INSTALLATION MANUAL FOR MARINE APPLICATIONS

GENVERTER M-GV 4

Variable speed: 2500-3400 RPM
230V / 50Hz
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1 INTRODUCTION

1.1 USE OF THIS MANUAL
This manual serves as a guideline for the safe and effective installation the Genverter M-GV4 basic for marine applications.

It is obligatory that every person who is involved with the installation of the M-GV4 must be completely familiar with the contents of this manual, and that he/she carefully follows the instructions contained herein.

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 only by qualified, authorised and trained personnel, consistent with the locally applicable standards and taking into consideration the safety guidelines and measures (chapter 2 of the user’s manual).

The information, specifications, illustrations and statements contained within this publication are given with our best intentions and are believed to be correct at the time of going to press.

Our policy is one of continued development and we reserve the right to amend any technical information without prior notice.

Whilst every effort is made to ensure the accuracy of the particulars contained within this publication neither the manufacturer, distributor, or dealer in any circumstances shall be held liable for any inaccuracy or the consequences thereof.

Keep this manual at a secure place!

1.2 VALIDITY OF THIS MANUAL
All of the specifications, provisions and instructions contained in this manual apply solely to standard versions of the GV4 delivered by Whisper Power

This manual is valid for the following models:

<table>
<thead>
<tr>
<th>Part number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>41002005</td>
<td>M-GV4 50 Hz 230V variable speed</td>
</tr>
</tbody>
</table>

Refer to the user’s manual for identification of the genverter set. For other models see our website: www.whisperpower.eu.

WARNING!
During installation and commissioning of the genverter, the Safety Guidelines & Measures are applicable at all times. See chapter 2 of the user's manual.

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.

DANGERS!
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.

1.3 INSTALLATION PARTS
Besides the parts that are included with the delivery you need at least the parts listed at section 4.4 to install the genverter. Please note that this listing may not be complete, as every installation differs from the other. Oil is
not included in the supply. Refer to the users manual for the right specifications.

1.4 CHP: COMBINED HEAT POWER GENERATION

The optimum engine operating temperature is between 80° and 110° Celsius. The outgoing oil temperature is about 90° up to 110°C. The heat exchanger reduces the temperature of the cooling liquid by 20°C to 25°C. The returning “cold” oil therefore has a minimum temperature of at least approx. 65° Celsius.

This means that the hot oil can be used for heating up water or any other medium to almost 100°C to use the heat from the engine for other purposes. This can be done with an additional heat exchanger. Also it could be useful to use the hot air of the radiator for heating purposes. Whisper Power can advice on this applications and supply additional installation parts for CHP.

2 INSTALLATION

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 GV4 in a boat all relevant aspects have to be taken into account
- Accessibility
- Solid foundation
- Space to mount the exhaust
- A route to fit the fuel lines

Since the Whisper Genvverters 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 genvverter, make sure there is sufficient room to carry out any maintenance work. The unit must be easily accessible on the service side.

All models can be serviced from one side. Oil filling can be done on the service side and on the top. (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 switch it is still essential that the oil level is checked regularly.

2.3 PROTECTION AGAINST DIRT, WATER, HIGH TEMPERATURE AND WEATHER CONDITIONS.

The unit is designed to be mounted inside a boat. The genvverter is not suited to mount on deck in the open air to be subjected to bad weathers conditions and (salt) water spray and rain or snow. The best place is a dedicated machine room.

Also inside the boat the genverter should be protected against bilge water, condensation, frost and other conditions that will affect the machinery.

The air inlet of the engine compartment must be protected against the ingress of water and can be protected by and air inlet strainer for dirt and dust.

2.4 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 inside the canopy by means of a double flexible engine mountings system. This frame is must be solidly mounted in the vehicle. (Not using rubber mountings again) When it is possible to mount the unit directly on the trusses of the vessel this has advantages in preventing vibrations by resonance.

