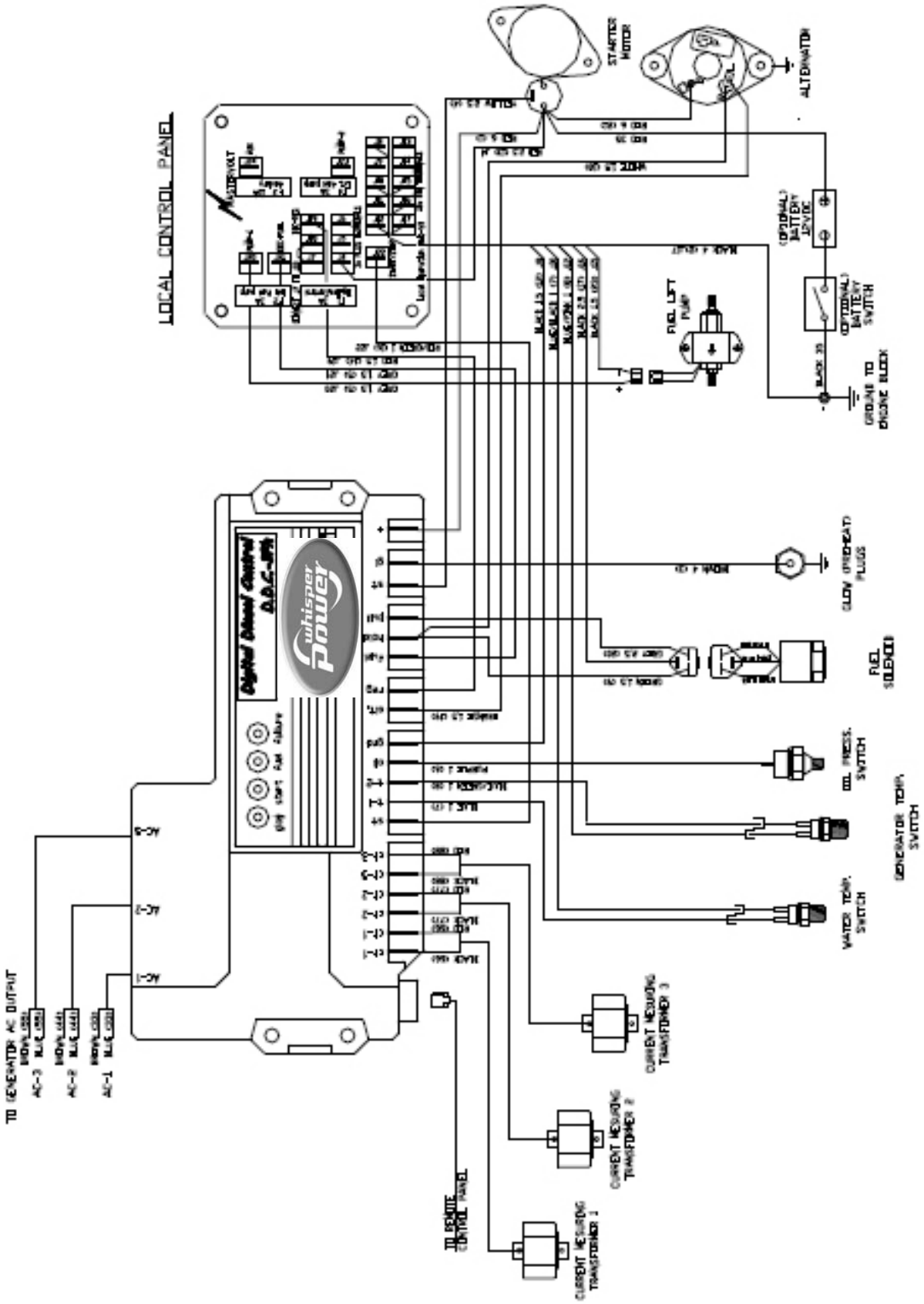


Figure 32: Layout generator control for W-SQ12 Three Phase – Mobile

4.3 WIRING COLOURS W-SQ16 THREE PHASE - MOBILE

	Cable code number	colour	cross section
battery > starter motor		red	35 mm2
starter motor > DDC	1	red	6 mm2
starter motor > LCP	13	red	2,5 mm2
battery > ground		black	35 mm2
ground > LCP ground (GND)	2	black	4 mm2
DDC > glow plug	3	brown	4 mm2
DDC > starter solenoid	4	yellow	2,5 mm2
DDC > LCD	5	grey	1,5 mm2
DDC > oil pressure switch	6	purple	1 mm2
LCP > oil pressure switch	6	purple/black	1 mm2
DDC > water temperature switch	7	blue	1 mm2
LCP >water temperature switch	7	blue/black	1 mm2
DDC > generator temperature switch	8	blue/green	1 mm2
LCP > generator temperature switch	8	blue/pink	1 mm2
DDC > fuel solenoid (hold)	9	green	1,5 mm2
DDC > fuel solenoid (pull)	20	pink	2,5 mm2
DDC > fuel solenoid (com.)	17	black	2,5 mm2
B+ terminal alternator > starter motor	21	red	6 mm2
DDC >R terminal alternator	18	wit	1,5 mm2
DDC > L terminal alternator	19	orange	1,5 mm2
DDC > current measuring transformer AC1	66	black	1 mm2
DDC > current measuring transformer AC1	66	red	1 mm2
DDC > current measuring transformer AC2	77	black	1 mm2
DDC > current measuring transformer AC2	77	red	1 mm2
DDC > current measuring transformer AC3	88	black	1 mm2
DDC > current measuring transformer AC3	88	red	1 mm2
DDC > LCP	12	black	1,5 mm2
DDC > LCP	14	red	1,5 mm2
DDC > LCP	16	red/green	1,5 mm2
DDC > generator AC output AC1	33	brown	1 mm2
DDC > generator AC output AC1	33	blue	1 mm2
DDC > generator AC output AC2	44	brown	1 mm2
DDC > generator AC output AC2	44	blue	1 mm2
DDC > generator AC output AC3	55	brown	1 mm2
DDC > generator AC output AC3	55	blue	1 mm2

