Fischer Panda

Operation manual

Description of the generator and operation manual

5.2.10

Panda_AGT_DC_4000_PMS_12V-72V.R02

Marine Generator
Panda AGT-DC 4000 PMS

Super silent technology

12 V ; 24V ; 36V ; 48V ; 72V

4kW

Fischer Panda GmbH

Revision

	Document
Actuelle:	Panda_AGT_DC_4000_PMS_12V-72V.R02_5.2.10
Replace:	Panda_AGT_DC_4000_PMS_12V-72V.R01

Revision	**Page**
Installationszeichnungen für den Wassersammler verändert	

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Special notes and safety instructions for AGT- Generators

Saferty First

Safety Precautions

General safety references for the enterprise of a AGT generator.

With all energized systems, with which the current is more than 50 Ampère, special safety precautions must be made, in order to protect the environment of the components against fire.

It is to be ensured absolutely that at the battery a main switch in well accessible place is accommodated, so that with danger of the main switches can be separated immediately. The main switch must be however also directly at the battery installed. If this place is not well accessible, a power relay must be used instead of the main switch which can be served manually, which can be served then if necessary from different places. The switches for the power relay are to mark accordingly as main switches DC battery "with danger switch off!".

Cooling of the rectifier block at the marine versions

The retifier block is cooled with fresh water. A normal cooling of the rectifier block is therefore only possible, as long as the cooling water supply of the generator functions duly. The cooling water supply of the generator must be so furnished therefore that by a wide dirt deflector it is guaranteed that from outside no dirt can be sucked in into the line system. If this is not attainable, the supply must be secured by a flow switch or a negative pressure switch. The generator must be switched off, if the cooling water supply is impair.

The temperature safety device on the rectifier block can be regarded only as additional safety device. The temperature rise at the diods is so fast that the rectifiers can be damaged during a unique interruption of the cooling water supply. A safe protection from damage of the rectifiers is not possible by the temperature monitoring on the rectifier radiator box. Thus this can take place only by means of an appropriate external monitoring of the cooling system.

ATTENTION!

Do not connect the minus pole of the starter battery to the ground of the boat because of galvanic reason.

Warning!

Never start the generator with the battery disconnected, the rectifiers will be damaged!

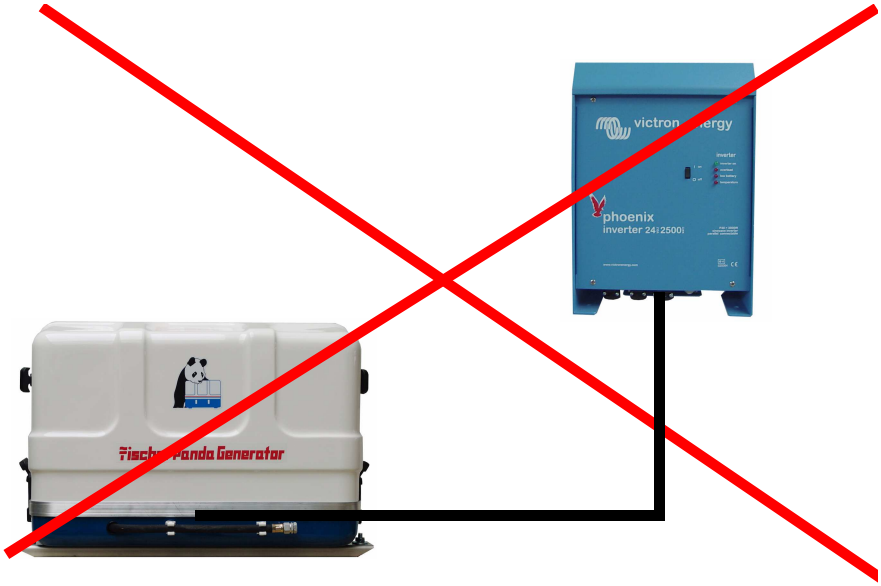
CAUTION!

Contact of the electrical contacts may be DANGER TO LIVE!

CAUTION!

The AGT-generator is not allowed to be connected to an inverter (without batteries)!

The Inverter generates voltage peaks, which can destroy the rectifier rectifiers of the generator!

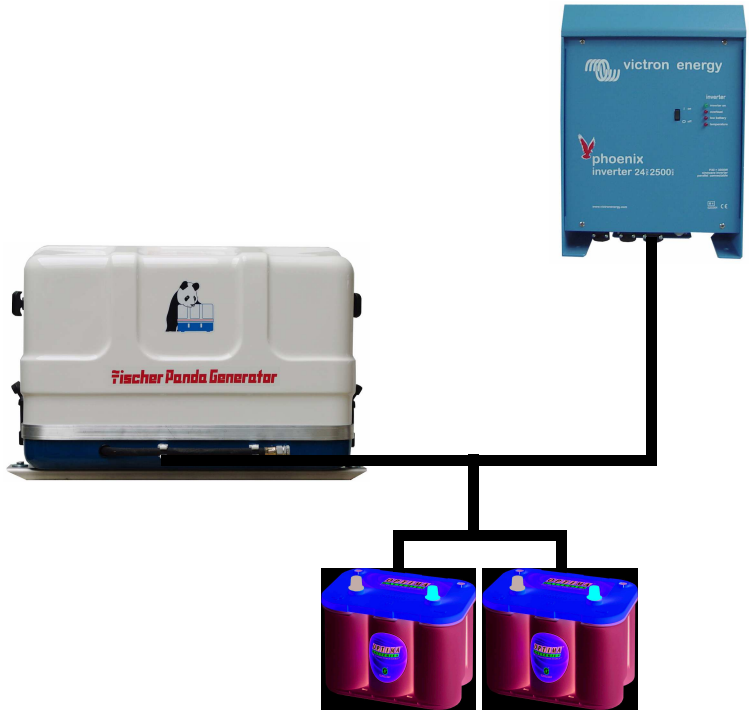


A battery must always be connected to the inverter as a capacity!

Recommended capacity

- at 12V ≥ 240Ah

- at 24V ≥ 120Ah



The screws at the electric rectifier may be pulled tight only with a torque wrench. Torque 6 Nm.

The battery cable must be secured at the generator and at the batteries with appropriate safety devices.

The generator is also include into the CO_2 - fire-extinguishing system.

Measures to the fire protection.

All construction units in the environment of energized parts, which carry more than 50 Amp., must be fire protection-moderately secured.

All junction points at the energized parts must be examined regularly on heating up (infrared thermometers).

Special notes for battery installation

ATTENTION !!! Commissioning:

Installation of battery lines.

! Consider ABYC regulation E11 AC and DC electrical systems on boats

and/or

EN ISO 10133:2000 small watercrafts, electrical systems, low voltage (DC) systems !

Install a right sized fuse in the positive battery line as close as possible to the battery, but max. 12 inch, 300mm from the battery. The length of the cable to the fuse, the cable must be protected by a sheath or conduit against damage of the insulation.

Use only cable with self retardant and self extinguishing insulation suitable for high temperatures up to 195℉, 90℃.

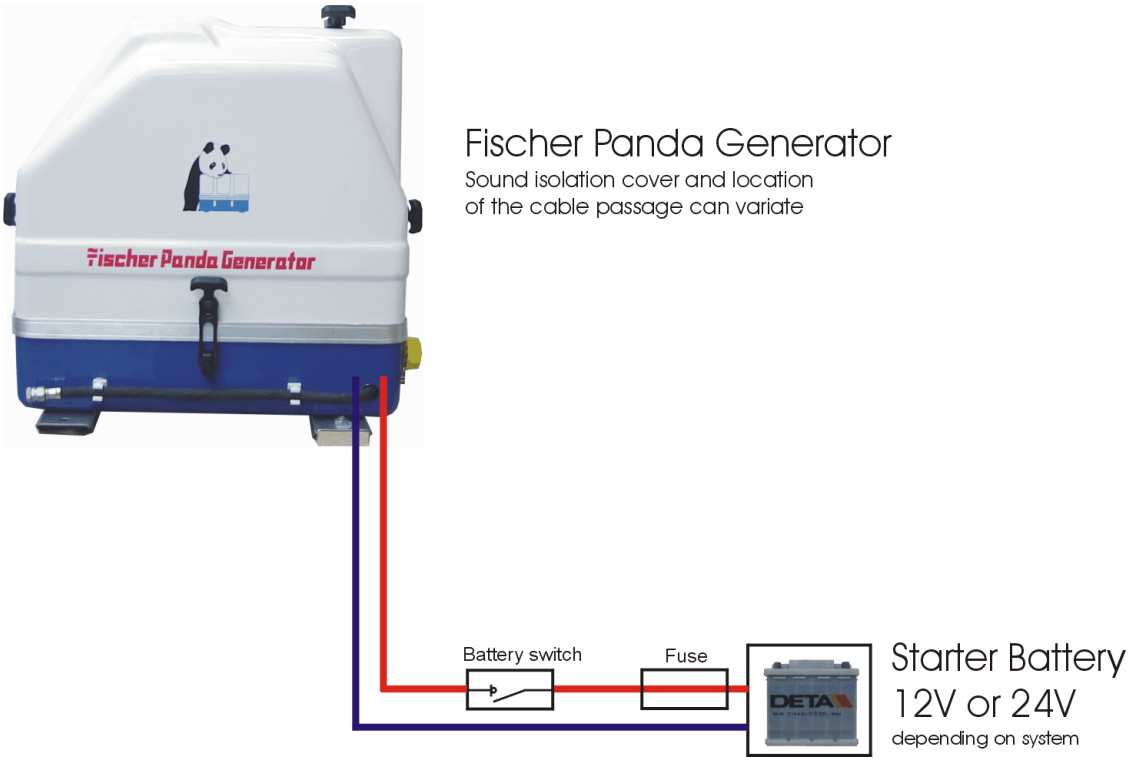
Install battery lines in a safe way the cable insulation will not be shaved or damaged.

Battery poles must be protected against short circuits by error.

Inside the capsule of the Fischer Panda Generator the battery positive line must be protected against heat and vibration by a suitable conduit or sheath and must be routed that way it is not touching any area that will get hot under normal operation like entire engine itself, exhaust elbow and exhaust manifold or exhaust lines or the V-belt and pulleys. The cable shall not be to tight otherwise damage will happen.

Run the generator carefully after installation and double check, if there is any possibility for damage of the battery cable. Correct if necessary.

Sample scheme for starter battery installation



Safety Instructions for the Handling with Batteries

These instructions must be noticed additionally to the instructions of the battery manufacturer:

- If the batteries are working, someone should be in your near area to help you in a case of emergency.
- Water and soap must be hold ready if battery acid corrode your skin.

- Wear eye protection and protective clothing. During working with the batteries don´t touch the eyes.
- If you got a acid splash on your skin or clothing grow it with much water and soap out.
- If you got acid in your eyes rinse them immediately with clear water until no cauterization is noticeable. Visit immediate a doctor.

- Don´t smoke in the near of the batteries. Avoid naked flames or open fires. In the area of batteries exists danger of explosions.
- Pay attention that no tools fall on the battery poles, if necessary cover them.
- During the installation don´t wear a wrist watch or arm jewels, you can create under these circumstances a battery short-circuit. Burning of the skin could be the result.
- Protect every battery contact against unintentional touch.

- Use only cyclical profoundly dischargeable batteries. Starter batteries are not appropriate. Lead-gel batteries are commended. They are maintenance-free, profoundly dischargeable and not produce gas.

- Do not charge a frozen battery.
- Avoid a batterie short-curcuit.
- Take care of a good ventilation of the battery to drain off developing gas.
- The battery connection terminals must be checked of a tight contact at least before operating.

- The battery connection cable must be carefully mounted and checked about incorrect heating at operation with load. The vibrating devices must be regulary checked about scour points and flaw in the isolation.

Attention !! For battery charge generators (Fischer Panda AGT-DC)!

Check before installation if the battery bank voltage correspond with the generator output voltage

Special Tools

This symbols are used throughout this manual to show which tool must be used at maintenance or installation.	
	Infrared temperature mesuring pistol
	Thermometer
	Current clamp (DC for synchron generators; AC for asynchron generators)

Intentionally Blank

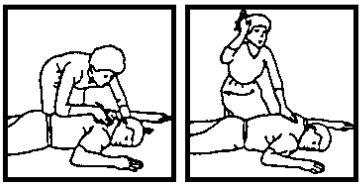
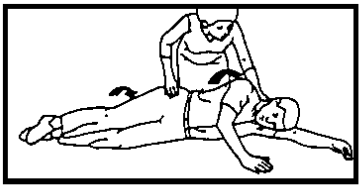
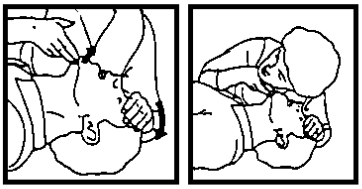
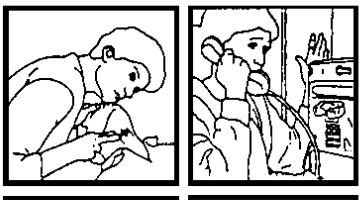
2. In case of Emergency First Aid / Im Notfall - Erste Hilfe



	5 Safety steps to follow if someone is the victim of electrical shock	
1	Do not try to pull or grab the individual.	
2	Send for help as soon as possible.	
3	If possible, turn off the electrical power.	
4	If you cannot turn off the electrical power, pull, push, or lift the person to safety using a wooden pole, rope, or some nonconductive material.	
5	After the injured person is free of contact with the source of electrical shock, move them a short distance away and immediately start necessary first aid procedures.	

2.7 WHEN AN ADULT STOPS BREATHING

WARNING!: DO NOT attempt to perform the rescue breathing techniques provided on this page, unless certified. Performance of these techniques by uncertified personnel could result in further injury or death to the victim.

1 Does the Person Respond?		**2** Shout, "Help!"
Tap or gently shake victim. Shout, "Are you OK?"		Call people who can phone for help.
3 Roll Person onto Back.		
Roll victim toward you by pulling slowly.		
4 Open Airway.		**5** Check for Breathing.
Tilt head back, and lift chin. Shout, "Are you OK?"		Look, listen, and feel for breathing for 3 to 5 seconds.
6 Give 2 Full Breaths.		
Keep head tilted back. Pinch nose shut. Seal your lips tight around victim's mouth. Give 2 full breaths for 1 to 1½ seconds each.		
7 Check for Pulse at side of Neck.		**8** Phone EMS for Help.
Feel for pulse for 5 to 10 seconds.		Send someone to call an ambulance.
9 Begin Rescue Breathing.		**10** Recheck Pulse Every Minute.
Keep head tilted back. Lift chin. Pinch nose shut. Give 1 full breath every 5 seconds. Look, listen, and feel for breathing between breaths.		Keep head tilted back. Feel for pulse for 5 to 10 seconds. If victim has pulse, not breathing, continue rescue breathing. If no pulse, begin CPR.

A. The Panda Generator

A.1 Type plate at the Generator

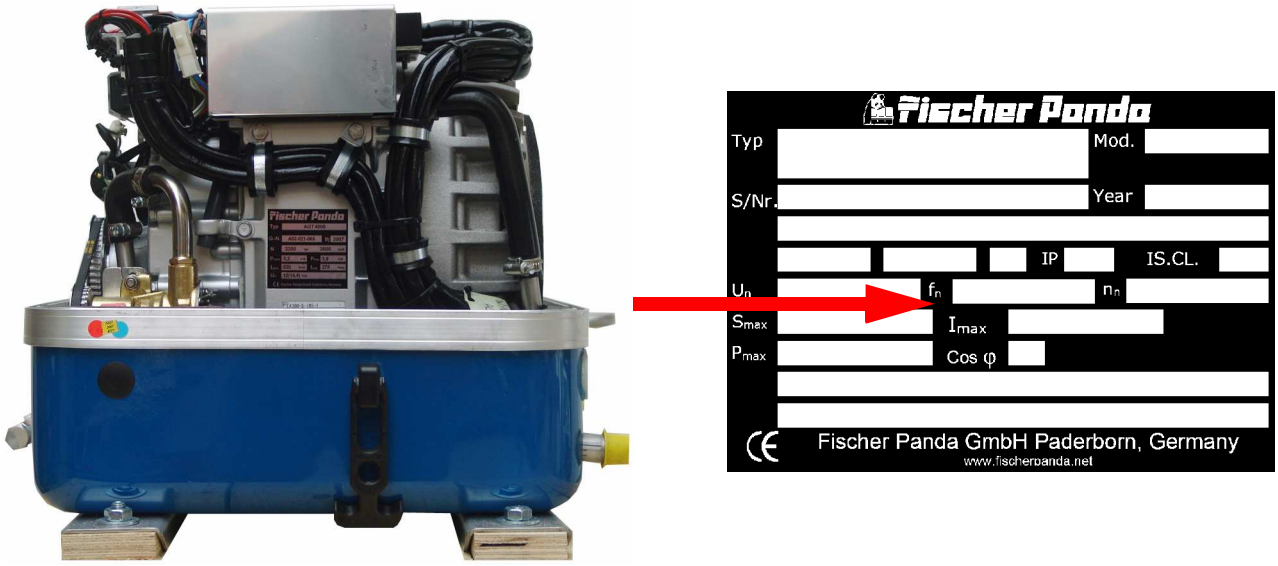


Fig. A.1-1: Type plate

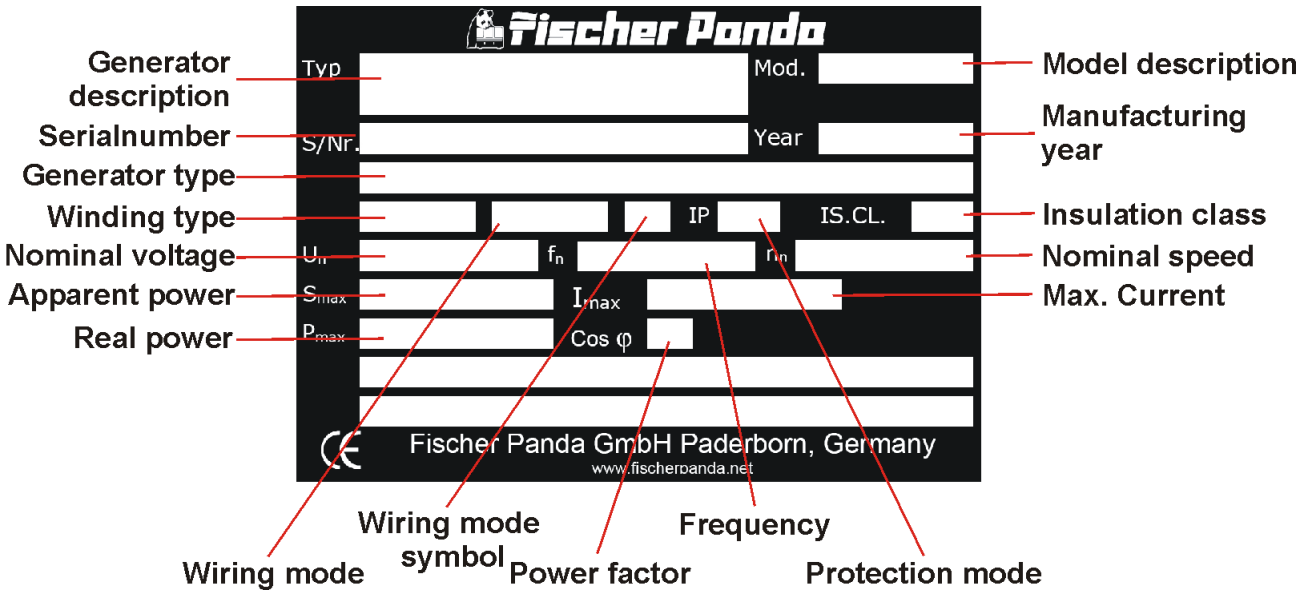
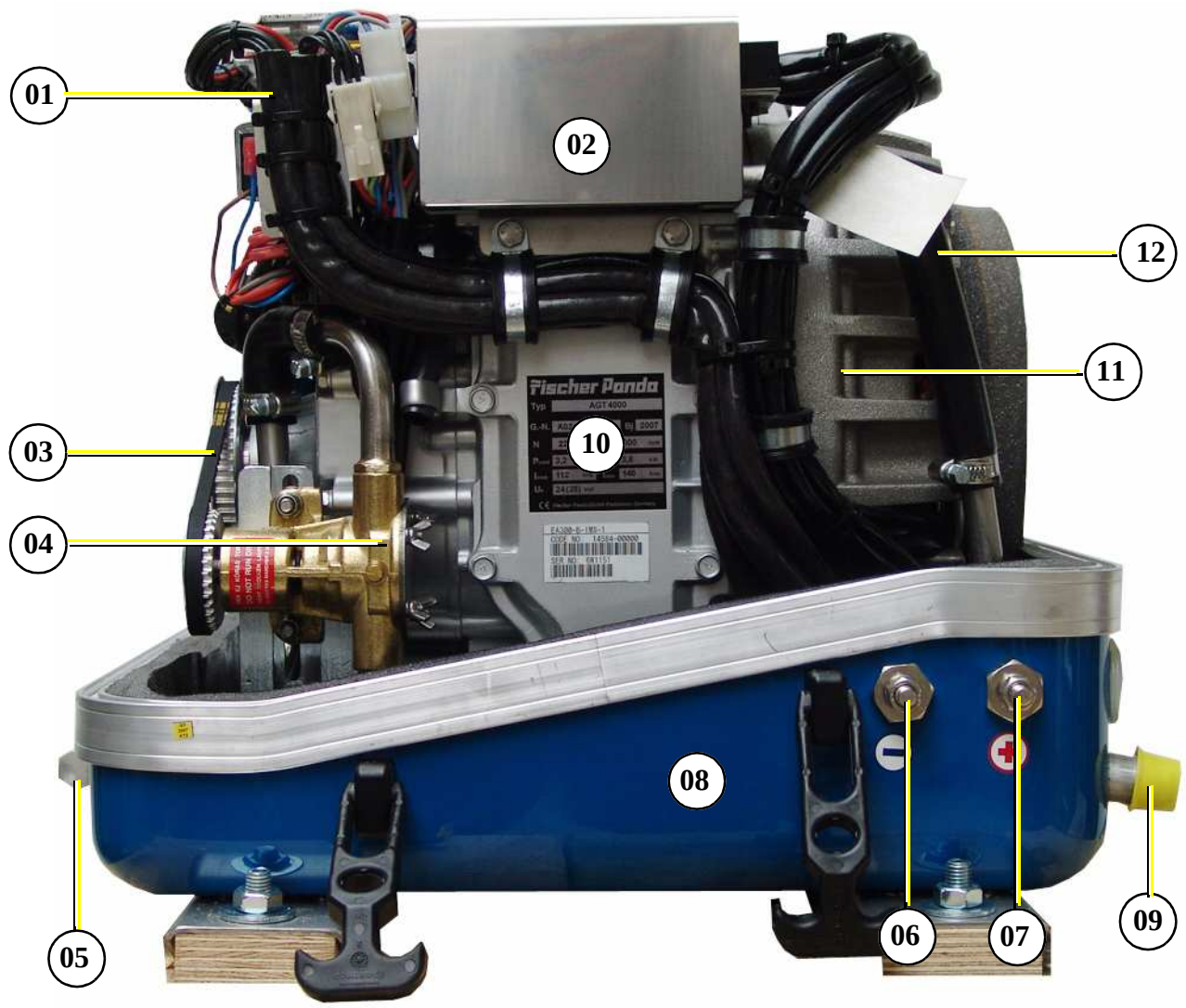


Fig. A.1-2: Discription type plate

A.2 Description of the Generator

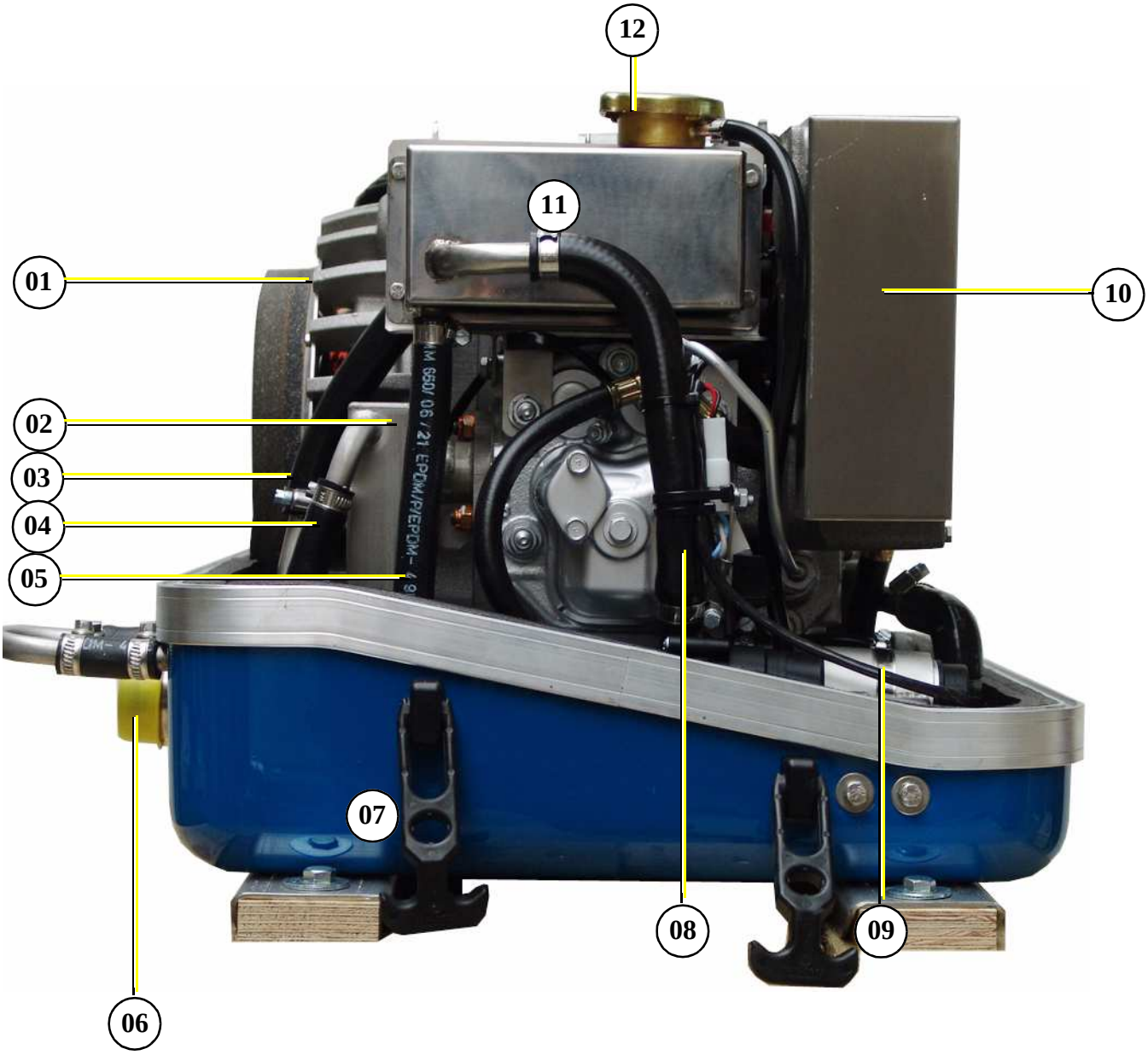
A.2.1 Right Side View



01) Terminal block for remote control panel, fuses and relays
02) Cooling water tank
03) Toothed belt
04) Raw water pump
05) Oil drain hose
06) Connection starter battery minus (-)
07) Connection starter battery plus (+)
08) Sound cover base part
09) Raw water inlet
10) Type plate at engine Kubota EA300
11) Generator housing with coil
12) Coolant pipe

Fig. A.2.1-1: Right side view

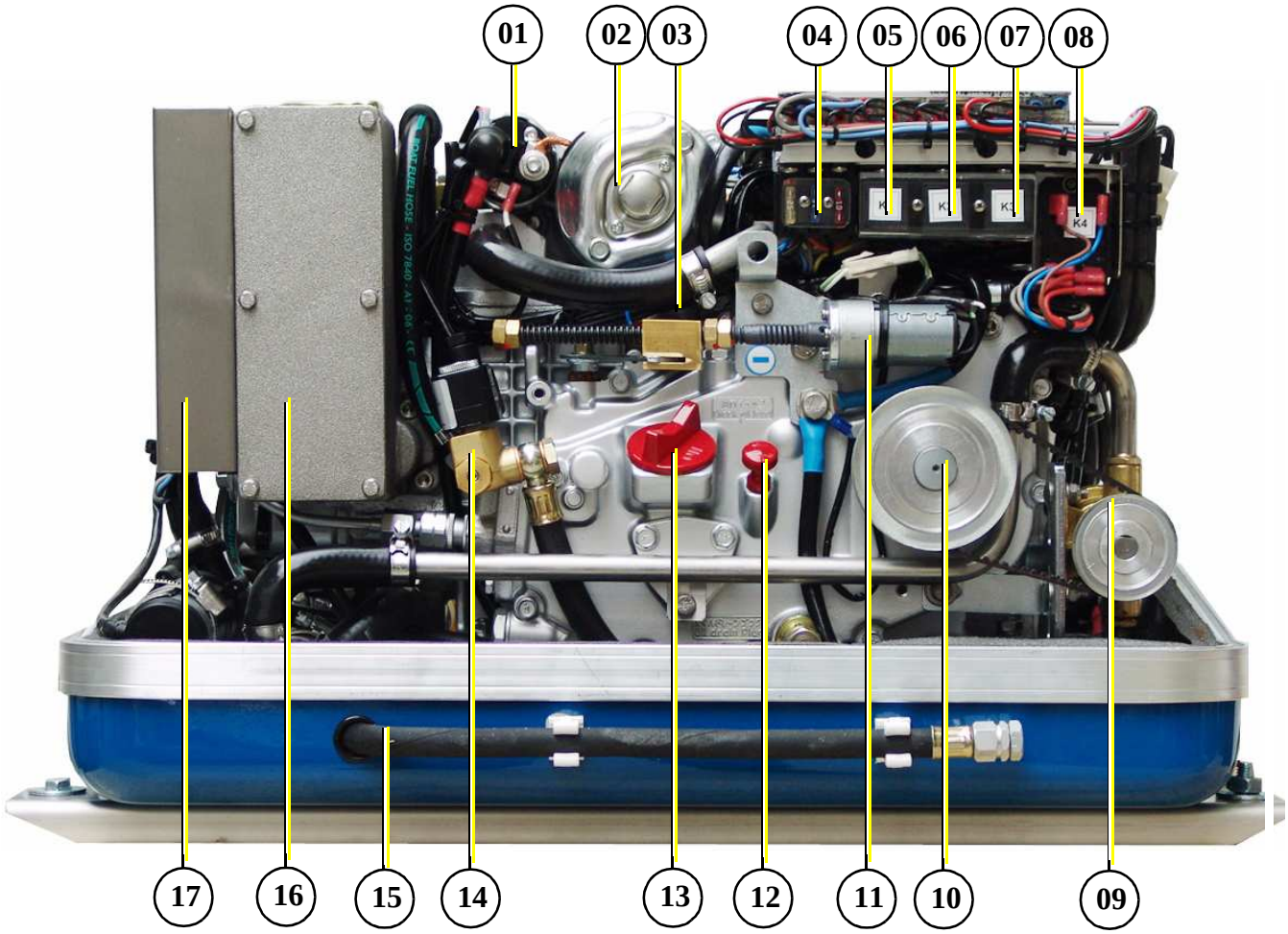
A.2.2 Left Side View



01) Generator housing with coil
02) Water-cooled exhaust elbow
03) Thermo-switch at exhaust elbow
04) Raw water injection pipe
05) Coolant pipe, water tank - heat exchanger
06) Exhaust outlet
07) Sound cover base part
08) Coolant pipe to water pump
09) Elect. water pump
10) Suction port at air suction housing
11) Cooling water tank
12) Cooling water filler neck