2.4.1 Further recommendations

Whisper generating sets are standard equipped with a sound cover canopy. 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 Genverter is placed to be stiff. Directly below the base frame the structure should be supported vertically to the trusses of the boat. When this is not possible horizontal structures should be made stiff by additional provisions. (refer to fig. 1)
2 In larger vessels a separate and insulated machine room for the genverter 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. (refer to fig. 1)

Figure 1: Mounting of the Whisper generating set. X = wrong, V = OK

2.5 VENTILATION

2.5.1 General
The generator normally draws air from the engine compartment or machine room. An engine compartment with natural ventilation must have vent openings of adequate size and location to enable the generator 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. Further the electronic inverter is rated for 40°C. At higher temperatures the electric output will be lower. 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 water spray.
2.6 CONNECTIONS

2.6.1 Overview
The genverter GV4 comes supplied with all supply and output lines (i.e. cooling water connections, exhaust, fuel lines etc.) already connected to the engine and inverter. The supply lines are fed through the capsule’s front base. The connections are marked as shown in figures 2.
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 2: Connections of the GV-4

Exhaust connection for 40 mm exhaust hose
2.7 FUEL SUPPLY

2.7.1 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 genverter engine) should be avoided.

Do NOT connect the fuel lines to the lines of the vehicles engine fuel supply.

Using the tank empty below the level of the suction pipe of the genverter could make it necessary to bleed the fuel system.

2.7.2 Fuel lift pump
The generating set itself is equipped with a separate fuel lift pump; therefore the tank can be installed at a lower level than the generating set. See figure 3. The maximum suction height is 1 m. If the pump has to lift the fuel higher than one meter an external fuel lift pump must be installed (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 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).
2.7.3 FUEL PIPES

When the tank is above the generating set (figure 4) 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 (figure 3) we recommend ending the return line on the bottom of the tank (A) below the inlet of the supply line. In this way the fuel cannot drain back into the tank when the engine is stopped; as the return line will not let air in. This prevents starting trouble caused by air in the fuel supply line.

Both supply and return fuel pipe lines should be appropriate material and 8 mm outer diameter tubing. The quality of the tubing of fuel pipes could be submitted to local regulations depending on the application of the boat. 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 fulfills 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 to 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.

2.7.4 Fuel filters

A fine fuel filter is installed which requires maintenance. 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.

2.8 COOLING

2.8.1 General

For the cooling of an engine on a boat there are two methods available:

Inter-cooling and keel cooling

Inter-cooling is based on a raw water pump, heat exchanger and water-injected exhaust. Keel cooling means cooling the coolant (in case of the GV4 this is oil) by circulating the hot coolant through a space in the keel, or through a double walled skin of the boat, through a box cooler welded in a steel boat, using a big tank or any other external cooler.

Most of the time; using keel cooling, one apply a dry exhaust, but other combinations could be supplied on request:

1) Inter-cooling with water injected a wet exhaust
2) Inter-cooling with a dry exhaust
3) Keel cooling with a dry exhaust
4) Keel cooling with a wet exhaust

2.8.2 Inter-cooling

When applying inter-cooling the genverter should have its own sea water inlet and should not be connected to any other engine systems. See figure 6. A properly installed cooling system is critical to keep engine temperatures within an acceptable range. Ensure that the installation complies with the following installation instructions.

2.8.3 Raw water supply

For raw water supply the following installation materials are required: -a skin fitting - a sea cock - a water strainer - hoses and clamps. In order to keep the suction resistance in the line at a minimum, the sea water intake system (i.e. sea cock, thru-hull fitting, inlet filter, etc.) must have an inner diameter of at least 12.5 mm diameter (1/2”). The suction hose should be kept as short as possible. Raw water plumbing should avoid bends as much as possible.
Restriction of raw water flow, caused by kinked hoses, undersized pipes or connections, will reduce the engine cooling capability. This is the main cause for overheating of an engine.

When in doubt check the coolant flow rate using a stopwatch and by holding a pail of a known volume under the wet-exhaust outlet. The flow rate should be 8 to 12 litres /min.

2.8.4 Installation of through hull fitting

It is good practice for yachts to use a hull inlet fitting with an integrated strainer (water scoop). For propulsion engines in motorboats the water scoop is often mounted against the sailing direction to induce more water intake for cooling.

2.8.5 Water strainer

Use an appropriate water strainer with connections of 12.5 mm (1/2"). Install the water strainer in a well accessible position, (refer to figure. 6, ref 6) 5 cm above the waterline.

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**Figure 6: Raw water cooling system**

1 Water level
2 Water/exhaust separator
3 Seacock
4 Waterlock
5 Air vent (Siphon breaker);
6 Water strainer;
7 Seacock.

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**Figure 7 Installing water intake**

THIS SHOULD NOT BE DONE IN THE CASE OF A GV4 OR ANY OTHER GENVERTER! WHEN SAILING AT HIGHER SPEEDS, WATER WILL BE FORCED INTO THE INLET AND YOUR ENGINE WILL OVERFLOW!