DDC=Digital Diesel Control Unit
LCP=Local Control Panel

4.4 LAYOUT GENERATOR CONTROL W-SQ16 THREE PHASE - MOBILE

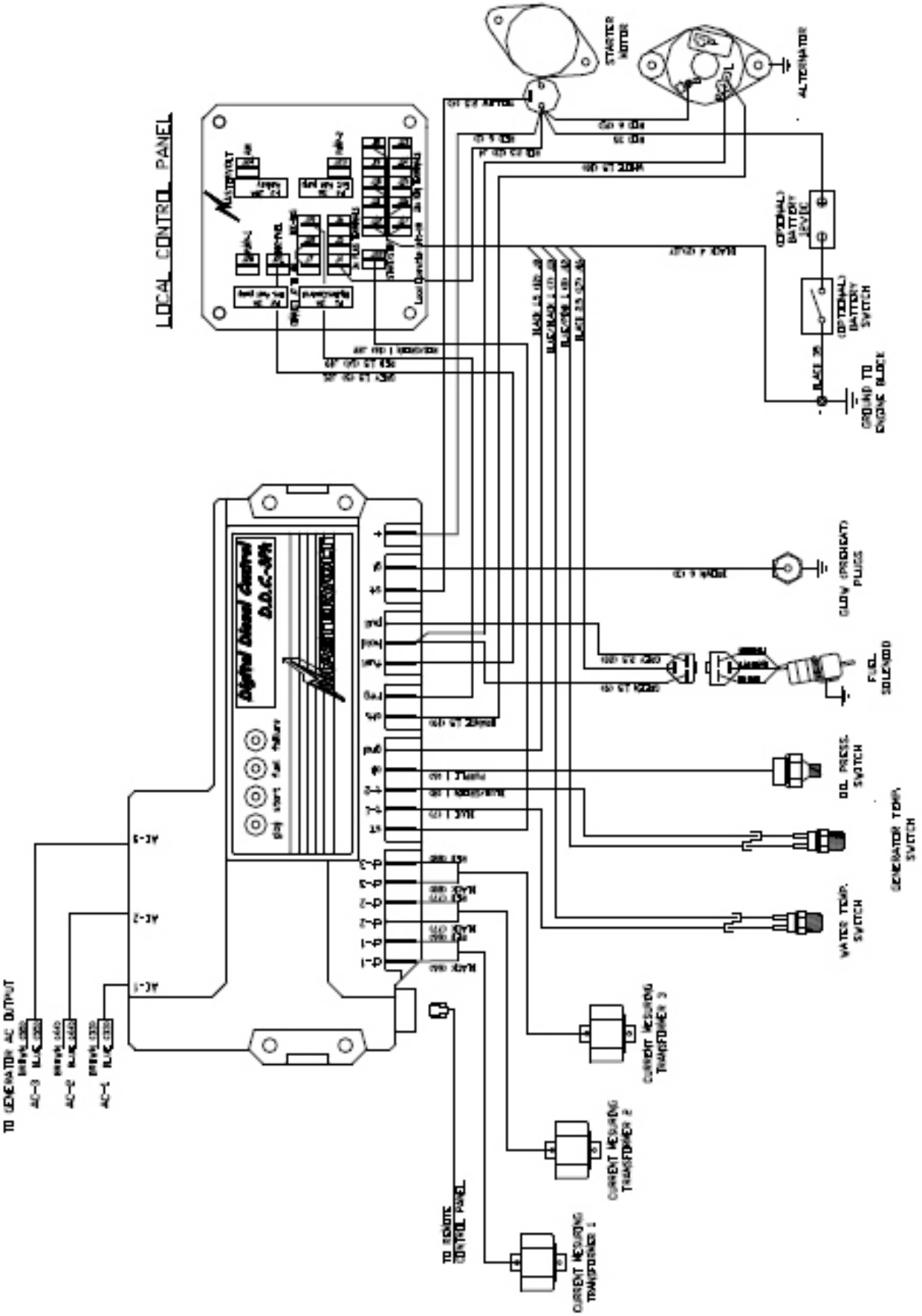
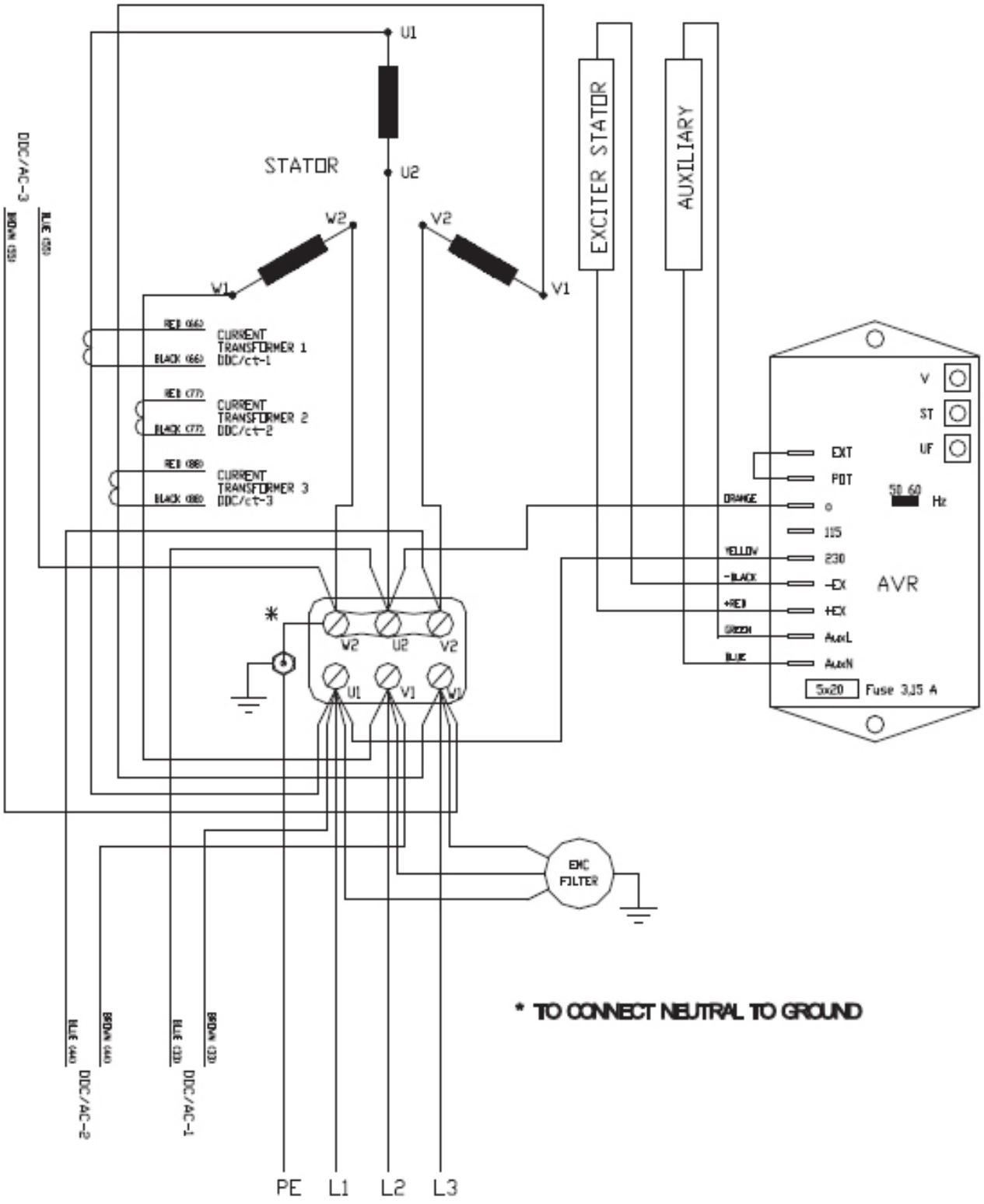