Fig. A.2.2-1: Left side view

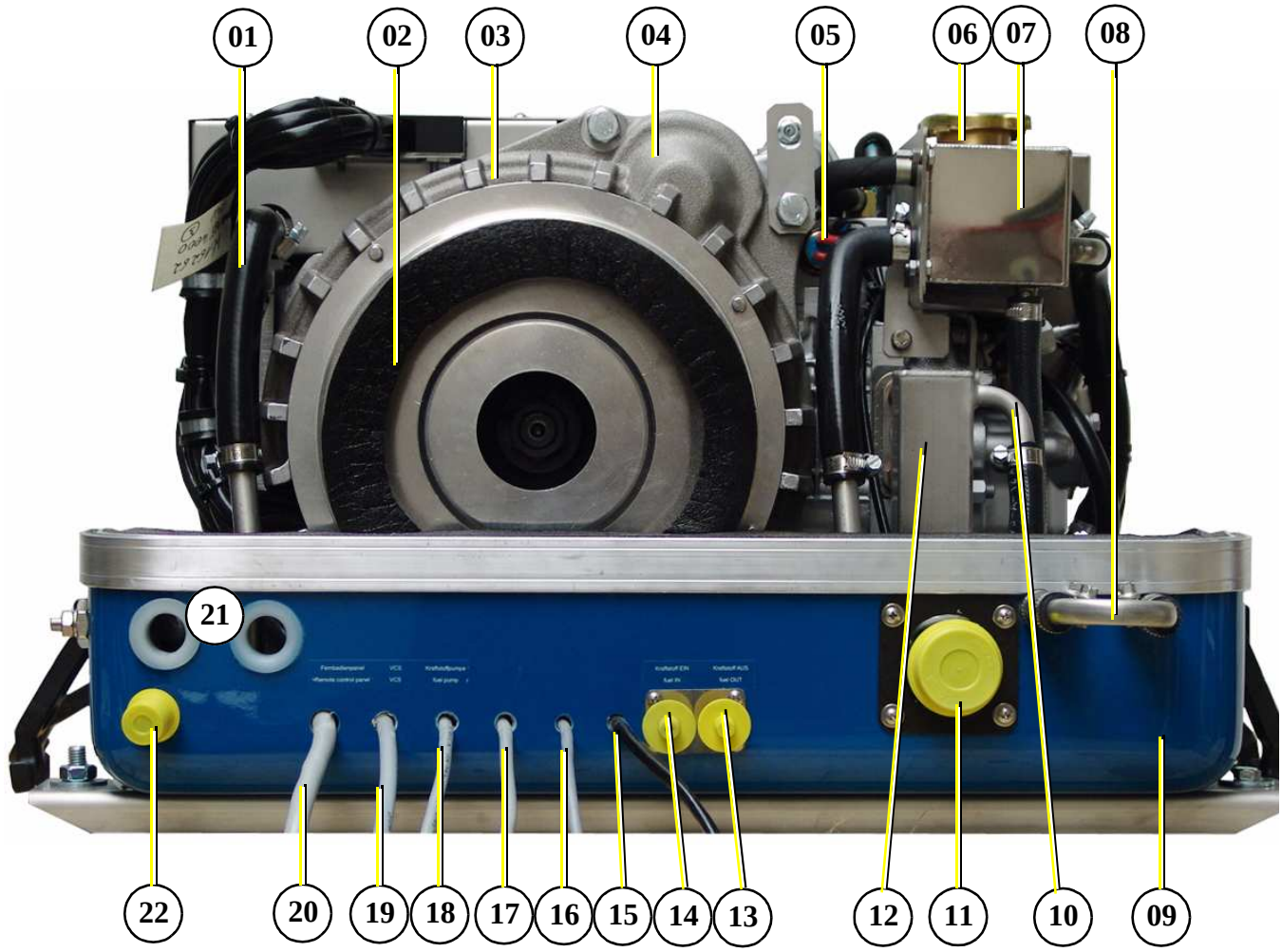
A.2.3 Front View



01) Solenoid switch for starter motor
02) Starter motor
03) Oil pressure switch
04) Electrical fuses (see wirering plan)
05) Start relay Ks
06) Glow-plug relay K2
07) Fuel pump relay K3
08) Release relay K4 (only at 24V version)
09) Raw water pump
10) Pulley
11) Actuator
12) Oil dipstick
13) Engine oil filler neck
14) Fuel solenoid valve
15) Oil drain hose
16) Air suction housing with air filter inlet
17) Suction port

Fig. A.2.3-1: Front view

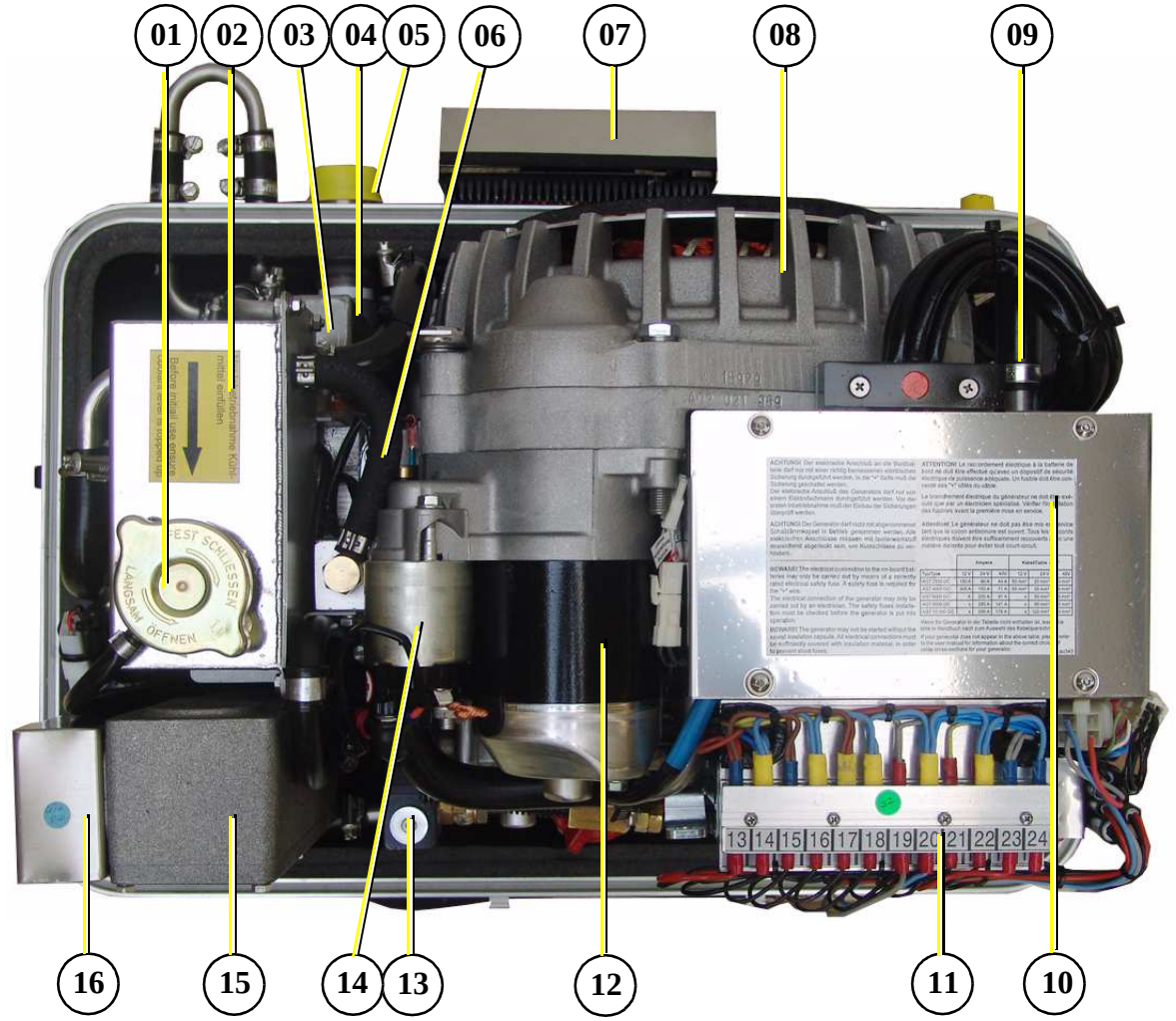
A.2.4 Back View



01) Coolant pipe
02) Generator front cover
03) Generator housing with coil
04) Starter motor
05) Thermo-switch at engine
06) Coolant filler neck
07) Cooling water tank
08) Connection for Ventilation valve
09) Sound cover base part
10) Raw water injection nozzle
11) Exhaust outlet
12) Water-cooled exhaust elbow
13) Connection for fuel OUT
14) Connection for fuel IN
15) Cable for DC/DC converter (only 24V version)
16) Cable for voltage sense
17) Cable for shunt
18) Cable for fuel pump
19) Cable for VCS
20) Cable for remote control panel
21) Passage for cable of battery bank
22) Raw water inlet

Fig. A.2.4-1: BNack side view

A.2.5 View from Above



01) Cooling water filler neck
02) Cooling water tank
03) Water-cooled exhaust elbow
04) Thermo-switch at exhaust elbow
05) Exhaust outlet
06) Ventilation hose
07) Cover for DC/DC-converter (only 24V Version)
08) Generator housing with coil
09) Coolant pipe
10) Diode plate under protection cover
11) Terminal block for remote control panel, fuses and relays
12) Starter motor
13) Fuel solenoid valve
14) Solenoid switch for starter motor
15) Air suction housing with air filter inlet
16) Suction port

Fig. A.2.5-1: View from above

A.3 Details of functionl units

A.3.1 Components of Cooling System (raw water)

Raw water inlet

The diagram shows the supply pipes for the generator. The connection neck for the raw water connection is shown on the left hand side. The cross-section of the intake pipe should be nominally larger than the generator connection.

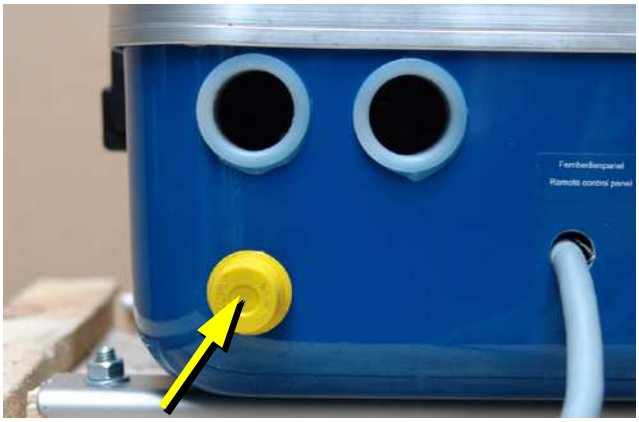


Fig. A.3.1-1: Raw water inlet

Seawater impeller pump

The raw water pump is fitted with a rubber impeller. This pump is self-inductive. If, for example, you forget to open the sea valve, then you must expect the impeller to be destroyed after a short period of time. It is recommended to store several impellers on board as spare parts.

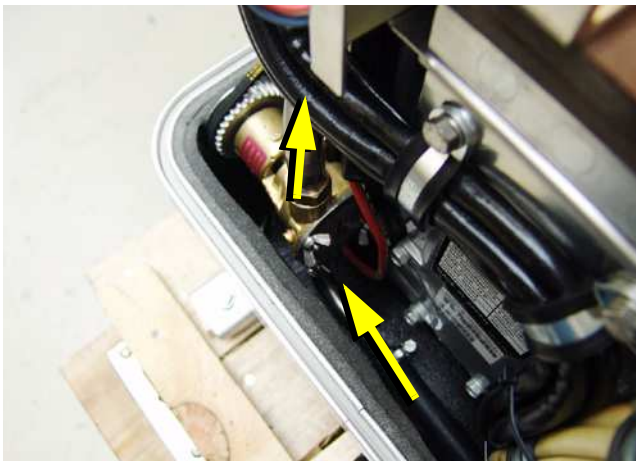


Fig. A.3.1-2: Raw water pump

Heat exchanger

Separates the seawater system from the freshwater system.

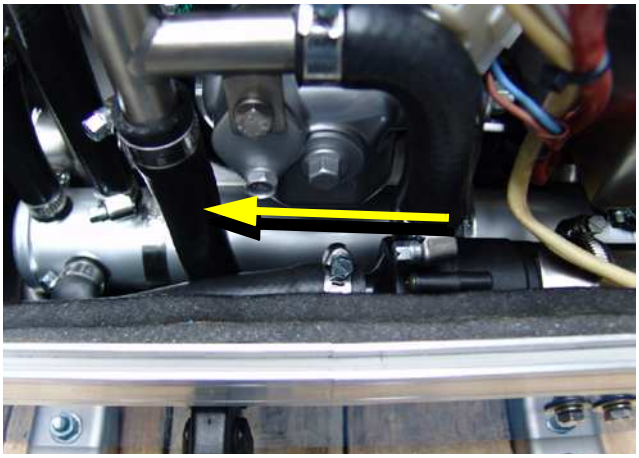


Fig. A.3.1-3: Heat exchanger

Ventilation valve

A siphon must be installed if the generator sinks below the water line because of the rocking of the boat, even if it is only for a short period of time. A hosepipe on the generator casing has been produced for this. Both connecting pieces are bridged by a formed piece of pipe.

Fig. A.3.1-4: Ventilation valve

Cooling water injector nozzle

The injection point for the marine generator water-cooled exhaust system is situated at the exhaust connection pieces The exhaust connections must be regularly checked for signs of corrosion.

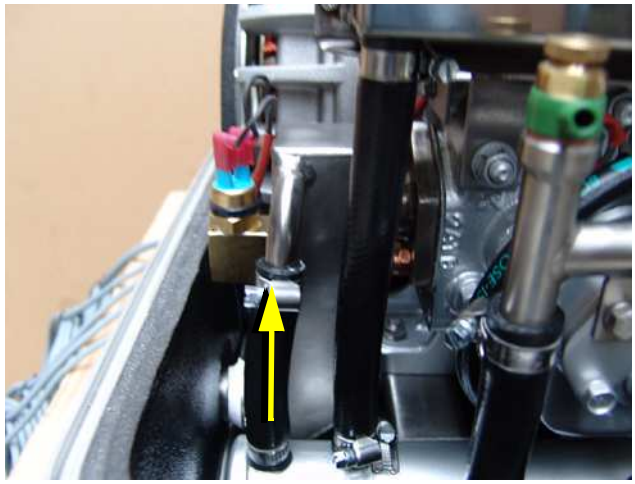


Fig. A.3.1-5: Cooling water injector nozzle

Raw water out

The raw water gets out together with the exhaust

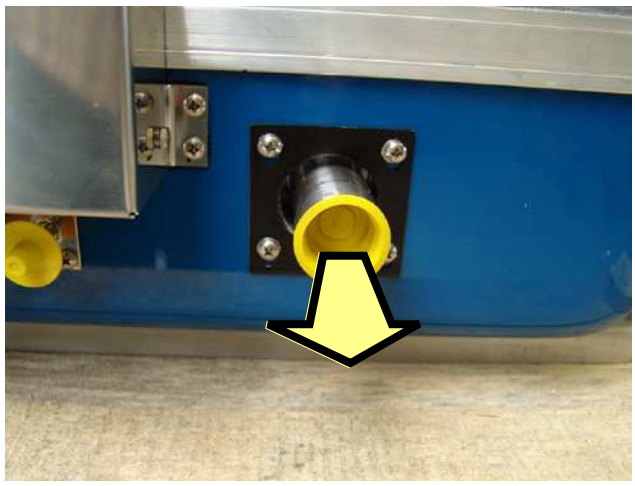


Fig. A.3.1-6: Raw water out

A.3.2 Components of Cooling Systems (Freshwater)

Cooling water filler neck

The cooling water filler neck is situated at the colling water tank and only used, when the generator is initially started. Since the generator is normally already filled with cooling water, these components are only by the user, if repairs are to be carried out.

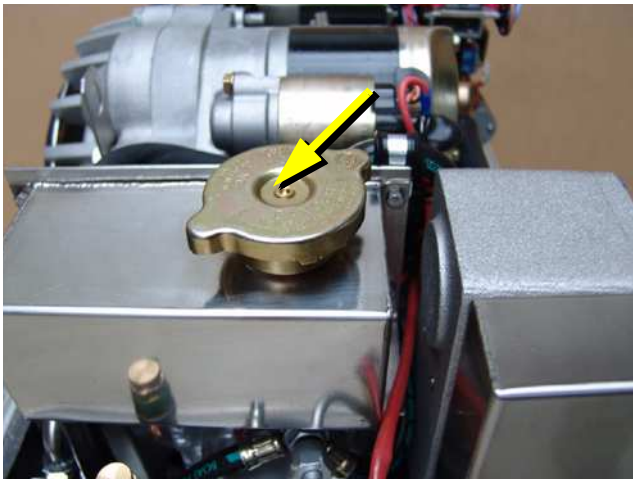


Fig. A.3.2-1: Cooling water filler neck

Freshwater backflow

The cooling water is fed to the heat exchanger from the cooling water tank by means of the pipe shown in the diagram.

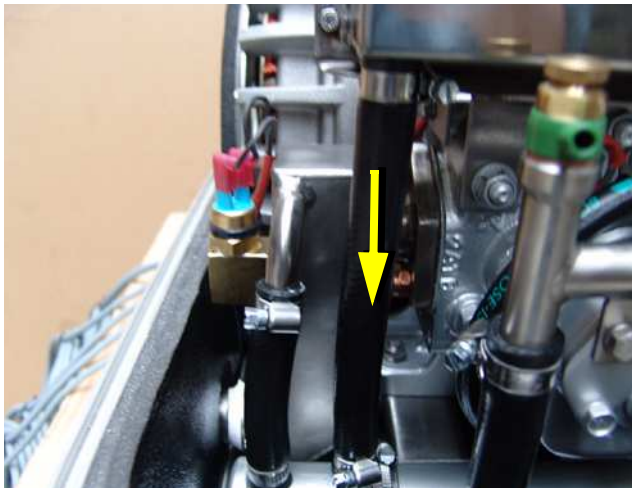


Fig. A.3.2-2: Freshwater backflow

Heat exchanger

Separates the seawater system from the freshwater system.

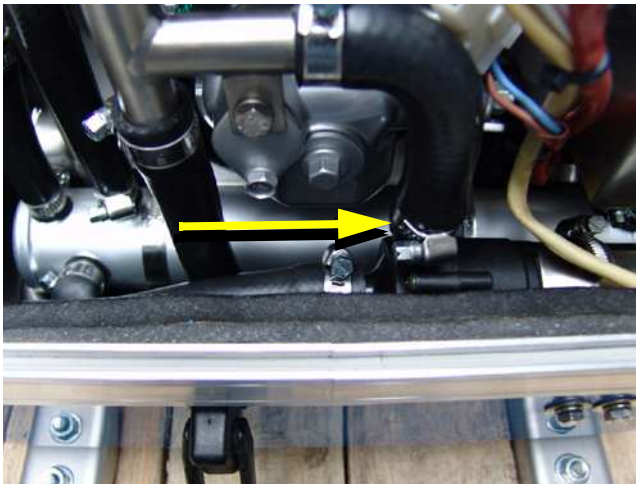


Fig. A.3.2-3: Heat exchanger

Internal cooling water pump

The diesel motor cooling water pump (see arrow) aids the circulation of the internal freshwater system.

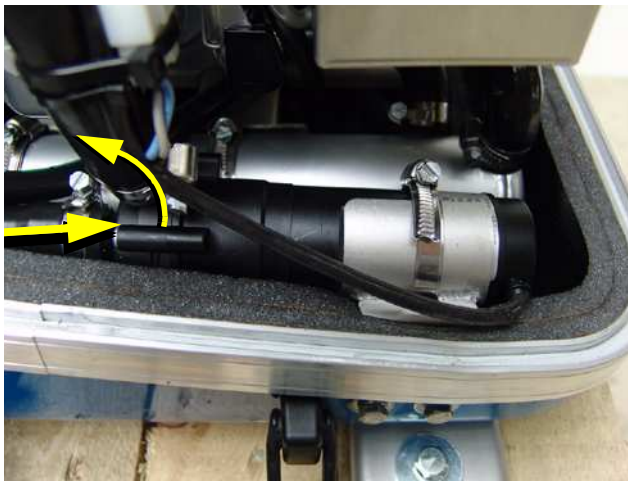


Fig. A.3.2-4: Internal cooling water pump

Water-cooled diode plate

Coolant pipe intake into the diode plate.

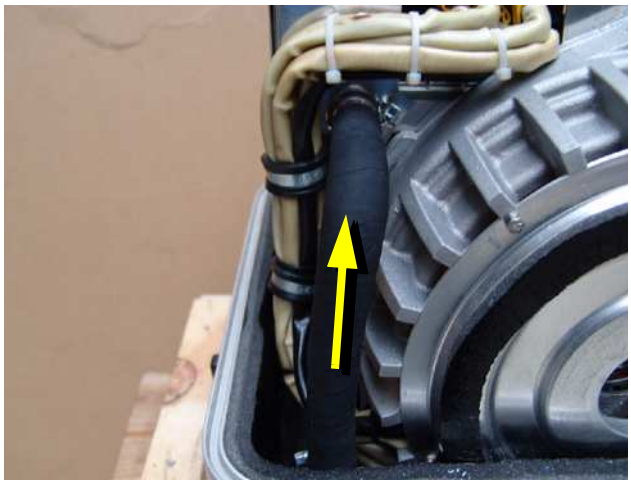


Fig. A.3.2-5: Water-cooled diode plate

Coolant pipe, dioden plate - engine

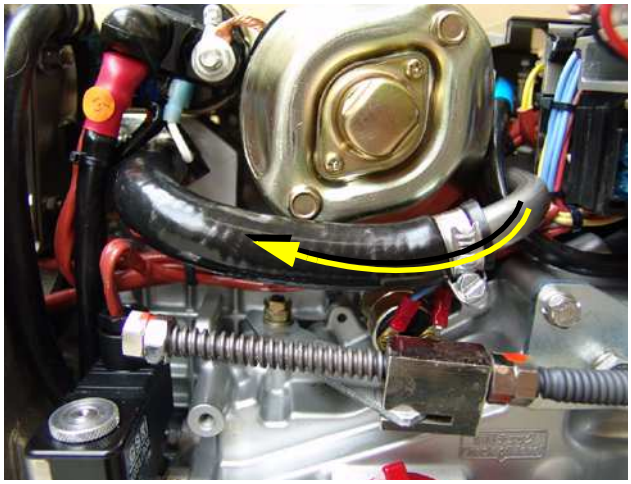


Fig. A.3.2-6: Coolant pipe

Coolant outtake engine

The coolant gets below of the engine out into the heat exchanger.

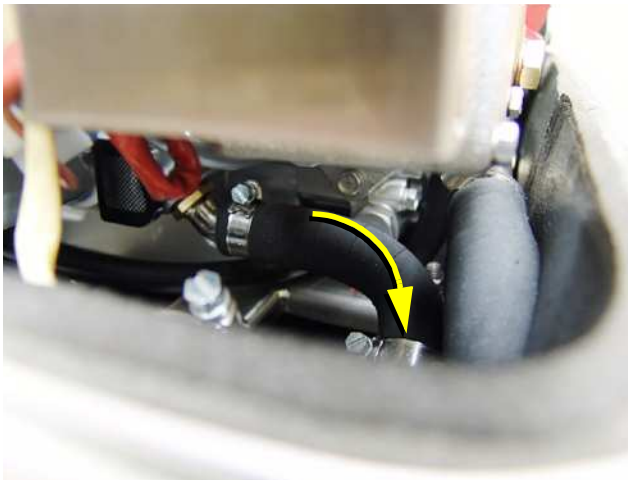


Fig. A.3.2-7: Cooant outtake engine

Ventilation pipe

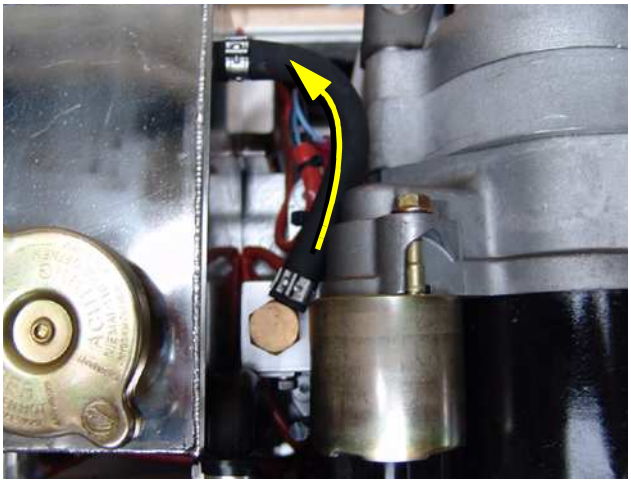


Fig. A.3.2-8: Ventilation pipe

A.3.3 Components of the Fuel System

External fuel pump

The Panda generator is always supplied with an external, electrical (12 V of DC) fuel pump. The fuel pump must be always installed in the proximity of the tank. The electrical connections with the lead planned for it are before-installed at the generator. Since the suction height and the supply pressure are limited, it can be sometimes possible that for reinforcement a second pump must be installed.

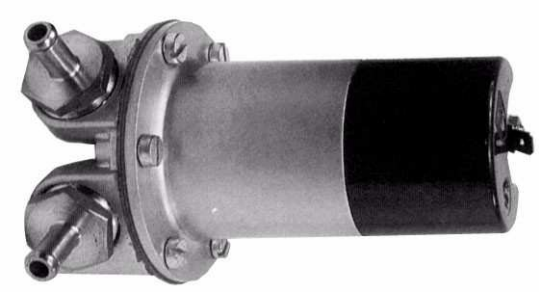


Fig. A.3.3-1: External fuel pump

Connecting pieces for the fuel pipe

1. Fuel intake
2. Fuel backflow

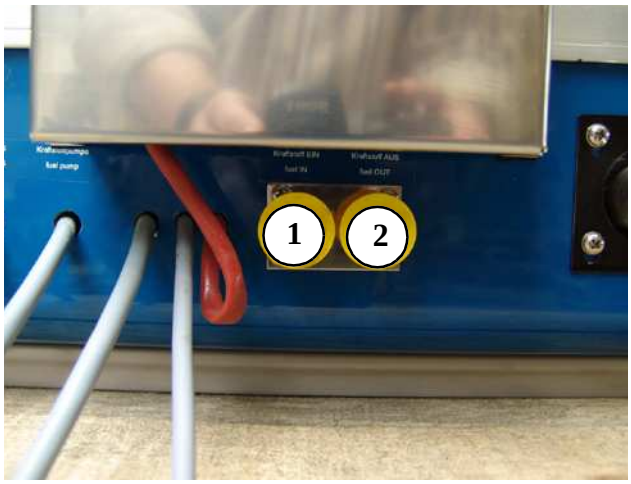


Fig. A.3.3-2: Fuel connections

Fuel solenoid valve

The fuel solenoid valve opens automatically if „START“ is pressed on the remote control panel“. The solenoid closes, if the generator is switched to „OFF“ position.

It takes a few seconds before the generator stops. If the generator does not start or does not run smoothly (i.e. stutters), or does not attain full speed, then the cause is fore-mostly the solenoid.

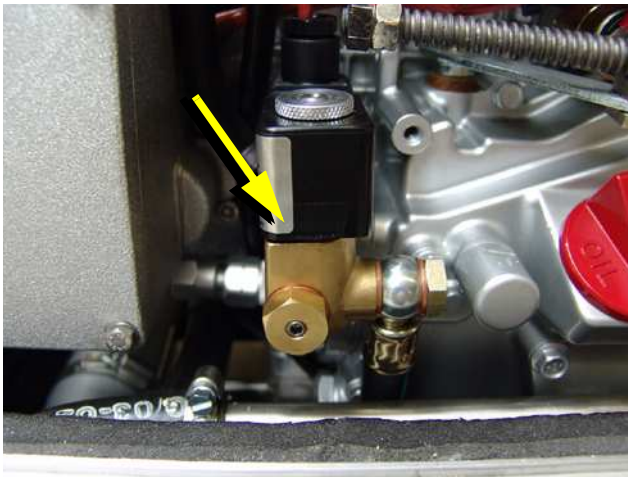


Fig. A.3.3-3: Fuel solenoid valve

Injection nozzle

If the engine does not start after the ventilation, the fuel injection line must be deaerated.

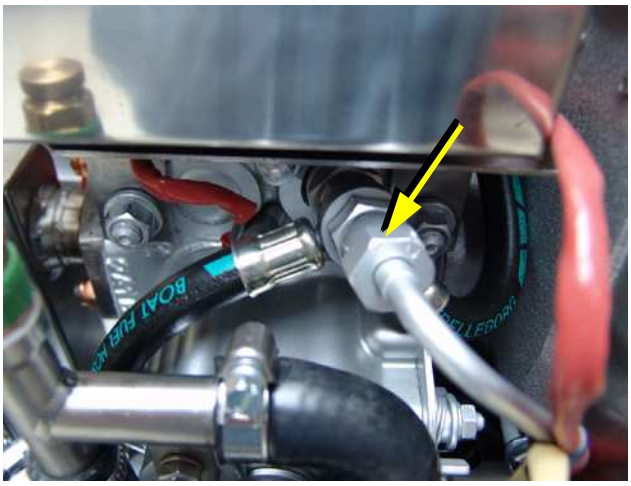


Fig. A.3.3-4: Injection nozzle

Glow plug

The glow plug serve the pre-chamber for the heating with cold start. The heat-treat fixture must be operated, if the temperature of the generator is under 16℃. This is practically with each start the case. The heat-treat fixture may be held down also during start and favoured the starting procedure.

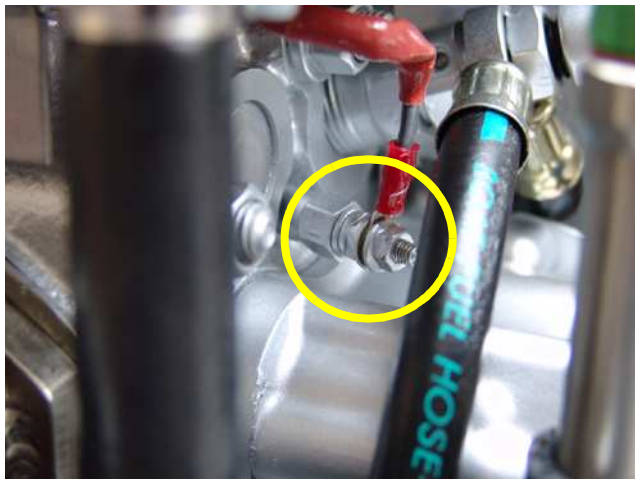


Fig. A.3.3-5: Glow plug

A.3.4 Components of Combustion Air

Air suction openings at the sound cover (sample 24V version)

The sound cover is provided at the upper surface with drillings, through which the combustion air can influx.

It must be consistently paid attention that the generator is installed in such a way that from no water can arrive into the proximity of these air openings.