See figure 7. On motorboats and on sailing boats the water scoop for a GV4 should be fitted with the opening faced backwards to prevent water being forced in during sailing. Use a sealant when mounting the skin fitting.
2.8.6 Siphon breaker (air vent)

When the point of water injection is below the waterline, then - when the engine is stopped - there is a risk that the cooling water may enter the engine as a result of siphoning. To avoid this happening, the GV4 is designed to accommodate a siphon breaker (air vent). In the standard delivery of the GV4 connections are bypassed. Hose of 12.5 mm (1/2") inner diameter should be used.

If the GV-4 cannot be mounted such that the bottom of the GV-4 is placed above the waterline, an air vent must be installed. Extend the water hose of the by-pass 60 cm above waterline and install an air vent. Ideally, the air vent should be mounted above the yacht keel centre line (i.e. to minimize the influence of swaying on the water intake).

Fast motorboats will lay deeper when sailing at large speed and can cause pressure on the water inlet. This should be avoided to prevent flooding the engine.

\[ \text{IF THE AIR VENT IS CLOGGED THE WATER HOSES WILL NOT BE VENTED WHEN THE GV-4 HAS STOPPED AND WATER CAN BE FORCED INTO THE ENGINE. THIS LEADS TO IMMEDIATE ENGINE PROBLEMS AND EVENTUALLY SEVERE DAMAGE!} \]

\[ \text{DAMAGE CAUSED BY THE INGRESS OF WATER IN THE ENGINE IS NOT COVERED BY WARRANTY} \]

The siphon breaker that is delivered with the Whisper Power siphon breaker installation kit does not require a connection for a hose to drain the little water that could be spilled from the valve. If you use another kind of siphon breaker that has a hose connection, make sure that the drain should go downwards down directly and that it may not end under water. Water must flow out freely and air has to flow in freely as well (refer to figure 8).

Check the air vent at regular intervals. Open, clean and lubricate the valve as required (figure 8).

2.9 EXHAUST SYSTEM

Inter-cooling is almost always combined with a wet exhaust system: Water is injected in the exhaust system of the genverter. In this way the cooling water that has passed the heat exchanger is mixed with the exhaust gases. Temperature and volume of the gases are thereby reduced considerably, so that a rubber exhaust hose can be used and the level of noise is reduced as well. However a dry exhaust is possible dumping the water over board separately.

Keel cooling is almost always combined with a dry exhaust.

2.9.1 Standard wet exhaust system installation

The genverter wet exhaust system must remain completely independent and separate from the exhaust system of any other engine on board. A water lock prevents the genverter from being flooded by cooling water and should be installed as close to the genverter as possible. The lock must be large enough to hold the entire water volume held in the hose from the top of the goose neck to the water lock. The water lock must be installed at the lowest point of the exhaust system (ref. to figure 6, ref. 1). The exhaust hose must have an inner diameter of 40 mm no less, no more-. The exhaust system must be installed so that the back pressure inside the exhaust does not exceed 0,8 psi 60 cm. water pressure (refer to the user's manual) and total length up to the outlet or water separator does not exceed 2,5 m. The exhaust hose descends from the capsule to the water lock. Then the hose rises maximum lift 120 cm via the "goose neck" to the through-hull exhaust outlet, situated minimum 50 mm above the water line (refer to figure 6, ref. 5). The "goose neck" must be vertical and situated preferable along the ship's keel centre line. It is recommended to install an extra muffler (see figure 6, ref. 2) close to the through-hull fitting.

\[ \text{BECAUSE OF THE SMALL GAS FLOW OF THE SMALL ENGINE IT IS VERY IMPORTANT TO KEEP STRICTLY TO THE INSTRUCTIONS ABOVE. SOME MUFFLERS AND WATER LOCKS CAUSE TOO HIGH BACK PRESSURE. YOU ARE ADVISED TO USE A WHISPER POWER INSTALLATION KITS OR CHECK THE BACK PRESSURE (REFER TO THE USERS MANUAL). TOO HIGH BACK PRESSURE CAUSES THE SYSTEM TO FILL UP WITH} \]
WATER THAT AFFECTS THE OUTLET VALVE AND VALVE SEAT.