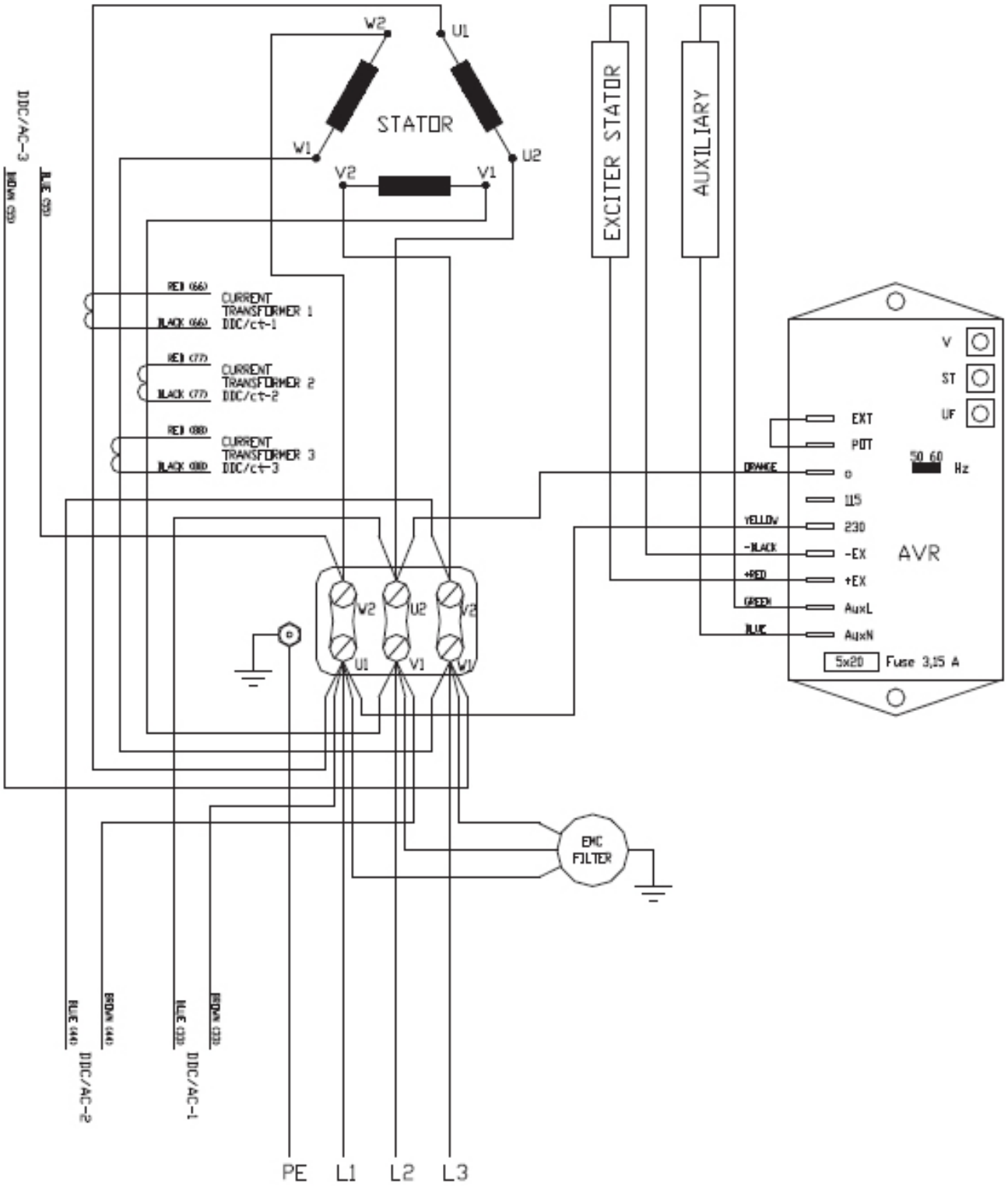
Figure 33: Layout generator control for W-SQ16 Three Phase - Mobile

4.5 ELECTRICAL DIAGRAMS AC CONNECTIONS (ALTERNATOR MODELS WITH 6 WIRES)



Only valid for alternator models with 6 wires.