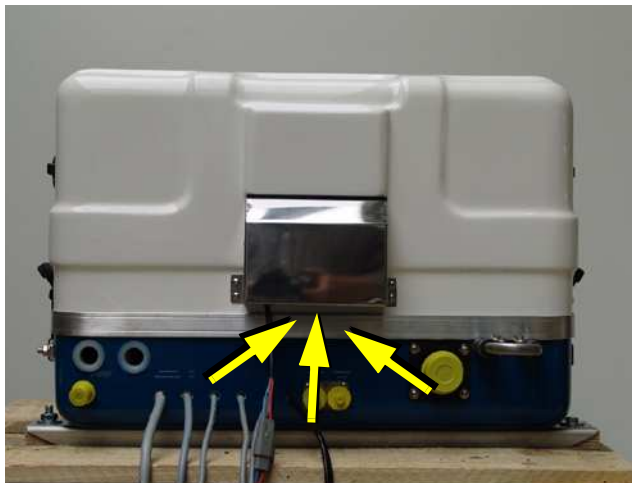


Fig. A.3.4-1: Combustion air intake

Air suction housing

Remove the cover to look indes the housing. There is a filter element. This must be checked from timt to time.

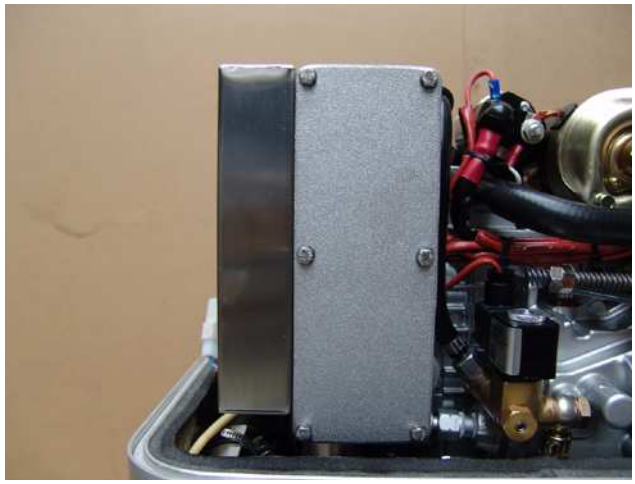


Fig. A.3.4-2: Air suction housing

Air suction housing with air filter set

The figure shows the air filter element in the air suction housing. An check is advisable once in a while.

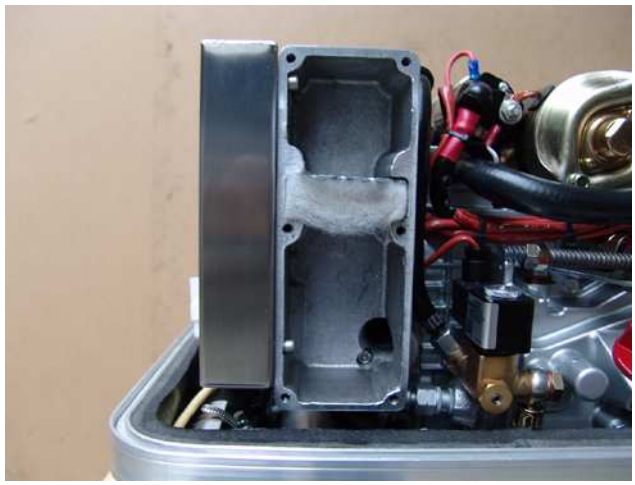


Fig. A.3.4-3: Air filter set

Exhaust elbow

After the combustion air was led through the engine it occurs into the water-cooled exhaust elbow. On the top side the pipe union for the internal raw water circle is to be seen.

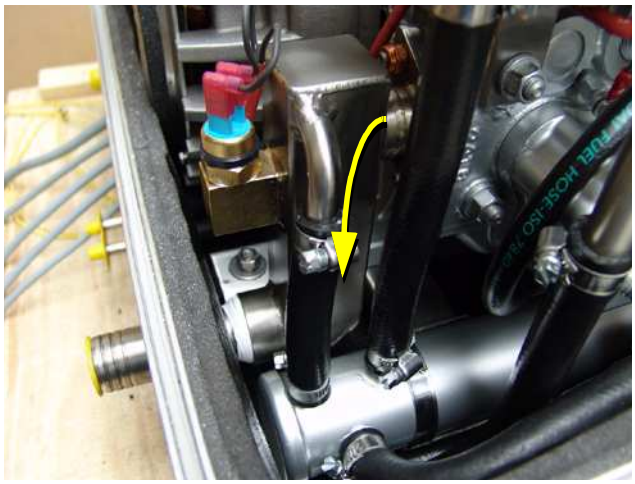


Fig. A.3.4-4: Exhaust elbow

Exhaust outlet

Connect the exhaust pipe with the water lock.

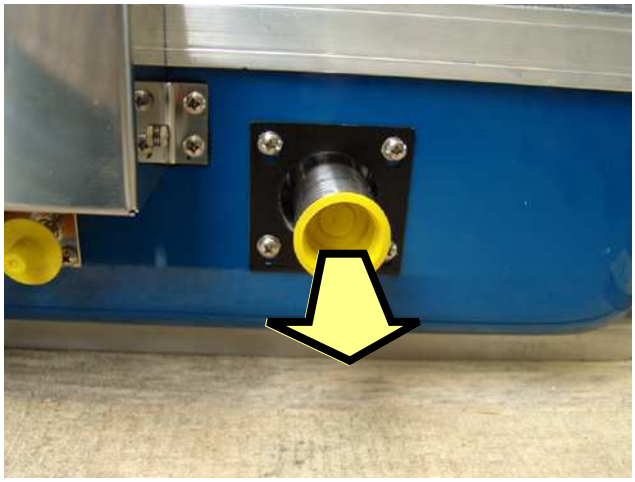


Fig. A.3.4-5: Exhaust outlet

A.3.5 Components of the Electrical System

Connection starter battery

Connect here the cables of the starter battery.

1. Cable starter battery minus (-)
2. Cable starter battery plus (+)

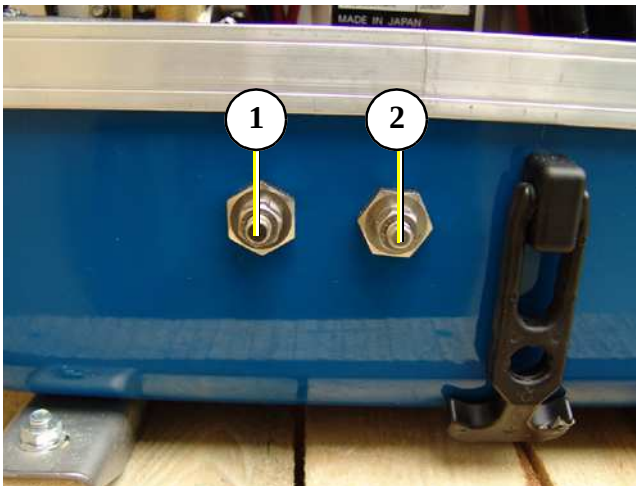


Fig. A.3.5-1: Connection starter battery

Passage for battery cable

The battery cables of the battery bank must be laid through this passage to the clamps at the diode plate.

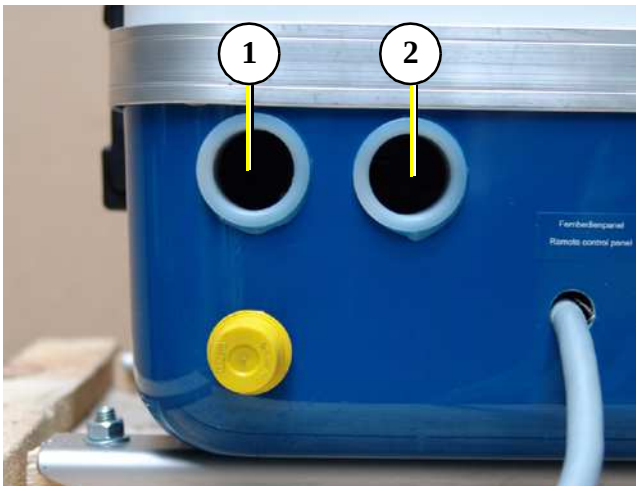


Fig. A.3.5-2: Passage

Clamps for battery cable

1. Clmap (+) for battery cable (+)
2. Clamp (-) for battery cable (-)

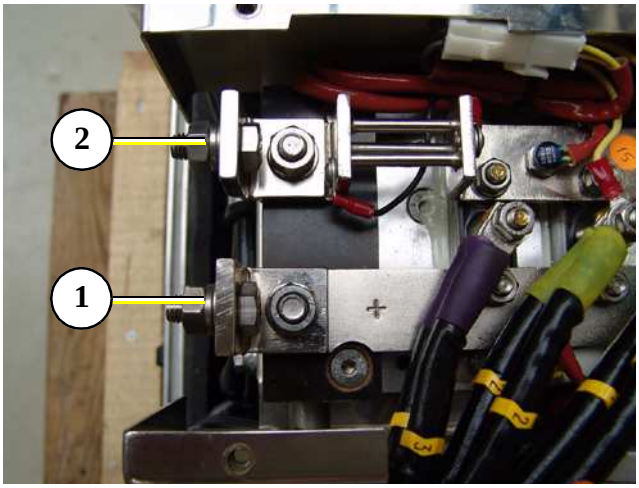


Fig. A.3.5-3: Connections battery cable

Electrical connection for control

At the front of the generator also all remaining cables for the electrical connections are depending upon type. See here:

1. Remote control panel
2. VCS
3. Fuel pump
4. Voltage sense 24V
5. Shunt
6. DC/DC converter (24V version only)

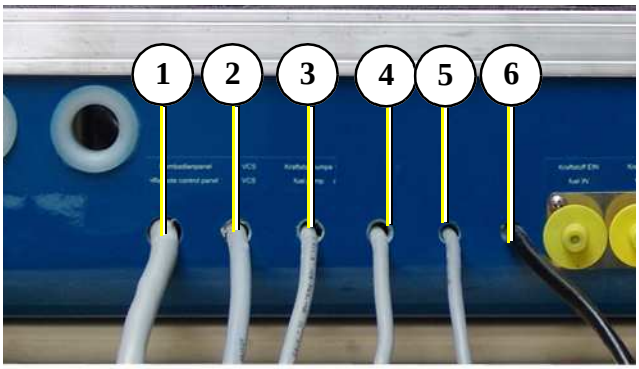


Fig. A.3.5-4: Electrical connections

Starter motor

1. Starter motor and
2. Solenoid switch

The Diesel engine is electrically started. On the top of the engine is accordingly the electrical starter with the solenoid switch.

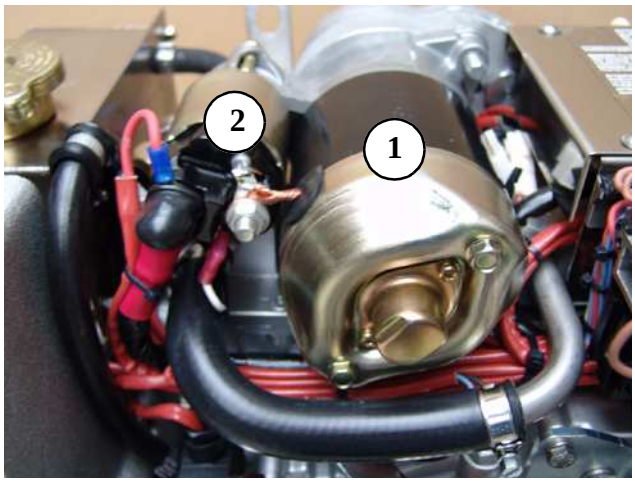


Fig. A.3.5-5: Starter motor

Actuator for speed regulation

The generator voltage is determined by progressive speed control through "VCS" in conjunction with the speed actuator. Speed increases with increasing load.

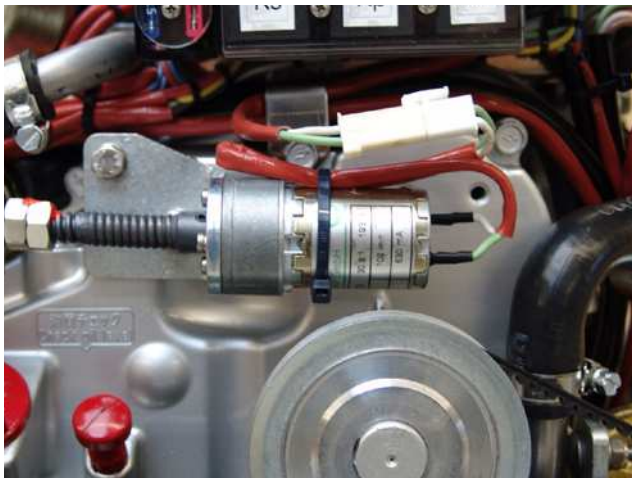


Fig. A.3.5-6: Actuator

Plug for speed sensor

All Panda generators can be equipped with an external automatic start. For the operation of this automatic starting system a separate speed sensor is necessary. At some models the speed sensor is standard installed.

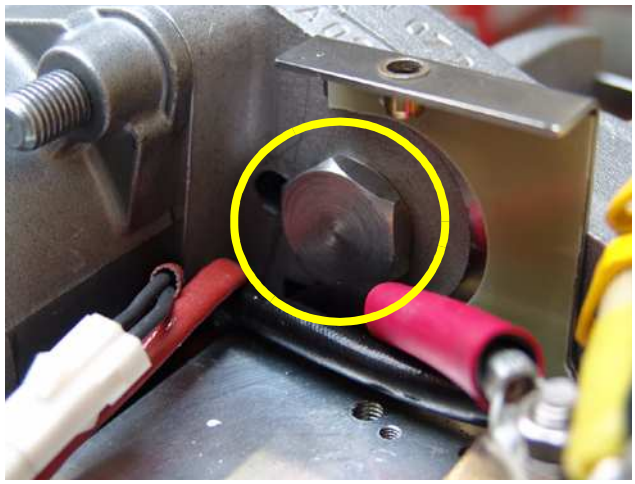


Fig. A.3.5-7: Plug for speed sensor

Diode plate

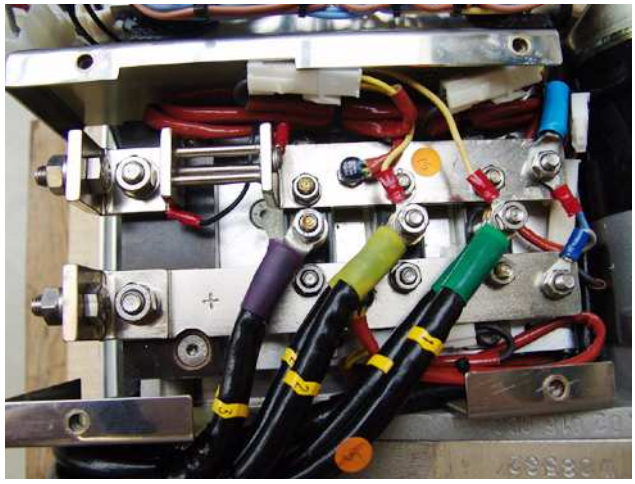


Fig. A.3.5-8: Diode plate

Terminal block for remote control

see wiring plan of your version

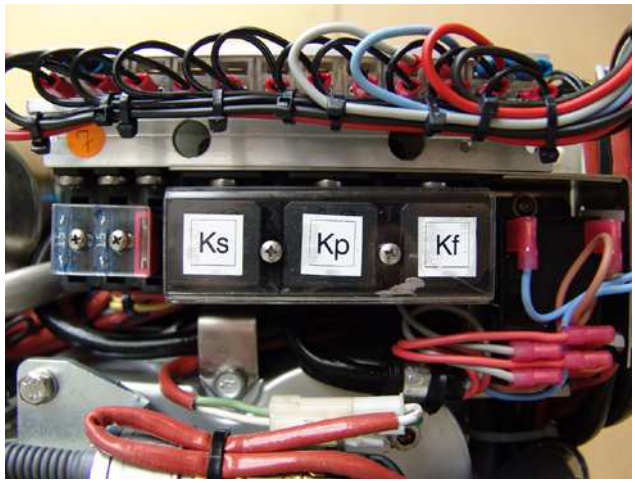


Fig. A.3.5-9: Terminal block

DC/DC-converter

24V version only

Fig. A.3.5-10: DC&DC/converter

A.3.6 Sensors and switches for operating surveillance

Thermo-switch at engine

The thermo-switch at the engine is used for monitoring the engine temperature.

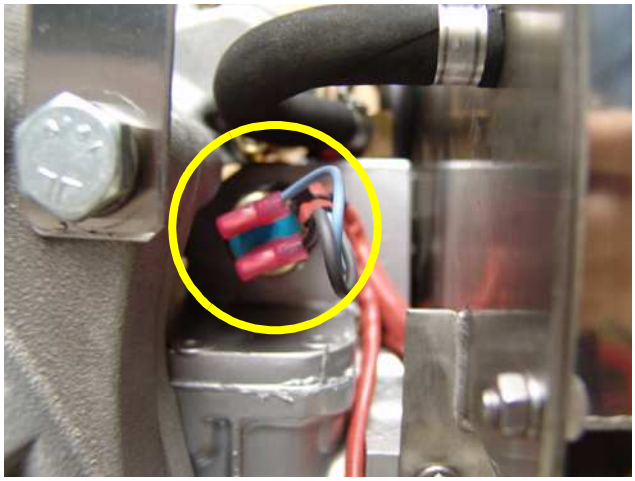


Fig. A.3.6-1: Thermo.switch at engine

Thermo-switch at exhaust connection

If the impeller pump drop out and deliveres no more seawater, the exhaust connection becomes extremely hot.

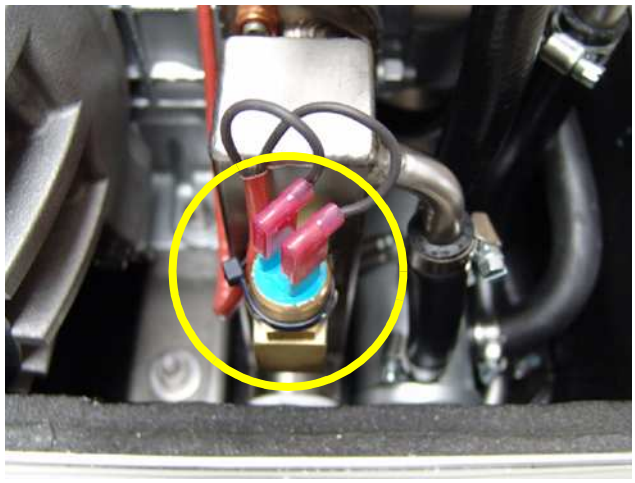


Fig. A.3.6-2: Thermo-switch at exhaust connection

Thermo-switch coil

additional switches are build in the coil

1. Thermo-switch coil 125℃
2. Generator housing
3. Thermo-sensor NTC 981S

(for measuring)

Fig. A.3.6-3: Thermo-switch coil

Oil pressure switch

In order to be able to monitore the lubricating oil system, an oil pressure switch is built into the system.

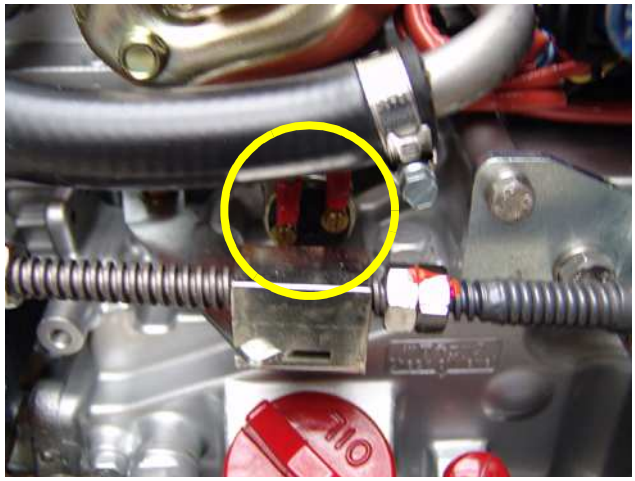


Fig. A.3.6-4: Oil pressure switch

Thermo-switch on the (-)-bar

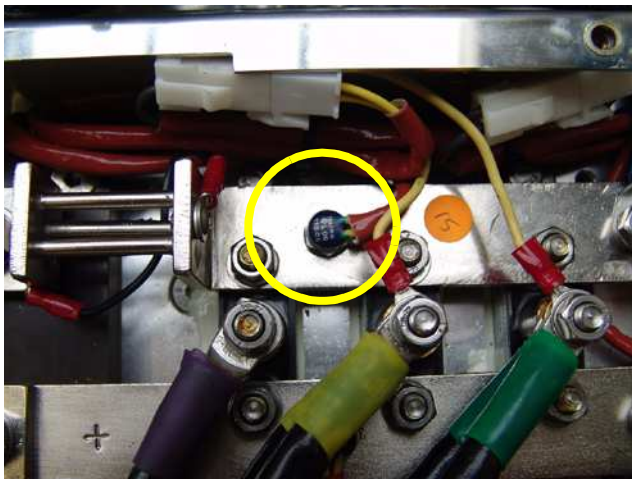


Fig. A.3.6-5: Thermo-switch on the (-)-bar

Thermo-switch on the (+)-bar

Fig. A.3.6-6: Thermo-switch on the (+)-bar

A.3.7 Components of the Oil Circuit

Oil filler neck with cap

Please pay attention that the filler necks are always well locked after filling in engine oil.

Consider also the references to the engine oil specification.

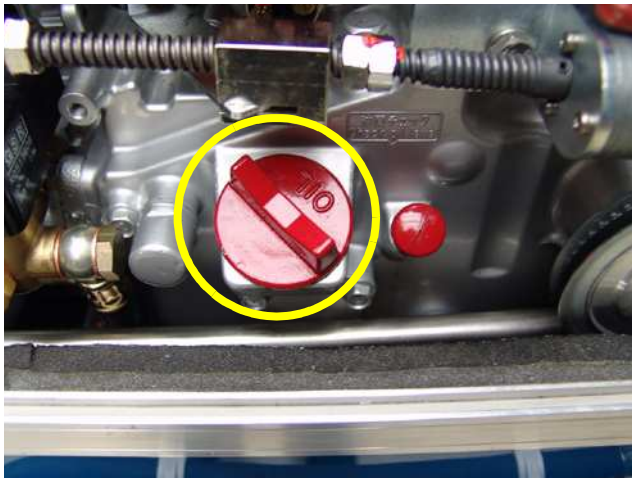


Fig. A.3.7-1: Oil filler neck

Oil dipstick

At the dipstick the permissible level is indicated by the markings "maximum" and "minimum". The engine oil should be never filled up beyond the maximum conditions.

Fischer Panda recommend 2/3 oil level.

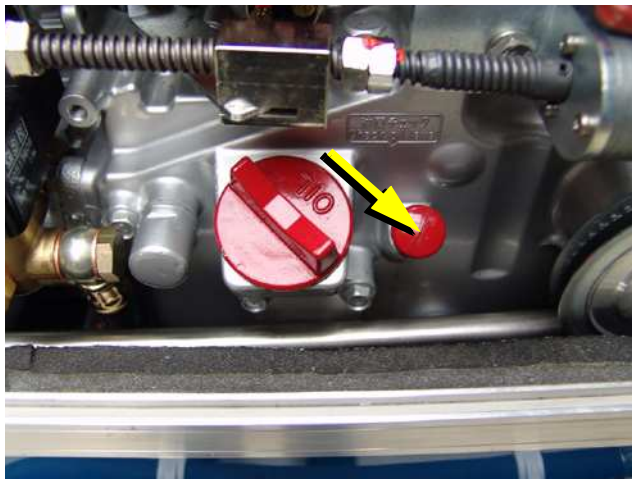


Fig. A.3.7-2: Oil dipstick

Oil strainer

The oil strainer should be cleaned every 500 operating hours.

Fig. A.3.7-3: Oil srtainer

Oil drain hose

The Panda generator is equipped that the engine oil can be drained over an drain hose. The generator should be always installed therefore that a collecting basin can be set up deeply enough. If this is not possible, an electrical oil drain pump must be installed.

Note: Lubricating oil should be drained in the warm condition!

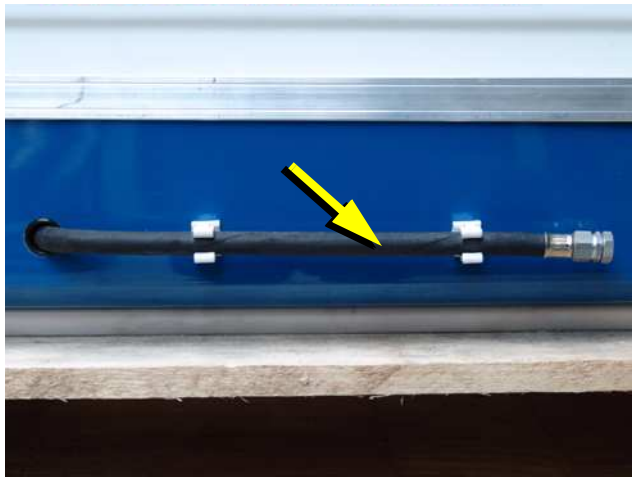


Fig. A.3.7-4: Oil drain hose

A.3.8 External Components

Voltage control VCS

The figure shows the control printed board for the VCS voltage regulation. Over this control printed board the control signals are given for the actuator for speed regulation. On the VCS board are also adjustment possibilities for the control parameters.

The VCS is build for an nominal Voltage. You need an VCS with the same nominal Voltage as the generator nominal output.

Fig. A.3.8-1: VCS

Battery monitor

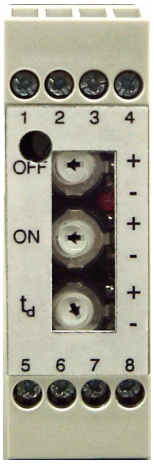


Fig. A.3.8-2: Battery monitor

A.4 Operation Instructions

A.4.1 Daily routine checks before starting

1. Oil Level Control (ideal level: 2/3).

   AtTTENTION! OIL PRESSURE CONTROL!
   True, the diesel motor automatically switches off when there is a lack of oil, but it is very damaging for the motor, if the oil level drops to the lowest limit. Air can be sucked in suddenly when the boat rocks in heavy seas, if the oil level is at a minimum. This affects the grease in the bearings. It is therefore necessary to check the oil level daily before initially running the generator. The oil level must be topped up to the 2/3 level, if the level drops below the mark between maximum und minimum levels.

2. State of Cooling Water.

   The external compensation tank should be filled up to a maximum of in a cold state. It is very important that large expansion area remains above the cooling water level.

3. Open Sea Cock for Cooling Water Intake.

   For safety reasons, the seacock must be closed after the generator has been switched off. It should be re-opened before starting the generator.

4. Check Seawater Filter.

   The seawater filter must be regularly checked and cleaned. The impeller fatigue increases, if residual affects the seawater intake.

5. Check all Hose Connections and Hose Clamps are Leakage.

   Leaks at hose connections must be immediately repaired, especially the seawater impeller pump. It is certainly possible that the seawater impeller pump will produce leaks, depending upon the situation. (This can be caused by sand particles in the seawater etc.) In this case, immediately exchange the pump, because the dripping water will be sprayed by the belt pulley into the sound insulated casing and can quickly cause corrosion.

6. Check all electrical Lead Terminal Contacts are Firm.

   This is especially the case with the temperature switch contacts, which automatically switch off the generator in case of faults. There is only safety if these systems are regularly checked, and these systems will protect the generator, when there is a fault.

7. Check the Motor and Generator Mounting Screws are Tight.

   The mounting screws must be checked regularly to ensure the generator is safe. A visual check of these screws must be made, when the oil level is checked.

8. Switch the Land Electricity/Generator Switch to Zero before Starting or Switch Off all the Consumers.

   The generator should only be started when all the consumers have been switched off. The excitation of the generator will be suppressed, if the generator is switched off with consumers connected, left for a while, or switched on with extra load, thus reducing the residual magnetism necessary for excitation of the generator to a minimum. In certain circumstances, this can lead to the generator being re-excitated by means of a DC source. If the generator does not excitate itself when starting, then excitation by means of DC must be carried out again.

9. Check the Automatic Controls Functions and Oil Pressure.

   Removing a cable end from the monitoring switch carries out this control test. The generator should then automatically switch off. Please adhere to the inspection timetable (see Checklist in the appendix).

A.4.2 Starting Generator - see remote control panel datasheet

A.4.3 Stopping the Generator - see remote control panel datasheet

Blank

Fischer Panda Datenblatt

B. Modifikation exhaust out at EA300 engines

Fischer Panda Datenblatt

B.1 Safety instructions / Sicherheitshinweise

The battery must always be disconnected, if work on the generator or electrical system is to be carried out, so that the generator cannot be unintentionally started.

Note the safety instruction in the generator manual.

The raw water valve must be shut (marine version).

Bei Arbeiten am Generator oder am elektrischen System,muß die Starterbatterie abgeklemmt werden, um ein unbeabsichtigtes Starten des Generators zu vermeiden.

Beachten Sie die Sicherheitshinweise im Generator Handbuch.

Das Seeventil muss geschlossen werden. (nur PMS Version)

Attention!!! Parts of the generator and the cooling water/oil may be hot after operation !!!DANGER!!!

Achtung!!! Teile des Generators und das Kühlwasser/Öl können nach dem Betrieb heiß sein. „!!!Verbrennungsgefahr!!!

See also the safety instruction of the other components of your system.

Beachten Sie auch die Sicherheitshinweise der anderen Komponenten Ihres Systems.

B.2 Reason for the modifikation

The Fischer Panda Marine generators are built to operate under a heeling angle of 20 / 25 degrees.

So that these generators can be used for example in a sailing boat which is sailing under the above mentioned max heeling angle .

A stop of the generator under any heeling angle can occure some amount of water in the exhaust system like mixing elbow and further exhaust hoses which will not be released into the waterlock !!!

We request that the generator has to be brought back in a levelled position before the generator will be stopped to take care that the rest amount of water inside the exhaust manifold will be released to the water lock.

The rest amount of water in the exhaust system and / or its condensation is dangerous for any generator or engine and not only for Fischer Panda generators.

Some generators are more sensitive especially generators based on horizontal engines

(like : AGT 4000, Panda 5000 LPE , Panda 4000i). To make the installation of those generators more save and easy, the exhaust elbow is changed for the EA300 engine to make shure that the water is released to the water-lock.