2.9.2 “Super silent” exhaust system

See figure 8. In order to reduce the noise level of the GV4 to a minimum, an option to reduce the exhaust noise further (especially exhaust water splashing) is an exhaust/water separator. The exhaust/water separator allows the cooling water to be ejected through a line separate from the exhaust fumes and also functions as a goose neck to prevent water from flooding the engine. The exhaust/water separator is mounted more than 60 cm above the water level.

See figure 9. If the through-hull exhaust outlet has to be mounted far from the GV4, an exhaust/water separator must definitely be installed. (Total length of the exhaust piping from generator to top of goose neck (water separator) is more than 2,50 m.) The sea water from the separator must run down along the shortest possible path to the through-hull outlet.

1 Exhaust water lock; 4 Goose neck;
2 Exhaust outlet muffler; 5 Through-hull exhaust outlet Ø 40 mm
3 Exhaust line Ø 40 mm; 6 Water level.

Figure 9: Standard exhaust system

Figure 10: Super silent exhaust system
Only when using an exhaust/water separator the exhaust may have a length up to 7.5m after the water/gas separator. However water traps should be avoided as the fumes still contains water and this should not accumulate in bents (refer to figures 12 and 13). An additional outlet exhaust muffler close to the hull outlet will help further to reduce noise emission.

If the M-GV4 and the exhaust system have been installed correctly, neighbouring boats will not be disturbed by outlet noise. With the "super silent" exhaust system, GV-4 noises are almost inaudible. For optimal noise reduction, the sea water outlet from the exhaust/water separator (centre outlet on the unit) should be installed below the water level to eliminate noisy splashing of the effluent sea water.

The through-hull outlet for the exhaust fumes should not direct the fumes directly toward the water surface as this will cause excessive noise (refer to figure 14).

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Figure 11, keep the waterlock close to the generator

Figure 12, one time up
Figure 13: Water will collect in the hanging bend of the exhaust gas hose and will cause back pressure

Do not direct the outlet directly toward the water surface.

Figure 14

Figure 15: Dry exhaust systems on boats

2.10 DRY EXHAUST SYSTEM

2.10.1 General remarks
A dry exhaust muffler system should be very effective in silencing exhaust noises when applying the right mufflers. However noise could be generated by vibrations in the mufflers and be transferred to the boat. 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.

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 jacket 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 boat, measures has to be taken to prevent rainwater to enter the system. Special rain caps are available as an option.
A negative feature of a dry exhaust system is the heat radiated by its components. Measures must be taken to overcome the heat problem: When a dry exhaust has its outlet on the deck or on the roof of the steering house, all the pipes inside the boat 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. On request Whisper Power can supply insulation jackets for all king of pipes and bents.

1 THE STANDARD DRY EXHAUST SYSTEM

The standard exhaust system contains:

On the genverter:
- 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
- Jackets for thermal and sound insulation.

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

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3 ELECTRICAL INSTALLATION (12 VOLT)

3.1 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. A local control panel is on the generating set.

3.2 REMOTE CONTROL
A remote control panel also containing a microprocessor is in the delivery. A 10 m intermediate 8-pole communication cable is in the standard supply as well (refer to fig. 18). If necessary other lengths are available on request. A longer (up to 30m) intermediate cable can be connected if the standard length does not suit the required distance. When a longer distance than 30m is required, consult the Whisper Power service department for advice.

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.

Two 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.

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. 18.

3.3 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 and minus to minus as indicated. Refer to fig. 19.

3.3.1 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 J4 and J5 on the backside of the local control panel. See fig. 20. To do so, remove this bypass connection and then replace it.

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Fig. 18 Remote control cable

Fig. 19 Remote box terminals
Fig. 20: Connection for emergency stop / fire alarm switch

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

3.4 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 users manual.

One of these options is to monitor a second battery (not being the starter battery) to start the generator automatically when the voltage of this battery drops below a certain setting.

Other names for this second battery are “auxiliary battery”, “service battery”, “users battery” or “consumers battery”.

We will refer to this battery as “the second battery” (BAT2). In some menus the starter battery could be indicated as “the first battery” (BAT1).

A sense wire to monitor the second battery should be connected (attention polarity!) to the connector on the back of the remote panel. Refer to fig. 19. 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.

3.5 STARTER BATTERY

For starting, the GV4 requires a 12V starter battery with at least 55 Ah.