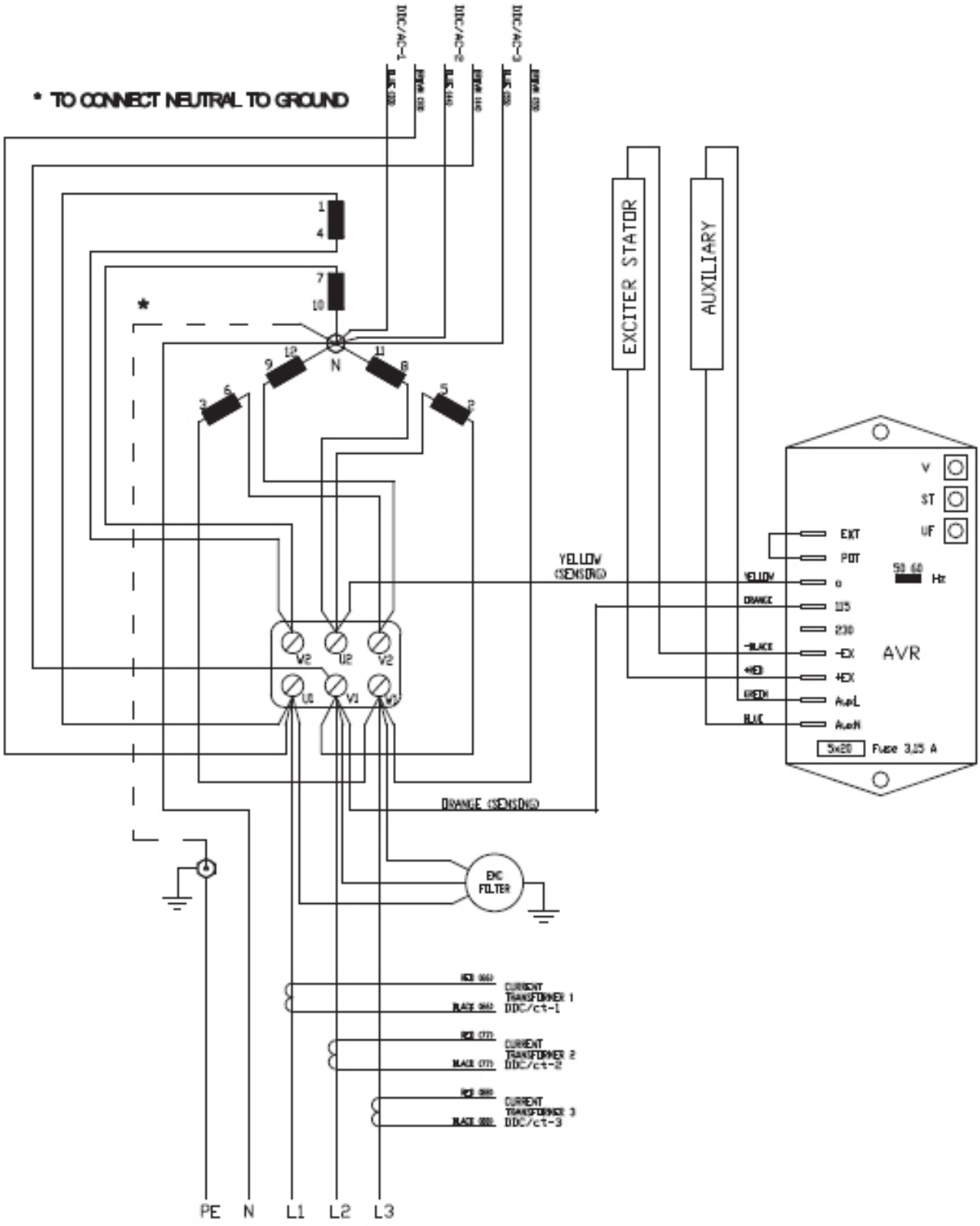
Fig. 34a: Electrical Diagram 230 / 400 V AC / 50 Hz three phase (Star configuration)



Only valid for alternator models with 6 wires.