Fischer Panda

Fischer Panda Datenblatt

B.2.1 Modified generators

Panda 5000 LPE PMS

AGT 4000 PMS

Panda 4000i PMS

B.2.2 Modifikation

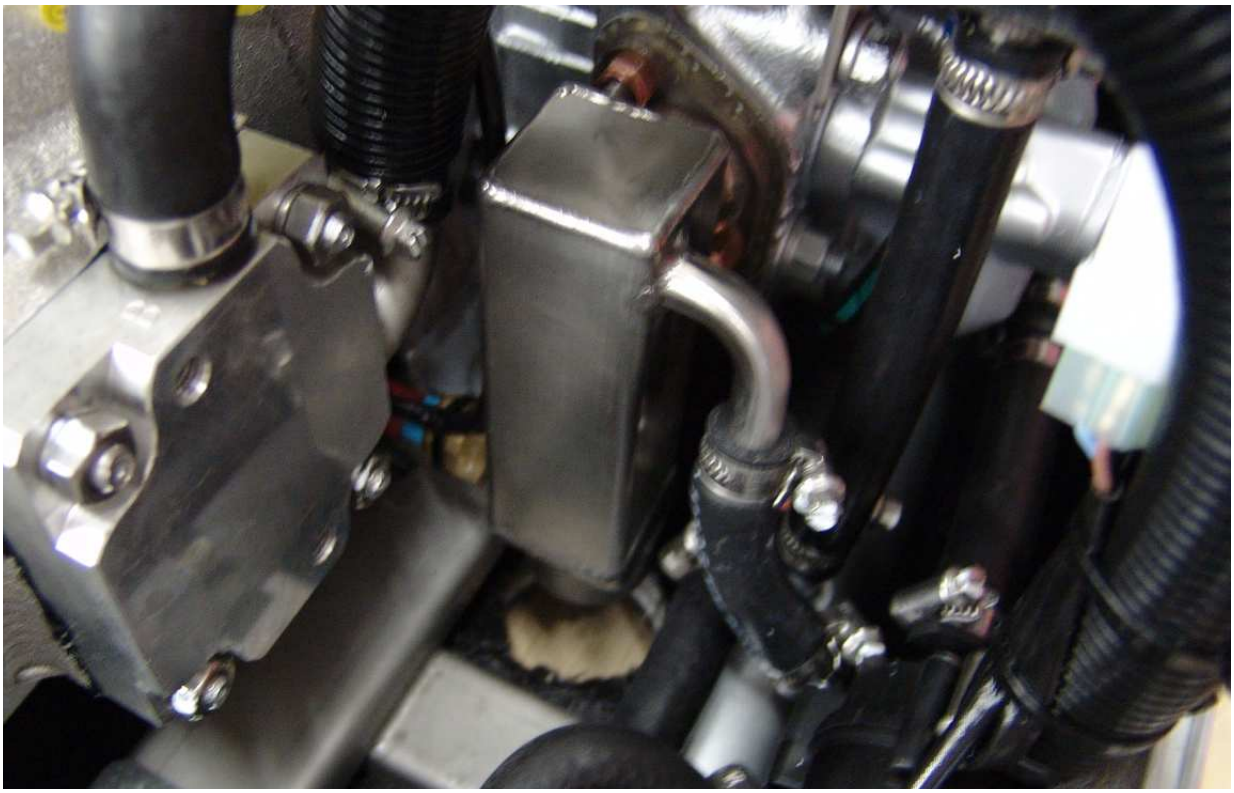
PMS generators with EA300 engine get a mifified exhaust elbow which goes straight through the capsul bottem.

With this modifikation it is realized that the waterlock work properly, even if it is mounted directly under the generator

Fischer Panda follows a lot of customers request foe an easy and save installation and a high protection against water carrosion even when the generator is stopped under a heeling angle.

If the installation with the exhaust out through the generator bottem is not possible, a special designed exhaust manifold with out through the side can ordered seperate. Please ask your Fischer Panda dealer for information.

B.2.3 Modifizierter exhaust out (sample picture LPE 5000)



Fischer Panda Datenblatt

C. Installation Instructions

C.1 Placement

C.1.1 Placement and Basemount

Since Panda generators have extremely compact dimensions they can be installed in tight locations, attempts are sometimes made to install them in almost inaccessible places. Please consider that even almost maintenance-free machinery must still remain accessible at least at the front (drive belt, water pump) and the service-side (actuator, dipstick). Please also note that in spite of the automatic oil-pressure sensor it is still essential that the oil level has to be checked regularly.

The generator should not be installed in the proximity of light walls, which can get into resonant vibrations by airborne sound. If this is not possible, these surfaces should line with 1mm lead foil, so the mass and the swinging behavior are changed.

Avoid to install the generator on a smooth surface with small mass (e.g. plywood plate). This affects in the unfavorable case like an amplifier the airborne sound waves. An improvement obtains by compound these surfaces by ribs. Also break-throughs should be sawed, which interrupt the surface. Disguising the surrounding walls with a heavy layer (e.g. lead) plus foam material improves the conditions additionally.

The engine draws its inlet combustion air through several holes in the capsule base. Therefore the capsule must be fitted with sufficient clearance between the capsule underside and the base plate (min. 12mm (½")).

The generator sucks its air from the surrounding engine room. Therefore it must be ensured that sufficient ventilation openings are present, so that the aggregate cannot overheat.

High temperature of the intake air decline the power of the aggregate and increases the coolant temperature. Air temperatures of more than 40℃ reduce the power by 2% per temperature rise of 5℃. In order to keep these effects as small as possible, the temperature in the engine room should not be higher than 15℃ in relation to the outside temperature.

C.1.2 Notice for optimal sound insulation

The convenient base consists of a stable framework, on which the generator is fastened by means of shock-mounts.

Since the aggregate is "free" downward, the combustion air can be sucked in unhindered.

In addition are void the vibrations, which would arise with a closed soil.

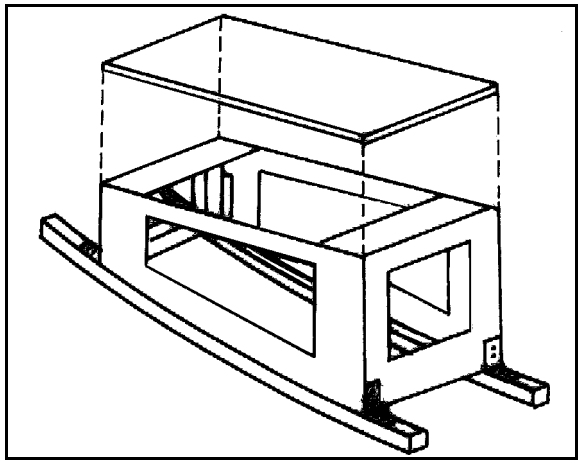


Fig. C.1.2-1: Convenient base

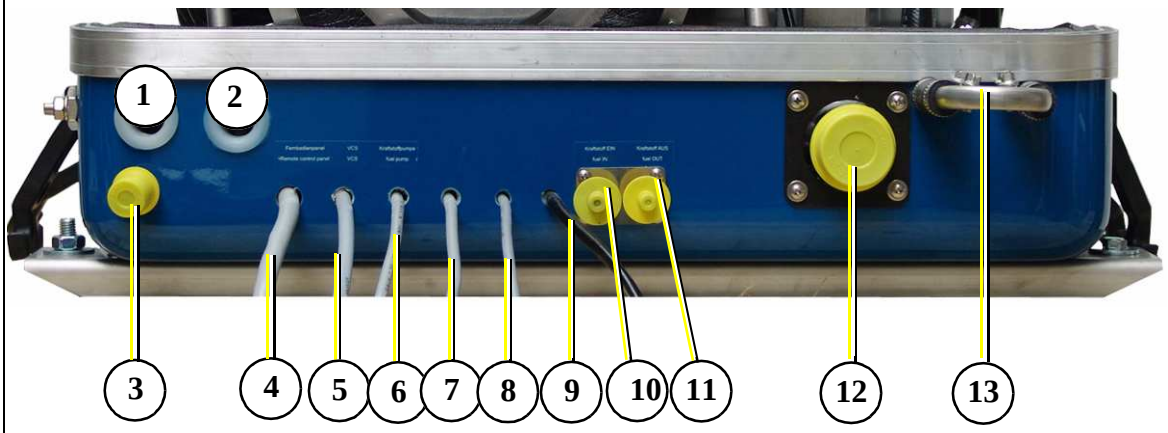
C.2 Generator Connections - Scheme

The generator comes supplied with all supply lines (i.e. electric cables, fuel lines etc.) already connected to the motor and generator. The supply lines are fed through the capsule's front base panel and are shielded at the capsule inlets with water-proof grommets.

All electrical connections, cable types and sizes must comply to the appropriate regulations. The supplied cables are rated for ambient temperatures up to 70℃ (160℉). If the cables are required to meet higher temperature requirements, they must be run through conduits.

C.2.1 Connections Panda AGT 4000

ATTENTION! Before working on the System read the section “Safety Precautions” on Page 12.



1. Passage for battery cable
2. Passage for battery cable
3. Raw water inltake
4. Cable for remote control panel
5. Cable for VCS
6. Cable for fuel pump
7. Cable for voltage sense
8. Cable for shunt
9. Cable DC/DC converter (omly 24V version)
10. Connection fuel IN
11. Connection fuel OUT
12. Exhaust OUT
13. Connection external ventilation valvel

Fig. C.2.1-1: Connections AGT 4000 24V

1. Connection starter battery minus cable (-)
2. Connection starter battery plus cable (+)

Fig. C.2.1-2: Connections starter battery

C.3 Cooling System Installation - Raw water

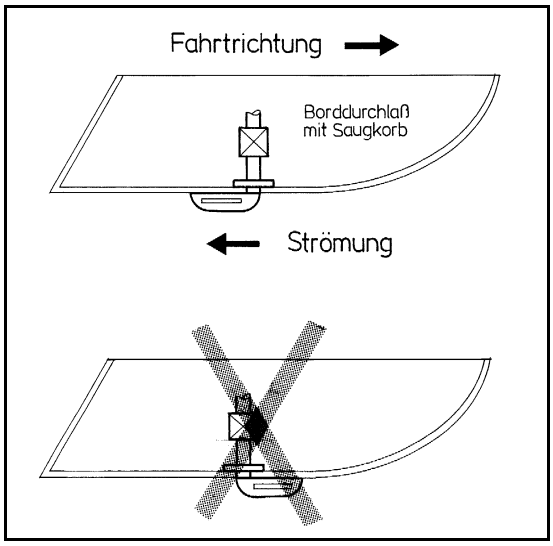
C.3.1 General References

The genset should have its own raw water (coolant water) inlet and should not be connected to any other engine systems. Ensure that the following installation instructions are complied with:

Avoid galvanic corrosion

For the avoidance of galvanic corrosion the chapter "Service instruction for marine aggregates (corrosion protection)“ is to be considered.

C.3.2 Installation of the thru-vessel fitting in Yachts



It is good practice for yachts to use a hull inlet fitting with an integrated strainer. The thru-vessel fitting (raw water intake) is often mounted against the sailing direction to induce more water intake for cooling.

For Panda generators, the thru-vessel inlet should NOT point in the sailing direction! When sailing at higher speeds more water will be forced into the inlet than what the pump can handle and your generator will overflood!

Fig. C.3.2-1: Thru-vessel fitting

C.3.3 Quality of the raw water sucking in line

In order to keep the suction resistance in the line at a minimum, the raw water intake system (i.e. sea cock, thru-hull fitting, inlet filter, etc.) must have an inner diameter of at least 1" (25mm).

This applies also to installation components such as thru-hull fitting, sea cock, raw water filter etc. The intake suction line should be kept as short as possible. Install the raw water inlet in close proximity to the genset.

After start-up the cooling water quantity must be measured (e.g. by catching at the exhaust). The flow rate, as well as the necessary cross section of the cooling water pipe take from Table F.1-1, “Diameter of conduits,” on page 97.

C.3.4 Installation above waterline

The Panda is equipped with a direct drive water intake pump mounted directly on the motor. Since the intake pump is an impeller pump there are wearing parts which will likely require replacement after some time. Ensure that the genset is installed such that the intake pump can be easily accessed. If this is not possible, an external intake pump could be installed in an easily accessed location.

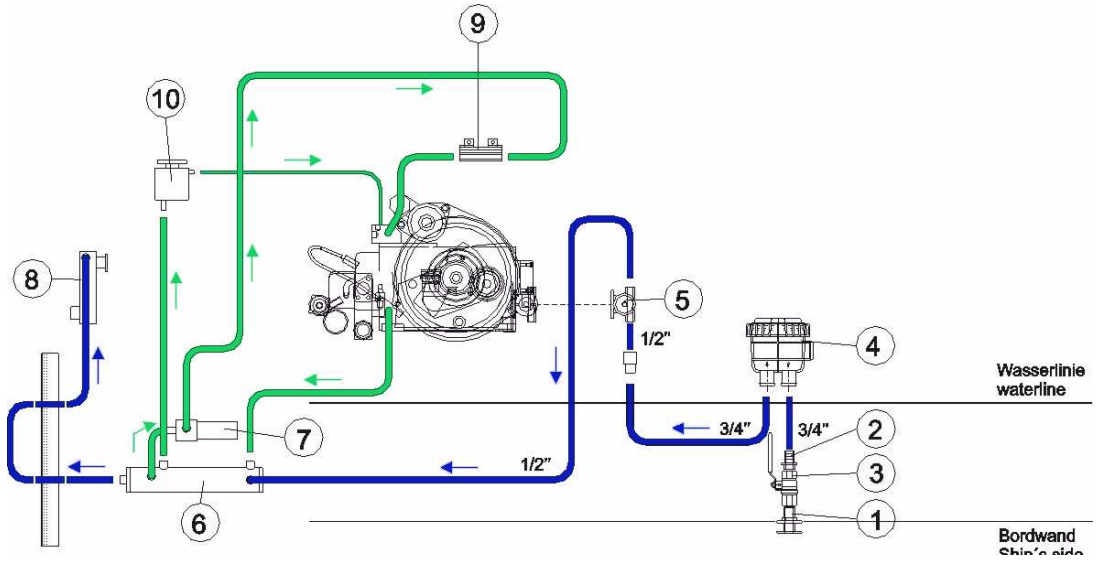
If the generator is installed above the waterline it is possible that the impeller wearout will be stronger. After the start the pump runs dry some seconds. The raw water hose should describe a loop as near as possible to the raw water inlet of the gene ator (see picture below). With it the pump only sucks in air for a short time. The impeller will be lubricated by the raw water and its life time will rise. By the installation of a check valve in the raw water inlet line, which is under the waterline, this problem can be limited a little. It is very important to change the impeller every few month.

When starting the generator you should pay attention and listen when raw water comes out from the exhaust. If this lasts longer than 5 seconds the impeller has to be changed, because he sucks to much air before raw water reaches the impeller and the impeller wears out strongly. In this case the impeller looses its function, which leads to an overheating of the engine. If the impeller isn't exchanged early enough, the impeller wings can break into pieces and clog the cooling circuit. Therefore it is very important to change the impeller every few month.

NOTE:

Never change the impeller for many years, without exchanging the old pump. If the sealing ring is defective within the pump, seawater runs into the sound cover of the aggregate. A repair is then very expensive.

Replacement impeller and also a spare pump should always be on board. The old pump can be sent back to ICEMASTER, where it is then economically overhauled completely.



1) Hull inlet
2) Reducer
3) Water cock
4) Raw water filter
5) Raw water pump
6) Heat exchanger
7) Fresh water pump
8) Exhaust manifold, water-cooled
9) Diode block, water-cooled
10) Cooling water tank

Fig. C.3.4-1: Installation example

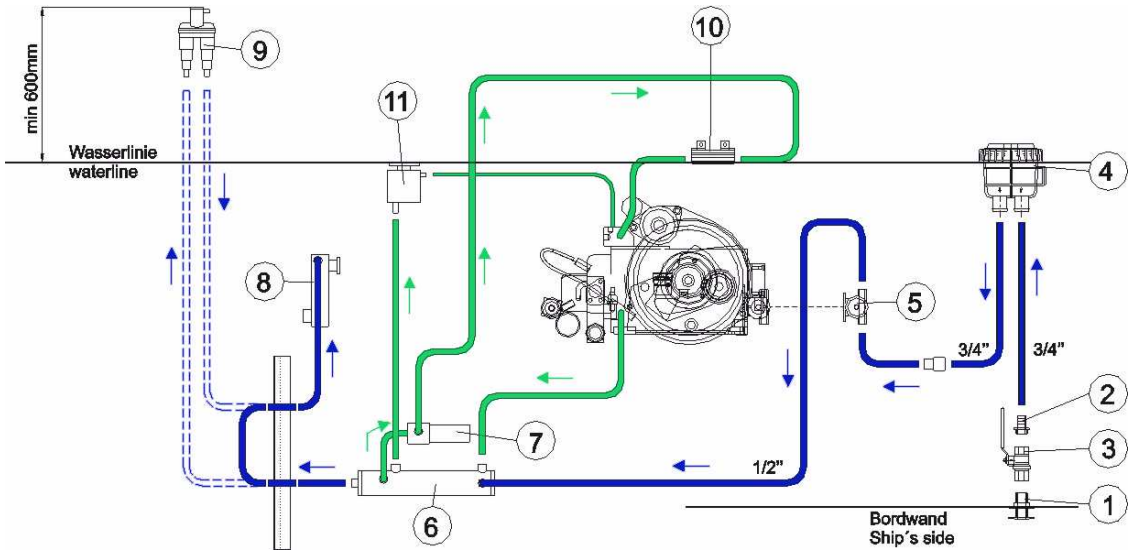
C.3.5 Installation below waterline

If the generator can not be attached at least 600mm over the waterline, a vent valve must be installed into the seawater line. With location beside the "midship line" a possible heeling must be considered! The water hose for the external vent valve at the back of the sound cover splits on the pressure side of the pump and at both ends in each case extended with a connecting nipple by a hose end. Both hose ends must be led out outside of the sound cover to one point, if possible 600mm over the waterlinee in the midship line. The valve is connected at the highest place with the two hose ends. If the valve is blocked, the cooling water pipe cannot be ventilated after the stop of the generator, the water column is not interrupted and the water can penetrate into the combustion chamber of the engine. This leads to the destruction of the engine!

Fig. C.3.5-1: Ventilation valve

The tube bend must be removed. Now the two ends are extended in each case with a hose and attached at a value of approx. 600mm over the waterline with a ventilation valve.

Fig. C.3.5-2: Tube bend for ventilation valve



1) Hull inlet
2) Water cock
3) Reducer
4) Raw water filter
5) Raw water pump
6) Heat exchanger
7) Fresh water pump
8) Exhaust manifold, water-cooled
9) External vent valve
10) Diode block, water-cooled
11) Cooling water tank

Fig. C.3.5-3: Installation example

C.4 The Freshwater - Coolant Circuit

Anti-freeze

In the interest of safety, the freezing point of the closed circuit coolant should be **checked on a regular basis**. Be sure that the coolant/antifreeze mixture is good for at least -15℃ (5℉) and if it is possible that your genset experiences lower temperatures, for example during storage or transportation, then the entire cooling system should be drained and purged. To purge the cooling system, compressed air at about 0.5 bar (7.5 psi) is sufficient.

C.4.1 Pressure test for control of cooling water circuit

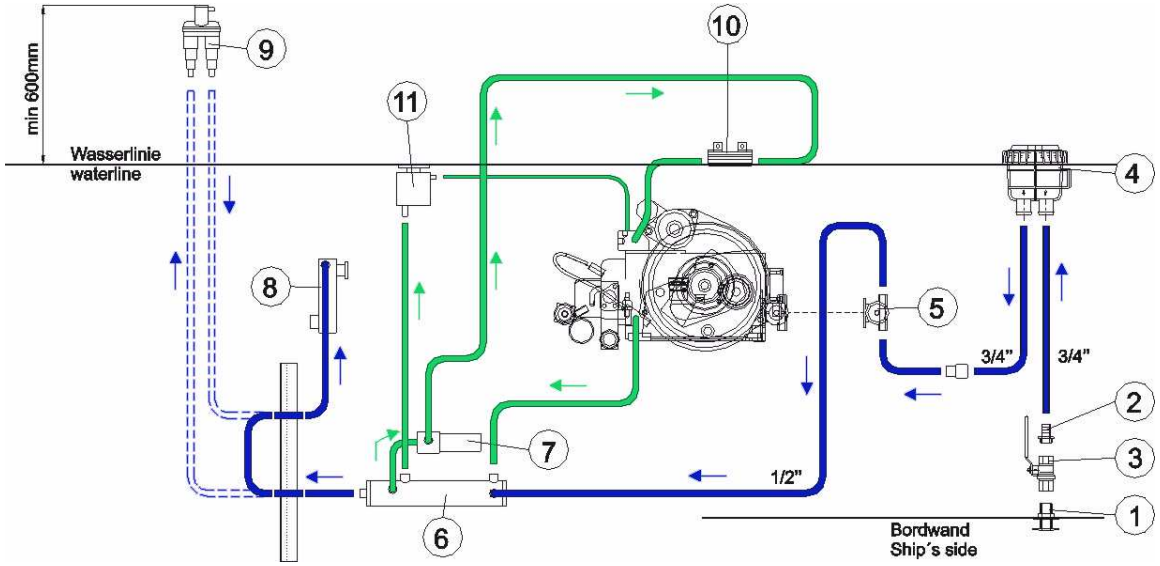
Check with the hand if a temperature difference exists whether between cooling water in-flow and cooling water return.

Feel the cooling water in-flow line at the internal cooling water pump.

Feel the cooling water return pipe either at the outlet of the water-cooled exhaust elbow union or at the side, where this pipe entry at the heat exchanger.

The temperature difference between in-flow and return is approx. 10 degrees.

C.4.2 Scheme for freshwater circuit at two circuit cooling system



1) Hull inlet
2) Water cock
3) Reducer
4) Raw water filter
5) Raw water pump
6) Heat exchanger
7) Fresh water pump
8) Exhaust manifold, water-cooled
9) External vent valve
10) Diode block, water-cooled
11) Cooling water tank

Fig. C.4.2-1: Installation expample

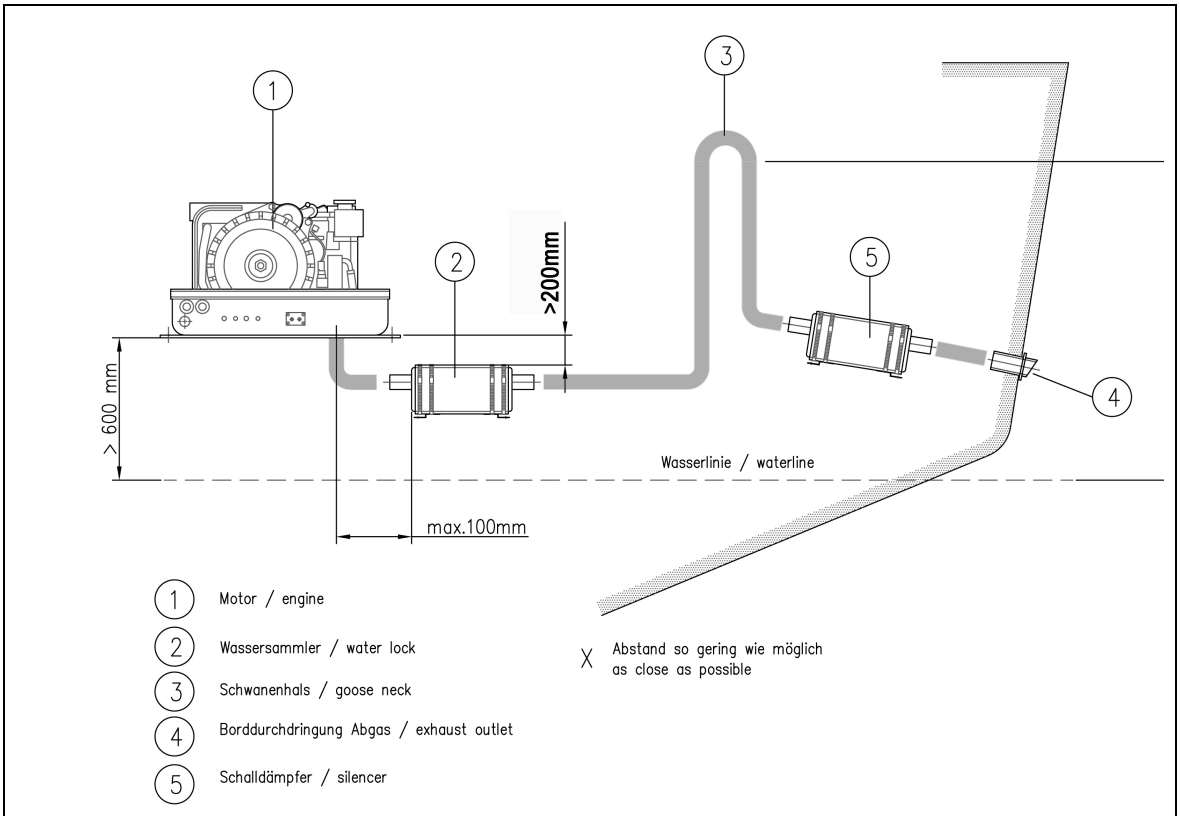
C.5 Watercooled Exhaust System

By injecting the outlet raw water into the exhaust manifold, the exhaust gases are cooled and the noise emissions from the exhaust system are reduced.

C.5.1 Installation of the standard exhaust system

The generator exhaust system must remain completely independent and separate from the exhaust system of any other unit(s) on board. The exhaust hose has an inner diameter of 40mm (1.6") (Panda 14000 and above approx. 50mm). The water lock must be installed at the lowest point of the exhaust system. An optional noise insulated water lock can also be installed. The exhaust hose descends from the capsule to the water lock. Then the hose rises via the "goose neck" to the silencer (see drawing). The goose neck must be vertical and sit preferably along the ship's keel centre line. The exhaust system must be installed so that the back pressure inside the exhaust does not exceed 0.4 bar (6 psi) and total length does not exceed 6m (20 ft.).

Exhaust diameter see “Diameter of conduits” on Page 97.



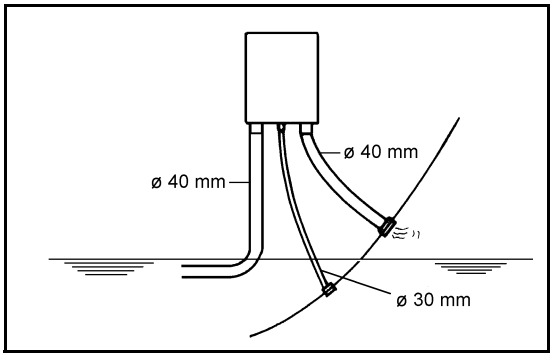
1. Generator
2. Water lock
3. Goose neck
4. Hull inlet exhaust
5. Silencer
X. Distance, as small as possible, max. 6m

Fig. C.5.1-1: Installation example

C.5.2 Exhaust / water separator

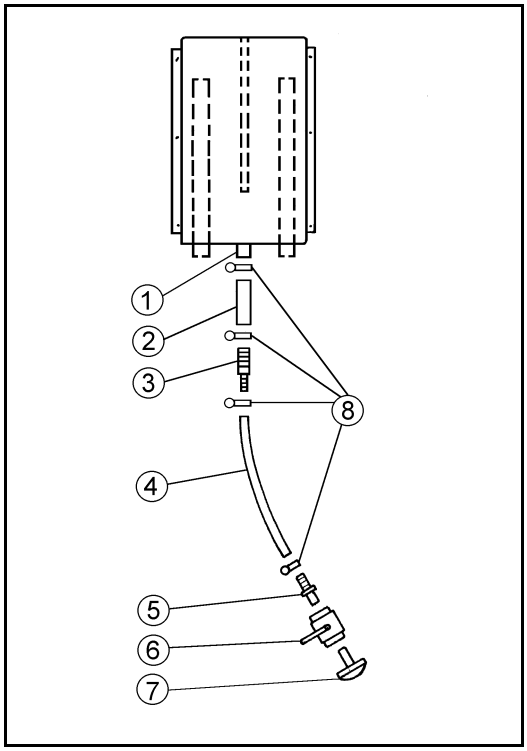
The exhaust/water separator

In order to reduce the noise level of the generator unit to a minimum, an optional exhaust outlet muffler mounted next to the thru-hull fitting can be installed. Additionally there is component at ICEMASTER, which exercise both functions of a "exhaust goose neck", and the water separation. With this "exhaust/water separator" the cooling water is derived over a separate pipe. Thereby the exhaust noises at the exterior of the yacht are strongly decreased. Particularly the "water plash" allocate.



The water flow on the exhaust/water separator unit has an inner diameter (ID) of 30mm. If the path from the water separator to the sea water outlet is very short, the hose can be further reduced to 1" (25mm) ID.

Fig. C.5.2-1: Exhaust/water separator

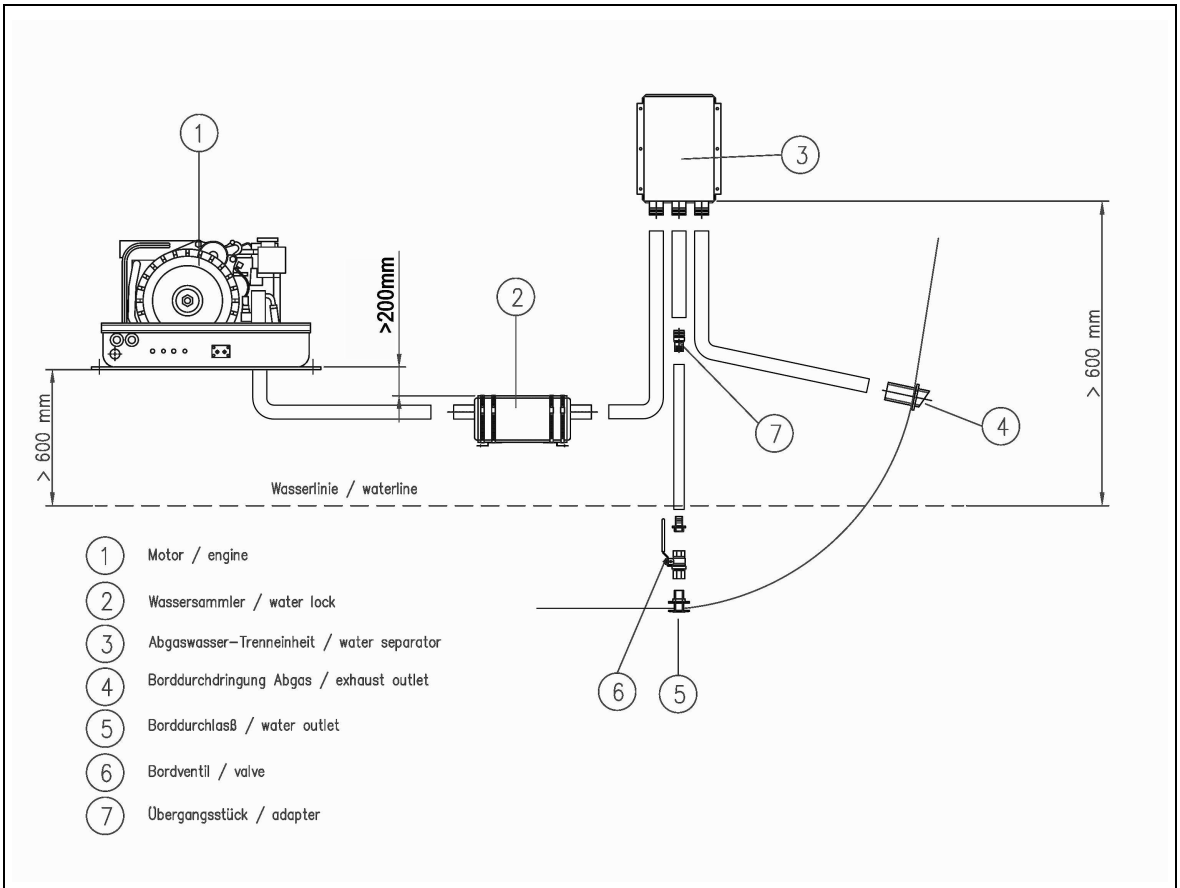


1. Raw water outlet ø 30mm
2. Hose connection ø 30mm
3. Reducer 30/20mm (if required)
4. Hose for hull inlet
5. Hose connector
6. Sea cock
7. Hull outlet
8. Hose clamps

Fig. C.5.2-2: Exhaust/water separator

C.5.3 Installation exhaust/water separator

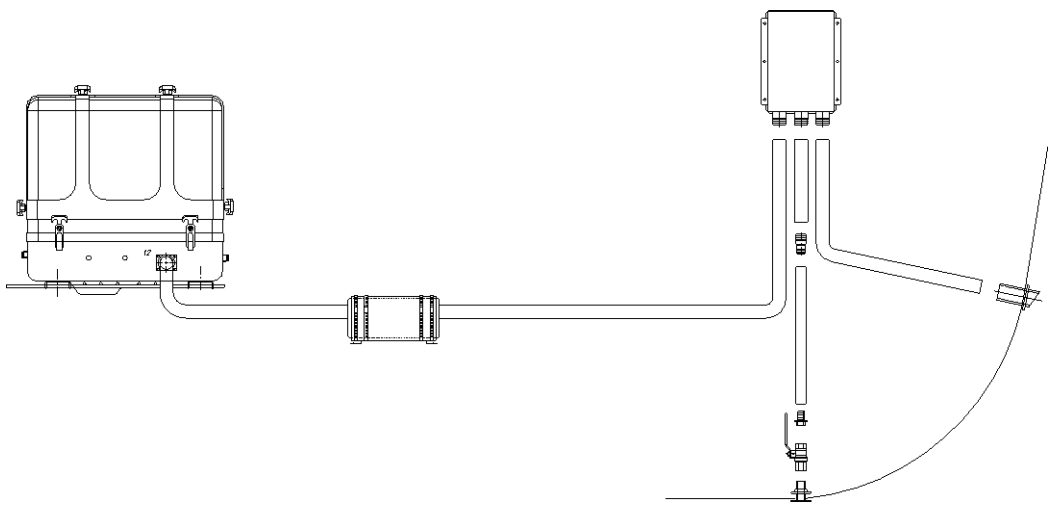
If the exhaust/water separator was sufficiently highly installed, a goose neck is no longer necessary. The exhaust/water separator fulfills the same function. If the "Supersilent" exhaust system were installed correctly, the generator will not disturb your boat neighbour. The exhaust noise should be nearly inaudible. The best result is reached, if the hose line, which derive the cooling water, is relocate on a short way "falling" directly to the outlet and this outlet is under the waterline.