The GV4 can be connected with the main engine battery or have its own battery.

We strongly recommend the use of a separate battery for the GV4 and to keep the wiring system for the boat engine and the domestic DC supply system completely separate and individually connected to separate batteries.

Fig. 21: Starter battery

However, the negative of all the batteries on the boat 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 boats having the starter battery of the boat 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 boat’s main battery and the starter battery. Also a small charger can be used to charge the starter battery only.

3.6 OTHER RECOMMENDATIONS AND WARNINGS

The battery should be secured for rough sea conditions and the terminals should be insulated. For extra safety the battery can be enclosed in a wooden, plastic, fiberglass etc. (non metal) box. Even when the earth return system is applied a negative battery cable should be used and the boat 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.

3.7 AC POWER SYSTEM (230 VOLT)

The electric power supplied by the GV4 is of a high voltage and dangerous to people. Before working (installation) on the system read the sections on safety in the users manual.

Generators used on boats 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 boats 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.

3.8 FUSE

An output fuse (between the GV4 and the electrical installation) should be installed to protect the installed electrical system. A maximum single phase output current applied is 18 Amps.

The fuse must be of the slow reacting type. For electrical motors connected to the system, a motor protection switch must be installed.

3.9 GROUNDING

The AC alternator windings are not grounded. The housing of the alternator and all other metal parts are grounded.

It is necessary that the electric installation in the boat must be protected against insulation failures. Methods of protection are subjected to rules that can be different depending on the use of the boat and local standards. Experts in this field should be consulted.

To make a connection between “neutral” and “ground” is necessary as part of a specific insulation failure protection system. In the GV 4 this connection is NOT made in the factory. Do not make this connection without installing this specific insulation protection system!

3.10 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)

3.11 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 “land” (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.

Whisper Power recommends the installation of a Systemswitch as the power source selector. This works automatically when the generating set is not running the input remains in the land line position and as soon as the generating set is running the Mass Systemswitch switches automatically after 10 seconds delay time over to the generating set position.

In all situations the transfer switches between land line, inverter and genverter should switch both neutral and L1.

4 INSTALLATION SPECIFICATIONS

4.1 GENERAL
1 Mount the generating set directly, without additional vibration dampers, on a solid surface.
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 Install a Whisper Power battery charger. (optional)

4.2 COMMISSION TABLE
1 Check if the cooling system for the engine is properly installed.
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.
10 To bleed the fuel system:
   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.
11 Start the engine by pushing the start button
12 Check when the genverter is running, the delay of some seconds in the power source selector transfer.
13 Check voltage and frequency under ‘no load’ conditions.
14 Check if the genverter increase speed when loaded more. Check if the genverter can bring the full load.
15 Check if the genverter can speed up when largest load step that can occur comes in. If not increase no load speed (Refer to DDC manual)
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 genverter set and check the engine again for leakages of oil, fuel or coolant and check the oil level again.

## 4.3 TECHNICAL DATA

### GENERAL

<table>
<thead>
<tr>
<th>Model</th>
<th>M-GV4</th>
</tr>
</thead>
<tbody>
<tr>
<td>RPM</td>
<td>2500 up to 3400</td>
</tr>
<tr>
<td>Intermittent Power</td>
<td>3.8 kW 230V 50Hz at 3400 rpm</td>
</tr>
<tr>
<td>Continuous Power</td>
<td>3 kW 230V 50Hz at 3000 rpm</td>
</tr>
<tr>
<td>Max surge current 5 seconds</td>
<td>36 l/t</td>
</tr>
</tbody>
</table>