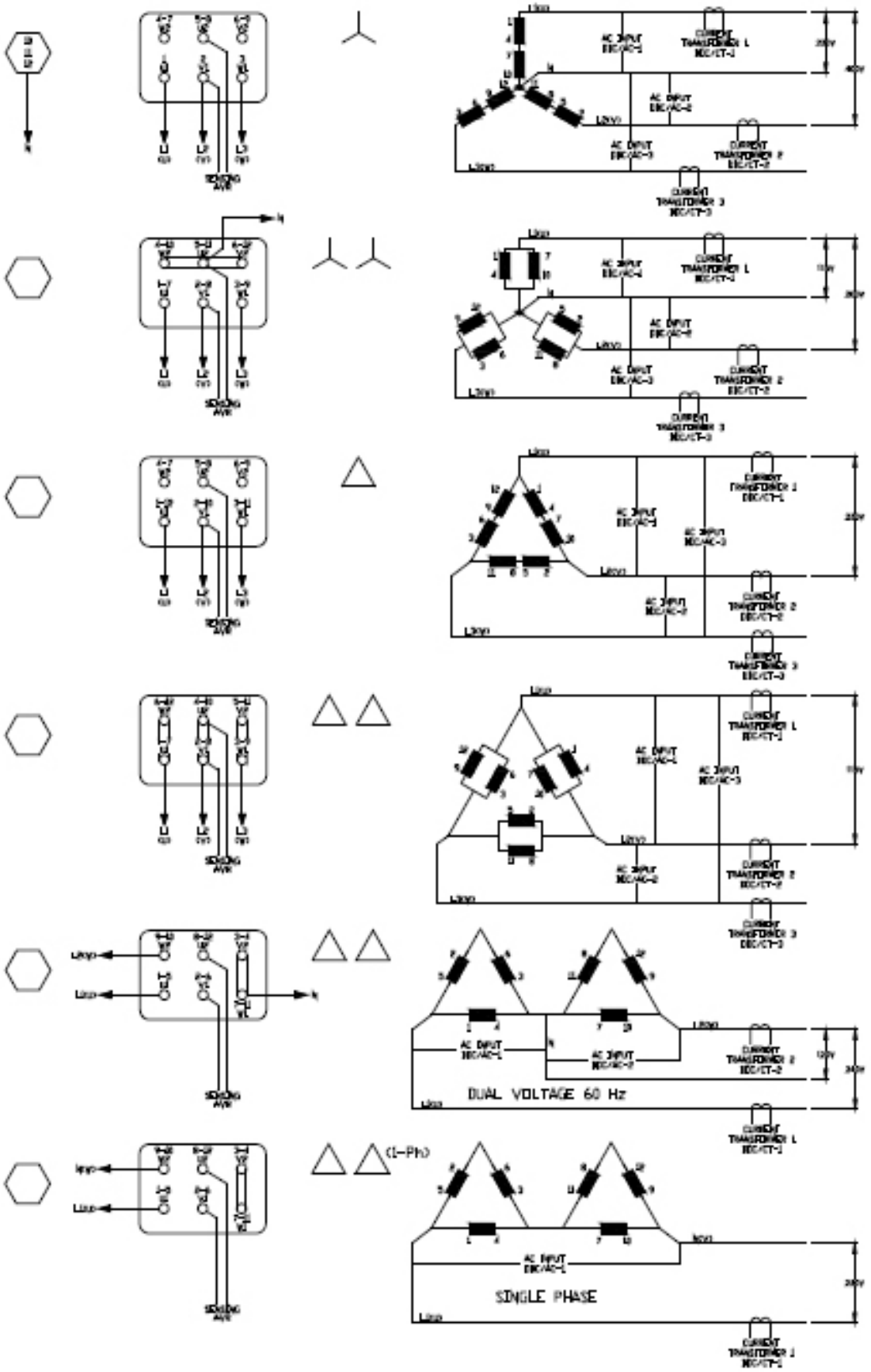
Fig 34b: Electrical Diagram 230 V AC / 50 Hz three phase (Delta configuration)

4.6 ELECTRICAL DIAGRAMS AC CONNECTIONS (ALTERNATOR MODELS WITH 12 WIRES)



Only valid for alternator models with 12 wires.

Fig. 35a: Electrical Diagram 230 / 400 V AC / 50 Hz three phase (Star configuration)



Only valid for alternator models with 12 wires.

Fig. 35b: Optional configuration modes of the AC wiring for alternator models with 12 wires

4.7 ELECTRICAL DIAGRAMS RADIATOR FAN CONTROL 230VAC

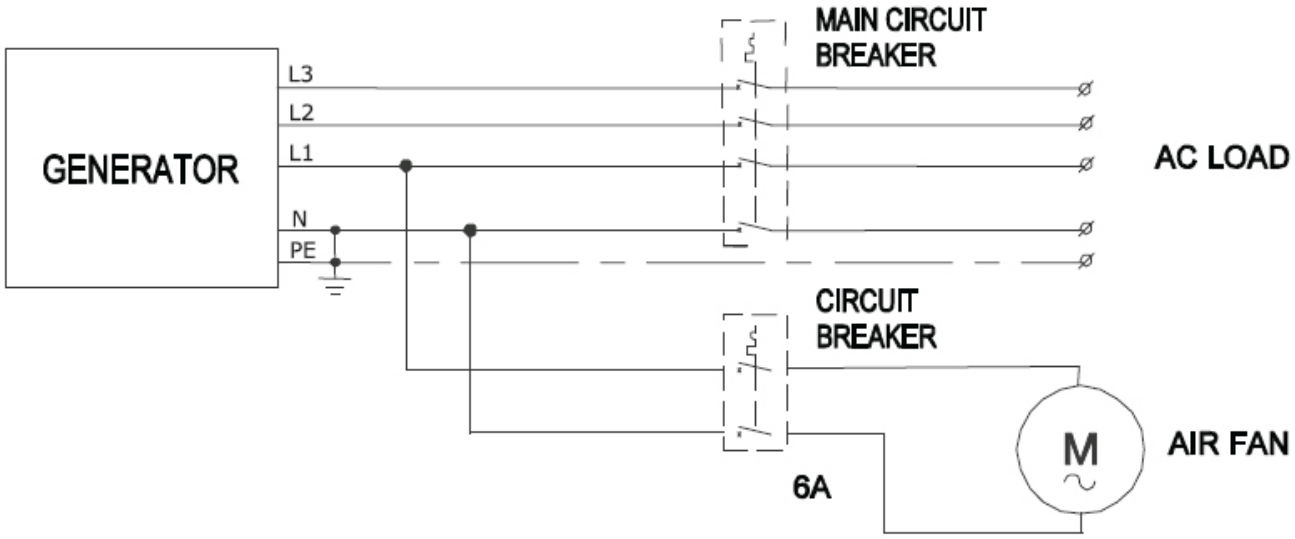


Fig. 36: Electrical diagram for standard fan control using a 230 Volt AC radiator fan