1. Generator
2. Water lock
3. Exhaust/water separator
4. Hull outlet exhaust
5. Hull outlet water
6. Sea cock
7. Reducer
8. Silencer
9. Exhaust pipe
10. Exhaust pipe
11. Waterline
12. Water hose
13. Exhaust hose

Fig. C.5.3-1: Installation example

If the thru-hull exhaust outlet has to be mounted far from the generator, an exhaust-water separator must definitely be installed. The sea water from the separator must then run along the shortest possible path is the thru-hull outlet. For such long exhaust routes, the exhaust hose diameter should also be increased from NW40mm to NW50mm in order to reduce the back-pressure. The exhaust may have a length of over 10m (32 ft.) if the exhaust hose diameter is increased to 50mm. An additional outlet exhaust muffler close to the hull outlet will help further to reduce noise emissions.



Example of an unfavorable installation:

- water lock not deeply enough under the hights level of the generator
- distance water lock to exhaust/water separator too largely

Fig. C.5.3-2: Example for unfavorable installation

C.6 Fuel System Installation

C.6.1 General References

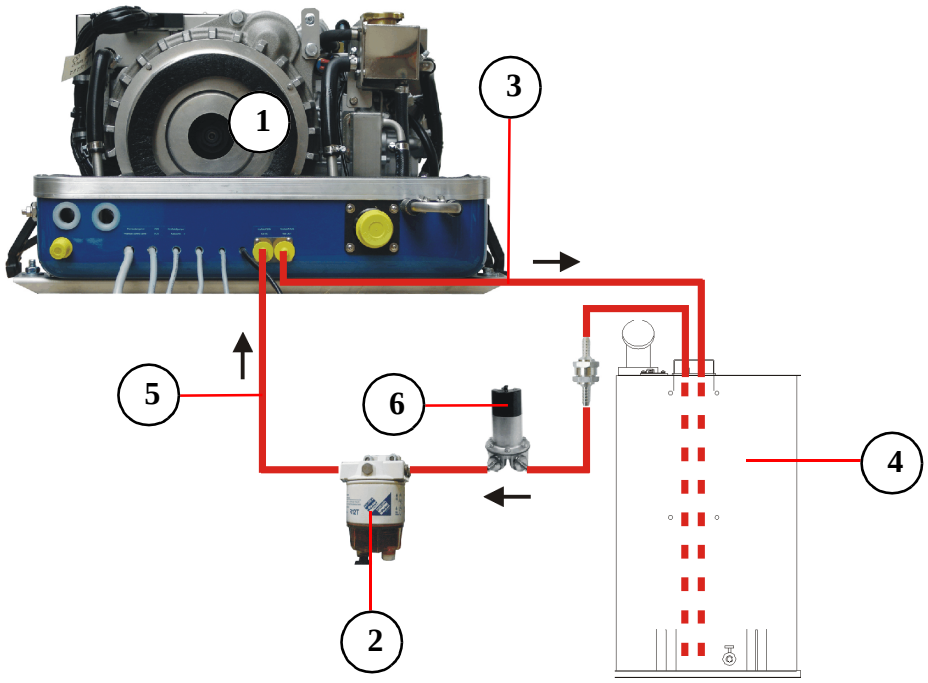
Additional fuel filters (with water seperator) must be mounted outside the capsule in easily accessible places in the fuel lines between the tank intake fuel pump and the diesel motor's fuel pump.

Generally forward and return fuel flow pipes must be mounted to the diesel tanks. Do not connect the generator fuel supply lines with any other fuel lines of other diesel systems.

The following items need to be installed:

- Fuel supply pump (12V-DC)
- Pre-filter with water separator (not part of the delivery)
- Fine particle fuel filter
- Return fuel line to fuel tank (unpressurized)

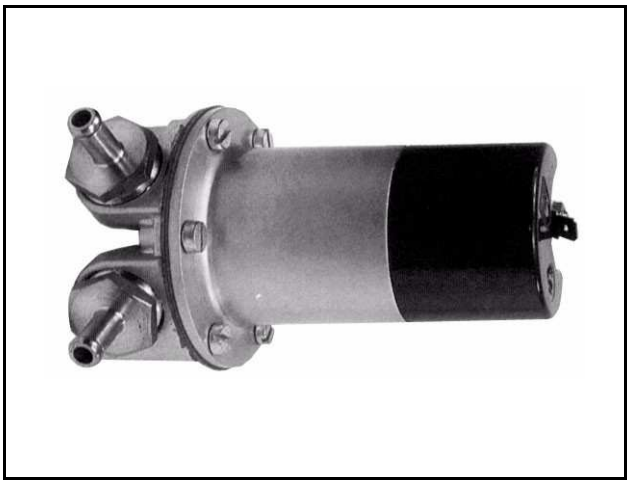
The fuel supply pump should be mounted as close to the fuel tank as possible. The electric cable for the fuel pump is already installed on the generator (length 5m).



1. Generator
2. Fuel filter
3. Fuel return pipe
4. Fuel tank
5. Fuel supply pipe
6. Electrical fuel pump (12V-DC)

Fig. C.6.1-1: Example for fuel installation

C.6.2 The electrical fuel pump



Electrical fuel pump

With the Panda generator is usually supplied an external, electrical fuel pump (12V DC). The fuel pump must be installed close at the fuel tank. The electrical connections are preloaded at the generator with the lead planned.

Fig. C.6.2-1: Electrical fuel pump

- • Suction hight of the pump: max. 1,2m at 02, bar
- • Diameter of fuel lines: “Diameter of conduits” on Page 97

C.6.3 Connection of the fuel lines at the tank

Lead the return fuel pipe connected to the day tank to the floor

The return pipe connected to the tank must be dropped to the same depth as the suction pipe, if the generfator is mounted higher than the tank, in order to prevent fuel running back into the tank after the motor has been switched off, which can lead to enormous problems if the generator is switched off for a long period.

Non-return Valve in the Suction Pipe

A non-return valve must be fitted to the suction pipe, which prevents the fuel flowing back after the generator has been switched off, if it is not possible to use the return flow pipe as a submerge pipe be placing it in the tank. The instructions "Bleeding Air from the Fuel System" must be read after initial operation or after it has stood still for a long period, in order to preserve the starter battery.

ATTENTION! Non-return valve for the fuel return pipe

If the fuel tank should be installed over the level of the generator (e.g. daily tank), then a non-return valve must be installed into the fuel return pipe to guaranteed that through the return pipe no fuel is led into the injection pump.

C.6.4 Position of the pre-filter with water separator

Additionally to the standard fine filter a pre-filter with water separator must be installed outside of the sound cover in the fuel system line. (is not included in delivery.)

Fig. C.6.4-1: External fuel filter

C.7 Generator DC System-Installation

C.7.1 Connection of the 12V starter battery (only for 24V version)

The positive (+) battery cable is connected direcly to the solenoid switch of the starter motor.

Fig. C.7.1-1: Connection starter battery

The negative (-) battery cable is connected to the engine foot below the raw water pump.

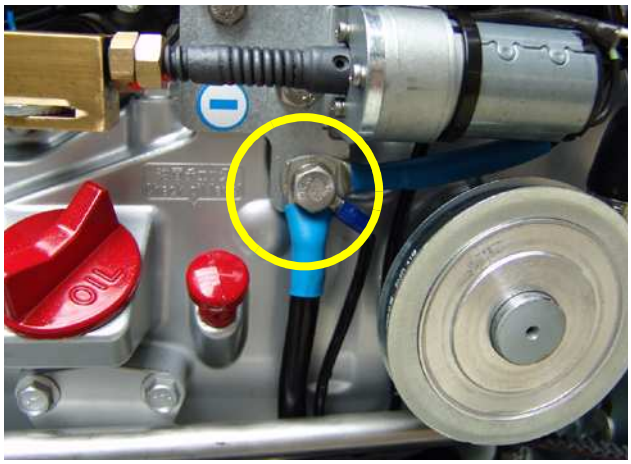


Fig. C.7.1-2: Connection starter battery

C.7.2 Terminal block AGT 4000

The Panda generators are equipped with various DC-relays, which can be found under the terminal strip. The various relays have the following tasks (also see the DC circuit diagram)

F1: Fuse 15A for DC-system

F2: Fuse 10A for AC-system

K1: Starter motor relay

K2: Pre-glow relay (glow plug)

K3: Fuel pump relay

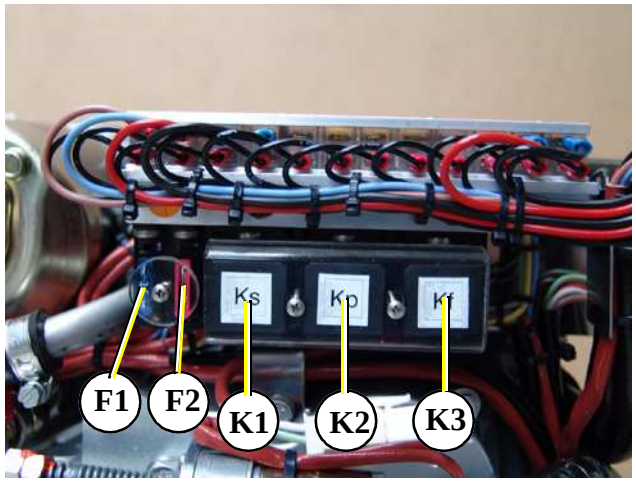
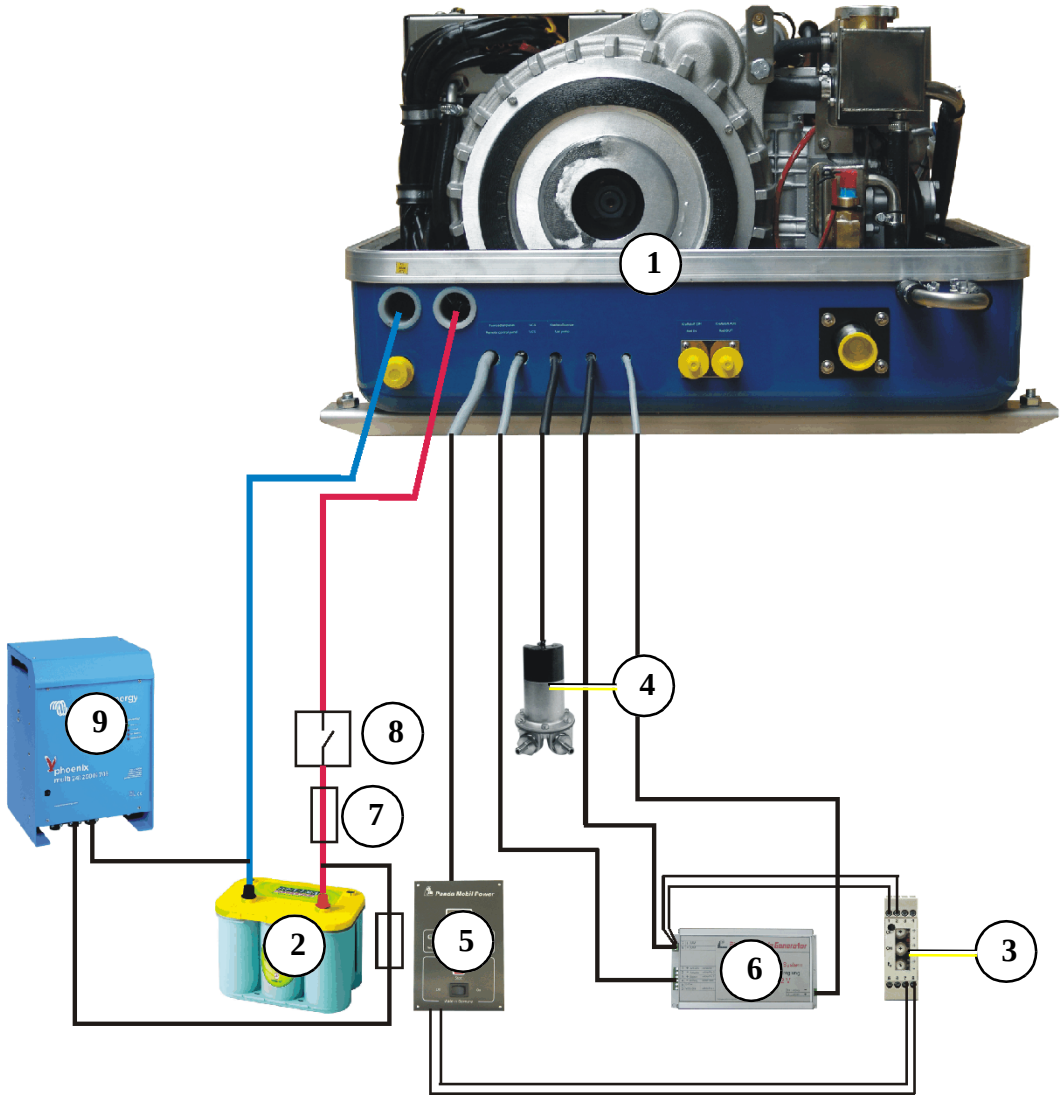


Fig. C.7.2-1: Terminal block AGT 4000 12V

C.8 Generator DC System-Installation

ATTENTION! Before the electrical system is installed, READ the “Safety Precautions” on Page 12 of this manual FIRST! Be sure that all electrical installations (including all safety systems) comply with all required regulations of the regional authorities. This includes lightnening conductor, personal protection switch etc.

C.8.1 Installation Panda AGT 12V-sytem

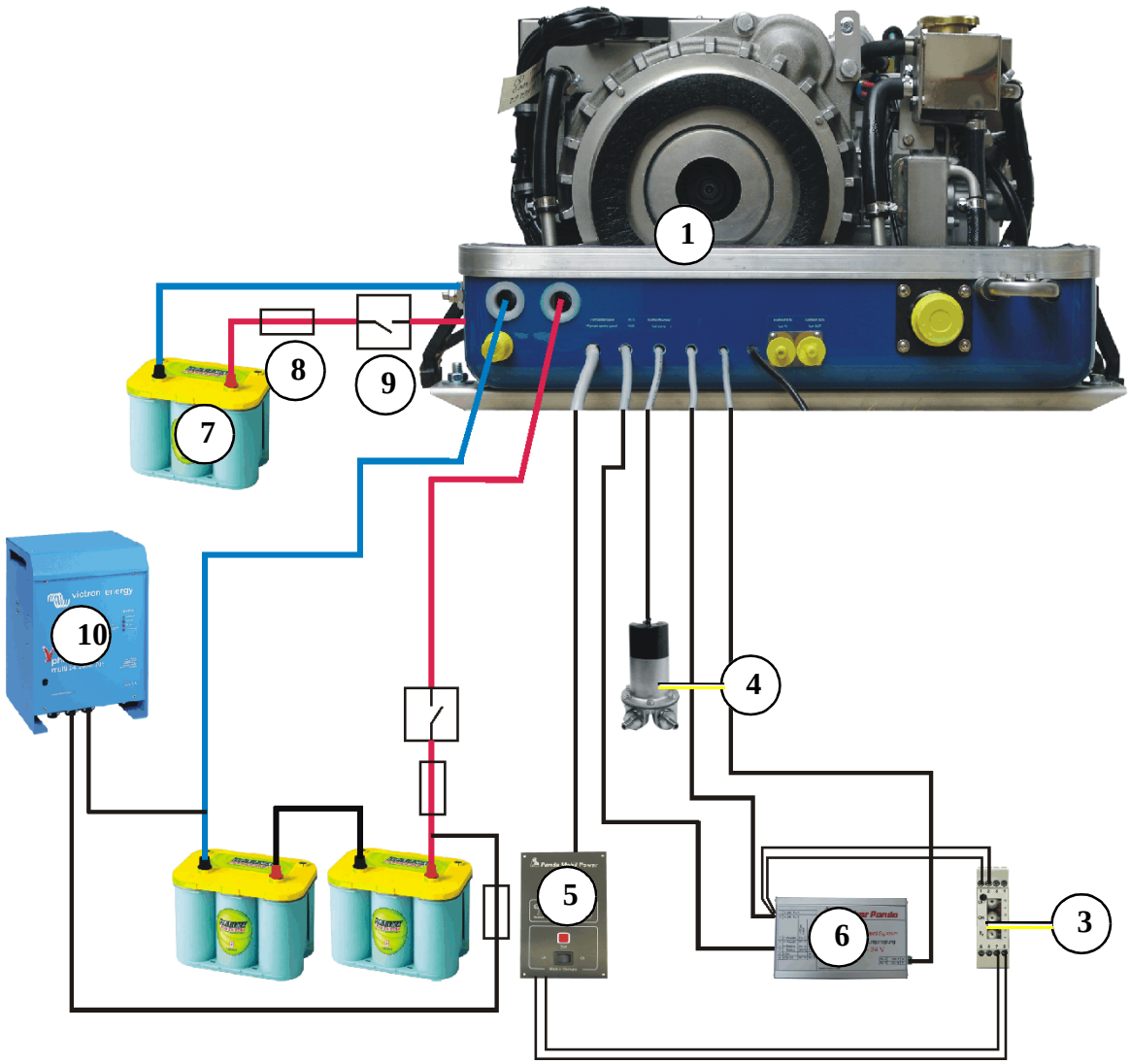


1. Generator
2. Battery bank 12V
3. Battery monitor
4. Fuel pump
5. Remote control panel
6. Voltage control VCS
7. Fuse
8. Battery switch
9. Inverter

Fig. C.8.1-1: Installation AGT 12V-system - example

All electrical safety installations have to be made on board.

C.8.2 Installation Panda AGT 24V-system

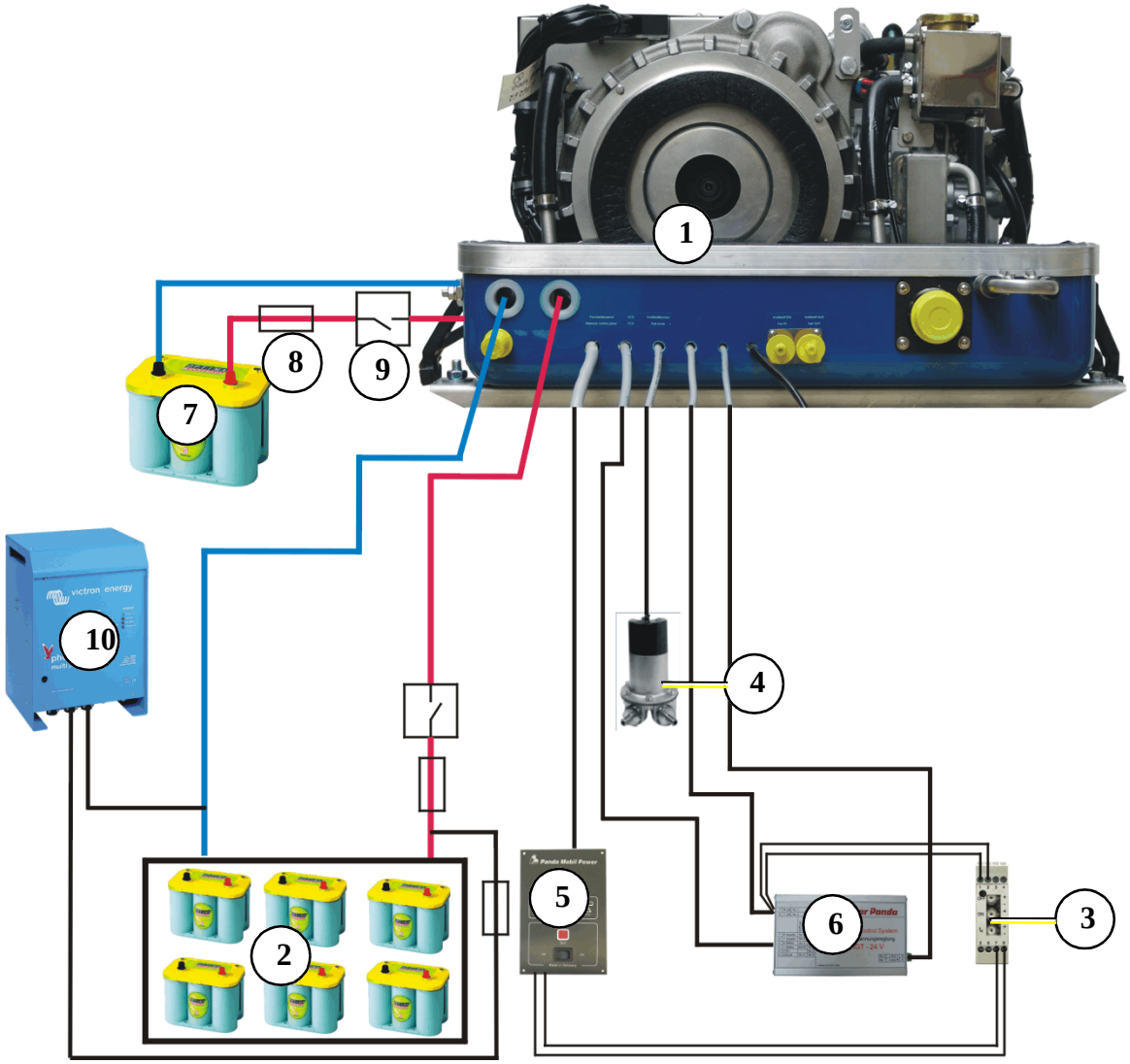


1. Generator
2. Battery bank 24V
3. Battery monitor
4. Fuel pump
5. Remote control panel
6. Voltage control VCS
7. Starter battery 12V
8. Fuse
9. Battery switch
10. Inverter

Fig. C.8.2-1: Installation AGT 24V-system - example

All electrical safety installations have to be made on board.

C.8.3 Installation Panda AGT 36-72V-system



1. Generator
2. Battery bank
3. Battery monitor
4. Fuel pump
5. Remote control panel
6. Voltage control VCS
7. Starter battery 12V
8. Fuse
9. Battery switch
10. Inverter

Fig. C.8.3-1: Installation AGT 24V-system - example

All electrical safety installations have to be made on board.

Electrical fuses

It is absolutely essential that the electrical system installation is inspected by a qualified electrical technician. The generator should have its own AC **input electrical fuses**. The fuses should be sized such that the rated current of the generator on each of the individual phases is not exceeded by more than 25%.

Data for gensets with power output greater than 30kW on request!

The fuses must be of the slow type. A 3-way motor protection switch must be installed to protect the electrical motor.

Required cable cross-sections

The following recommended electrical cable dimensions (cross sections) are the minimum required sizes for a safe installation. *(see "Cable cross-section" on Page 98)*

C.9 Voltage control VCS

It is of upmost importance to check the correct functioning of the voltage control system (VCS) during installation or maintenance.

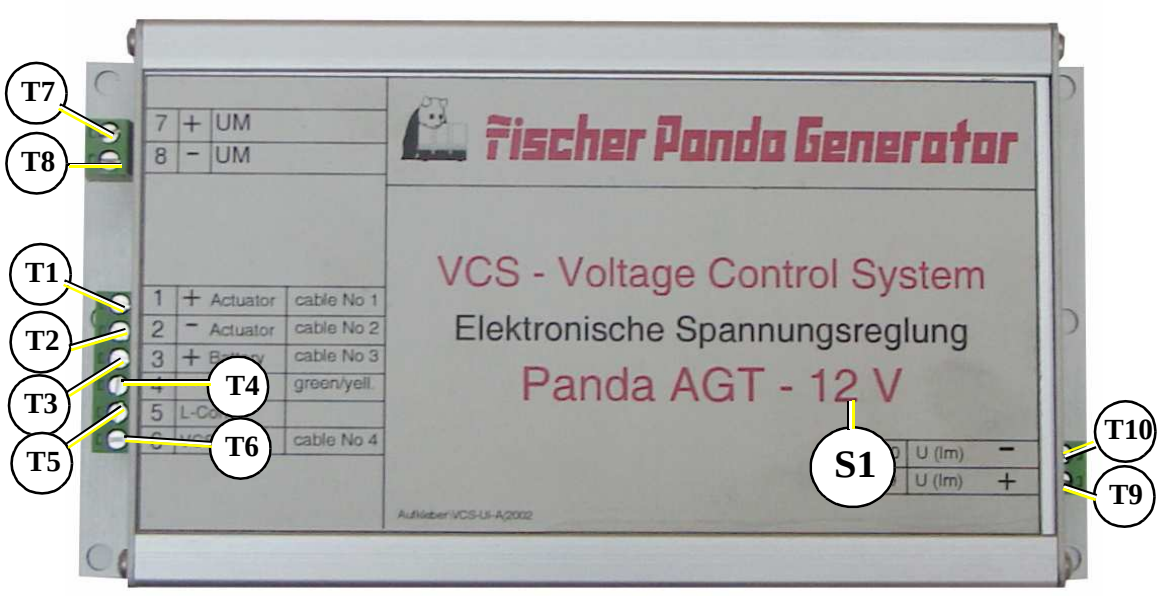


Fig. C.9-1: VCS

S1 : CAUTION:

The VCS is preset according to the output voltage of the generator. The nominal voltage level of the VCS is imprinted on the top side (S1). Examine whether this voltage agree with the nominal output voltage.

Instructions

At the installation and at the service it is absolutely necessary that the function of the voltage regulation system is examined correctly.

Connector 1			
T1	Terminal 1	+ Actuator	Actuator +
T2	Terminal 2	- Actuator	Actuator–
T3	Terminal 3	+ Battery	Battery + 12V
T4	Terminal 4	- Battery	Battery 0V
T5	Terminal 5	L-Con	Charge control
T6	Terminal 6	VCS-ON	DP+ fuel pump

Connector 2				
T7	Terminal 7	+ UM	+ Battery sense voltage	+ 12V/24V/36V/48V
T8	Terminal 8	- UM	- Battery sense voltage	0V

Connector 3				
T9	Terminal 9	+ U(Im)	Current sense signal +	Max. + 48mV
T10	Terminal 10	- U(Im)	Current sense signal -	0V

C.9.1 Checking the VCS voltage control without requiring the generator to run

Prerequisites :

1. Is VCS cable connected?
2. Is the cable for measurement voltage connected to VCS?
3. Is the cable for current measurement connected to VCS ?
4. Has graphite grease been smear on the spindle?

1. Remove connection 50 on starter motor (white cable).

2. Switch “Power” on remote control panel, Press “Start” button.

The VCS will keep the governor in the maximum position whenever the starter relay is activated. The actuator will return to stationary (NULL) position when the starter relay is deactivated.

Check that the actuator functions correctly.

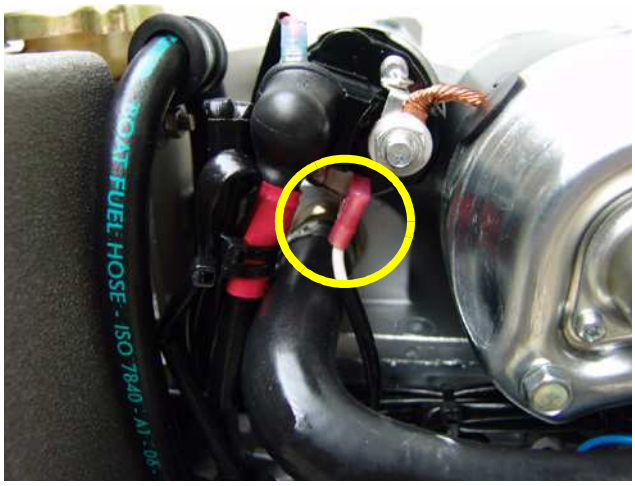


Fig. C.9.1-1: Connection 50

C.9.2 Funktion of the VCS

The output current of the generator is measured via a shunt with an output voltage of 60mV for the rated current.

Factors concerning current measurement:

- The generator will shutdown if a cable break in the measurement wire from the shunt to the VCS is detected.
- A short circuit of the measuring wires or polarity reversal is not recognised and considered as if no current is present. This will cause the VCS functioning for restricting current not to work. Therefore any functions for current restriction must be checked and a secondary protection against excessive current installed.
- A screened or twisted cable must be used for measuring current. One side must be grounded if an unscreened cable is used. The cable used for measurement must not be longer than 3 meters.

  The current regulation threshold can be finely-adjusted using the potentiometer on the rear side of the VCS (+5% / -24%).

The potentiometer should be sealed before the VCS is supplied to the customer.

C.9.3 Checking the voltage regulation

Reconnect terminal 50 to the starter motor and start the generator. Monitor the battery voltage and check that the generator regulates the voltage within the adjusted range. Ensure that the generator regulates the voltage exactly when switching the load on and off .

01. Potentiometer for adjusting the charging voltage.

Turning clockwise will increase the charging voltage.

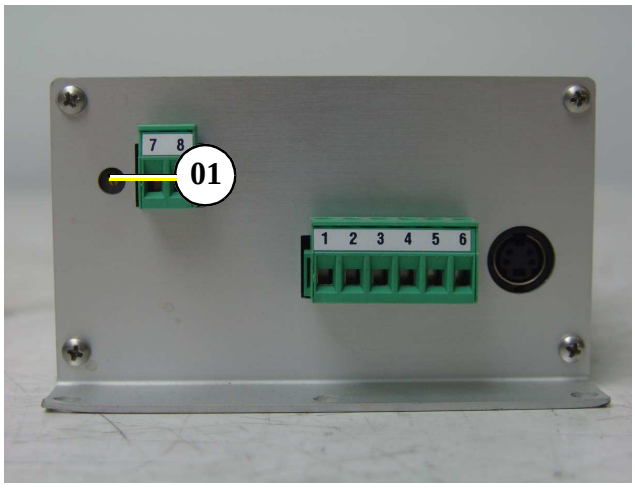


Fig. C.9.3-1: Potentiometer charging voltage

C.9.4 Checking the current limit

A DC clamp-meter to monitor the generator output current and a multimeter with a mV DC range are required for this test. The batteries must be discharged prior to testing to ensure that the generator is able to deliver the maximum output. Run the generator, monitor the DC output current of the generator and measure DC mV range between connections 9 and 10 on the VCS box. Please check the signal polarity. On generators built before 2003 the maximum DC voltage is 60 mV for the rated current. On generators built after 2003 the DC voltage is 48 mV for the continuous current.If this millivolt level is exceeded, please check the proper connection and polarity of the cable between the shunt and the VCS box.