### ENGINE

<table>
<thead>
<tr>
<th>Model</th>
<th>Whisper Power; direct injected, oil cooled diesel engine. WP 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of cylinders</td>
<td>1</td>
</tr>
<tr>
<td>Displacement</td>
<td>306 cc</td>
</tr>
<tr>
<td>Bore X stroke</td>
<td>78x64 mm</td>
</tr>
<tr>
<td>Combustion air consumption</td>
<td>0.42 m³/min.</td>
</tr>
<tr>
<td>Intermittent power engine</td>
<td>4.4 kW at 3400 rpm (SAE J1349, ISO 3046/1) (Ambient temperature 25°C, Atmospheric Pressure 100kPa, Rel. humidity 30%)</td>
</tr>
<tr>
<td>Continuous power engine</td>
<td>3.5 kW at 3000 rpm</td>
</tr>
<tr>
<td>Fuel temperature</td>
<td>Max 40°C At fuel injection pump</td>
</tr>
<tr>
<td>Fuel consumption</td>
<td>0.8-1.2 litre/hour, load dependent</td>
</tr>
<tr>
<td>Fuel lift pump engine</td>
<td>Electric pump (12 V DC); additional pump available upon request</td>
</tr>
<tr>
<td>Cooling system</td>
<td>Oil cooled by means of dedicated trochoid pump on the engine and heat exchanger</td>
</tr>
<tr>
<td>Lubrication system</td>
<td>Forced lubrication with dedicated trochoid pump (different from cooling pump)</td>
</tr>
<tr>
<td>Starting battery (optional)</td>
<td>55-90 Ah 12V</td>
</tr>
<tr>
<td>Starting system</td>
<td>Starter motor</td>
</tr>
<tr>
<td>Control</td>
<td>Digital Diesel Control including automatic start/stop</td>
</tr>
</tbody>
</table>

### ALTERNATOR

<table>
<thead>
<tr>
<th>Type</th>
<th>Permanent Magnet integrated in flywheel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output voltage</td>
<td>400V-500Hz 3 phase</td>
</tr>
<tr>
<td>Output rating</td>
<td>5 kW (oversized)</td>
</tr>
<tr>
<td>Efficiency</td>
<td>94%</td>
</tr>
</tbody>
</table>

### INVERTER

| Input Voltage                  | 400V-500Hz, 3 phase (max)                                     |
| Output voltage                 | 230V  50 Hz alternating current (AC) single phase             |
| Output rating                  | 4 kW                                                          |
| Voltage tolerance              | ± 5 %                                                         |
| Frequency tolerance            | ± 0.1%                                                       |

### MECHANICAL SPECIFICATIONS

| Supply includes               | Sound shield with steel base, mounted on double set of rubber anti vibration mountings. (Genverter without sound shield is optional) |
| Dimensions l x w x h          | 630x480x520 mm                                               |
| Colour                        | Metallic silver / white                                     |
| Weight                        | 92 kg including sound shield                                |
| Standard supplies             | Digital remote panel (10 m cable), fuel filter, fuel lift pump, user and installation manuals |
| Available as option:          | Installation kits, non earth return (ungrounded), spare part kits longer or shorter DDC cables |
4.4 SPECIFICATION OF THE ACCESSORIES

<table>
<thead>
<tr>
<th>Accessory</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water scoop</td>
<td>Min. 1/2&quot; (recommended 3/4&quot;)</td>
</tr>
<tr>
<td>Inlet valve</td>
<td>Min. 1/2&quot; in 12.5 mm out (recommended 3/4&quot; in 12.5 mm out)</td>
</tr>
<tr>
<td>Water strainer</td>
<td>12.5 mm in, 12.5 mm out</td>
</tr>
<tr>
<td>Anti siphoning valve</td>
<td>12.5 mm</td>
</tr>
<tr>
<td>Inlet suction hose</td>
<td>12.5 mm</td>
</tr>
<tr>
<td>Exhaust hose in/out</td>
<td>Ø 40 mm (1 5/8&quot;)</td>
</tr>
<tr>
<td>Water lock</td>
<td>Ø 40 mm (1 5/8&quot;)</td>
</tr>
<tr>
<td>Water/gas separator</td>
<td>Ø 40 mm (1 5/8&quot;)</td>
</tr>
<tr>
<td>Starter battery</td>
<td>55 Ah</td>
</tr>
<tr>
<td>Fuel filter/water separator</td>
<td>30 micron</td>
</tr>
<tr>
<td>Fuel inlet and return</td>
<td>8 mm</td>
</tr>
</tbody>
</table>

4.5 INSTALLATION MATERIALS M-GV4

Figure 22: Installation materials battery installation kit

<table>
<thead>
<tr>
<th>BATTERY INSTALLATION KIT 55 Ah</th>
</tr>
</thead>
<tbody>
<tr>
<td>pos.</td>
</tr>
<tr>
<td>------</td>
</tr>
<tr>
<td>51</td>
</tr>
<tr>
<td>52</td>
</tr>
<tr>
<td>55</td>
</tr>
<tr>
<td>56</td>
</tr>
<tr>
<td>58</td>
</tr>
<tr>
<td>TOTAL</td>
</tr>
</tbody>
</table>
### 4.6 FUEL KIT