4.8 WIRING DIAGRAM ELECTRONIC GOVERNOR (STANDARD FOR W-SQ12)

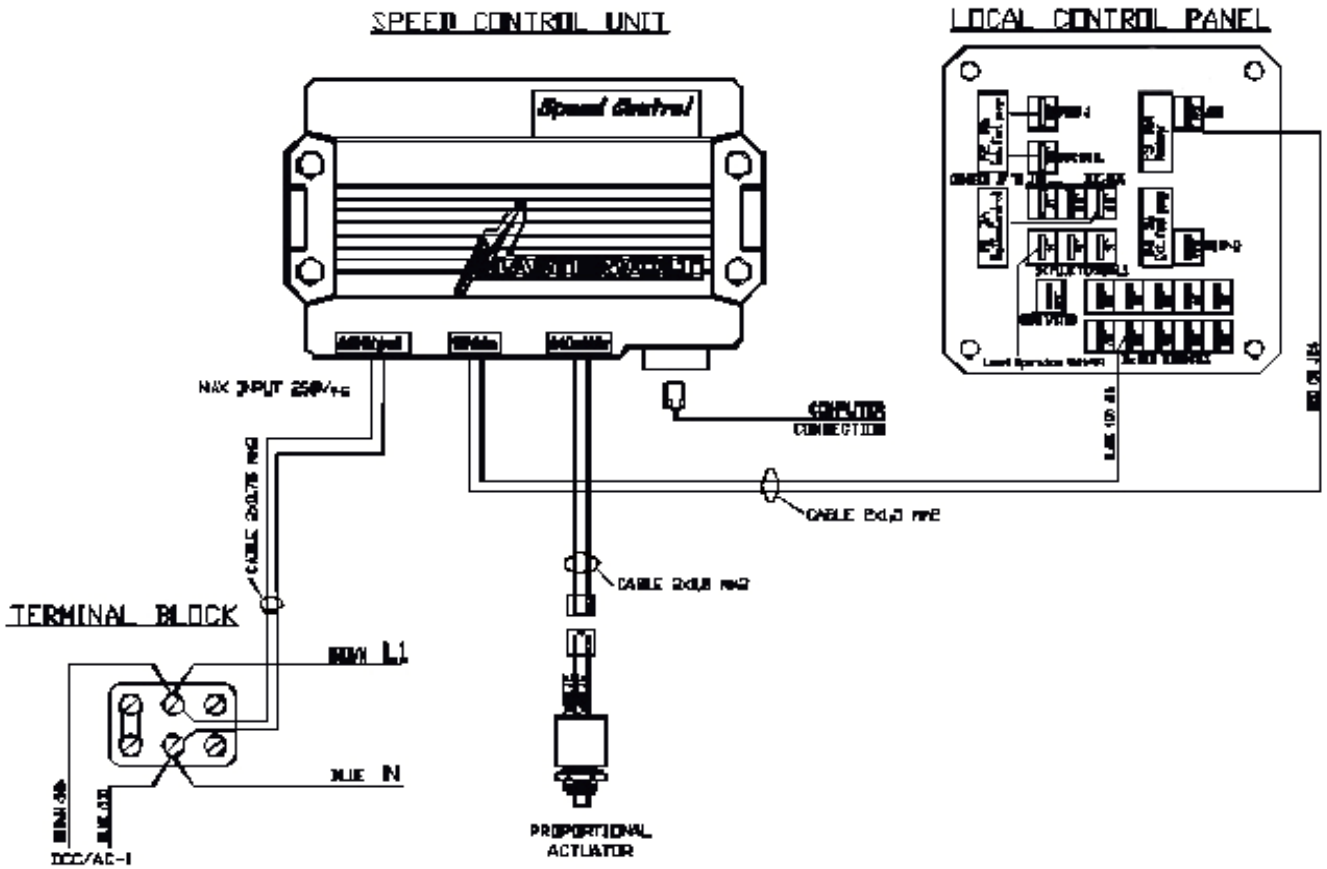


Figure 37: Electronic governer.

In addition to the mechanical governor, the W-SQ12 is standard equipped with an electronic governor. A governor keeps the speed (RPM=Rotations Per Minute) of the engine at a fixed value. The RPM of the engine correlates with the frequency of the electrical output (1500 RPM =50 Hz) of the alternator.
Under full load the RPM of the Whisper models that have only a mechanical governor can drop 75 RPM (=2.5 Hz) at full load and will go further down or collapse when further loaded. However the engines with the electronic governor will keep the RPM and frequency at the set value. As the voltage is related to the frequency, the voltage will be more stable as well.
The RPM represents power and the alternator performs better as well on a higher speed. Whisper models with an electronic governor will bring more power.
So the electronic governor offers three advantages: a more stable frequency and voltage and more power.

The electronic governor system contains two parts:

1 The actuator controls the engine speed. This actuator replaces the standard hold solenoid that is on all other mechanical controlled Whisper engines. The actuator controls the RPM directly on the fuel rack inside the fuel pump without levers and other mechanical transmissions.
2 A microprocessor keeps the speed at the set value by controlling the actuator. The microprocessor is programmed at the Whisper Power factory and many parameters are set to perform well. It should not be necessary to make adjustments. When adjustments are necessary this can only be done with the help of an interface to a computer and special software to get access to the microprocessor.

The Whisper Power electronic governor does not need a pickup device in the flywheel housing that counts the passing tooth of the flywheel and determines the exact RPM of the engine, because the processor uses the 50 Hz of the AC output voltage as a reference.