To set the charging current / voltage, consumers with the rated performance of the generator should be turned on. The charging current must now be measured and the potentiometer set to 110A so that the engine can operate in its nominal performance range.

01. Potentiometer for adjusting the charging current.

Clockwise turning will increase the charging current.

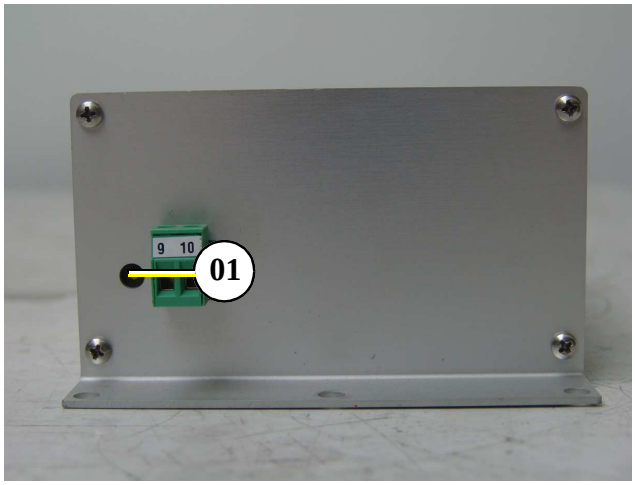


Fig. C.9.4-1: Potentiometer charging current

C.10 Battery monitor

Purpose:

Automatic battery voltage monitoring. The generator is started automatically via the remote control panel to start charging when the battery voltage drops below a minimum set level. When the battery voltage exceeds a maximum set level the battery-charging generator is stopped after an interval period which is adjustable

Description / Function:

Minimum battery voltage level, maximum battery voltage level (when charging is completed) and interval period before stopping the generator can be adjusted via potentiometers.

An LED indicates when the minimum battery voltage level is sensed. A period of 40 seconds must be present after reaching the minimum level so that the generator can be started correctly.

The battery monitor is supplied from the batteries it monitors.

The outputs are galvanically separated by an optocoupler.

The output signal is poled and must be CORRECTLY connected (connection 7 – positive / connection 8 – negative).

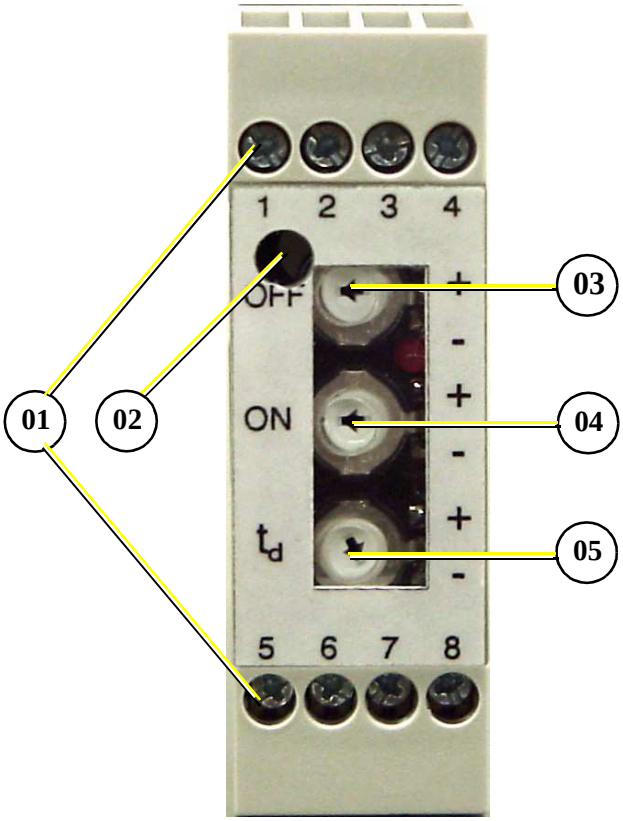
Incorrect poling of the output connections can destroy or damage the battery monitor and other electrically connected units.

- The value set for the maximum voltage level (end of charging) can be measured at connection 3 and connection 2 (negative).
- The value set for the minimum voltage level (begin charging) can be measured at connection 4 and connection 2 (negative).
- The switching voltage levels are measured per cell. The absolute switching voltage levels can be calculated by multiplying the measured voltage by the number of cells.
- Failure to use a multimeter with an impedance of 10 ohms or more for measuring these values will cause significant measurement errors

Rotation direction for trimming: Adjustment in clockwise direction = increases value.

- Using a instrument screwdriver, a switch is accessible through a hole underneath connection 1. For test purposes, this switch can be used to switch between states. This can only be carried out when the battery voltage is between the minimum and maximum levels. The battery monitor is not affected by use of this switch when the voltage level is outside the minimum or maximum levels.
- The connection cable used to connect the battery monitor to the control panel must be either screened or contain twisted wires.

Terminal	Function	Terminal	Function
1	Positive pole (+) of battery	5	not used
2	Negative pole (-) of battery	6	not used
3	Measurement connection switch-off voltage	7	positive output sensor
4	Measurement connection switch-on voltage	8	negative output sensor



01. Terminals 1-8
02. Test switch
03. Potentiometer switch-off voltage
04. Potentiometer switch-on voltage
05. Potentiometer delay time

Fig. C.10-1: Battery monitor

C.11 The fan control

Temperature controlled adjustable speed control for one or two stage DC Fan.

The fan regulator must be mounted an a dry and well-aired location. Ensure it is assembled vertically.

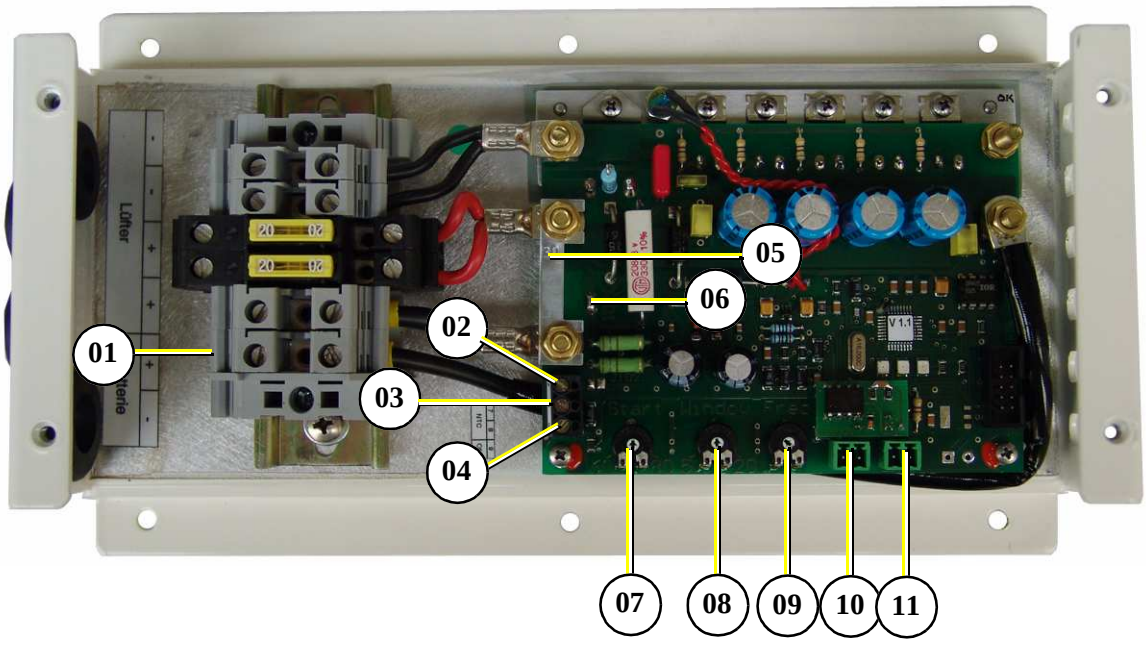
The speed adjustment of the fan is determined by the Running Voltage Pulse/Pause modulation. The Pulse/pause-ratio is goverened by the cooling water temperature via an external NTC-gauge (terminal 7 and 8). A NTC-resistor reduce his resistor value if the temperature is rising. The full running voltage is sent to the fan when the upper temperature has been reached.

The fan regulator can be switched on or off by the connection „ON" (terminal 9). The fan control is switched on, if there is the same voltage to „ON" as „Battery (+)". If no current flows to „ON", the fan control has been switched off. If this option is not required, the circuit board connection „ON" can be connected direct to „Battery (+)", via the solder bridge J1.

J1 closed : Fan control continually running

J1 open : Fan control only working if current flows to connection „ON".

The solder bridge J1 is located directly behind the circuit board fuse when viewed from the main connection.



01. Connection „Battery (+)"
02. Terminal 7
03. Terminal 8
04. Terminal 9
05. Internal fuse
06. Solder bridge J1
07. Potentiometer Start
08. Potentiometer Window
09. Potentiometer Freq
10. Terminal 11+12
11. Terminal 13+14

Fig. C.11-1: Fan control

Blank

D. Maintenance Instructions

D.1 General maintenance instructions

D.1.1 Checks before starting

• Oil level
• Cooling system leaks
• Visual check for any changes, leaks oil drain system, v-belt, cable connections, hose clips, air filter, fuel lines
Once a month • Lubrication of actuator-trapezoid thread spindle

Maintenance see Table F.4, “Inspection checklist for services,” on Page 104.

D.1.2 Hose elements and rubber formed component in the sound cover

Check all hoses and hose connections for good condition. The rubber hoses are very sensitive to enviromental influences. They can season fast with dry air, in which environment of muted oil and fuel steams and increased temperature. The hoses must be checked regularly for elasticity. There are operating situations, at which the hoses must be renewed once in the year.

Additionally to usual tasks of maintenance (oil level check, oil filter control etc.) further maintenance activities are to be accomplished for marine aggregates.

D.2 Oil circuit maintenance

The first oil change is to be accomplished after a period of operation from 35 to 50 hours. Afterwards the oil is to be changed after 100 hours. For this the oil SAE30 for temperatures over 20℃ and SAE20 for temperatures between 5℃ and 20℃ is to be used. At temperatures under 5℃ oil of the viscosity SAE10W or 10W-30 is prescribed.

Type and amount of required oil see:Table F.5, “Engine oil,” on Page 105 and Table F.5, “Engine oil,” on Page 105.

D.2.1 Execution of an oil change

Oil drain hose

For the oil change an oil drain hose is lead through the sound cover.

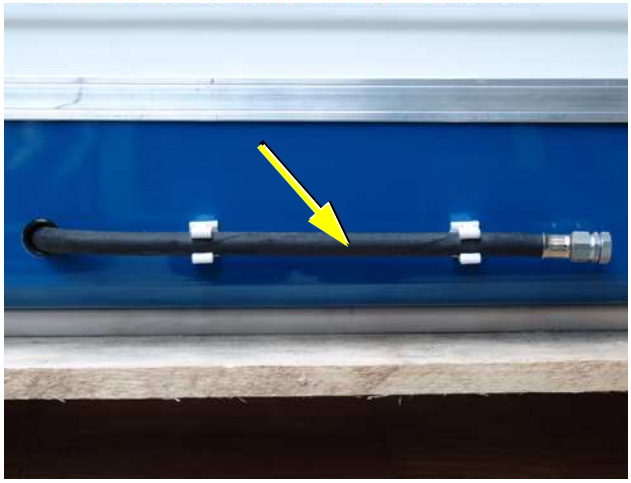


Fig. D.2.1-1: Oil drain hose

Oil drain screw

The oil can be discharged by opening the oil drain screw. For countering use a second wrench.

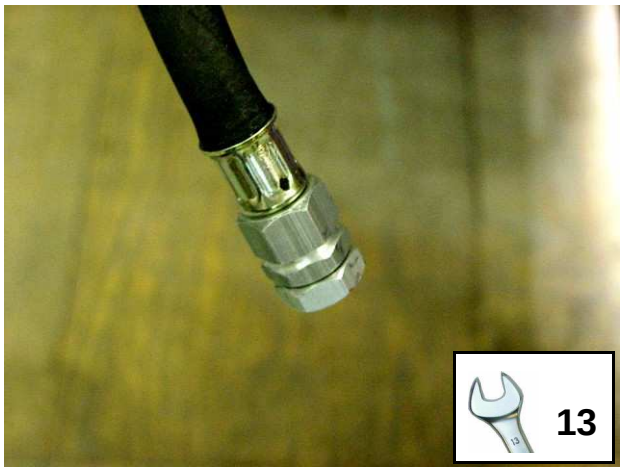


Fig. D.2.1-2: Oil drain screw

Oil drain pump

If discharging of the oil is not possible, we recommend the employment of a hand pump, which can be attached to the oil drain hose.

Afterwards the oil drain screw is closed again.

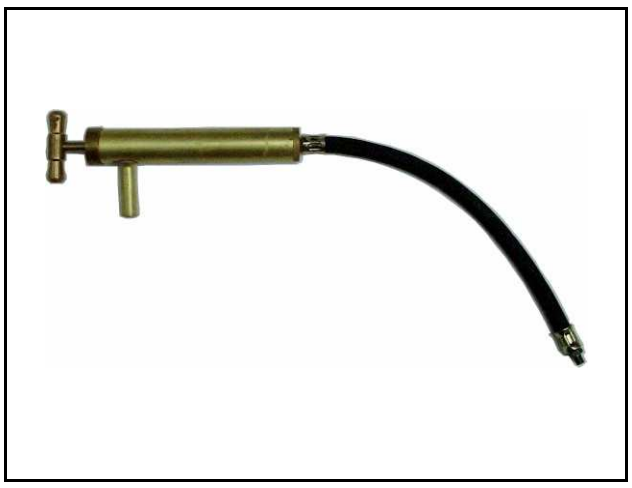


Fig. D.2.1-3: Oil drain pump

Oil strainer

The oil strainer must be cleaned every 500 opeatiing hours.

Fig. D.2.1-4: Oil strainer

Open the oil filler neck

After opening the cap of the oil filler neck the new oil is refilled.

Please wait instant, before measure the oil level, the oil must set off in the sump.

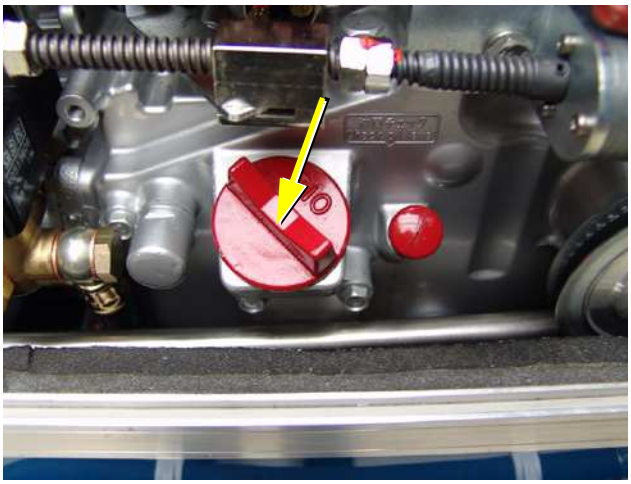


Fig. D.2.1-5: Oil filler neck

Oil dipstick

With the help of the engine oil dipstick the oil level is to examined. The prescribed filling level may not exceed the „Max“ marking.

Fischer Panda recommend 2/3 oil level.

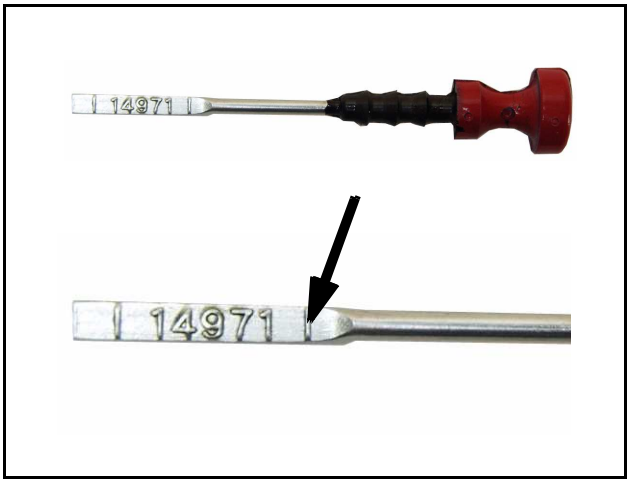


Fig. D.2.1-6: Oil dipstick

D.3 Venting the fuel system

Normally, the fuel system is designed to bleed out air itself i.e. as soon as the electric starter motor starts operation the fuel pump starts working and the fuel system will be ventilated after some time automatically. It is nevertheless essential to bleed the system as follows prior to the first operation (as all hoses are empty):

1. Put a container under the fuel return pipe to catch running out fuel to catch.

Fig. D.3.0-1: Fuel return pipe

2. Take off the plug at the solenoid of the starter motor.

Fig. D.3.0-2: Starter solonoid plug

3. Switch the panel „ON“.

4. Press „START“-button. The fuel pump runs audible.
5. Switch the panel „OFF“.
6. Switch the panel „ON“.
7. Press again the „START“-button.

This procedure must be repeated several times, until fuel (nonporously) withdraws perfectly at the fuel return pipe.

8. Switch the panel „OFF“.
9. Attach the plug at the solenoid of the starter motor.

D.3.1 Checking the water separator in the fuel supply

The pre-filter with water separator has a cock at its lower surface, with this cock the downward sunk water can be discharged.

This is simply possible, water is heavier due to its density than the Diesel.

Fig. D.3.1-1: External fuel filter

D.4 Replace of the air filter

Open the air suctin housing by loosen the six hexagon head screws on the frame cover.

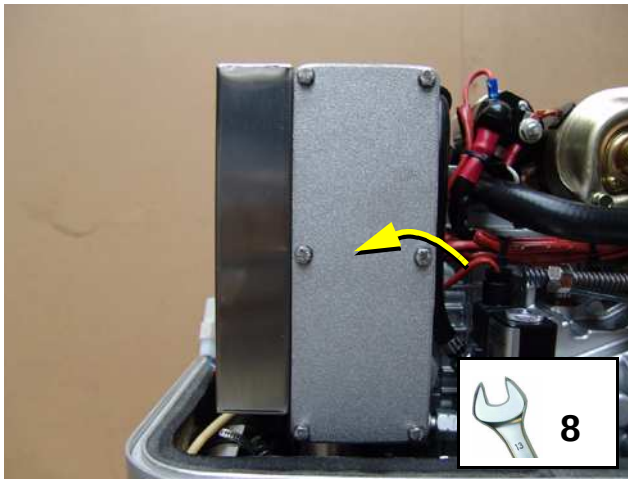


Fig. D.4.0-1: Open airfilter

Change the air filter mat and close the cover again.

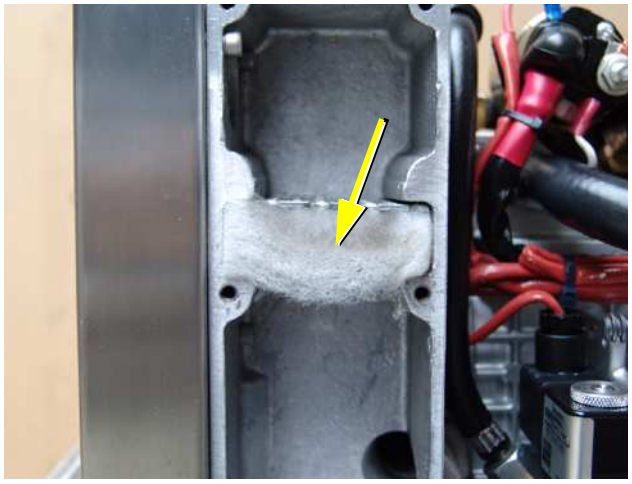


Fig. D.4.0-2: Change air filter mat

D.5 Lubrication of the spiral thread spindle

The spiral thread spindle must be lubricated carefully and regularly. Please only use a temperatur independence lubricant (up to 100℃) witch is also equiped with "emergency run qualities". Spread also lubricant to the end of the nuts.

It is possible that the spindle could clamp if the spindle is not enough lubricated. Then the generator can be switched off by over- or undervoltage.

All screws at the actuator and the spindle must be ensured "solveable" with a screw safety grease.

1. Actuator
2. Spiral thread spindle

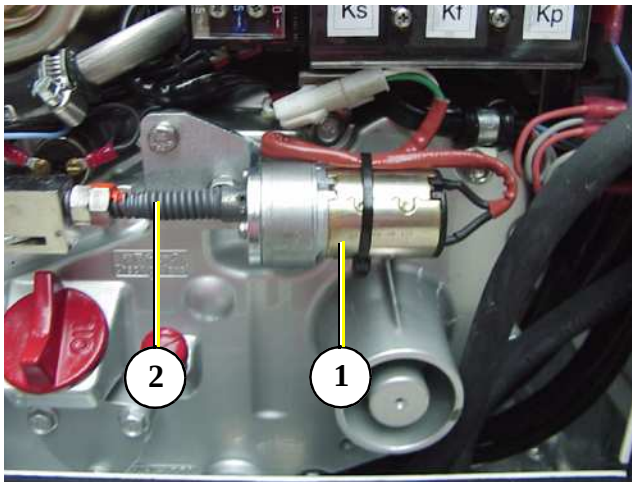


Fig. D.5-1: Actuator

D.6 Venting of the coolant circuit / freshwater

Special notes for the ventilation of the cooling system

If the cooling water is drained or if other air should have arrived into the cooling system, it is necessary to ventilate the cooling system. This ventilation procedure must be repeated several times:

ATTENTION ! Before opening the ventilation points the generator must be stagnant !!!

1. Connect the electrical cooling water pump to an external 12V power supply

2. Fill up the cooling water tank to max. level.

3. Switch the cooling water pump on

4. During the operation of the cooling water pump fill up the wtaer tank if necessary.

5. Run the cooling water pump for abouit 5 min.

6. switch the cooling water pump off and connect it again with the generator power curciut. Close the water tank.

7. Run the generator for 2 min.

Repeat the steps 1-6 three times to make shure that the system is deaerated.

Plug for the electrical cooling water pump

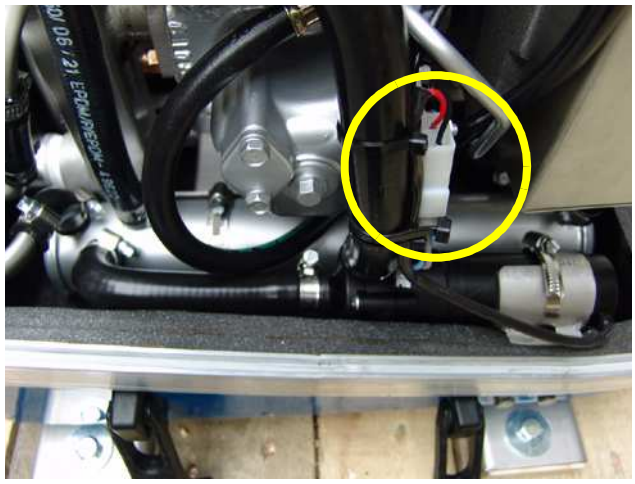


Fig. D.6-1: Plug water pump

Fill in cooling water into the cooling water filler neck. If it is to be recognized that the cooling water level does not fall anymore (with cold cooling water the cooling water levelmust cover the sheet metal in the exhaust elbow), close the filler-cap and the cooling water screws and start the generator.

Start the generator for max. 60 seconds.

Switch the generator off.

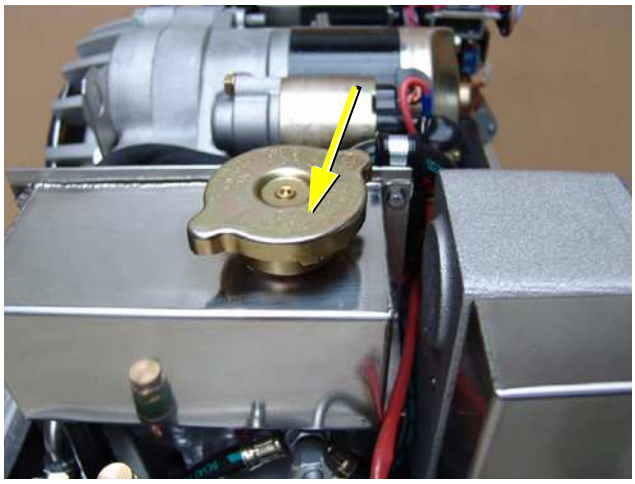


Fig. D.6-2: Water filler neck

Repeat this procedure several times.

If no change of the cooling water level can be determined, the generator is started for 5 minutes. Afterwards repeat the de-aeration two - three times.

It is meaningful to repeat the de-aeration procedure also after some days again to guarantee that in the system remained bubbles are removed.

D.7 Exchange of the toothed belt for the raw water pump

The relative high ambient temperature in the closed sound insulated capsule (about 85℃) can be a reason for a reduced lifespan of the toothed belts. It is possible that the "softener" in the rubber compound lose their effect after a short operating time because the air in the sound insulated capsule can be relative warm and dry.

The toothed belt must be controlled in a very short time interval. It can be happen to change the toothed belt after some weeks because of unfavorably conditions. Therefore the control is needed in an interval of 100 operating hours. The v-belt ia a wearing part. It should be enough spare toothed belts on board. We suggest to stand by the according service-packet.

Loosen the fixing bolts at the raw water pump.

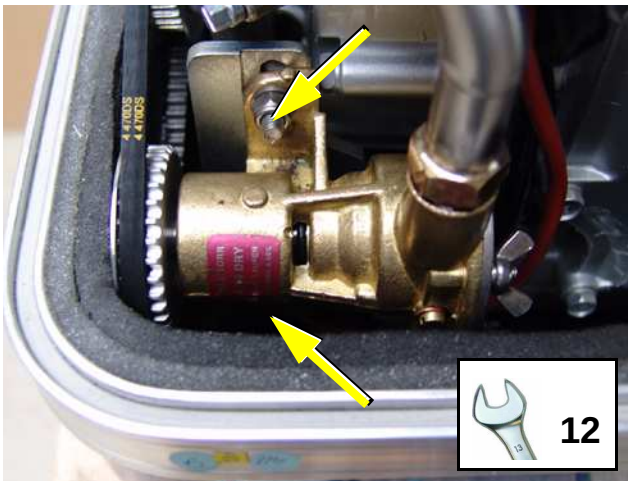


Fig. D.7-1: Raw water pump

Down-pull the toothed belt and put a new on.

Type of toothed belt: Gate power Grip GT MR (HTD-410-6-692-M5).

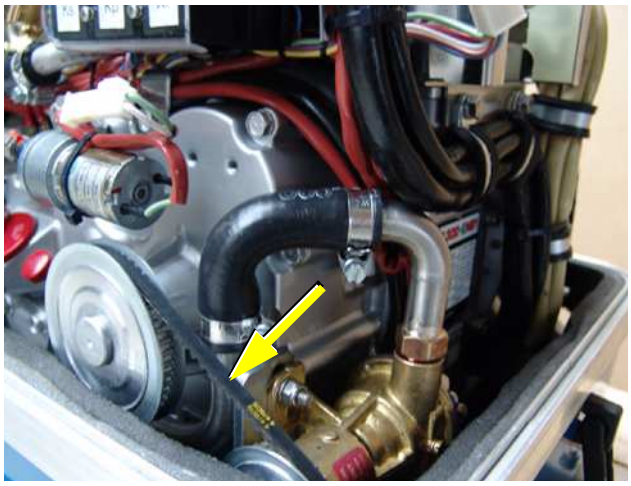


Fig. D.7-2: Change toth belt

Screw on the raw water pump again. Fasten the fixing bolts to the raw water pump again.

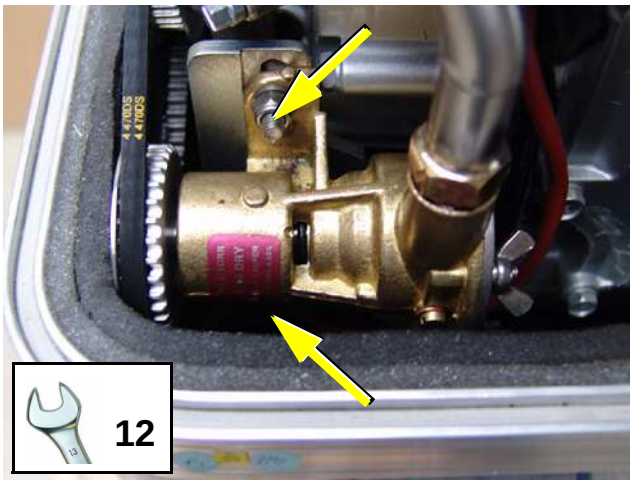


Fig. D.7-3: replace water pump

D.8 The raw water circuit

D.8.1 Clean raw water filter

The raw water filter should be released regularly from arrears. In each case the water cock must be closed before. It is mostly sufficient to beat the filter punnet.

If water should seep through the cover of the raw water filter, this may be sealed in no case with adhesive or sealant. Rather must be searched for the cause for the leakage. In the simplest case the sealing ring between caps and filter holders must be exchanged.

Fig. D.8.1-1: Raw water filter

D.8.2 Causes with frequent impeller waste

The impeller of the cooling water pump must be regarded as wearing part. The life span of the impeller can be extremely different and exclusively depends on the operating conditions. The cooling water pumps of the PANDA generators are laid out in such a way that the number of revolutions of the pump lies low compared with other aggregates. This is for the life span of the pump a positive effect.

Unfavorably affects the life span of the impeller, if the cooling water sucking in way is relatively long or the supply is handicapped, so that the cooling water sucking in range develops a negative pressure. This can reduce first of all the power of the cooling water pump extremely that the wings of the impeller are exposed to very strong loads. This can shorten the life span extremely.

Further the operation of the impeller pump loaded in waters with a high portion of suspended matters. The use of the impeller pump is particularly critical in coral waterbodies. Cases are well-known, which a impeller pump had so strongly run after 100 hours already that the lip seal on the wave was ground in. In these cases sharp crystal parts of the coral sand assess in the rubber seal and affect like an abrasive the high-grade steel shank of the impeller pump.

If the generator were mounted over the water level it is particularly unfavorable for the impeller pump. After the first start some seconds will pass by, until the impeller can suck in cooling water. This short unlubricated operation time damages the impeller. The increased wear can lead after short time to the loss. (see special notes: "Effects on the impeller pump, if the generator is mounted over the waterline").

D.8.3 Replacement of the impeller

Close the raw water stop cock.

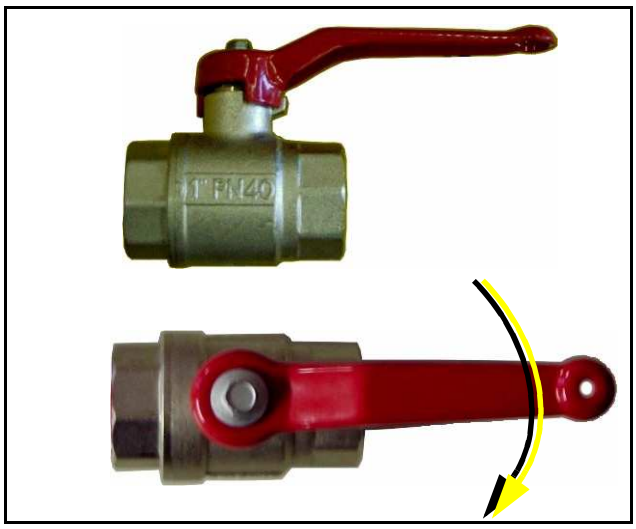


Fig. D.1: Raw water stop cock

Raw water pump on the front side of the genset.