**Figure 23: Installation materials fuel supply kit**

<table>
<thead>
<tr>
<th>no</th>
<th>qty</th>
<th>article no</th>
<th>description</th>
<th>dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td>41</td>
<td>2</td>
<td>50221203</td>
<td>Straight coupling</td>
<td>8 mm</td>
</tr>
<tr>
<td>42</td>
<td>1</td>
<td>40230090</td>
<td>Fuel strainer/water separator</td>
<td>M14x1.5 mm</td>
</tr>
<tr>
<td>43</td>
<td>2</td>
<td>50221618</td>
<td>Parallel male stud coupling</td>
<td>M14 - 8 mm</td>
</tr>
<tr>
<td>44</td>
<td>2</td>
<td>50221644</td>
<td>Reducing male nipple</td>
<td>M14-M16 60 gr.</td>
</tr>
<tr>
<td>45</td>
<td>2</td>
<td>50221615</td>
<td>Hose connection</td>
<td>8 mm</td>
</tr>
<tr>
<td>46</td>
<td>2</td>
<td>50221616</td>
<td>Nut coupling</td>
<td>M16x1.5 mm</td>
</tr>
<tr>
<td>47</td>
<td>1</td>
<td>50221252</td>
<td>Nipple hose pipe</td>
<td>8 mm</td>
</tr>
<tr>
<td>48</td>
<td>4</td>
<td>50221522</td>
<td>Hose clamps</td>
<td>10-16 mm</td>
</tr>
<tr>
<td>49</td>
<td>2</td>
<td>50221632</td>
<td>Gasket ring</td>
<td>14x20x1.5 mm</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>TOTAL</strong></td>
<td><strong>40230205</strong></td>
<td><strong>FUEL KIT</strong></td>
</tr>
</tbody>
</table>

**OPTIONAL INSTALLATION MATERIALS**

<table>
<thead>
<tr>
<th>no</th>
<th>qty</th>
<th>article no</th>
<th>description</th>
<th>dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td>50</td>
<td>1</td>
<td>50222020</td>
<td>copper fuel pipe</td>
<td>6x8 mm</td>
</tr>
<tr>
<td>51</td>
<td>1</td>
<td>50220063</td>
<td>fuel hose</td>
<td>8x16 mm</td>
</tr>
</tbody>
</table>

- Spare parts fuel kit

**Spare parts fuel kit**

<table>
<thead>
<tr>
<th>pos.</th>
<th>qty</th>
<th>article no</th>
<th>description</th>
</tr>
</thead>
<tbody>
<tr>
<td>46</td>
<td>40230092</td>
<td>Filter for strainer fuel/water separator</td>
<td></td>
</tr>
</tbody>
</table>
4.7 WATER INLET KIT

Figure 24: Installation materials Water inlet kit and Syphon breaker kit

WATER INLET KIT 1/2” (12.5 mm)

<table>
<thead>
<tr>
<th>pos.</th>
<th>qty</th>
<th>article no</th>
<th>description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>50230052</td>
<td>Intake strainer 3/4”</td>
</tr>
<tr>
<td>2</td>
<td>1</td>
<td>50230042</td>
<td>Lever operated ball valve FF 3/4”</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
<td>50221016</td>
<td>Male hose connection 3/4”x13</td>
</tr>
<tr>
<td>4</td>
<td>3</td>
<td>50221521</td>
<td>Hose clamp stainless 12-20</td>
</tr>
<tr>
<td>5</td>
<td>3m</td>
<td>50220055</td>
<td>Cool. water hose transp. spiral 13x19mm</td>
</tr>
<tr>
<td>6</td>
<td>1</td>
<td>50230062</td>
<td>Nickel plated brass intake strainer 3/4”</td>
</tr>
<tr>
<td>7</td>
<td>1</td>
<td>50230067</td>
<td>Mounting bracket small water strainer 1158</td>
</tr>
</tbody>
</table>

TOTAL 40230201 WATER INLET KIT 12.5 mm

SYPHON BREAKER KIT 1/2” (12.5 mm)

<table>
<thead>
<tr>
<th>pos.</th>
<th>qty</th>
<th>article no</th>
<th>description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>50230017</td>
<td>Siphon breaker valve 12.5mm (1/2”), complete (including valve assembly)</td>
</tr>
<tr>
<td>2</td>
<td>6</td>
<td>50221521</td>
<td>Hose clamp stainless 12-20</td>
</tr>
<tr>
<td>3</td>
<td>3m</td>
<td>50220057</td>
<td>Cooling water hose warm water 13x21mm</td>
</tr>
<tr>
<td>4</td>
<td>2</td>
<td>50221260</td>
<td>Hose connector 12.5mm (1/2”)</td>
</tr>
</tbody>
</table>

TOTAL 40230272 SYPHON BREAKER KIT 12.5 MM (1/2”)
According to ABYC recommendations all hose connections must be fitted with two hose clamps.