4.9 REMOTE CONTROL PANEL DRAWINGS

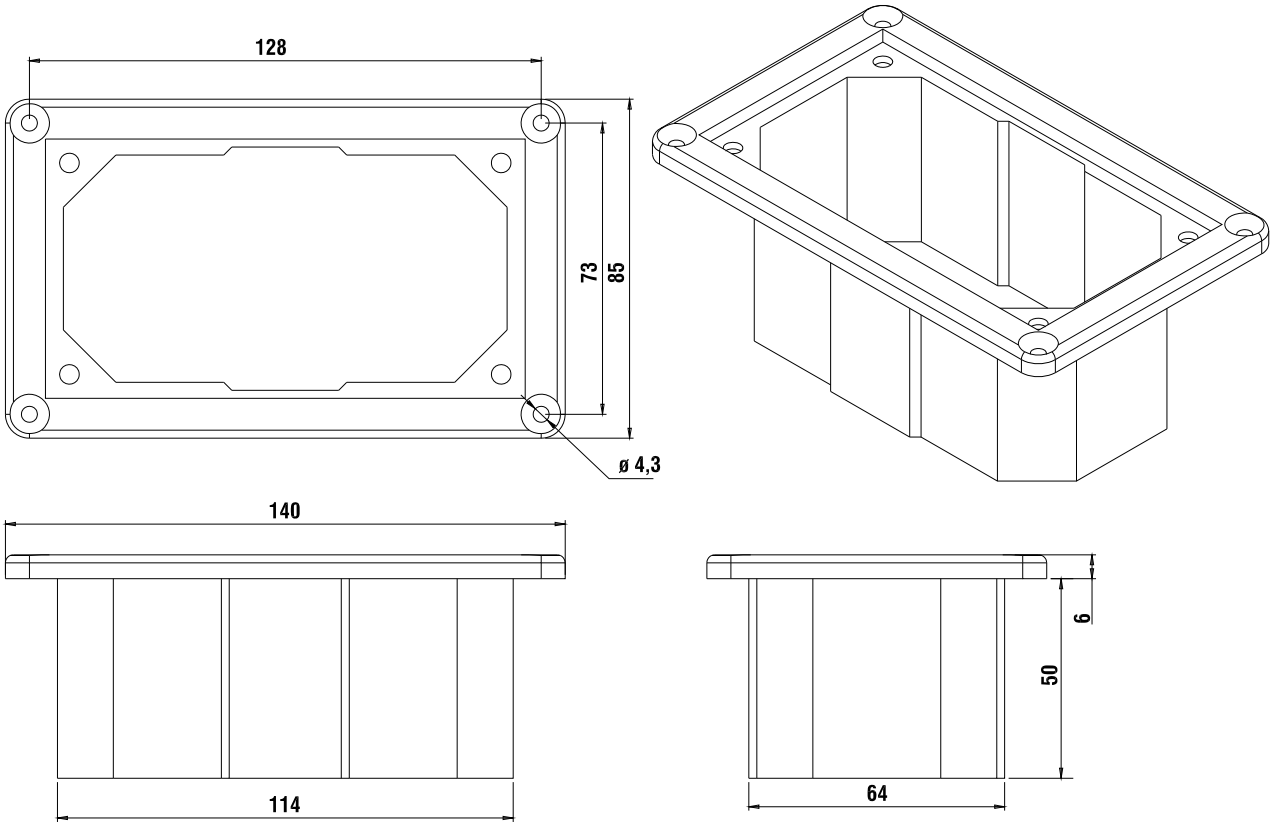


Fig. 38: Whisper remote panel

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

4.10 DIMENSIONS W-SQ12

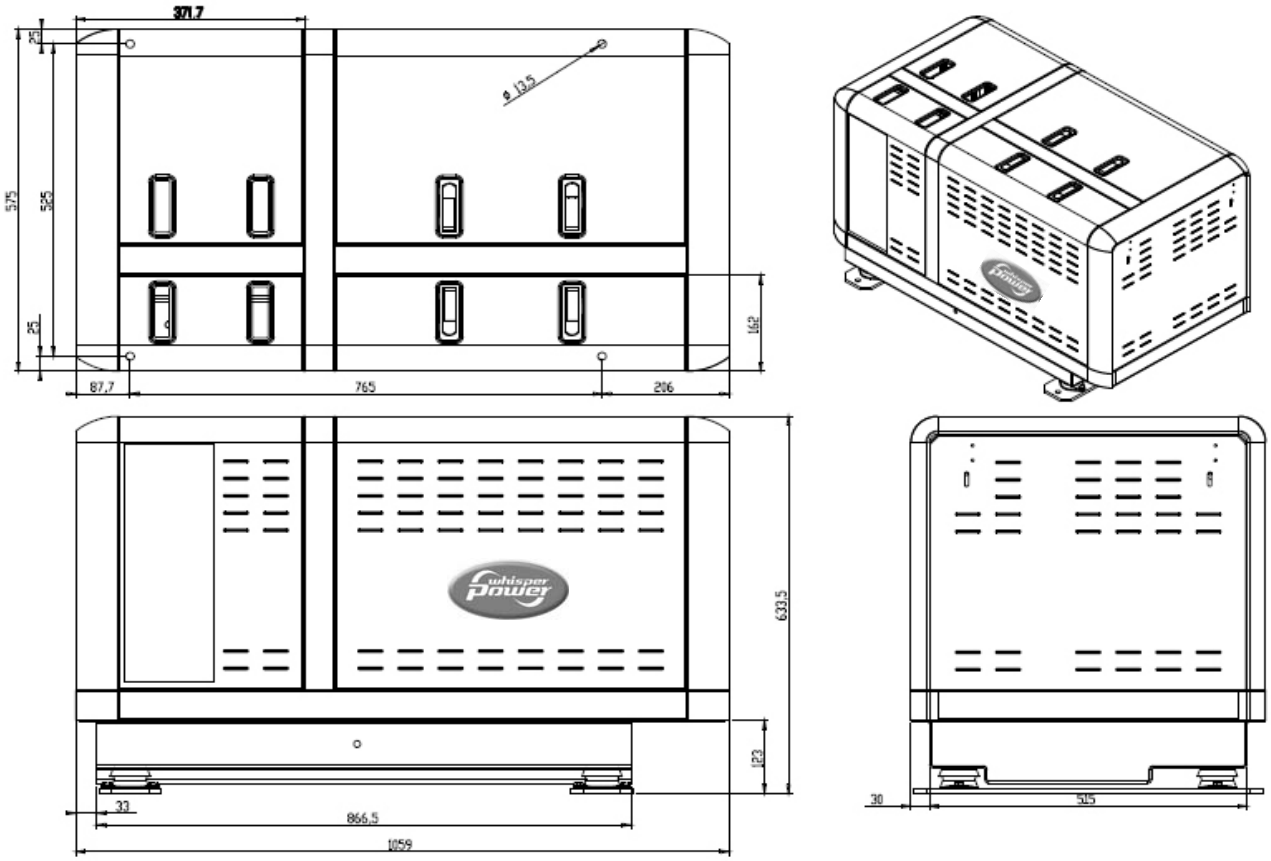


Fig. 39: Outer dimensions (mm) W-SQ12

CONNECTIONS W-SQ12:

• exhaust:	1 ½”
• fuel hose:	5/16” (8 mm)
• radiator engine:	1¼” (32 mm)
• battery +:	AWG 2 (25 mm2)
• battery -:	AWG 2 (25 mm2)

BOX DIMENSIONS W-SQ12:

• length	1060 mm (41.7’)
• width	575 mm (22.6’)
• height	640 mm (25.2”)
• weight	380 kg

POWERCABLES ISO 13297 annex A

• 5 x 2.5 mm2 (not included)

REMOTE CONTROL:

• 15 meter 8 wire communication cable (included)

4.11 DIMENSIONS W-SQ16

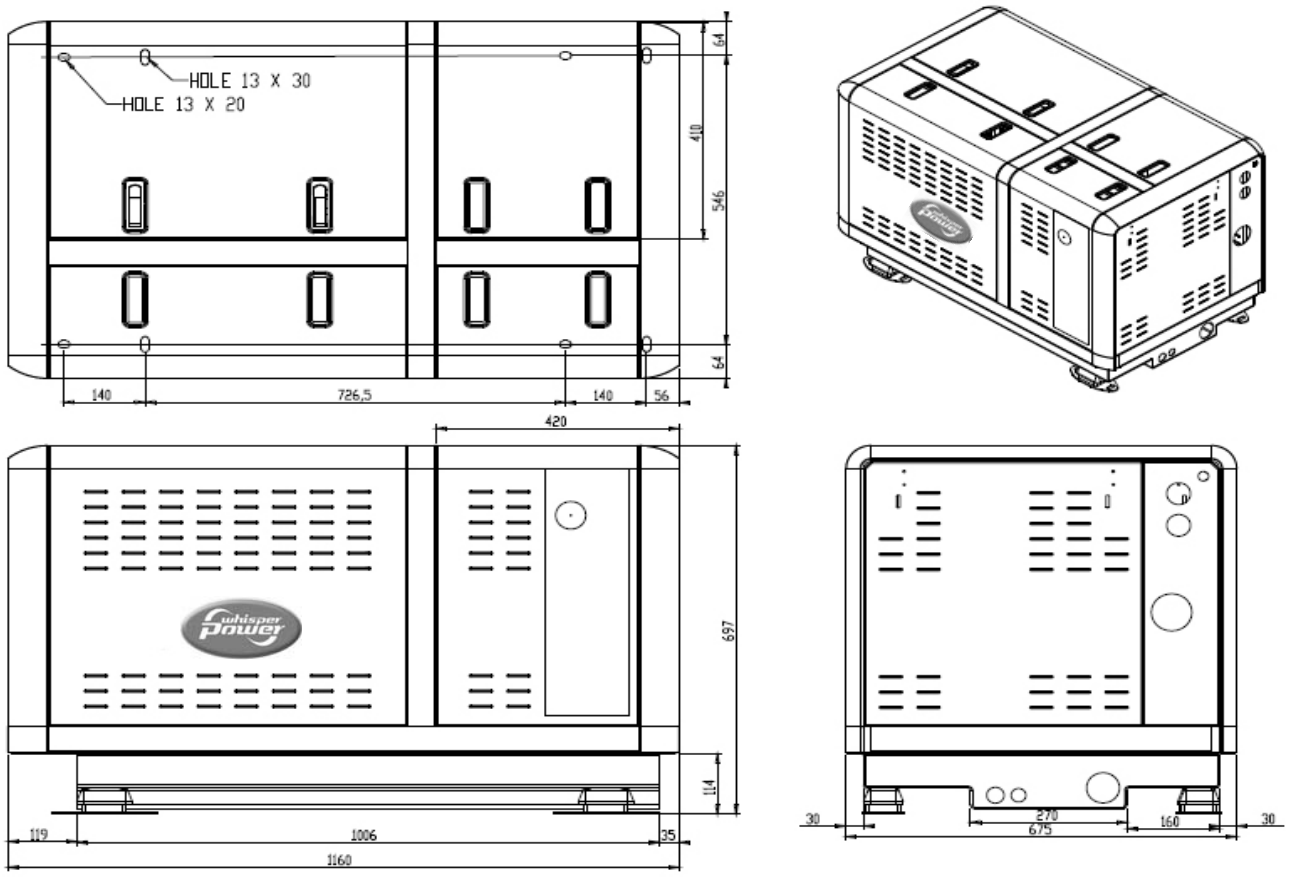


Fig. 40: Outer dimensions (mm) W-SQ16

CONNECTIONS W-SQ16:

• exhaust:	1 ½”
• fuel hose:	5/16” (8 mm)
• radiator engine:	1¼” (32 mm)
• battery +:	35 mm2
• battery -:	35 mm2

POWERCABLES ISO 13297 annex A

• 3x16 mm2 (not included)

REMOTE CONTROL:

• 15 meter 8 wire communication cable (included)

BOX DIMENSIONS W-SQ16:

• length	1160 mm (45.7”)
• width	680 mm (26.8”)
• height	700 mm (27.6”)
• weight	454 kg

A template to drill the mounting holes of the W-SQ16 is included in the delivery.

NOTES

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