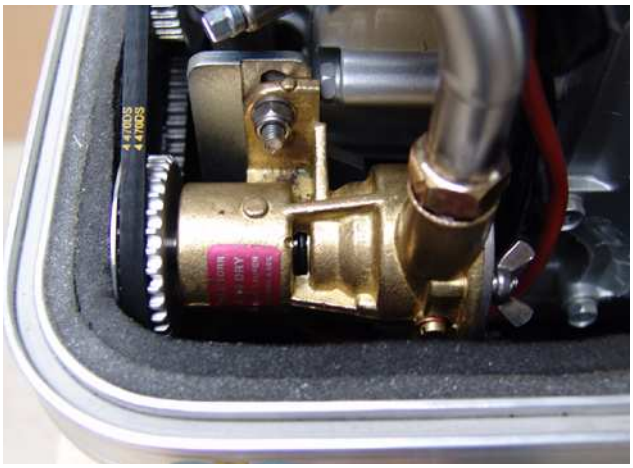
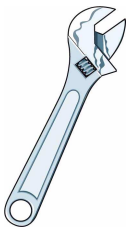


Fig. D.8.3-1: Raw water pump

Remove the cover of the raw water pump by loosen the wing screws from the housing.

Fig. D.8.3-2: Raw water pump cover



Pull to the impeller with a multigrip pliers of the wave.

Mark the impeller, to make sure that these is used in the correct position at re-installation.

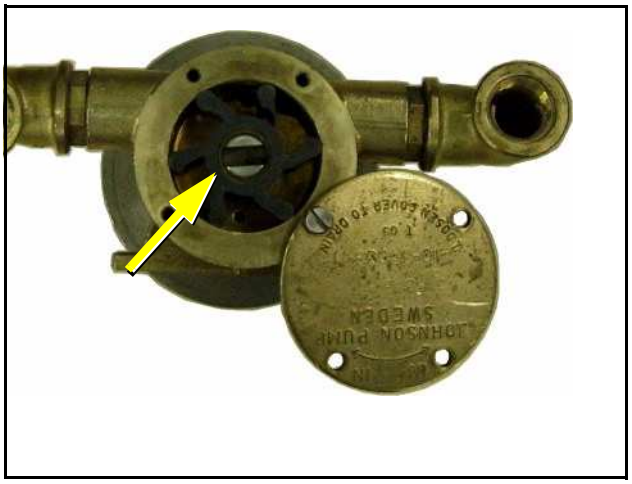


Fig. D.8.3-3: Impeller

Check to the impeller for damage and replace it if necessary.

Before the reinsertion into the housing the impeller should have been lubricated with glycerin or with a non-mineral oil based lubricant e.g. silicone spray.

Fig. D.8.3-4: Impeller

The impeller is attached to the pump wave (if the old impeller is used, pay attention to the before attached marking).

Fastening the cover and use a new seal.

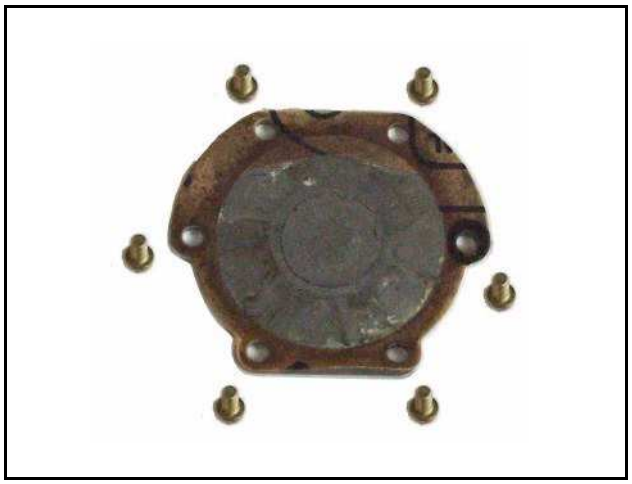


Fig. D.8.3-5: Seal

D.9 Additional maintenance

Furthermore in addition to the standards checks according to the manual following points of the generator have to be checked:

- automatic shut down of the generator in case off high heating temperature
  This shall be done by disconnecting the thermo-switch of the heat sink. Next to the rectifier you will find a 2-pole connector. If you disconnect this connector from the opposite socket, the generator shall shut down – or, when the generator is not running you will get a signal on the panel.

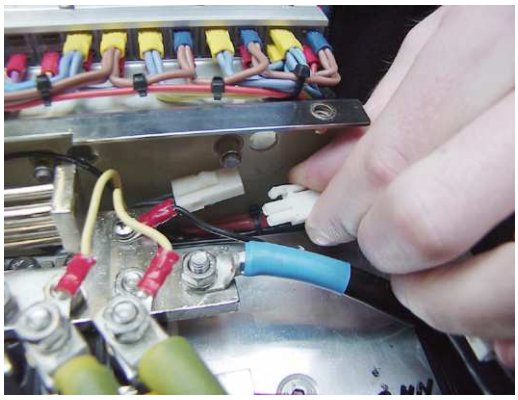
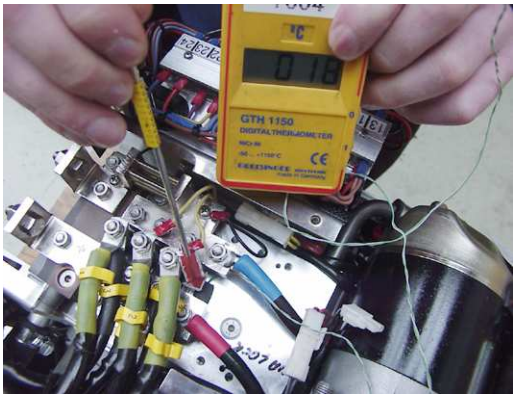


Fig. D.2: Plug thermo switch

Temperatures of the rectifier and heating

- Apply a thermocouple meter to the heat sink and the copper bars and monitor the maximum temperatures of the rectifier.



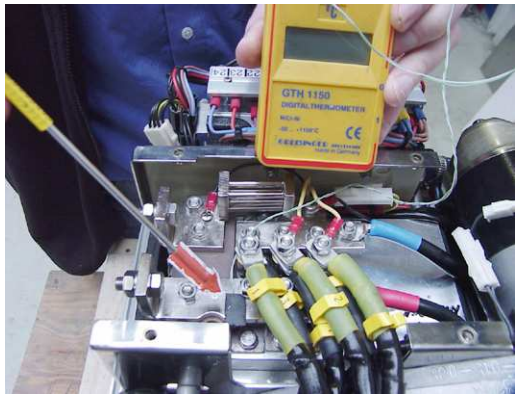


Fig. D.9-1: Measuring the temperature

- With the help of the infrared thermometer you can check all the temperatures on the rectifier. Check all the cable connections of the DC- wiring. The easiest is to touch them carefully with your finger. If they are getting warm or getting hot, these connections are poor and shall be replaced.

The temperature of the heat sink shall never exceed 95℃.

The temperature of the copper bars shall never exceed 120℃

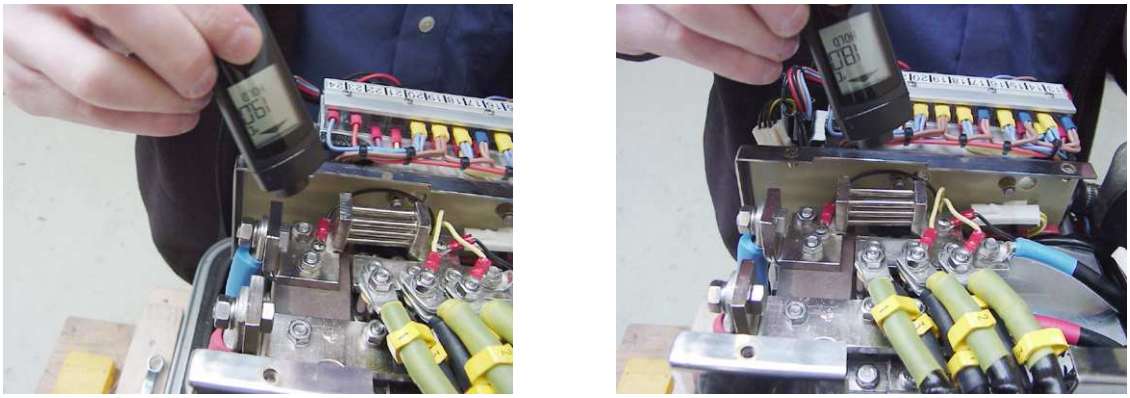


Fig. D.9-2: Measuring the temperature

Ensure, that a fuse next to the battery is installed in the battery line for the generator output cable.

Ensure that a battery switch is installed in the battery line. Never leave the generator behind without the cover mounted over the heat sink and capsule not closed.

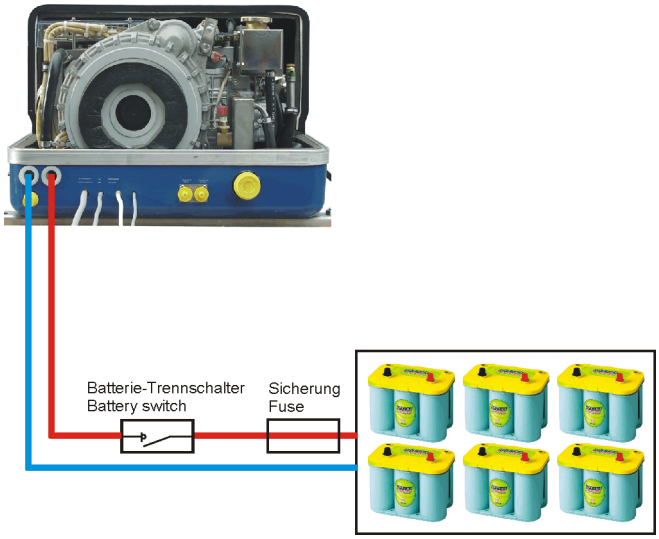


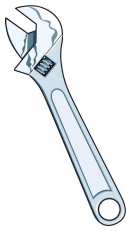
Fig. D.9-3: Installation example

Remind the customer

- to run the generator only with closed capsule.
- not to run the generator unattended
- to ask for regular service

D.10 Conservation at longer operation interruption

D.10.1Measures on preparation of the winter storage



1. Rinse raw water circuit with an anti-freeze solution, even if this contains a corrosion protection means. The raw water inlet must be removed at the water cock. Over a hose connector the anti-freeze protection mixture is to be sucked in from a container. The leaked cooling water with the exhaust is to be led back into the sucking in container. The circuit must be kept upright some minutes to guaranteed that the anti-freeze protection mixture reaches all ranges of the cooling system.
2. The concentration of the anti-freeze mixture in the internal cooling circuit must be checked with a suitable measuring instrument. The concentration must be furnished according to the lowest temperatures which can be expected.
3. Clean raw water filter and check seal.
4. Check water cock for practicability. And spray with a corrosion protection oil from the inside or lubricate with acidless grease.
5. Check all hoses and hose connectors for good condition. The rubber hoses are very sensitive to enviromental influences. They can age fast with dry air, in environment of light oil and fuel steams and increased temperature. The hoses must be checked regularly for elasticity. There are operating situations, which the hoses must be renewed once in the year.
6. Check the hose connectors at all raw water valves doubly and if possible protect them with double hose clamps.
7. Dismount the impeller of the cooling water pump and check for wear. The impeller may not remain in the pump. It must be greased with vaseline and be kept at a dark place. It can be reintragrated in the spring again into the pump, if it is in good condition. The impeller is a wearing part, it is recommended to renew it always in the spring, independently how many operating hours the aggregate ran.
8. Control of the vent valve at the raw water inlet. If the generator is installed below the waterline, always a vent valve is necessary. The vent valve must be checked also during the season regularly. In the winter storage the vent valve should always be disassembled, checked and greased. Hardens or got parts dirty are to be replaced.
9. Check water lock: If the generator were rinsed with an anti-freeze mixture, the antifreeze mixture can leave in the water lock. If the generator were rinsed with fresh water, the water in the water lock must be drained. Otherwise the danger exists that the collector is blown up and destroyed by ice.
10. Check the exhaust/water separator on leakage and if the hose connectors at the lower surface of the separation unit are in normal condition. (with extremely sulfureous fuels it is possible that also high-grade steel tube ends are attacked.)
11. Check all construction units at the generator inside the sound cover for leakages. If there are traces of humidity in the sound cover, the cover must be dried. Further the cause for the wetness must be surched and eliminated.
12. During the winter storage the upper section of the sound cover must be taken off, in order to avoid condensed moisture formation, if traces of humidity remain in the sound cover inside casing by leakages in the raw water circuit.

D.10.1Measures on preparation of the winter storage

13. The generator housing and the housing of the engine should be sprayed with a corrosion protection oil before the winter storage. This procedure is recommended also in the season. This procedure can avoid that arising and humidity marks on the surface of the aluminum construction units be noticed too late.
14. Disconnect the starter battery (positive and negative pole).
15. Lubricate the spindle for the number of revolutions adjustment device with a special lubricant (Antiseize grease).
16. Use of a air dehumidifier. The best way to protect a yacht in the winter storage against damage by humidity is, to places a air dehumidifier inside the ship and locks all hatches. The devices have a hygrometer, which switches the device off, if the humidity is under the adjusted value. There is no better method, in order to protect pads, cable, electronics, wood, engines etc. optimally against any rotting by humidity.

D.10.2Initiation at spring

- Before the first start turn the engine once with the hand, in order to eliminate necessary existing corrosion beginnings in the bushing. If necessarily carry out normal engine inspection.
- Change engine oil and engine oil filters.
- Reintegrate the impeller of the cooling water pump and check pump for leakage.
- Charge starter battery of the generator, connect cables and check battery voltage.
- Start generator and check the basic adjustments of the generator such as voltage, speed regulation etc..
- Check all switching off devices for function by operational procedures.

Fischer Panda does not take over adhesion for possible damages!

Blank

E. Generator Failure

E.1 Overloading the Generator

Please you make sure that the engine is not overloaded. An overloading in the long term can harm the engine. In addition the exhaust gases are soot-blackened (environment).

The full rated output of the generator is primarily intended for brief use.

As fatigue strength should be calculated in the interest of a long life span of the engine 70% of the nominal load.

E.2 Starting Problems

E.2.1 VCS does not work

For start problems one chief cause is that the VCS does not work. Check:

Is the voltage sense connecttion ok? Check polatrity!

Terminal 7+8

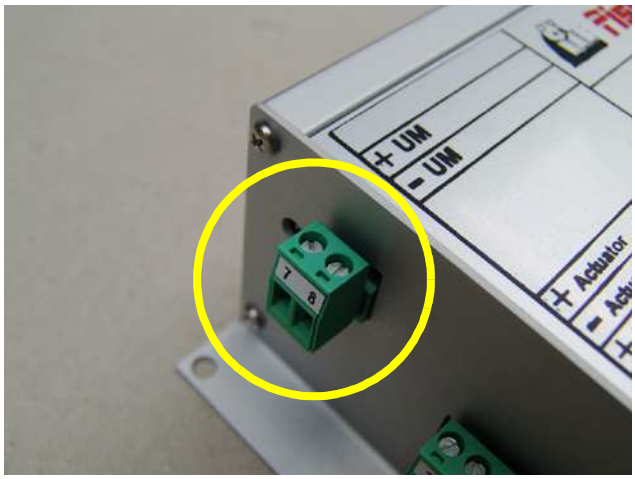


Fig. E.2.1-1: Terminal 7+8

Is the shunt connection ok? Check polatrity!

Terminal 9+10

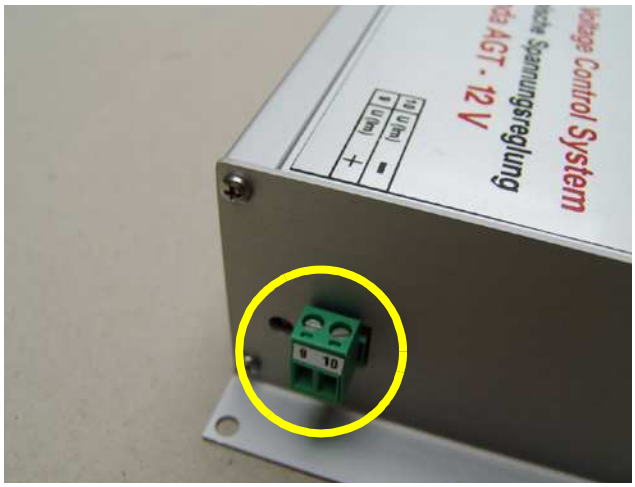


Fig. E.2.1-2: Terminal 9+10

Is the main supply connection ok? Check polatrity!

Does DP+ (VCS ON) lie on clamp 6 of the plug with 6 pins?

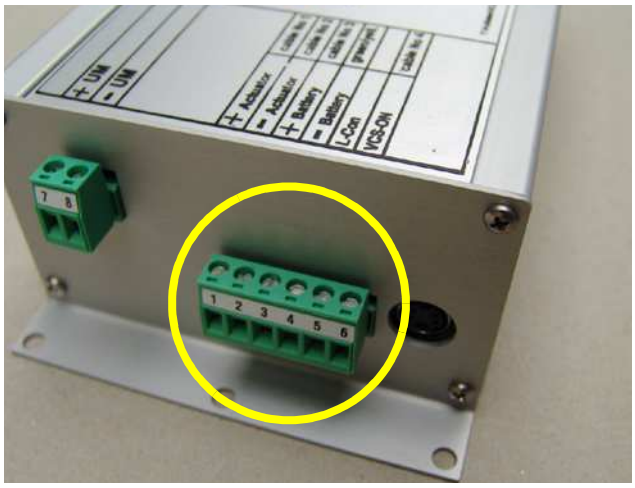


Fig. E.2.1-3: Terminal 1-6

Checking the fuse on the VCS printed circuit board.

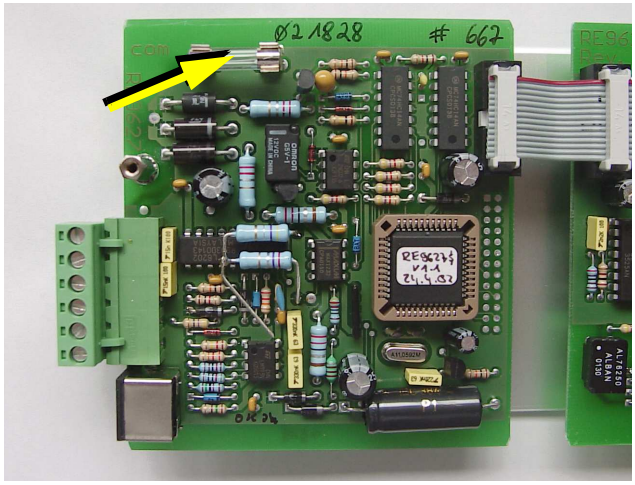


Fig. E.2.1-4: Fuse on VCS circuit board

E.2.2 Fuel Solenoid Valve

For start problems the possibility of an error exists with the solenoid for engine stop or fuel solenoid valve, which both effect affect simultaneous on the fuel system.

The fuel solenoid valve is located in front of the injection pump. It opens automatically, if the "START"-button is pressed on the remote control panel. The solenoid valve is CLOSED when the generator main power is switched "OFF". For this reason, it requires a few seconds before the motor comes to a full halt.

If the generator fails to start, runs rough, does not reach the proper RPM, or does not stop properly, the first item to suspect in most cases is the fuel solenoid valve and should be inspected first.

A check of the fuel solenoid valve by removing the plug from the fuel solenoid valve for a short period whilst in operation (first remove the small retention screw) and replace it immediately. The motor should "react immediately" by revving high.If the motor does not react sharply to the reconnection of the solenoid wire, it is a sign that the solenoid valve could be faulty.

Fuel solenoid valve

Fig. E.2.2-1: Fuel solenoid valve

E.3 Troubleshooting Table

For troubleshooting see section E.2, “Troubleshooting,” on Page 79.

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F. Technical data and tables

F.1 Technical Data

	Panda AGT-DC 4000 PMS
Type	EA 300
Govenour	VCS
Cylinder	1
Bore	75mm
Stroke	70mm
Stroke volume	309cm^3
max. Power (DIN 6270-NB) at 3000rpm	5,1kW
Rated speed 50 Hz	3000rpm
Idle speed running [a]	2900rpm
Valve clearance (engine cold)	0,16 - 0,20mm
Cylinder head torque	58,8 - 63,7Nm
Lubrication oil capacity	1,3l
Fuel consumption [b]	approx. 0,42 - 1,12 l

a. progressive speed by VCS
b. 0,35l/kW electrical power, the randomized values between 30% and 80% of the nominal power

Generator type	**Ø Cooling water pipe**		**Ø Exhaust hose**	**Ø Fuel hose**	
	Fresh water	**Raw water**		**Supply**	**Return**
	[mm]	**[mm]**	**[mm]**	**[mm]**	**[mm]**
Panda PMS AGT 4000	20	20	30	8	8

Fig. F.1-1: Diameter of conduits

Type	Nominal power [kW]	Continuous power [kW]	Nominal voltage[VDC]	Continuous charging current [A]
AGT 4000-12	4	3,2	12	220
AGT 4000-24	4	3,2	24	110
AGT 4000-36	4	3,2	36	74
AGT 4000-48	4	3,2	48	56
AGT 4000-72	4	3,2	72	37

Fig. F.1-2: Technical Data

If nothing else is mentioned : **Continuous charging current [A] =Continuous power [kW]/(Nominal voltage[VDC]x1,2)**

Wiring for vehicle. single phase, not tin-plated, PVC-isolated.		
nominal wire cross-section [mm²]	**allowed conrinuous current (reference point) [a]**	
	at +30℃ [A]	**at +50℃ [A]**
1	19	13,5
1,5	24	17,0
2,5	32	22,7
4	42	29,8
6	54	38,3
10	73	51,8
16	98	69,6
25	129	91,6
35	158	112
50	198	140
70	245	174
95	292	207
120	344	244

Fig. F.1-3: Cable cross-section

a. DIN VDE 0298, part 4.

F.2 Trouble shooting

GENERATOR OUTPUT VOLTAGE TOO LOW If the generator delivers less than 24V current ("undervoltage"), there can be various reasons for this:	
Cause	**Solution**
Generator is overloaded.	Reduce the electrical load. (Switch off load)
Motor is not reaching the rated rpm.	Refer to "motor faults" section.
Actuator is not in maximum position.	Check actuator resp. renew.
VCS-voltage controler defective or wrong adjusted.	Check resp. renew.

GENERATOR VOLTAGE TOO HIGH (MORE THAN 24V) The following reasons may be the cause, if the generator delivers more than 24V ("overvoltage"):	
Cause	**Solution**
The engine is running at the wrong speed.	Check the speed of the motor with a rev or frequency counter, set the correct speed.
VCS-voltage controler defective or wrong adjusted.	Check resp. renew.
Actuator defective.	Check resp. renew.

GENERATOR VOLTAGE FLUCTUATES	
Cause	**Solution**
1. Fault or defect on the load side. 2. A motor fault.	1. Check if the power requirement of the load fluctuates. 2. See "Motor running irregularly".

MOTOR DOES NOT TURN OVER WHEN STARTING	
Cause	**Solution**
Battery main switch is switched off.	Check the position of the battery main switch, if necessary switch on..
Battery voltage not sufficient.	Check that connection is firm and whether corrosion has occurred..
Starting current fault.	The voltage of full batteries fall to a maximum of 11V. The wiring is severed if the voltage does not drop. The battery is discharged if the voltage drops further.

MOTOR TURNS OVER BUT DOES NOT START	
Cause	**Solution**
Stop solenoid valve not opening.	Check wire connections and circuitry to solenoid valve. (ref. DC wiring diagram: Relay K2, Fuse)
Fuel pump does not operate.	Check fuel-filter and pump: clean if necessary.
Lack of fuel.	Check fuel supply.
Glow-plugs not working correctly.	Check glow plugs and heating time.
Too much air in fuel lines.	Test fuel system for leakage. Ventilate air from fuel system
Fuel filter blocked.	Replace fuel filter.
Low compression pressure.	See Kubota motor-manual.

MOTOR DOES NOT TURN OVER AT THE NORMAL SPEED DURING THE STARTING PROCESS	
Cause	**Solution**
Starter battery voltage insufficient.	Check battery.
Damaged bearing(s) piston (seized).	Repairs need to be carried out by Kubota-Service. (refer to Kubota motor-manual)
Cooling water in combustion chamber.	1. Turn generator "OFF" at control panel. 2. Remove the glow plug (see Kubota-manual). 3. Rotate the motor by hand carefully. 4. Check if there is water in the oil and change both oil and filter if necessary. 5. Determine cause for excess water in the combustion chamber. The excess water can be caused by a defective air vent in the cooling water system, which should be checked and cleaned, or replaced if faulty.

MOTOR RUNS IRREGULARLY	
Cause	**Solution**
Faulty centrifugal injector governor.	Have the centrifugal governor inspected by a Kubota-Service technician.
Too much air in fuel lines.	Venting the fuel system.

DROP IN THE SPEED OF THE MOTOR	
Cause	**Solution**
Too much oil.	Drain oil.
Lack of fuel.	Check fuel supply system: - fuel filter, renew if necessary - check fuel pump - check fuel lines (ventilate if necessary)
Lack of intake air.	Check air intake paths. Check and clean air filter (and intake muffler if installed).
Generator overloaded by too many load.	Reduce the electrical load (switch off load).
Generator overloaded by over-energizing.	Check that the proper capacitor type is installed and that they are connected correctly.
Defective generator (windings, bearings, or other).	Generator must be sent to manufacturer for repair of damaged bearings or winding.
Damaged engine.	Repair of bearing damage, etc., by Kubota-Service.

MOTOR SWITCHES ITSELF OFF	
Cause	**Solution**
Fuel solenoid valve or throttle shut solenoid is not switching off.	Check wire connections to solenoid. Check valve functions as in the "Inlet Fuel Solenoid Valve" or in the trottle shut off solenoid sections. Replace if necessary.

MOTOR STOPS BY ITSELF	
Cause	**Solution**
Lack of fuel.	Check fuel supply system.
Excess heat in cooling system (thermo switch tripped)- lack of cooling water. Is indicated on the remote control panel.	Check cooling water system flow: water pump, inlet water filter, extra heat exchanger coolant flow.
Lack of oil (oil pressure sensor tripped).	Check oil-level and if necessary top up. Check motor's oil-pressure and have repaired by Kubota-Service if necessary.

SOOTY, BLACK EXHAUST	
Cause	**Solution**
Generator is overloaded.	Check electrical load and switch off unnecessary load.
Insufficient intake air.	Check intake air filter; clean if necessary.
Fuel injector nozzles faulty.	Replace injector nozzles.
Valve clearance incorrect.	Readjust valve clearance to correct value (refer to Kubota-manual).
Poor fuel quality.	Use better quality diesel (recommended: 2-D Diesel).
Poor combustion.	Incorrect AFR (air/fuel ratio) due to motor timing adjustment. Have motor serviced by Kubota.
Low compression pressure.	See Kubota motor manual.

GENERATOR MUST BE SHUT OFF IMMEDIATELY IF:	
Cause	**Solution**
- motor rpm suddenly rises or drops - unusual noise comes from genset - exhaust colour suddenly becomes dark - motor overheats - oil pressure drops, oil light suddenly flashes	Refer to respective section of manual and if necessary, have repaired by Kubota-Service, or Panda representative.

TROUBLESHOOTING VCS SYSTEM	
Cause	**Solution**
Actuator does not move.	Check voltage supply and wire connections to actuator. Motor connected? Check connection to VCS.
Actuator sets throttle too high or too low.	Check that the wires to the actuator are connected properly (±). Check connection to VCS.
If the VCS electronics are faulty, the generator can still run by over-riding the system. To override the VCS, disconnect the plug and jumper the contacts.	

F.3 Types of coil

HP3 delta connection

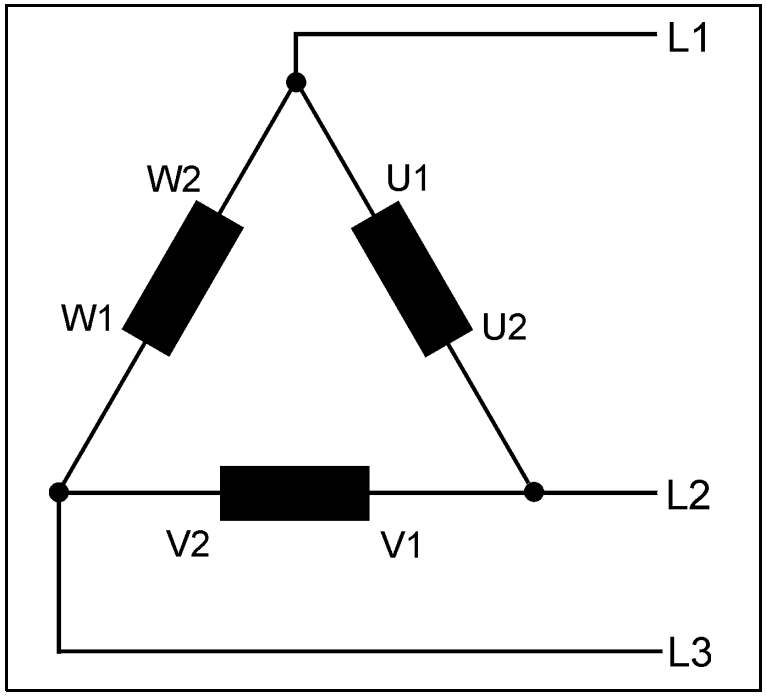

Fig. F.3-1: HP3 delta connection

HP3 star connection

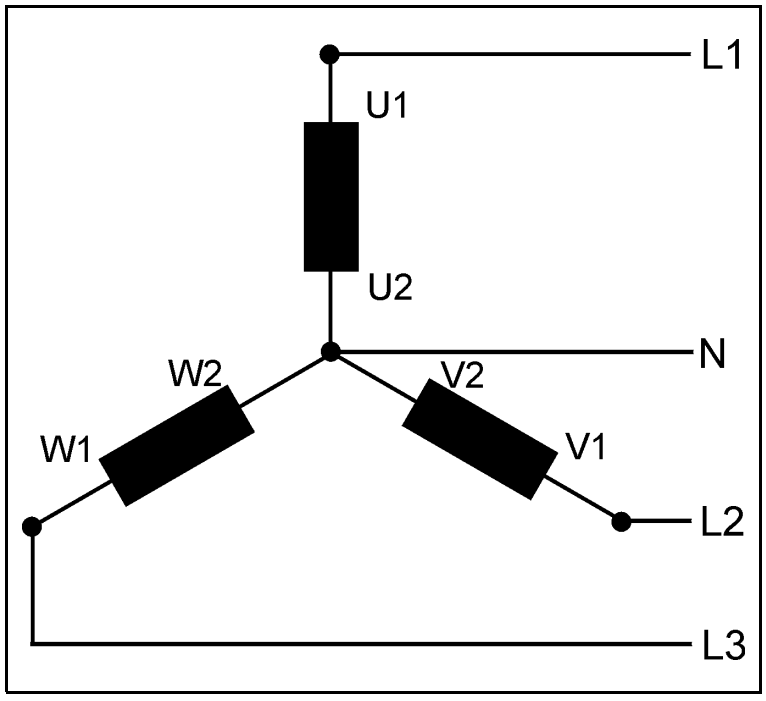

Fig. F.3-2: HP3 star connection

F.4 Inspection checklist for services

Inspection-Category			
A	Installation check	D	100 h
		E	500 h
B	daily	F	1000 h
C	35 - 50 h	G	5000 h

Inspection work			
1)	check	4)	change
2)	measure	5)	sealing
3)	clean	6)	check isolation

	Inspection-Category							Inspection work
	A	B	C	D	E	F	G	
01.	5)	5)	5)	5)	5)	5)	4)	coolant water hoses
02.	1)	1)	1)	1)	1)	4)	4)	raw water pump (impeller)
03.	1)	1)	3)	3)	3)	3)	3)	water separator / fuel pre-filter
04.	1)	1)	4)	4)	4)	4)	4)	engine oil
05.					3)	3)		oil strainer
06.	1)	1)	1)	4)	4)	4)	4)	air filter
07.	1)	1)	1)	1)	1)	1)	1)	fuel lines (leaks)
08.	1)	1)	1)	4)	4)	4)	4)	fine particle fuel filter
09.	1)		1)		1)	1)	1)	valve clearance
10.	1)	1)	4)	5)	4)	4)	4)	valve cover gasket
11.			1)		1)	1)	1)	coolant therm (sensor)
12.			1)		1)	1)	1)	exhaust temp sensor
13.			1)		1)	1)	1)	oil pressure sensor
14.		1)	1)	1)	1)	1)	1)	belt tension
15.	1)	1)	1)	1)	4)	4)	4)	"V" belts
16.						1)	1)	Thermostat
17.	1)	1)	1)	1)	1)	1)	1)	generator & engine screws
18.	1)	1)	1)	1)	1)	1)	1)	unit's base mount screws
19.	6)	6)	6)	6)	6)	6)	6)	check electrical cables
20.	1)	1)	1)	1)	1)	1)	1)	motor reinforced mountings
21.	1)	1)	1)	1)	1)	1)	1)	actuator mounting
22.	1)	1)	1)	1)	1)	1)	1)	starter motor mounting screws
23.	1)	1)	1)	1)	1)	1)	1)	screws generator-engine
24.	2)		2)	2)	2)	2)	2)	input temp of coolant under load
25.	2)		2)	2)	2)	2)	2)	outlet temp of coolant under load
26.						4)	4)	generator rotor bearing
27.			1)	1)	1)	1)	1)	signs of corrosion to generator
28.	1)		1)	1)	1)	1)	1)	VCS function test
29.	2)		2)	2)	2)	2)	2)	voltage without load
30.	2)		2)	2)	2)	2)	2)	voltage under load
31.	2)		2)	2)	2)	2)	2)	current under load
32.	2)		2)	2)	2)	2)	2)	engine speed (rpm)
33.						1)	4)	injector test
34.						1)	1)	compression
35.	1)	1)	1)	1)	1)	1)	1)	hose clips
36.	1)	1)	1)	1)	1)	1)	1)	recifier
37.	1)	1)	1)	1)	1)	1)	1)	test cable with temperature tester

F.5 Engine oil

Engine oil classification

Operating range:

The operating range of an engine oil is determined by SAE class. "SAE" is for the union of American engineers (Society of Automotives Engineers). The SAE class of an engine oil only informs over the viscosity of the oil (larger number = more viscous, lower number = more highly liquidly) e.g. to 0W, 10W, 15W, 20, 30, 40. The first number shows the liquid of cold weather, the second number refers to the fluidity with heat. Complete yearly oils have usually SAE 10W-40, SAE 15W-40 etc.