Maximum torque hose clamps: 12Nm / 105 InLbs.

**Figure 25:** Installation materials “Delta” exhaust kit ø 40 mm (1 5/8”) and water separator kit 40 mm (1 5/8”)

### “DELTA” EXHAUST KIT Ø 40 mm (1 5/8”)

<table>
<thead>
<tr>
<th>pos.</th>
<th>qty</th>
<th>article no</th>
<th>description</th>
</tr>
</thead>
<tbody>
<tr>
<td>22</td>
<td>8</td>
<td>50221504</td>
<td>Hose clamp stainless 32-44 mm</td>
</tr>
<tr>
<td>23</td>
<td>3m</td>
<td>40220033</td>
<td>Marine exhaust hose 40 mm (1¾&quot;)</td>
</tr>
<tr>
<td>24</td>
<td>1</td>
<td>40230093</td>
<td>Waterlock 40 mm Delta</td>
</tr>
<tr>
<td>25</td>
<td>1</td>
<td>50230038</td>
<td>Brass hull fitting hose connection 1¼”x40</td>
</tr>
</tbody>
</table>

**TOTAL**
40230251 DELTA EXHAUST KIT 40 mm

### “DELTA” WATER SEPARATOR KIT 40 mm (1 5/8”)

<table>
<thead>
<tr>
<th>pos.</th>
<th>qty</th>
<th>article no</th>
<th>description</th>
</tr>
</thead>
<tbody>
<tr>
<td>22</td>
<td>8</td>
<td>50221504</td>
<td>Hose clamp stainless 32-44 mm</td>
</tr>
<tr>
<td>23</td>
<td>2.5m</td>
<td>40220033</td>
<td>Marine exhaust hose 40 mm (1¾&quot;)</td>
</tr>
<tr>
<td>31</td>
<td>1</td>
<td>50221015</td>
<td>Male hose connection 1¼” x 40mm</td>
</tr>
<tr>
<td>32</td>
<td>1</td>
<td>50230044</td>
<td>Lever operated ball valve FF 1¼”</td>
</tr>
<tr>
<td>33</td>
<td>1</td>
<td>50230033</td>
<td>Brass through hull fitting 1¼” x 70</td>
</tr>
<tr>
<td>34</td>
<td>1</td>
<td>40230097</td>
<td>Water / gas separator Delta 40/40/40mm (1¾&quot;)</td>
</tr>
</tbody>
</table>

**TOTAL**
40230261 Delta water/gas separator kit 40mm

### OPTIONAL INSTALLATION MATERIALS

<table>
<thead>
<tr>
<th>pos.</th>
<th>qty</th>
<th>article no</th>
<th>description</th>
</tr>
</thead>
<tbody>
<tr>
<td>21</td>
<td>1</td>
<td>50201830</td>
<td>Elbow 90° adapter exhaust hose</td>
</tr>
<tr>
<td>22</td>
<td>4</td>
<td>50221504</td>
<td>Hose clamp stainless 32-44 mm</td>
</tr>
<tr>
<td>27</td>
<td>1</td>
<td>50230113</td>
<td>Straight coupling Delta 40mm</td>
</tr>
<tr>
<td>28</td>
<td>1</td>
<td>50230112</td>
<td>Elbow (45°) Delta 40mm</td>
</tr>
</tbody>
</table>

EN / M-GV4 for marine applications / April 2011
**Figure 26: Installation materials dry exhaust kit**

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

5.1 ELECTRICAL DIAGRAMS

Fig. 27: Electrical control diagram overview

Fig. 28: Electrical diagram control panel
5.2 LAY OUT CONNECTIONS

Fig. 29: Lay out connection terminals
5.3 DIMENSIONS W-GV4

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

5.4 REMOTE CONTROL PANEL DRAWINGS