Quality of oil:

The quality of an engine oil is specified by the API standard ("American Petroleum Institutes"). The API designation is to be found on each engine oil bundle. The first letter is always a C.

API C for diesel engines

The second letter is for the quality of the oil. The more highly the letter in the alphabet, the better the C für Dieselmotoren.

Examples for diesel engine oil:

API CG Engine oil for highest demands, turbo-tested!

Engine oil types	
above 25℃	SAE30 or SAE10W-30 SAE10W-40
0℃ to 25℃	SAE20 or SAE10W-30 SAE10W-40
below 0℃	SAE10W or SAE10W-30 SAE10W-40

F.6 Coolant specifications

Use a mixture of water and antifreeze. The antifreeze needs to be suitable for aluminium. The antifreeze concentration must be regularly checked in the interests of safety.

Fischer Panda recommend to use the product: GLYSANTIN PROTECT PLUS/G 48.

Engine coolant automotive industry Product description		
Product name	GLYSANTIN ® PROTECT PLUS / G48	
Chemical nature	Monoethylenglycol with inhibitors	
Physical form	Liquid	
Chemical and physical properties		
Reserve alkalinity of 10ml	ASTM D 1121	13 – 15 ml HCl 01 mol/l
Density, 20℃	DIN 51 757 procedure 4	1,121 – 1,123 g/cm^3
Water content	DIN 51 777 part 1	max. 3,5 %
pH-value undiluted		7,1 – 7,3

Coolant mixture ratio	
Water/antifreeze	Temperature
70:30	-20℃
65:35	-25℃
60:40	-30℃
55:45	-35℃
50:50	-40℃

F.7 Measurements

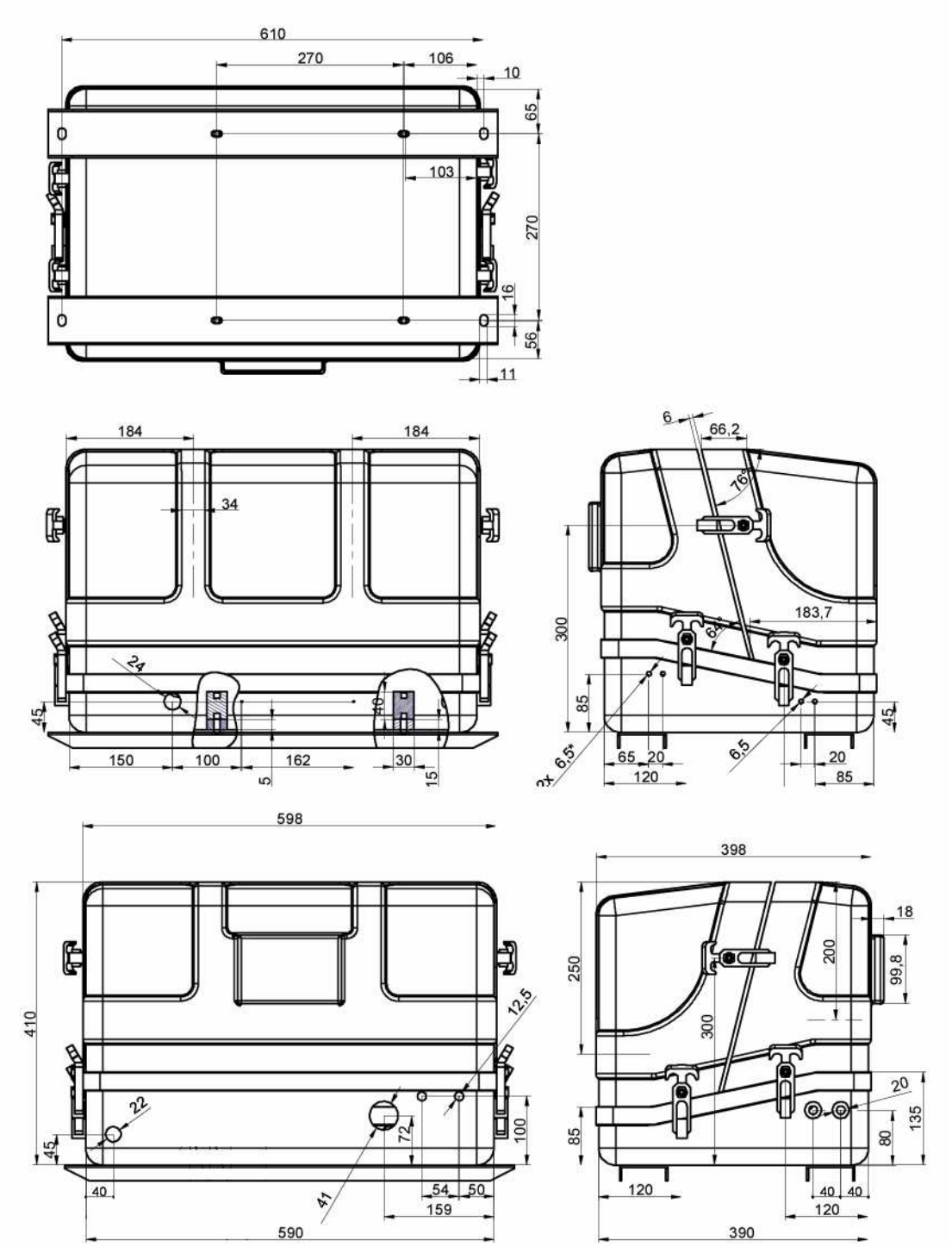

Fig. F.7-1: Measuremants

F.8 Special option: MPL-capsul

Fig. F.8.0-1: MPL-capsul

F.8.1 Measurements - MPL Capsul

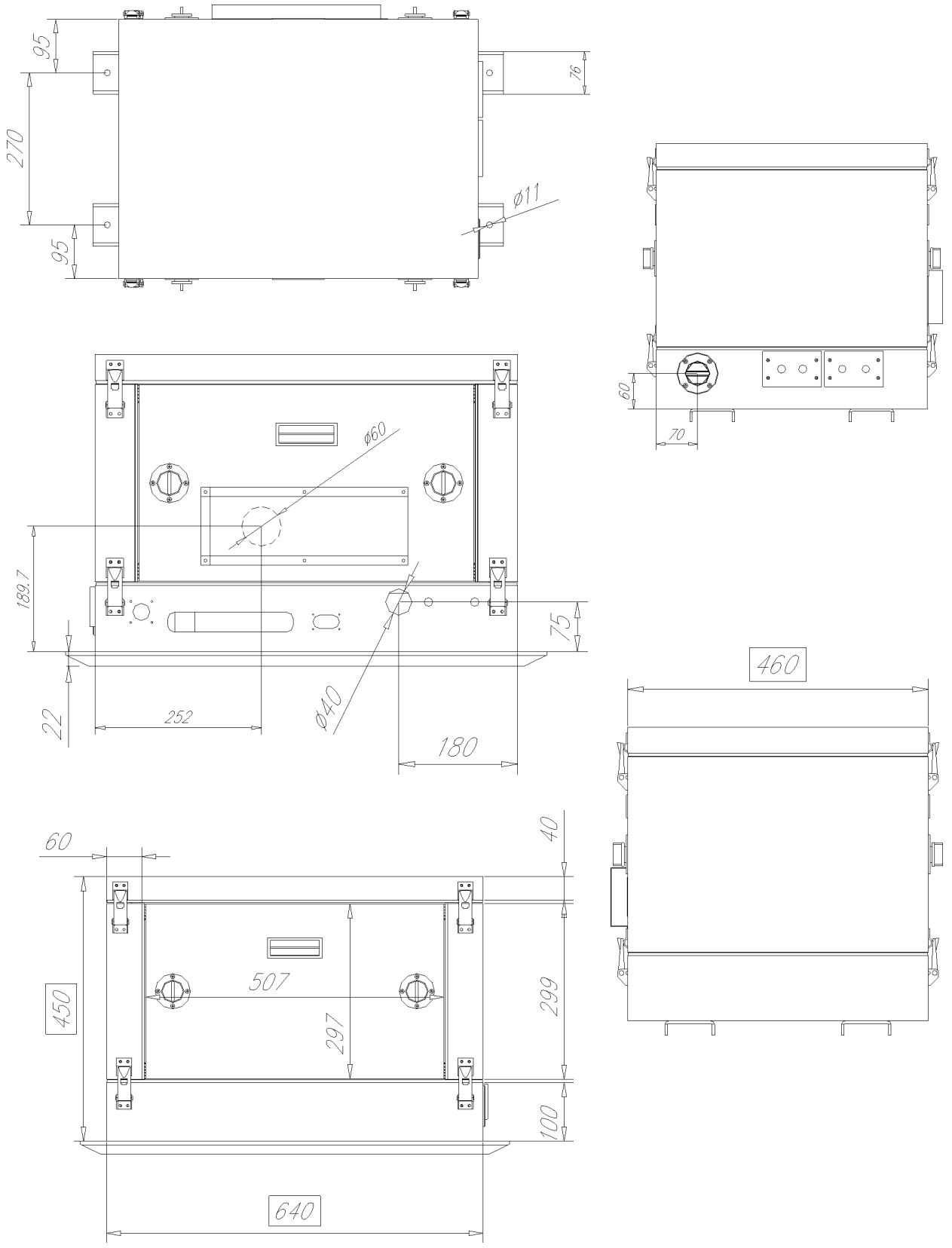

Fig. F.8.1-1: Mesurement MPL capsul

Fischer Panda Datasheet

B. Control panel for AGT 2500/4000 V6

Art Nr.	**21.02.02.013H**
Bez.	**Remote control panel AGT 2500/4000** Typ RE9513 Rev6

	Document	Hardware	Software
Actual:	R06	Rev.6	----------
Replace:	R05	Rev.5	

B.1 Safety instructions

Do not run the generator with an open capsule!

There are dangerous rotating machine components which could cause injury.

All servicing, maintenance and repair work must be carried out with the generator switched off.

High Voltage DANGER !

The genset output voltages can be lethal.

Ensure that all electrical installations comply with all required regulations of the regional authorities.

The electrical installation should only be maintained by a qualified technician.

The battery must be always clamped (first minus then positive terminal), if work on the generator or on the electrical system of the generator is made, so that the generator cannot be started unintentionally.

B.2 Connection of the remote control panel

As standard a 12 core connection-cable, 7m long, is included in the supply. Cores are numbered from 1 to 11 and the 12th core is coloured (yellow/green). The control cables are securely connected to the genset. On the back of the control panel there are terminals numbered from 1 - 12. Connect the cores of the control-cable in respective order.

Please ensure that the remote control panel is installed in a protected, dry and easily accessible place.

Fig. B.2-1: Control panel back side

B.3 Remote control panel for AGT-Generator

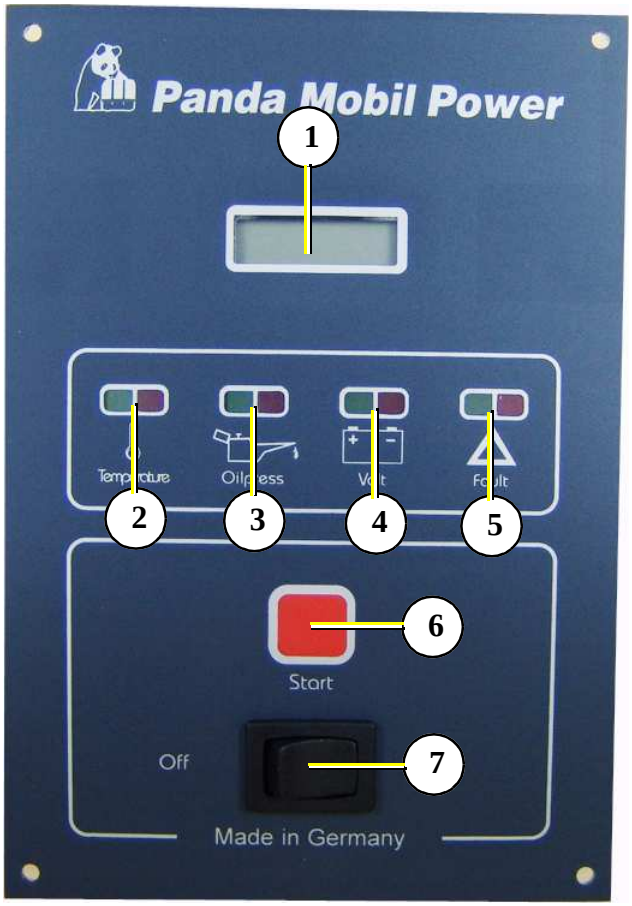

Fig. B.3-1: Control panel front side

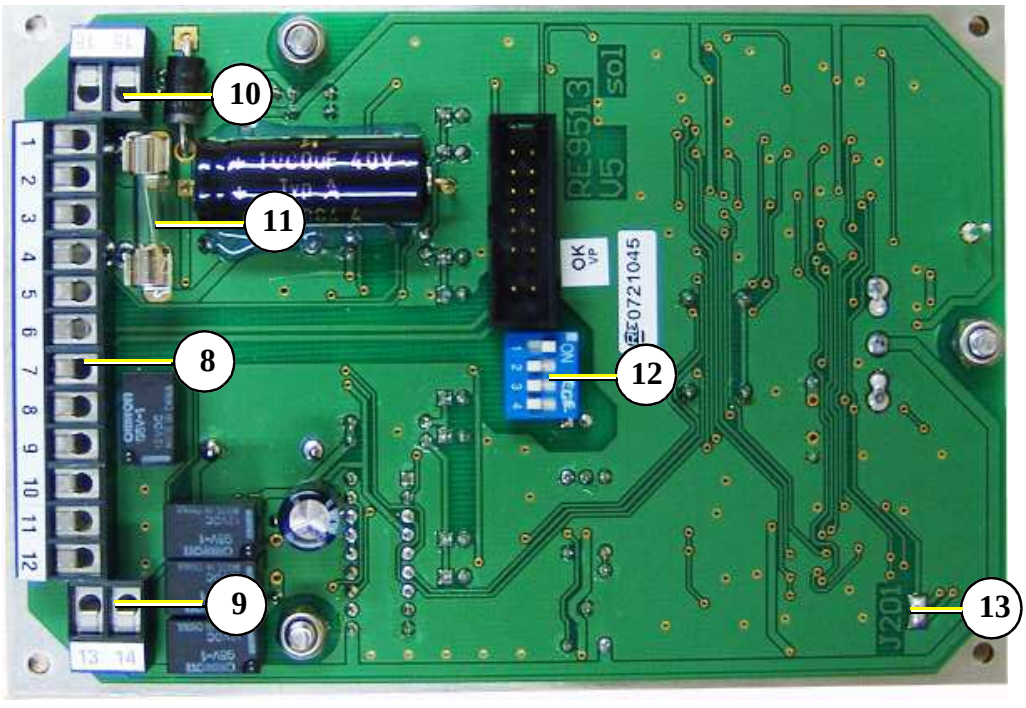

Fig. B.3-2: Control panel back side

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1. Display operating hours

2. Control light - temperature

3. Control light - oil pressure

4. Control light - charge control

5. Control light - operating status

red glowing	Generator is in „Stand-by“-mode
red blinking	Generator is started manually
red blinking for more than 20 seconds	Generator did not start when activated manually
green blinking	Generator runs in manual mode
green glowing	Generator runs in automatic mode

6. Switch for Manual Start:
   - Switch pressure in sleeping mode: Generator is started and the panel switches to manual mode, i.e. automatic cut off requirements are not carried out.
   - Switch pressure in manual mode: If the generator starts automatically, the generator continues to run and the panel switches to automatic mode, i.e. when the last automatic start cuts out, the generator stops and the panel goes into sleeping mode; If the generator is not started automatically, the generator stops and the panel goes into sleeping mode.
   - Switch pressure in automatic mode: The generator continues to run and the panel switches to manual mode.

7. Main switch:

   If it is already in automatic mode when it is switches on, the generator starts and the panel switches to automatic mode; If it is not in automatic mode, the panel switches to sleeping mode; If the generator is switched off, the generator will stop in every case.

8. Main terminal clamp - allocation:

   1: Battery plus (+)
   2: Battery minus (-)
   3: Input temperature failure
   4: Input charge control
   5: Input oil pressure failure
   6: Input generator voltage 1
   7: Input generator voltage 2
   8: Output pre-glow
   9: Output fuel pump
   10: Output starter motor
   11: Output VCS-ON (voltage control for VCS)
   12: Output operating voltage, maximum permissible load: 0,2A

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9. Terminal clamp for battery monitor - allocation:

   13: Battery minus (-)
   14: Input for battery monitor
   The potential-free contact of a battery monitor can be connected to these two terminals, the starting sequence occurs automatically if the contact closes.

10. Terminal clamp for external automatic start - allocation:

    15: Battery minus (-)
    16: Input for external start demand
    The potential-free contact can be connected to these two terminal. The starting sequence occurs automatically if the contact closes.

11. Fuse 1,6A slow to blow

12. Switch for the starter motor cut-off voltage:

    Switch 1: 12V - generator
    Switch 2: 24V - generator
    Switch 3: 36V - generator
    Switch 4: 48V - generator
    Attention! Only one switch may remain switched „ON“, all others must be switched „OFF“, otherwise the complete generator could break down! An external voltage-cut-off-switch is neccessary for voltages exceeding 48 Volts.

13. Soldering bridge for choice of pre-glow time

    - Soldering bridge open - pre-glow time 8 sec.
    - Soldering bridge closed - pre-glow time 4 sec.

Attention! The panel-circuit board voltage is dangerous if the battery voltage exceeds 48 Volts. The panel must be mounted, that the voltage carrying points can not touched. This is also the case during testing.

B.4 Engine monitoring

1. Operating and starting the Generator will works with the Control Panel. This implementing the Main Switch (7) is effected for. By switching 'On' the Main Switch the Generator will be at first in operaton modus. After pressing the button 'Start' (7) the Generator (Motor) will be aglow and starting. Pay attention, the button (7) will only be hold down for a second to ignitiate the start procedure.
2. Therefore with the panel it is possible, monitoring the operation modus. Hereto are beeing placed four diodes (LED), which are connected as a pair each other, so they have the possibility to light up in green or red.

   These are:
   (3) for exhaust, cooling water temperature
   (4) Control unit meter - oil pressure
   (5) Control unit meter - operating status
   (6) Control unit meter - charge control
   If (2), (3) or (4) is been illuminated red, this lights will indicate the precise cause. Illuminate constant green the genset is in operation modus.
   In the starting sequence, (2) is been illuminte green, (3,4,5) red,is there no fault all diodes becomes green or green flashing when the generator runs.

If the external battery monitor is inbuilt to monitoring a battery-group, it will be advisable to switch it with an accessory (On/Off) switch. This battery monitor ensures that he will be activ while the voltage of the batteries is on the pre-set level. Therefore there is a time delay available the genset will run until he reached the upper level. More information see battery monitor.

B.5 Operation instruction

B.5.1 Daily routine checks before starting the Generator

1. Check engine oil level and top up to MAX.

LOW OIL PRESSURE WARNING LIGHT!
The generator switches off automatically in the case of insufficient oil-pressure. Do not run the generator with the oil at the lowest level in the crankcase. (A smaller volume of oil will become contaminated considerably quicker than a larger volume and there is the possibility that small air bubbles will get in the oil.) Therefore daily oil-checks are required. The oil-level should always be refilled to MAX. Check oil level prior to starting motor or at least 5 minutes **after the motor has stopped.**

Engine oil should have properties of API classification CF grade or higher. Change the type of engine oil according to the ambient temperature. See Table F.2.1, “Engine oil specification,” on Page 70. For Oil-Quantities see Table G.4, “Technical data engine,” on Page 77.

2. Check engine cooling system: coolant level in radiator, all hoses and hose connections for leaks or deterioration.
3. Check thermal switches and all cables and terminal connections
   a. Thermo-switch pre-silencer
   b. Thermo-switch engine
   c. Thermo-switch exhaust
   d. Oil pressure switch
4. Check tightness of all retaining and connection bolts on the engine & generator and generator base mount bolts.
5. Switch main battery switch "ON" (if installed).
6. Open fuel inlet valve (if installed).

Fischer Panda Datasheet

B.5.2 Starting - Preliminary remarks

Pre-heating the diesel motor

The motor can be started for temperatures up to minus 20℃, as long as running conditions are suitable . The fuel must be suitable for such conditions, as conventional diesel fuel can produce a paraffin coating at temperatures lower than minus 8℃. so blocking all filters and p ipes. It is normal in Europe to use an additive, obtainable from gas stations to ensure use at temperatures as low as minus 15℃. If a generator is to be used for temp eratures below minus 8℃, then it must be ensured the fuel i s suitable for winter. By use of extra additive, the fuel can also be used at lower temperatures. The appropriate regulations can be obtained from the fuel suppliers. The mineral oil trade have stocks of fuel, which are suitable for use for temperatures below minus 20℃.

Starter Battery

Adequate batteries are installed for extreme winter conditions. Unless the generator is being run frequently for extended (over 1 hour) periods, it is recommended that the starter battery is regularly charged by a suitable external battery-charging device, at least every 2 months. A correctly charged battery is essential for low temperature starts.

Motor Oil Quality during extreme Winter Conditions

Motor oil of the correct grade for the temperatures anticipated should be used. There is advice elsewhere in this handbook on the grades which are suitable for various environmental conditions.

B.5.3 Overloading of engine during longer operation

Please ensure that the genset is not overloaded. Overloading occurs when the electrical load (demand) induces a load torque in the generator which is higher than that which the diesel drive motor can provide. Overloading causes the engine to run rough, burn oil, creates excessive exhaust (environmentally unfriendly) and even to stall. Extra caution should be practised with multi-power units (single and 3-phase current generation) to avoid overloading the diesel drive engine.

The generator should only be loaded at the peak rated power for short periods only! A high peak current is required to start many electrical devices, especially electric motors and compressors (from a still stand state).

The height of the rated output (P) can taken from the identification plate attached on the engine.

In order to guarantee a long life span, the continuous load should not exceed 80% of the nominal load. By continuous output we understand the continuous operation of the generator over many hours. It is harmless for the engine to supply for 2-3 hours the full rated output.

The total conception of the Panda generator guarantees that the continuous load operation does not release superelevated temperatures of the engine also with extreme conditions. It is to be considered that the exhaust gas values in the full load operation become more unfavorable (soot formation).

B.5.4 Starting the Generator (in this respect, the battery bank is no load)

1. If necessary, open the fuel valve..
2. If necessary, close the main battery switch.
3. Check if all the load have been switched off.
The load is switched off, before the generator is switched off. The generator is not to be started with load connected. If necessary, the main switch or fuse should be switched off or the load should be individually switched off.
4. Press „ON“ button.
If an automatic start is requested during the switching on process, the generator is started and the panel switches to automatic mode; if there is no automatic start request, the panel switches to delay mode.
5. Press „START“ button.
Press the "START"-button for a short period. The generator is started automatically. As soon as the motor turns over, the starter switches off automatically. It must be monitored every time it is started. The generator must be immediately switched off if the starter is still audible after the engine revs up. The "START"-button fulfills several functions in the different operation modes of the panel: If the panel is in **delay mode,** the generator is started and the panel switches to manual mode, that means the automatic stop functions are not carried out. If the "AGT"-generator is started manually, it must be stoped manually, too. In this case there is **no** automatic stop! In the **manual mode**, the generator continues to run and the panel switches to automatic mode, that means if the last automatic start programm is dispensed with, the generator is stopped and the panel switches to delay mode; if there is no automatic start programm, the generator is stopped and the panel switches to delay mode.
6. Check coolant flow.
Immediately after starting it must be checked whether sufficient coolant flows out at the exhaust.
7. Check with voltmeter if electrical voltage is in the range of tolerance.
8. Switch on load.

ATTENTION: If there is difficulty in starting - close the seacock (Panda Marine Generators only)

If the generator engine does not start immediately and further start attempts are necessary, then the seacock MUST be closed (i.e. for ventilating the fuel lines etc.) The cooling water impeller pump turns automatically and draws cooling water as long as the motor is turning. If the diesel motor is running, the cooling water is blown out by the exhaust system gases. The cooling water cannot be pressed through the exhaust as long as the diesel motor does not run at sufficient speed. This leads to severe motor damage.

Open the seavalve as soon as the generator is started.

B.5.5 Stopping the Generator (in this respect, the battery bank is no load)

1. Switch off load.
2. If the running load has been higher than 70% of the nominal load, then generator temperature should be stabilised by running the generator for at least 5 minutes after switching off the load.

At higher ambient temperatures (more than 25°C) the generator should always be run for at least 5 minutes without load, before it is switched off, regardless of the load.

3. Press „ON/OFF“ button and switch off the generator.
4. Activate additonal switches (Battery switch, fuel stop valve etc.).

B.5.6 Wiring diagram

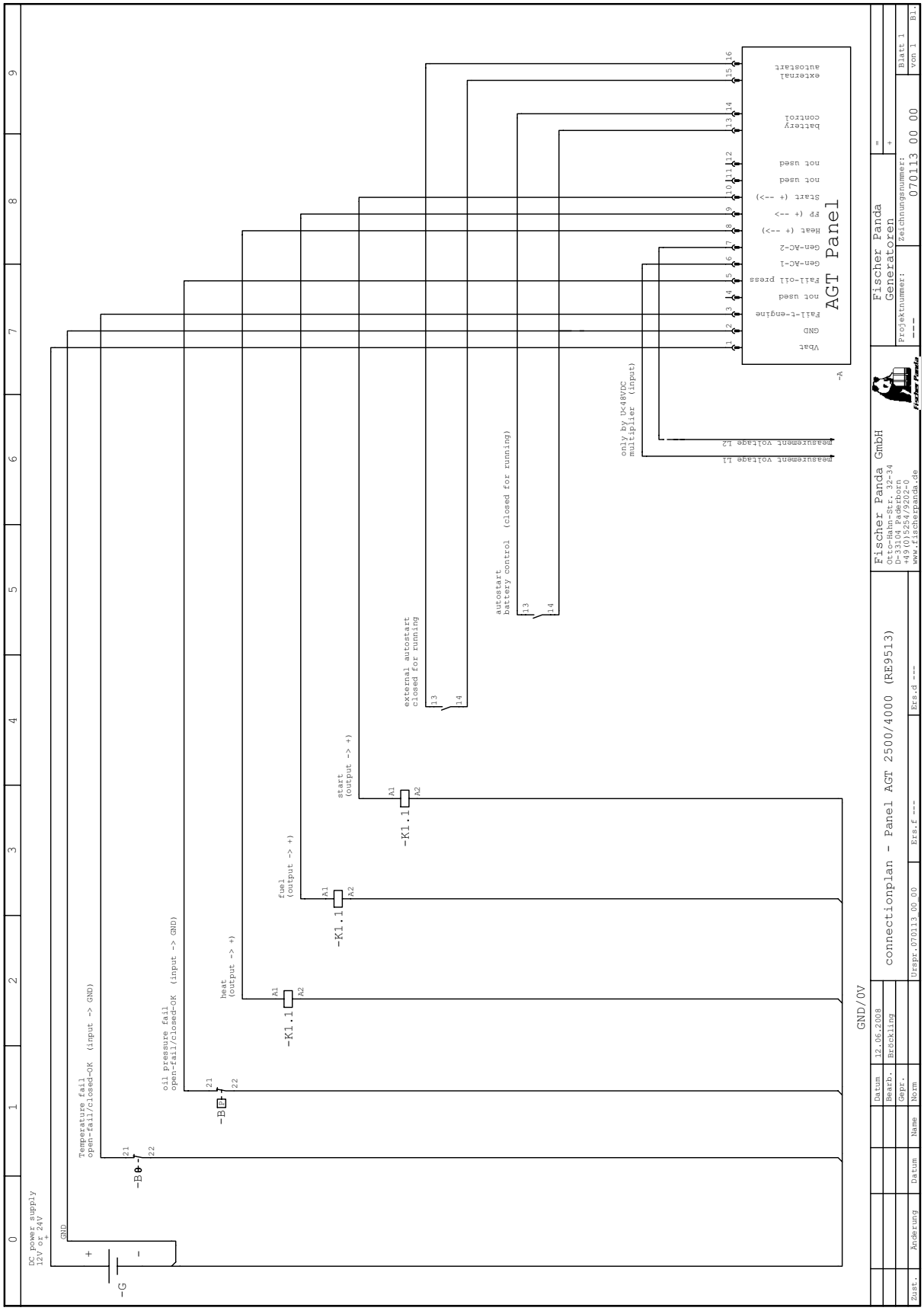

Fig. B.5.6-1: Wiring diagram