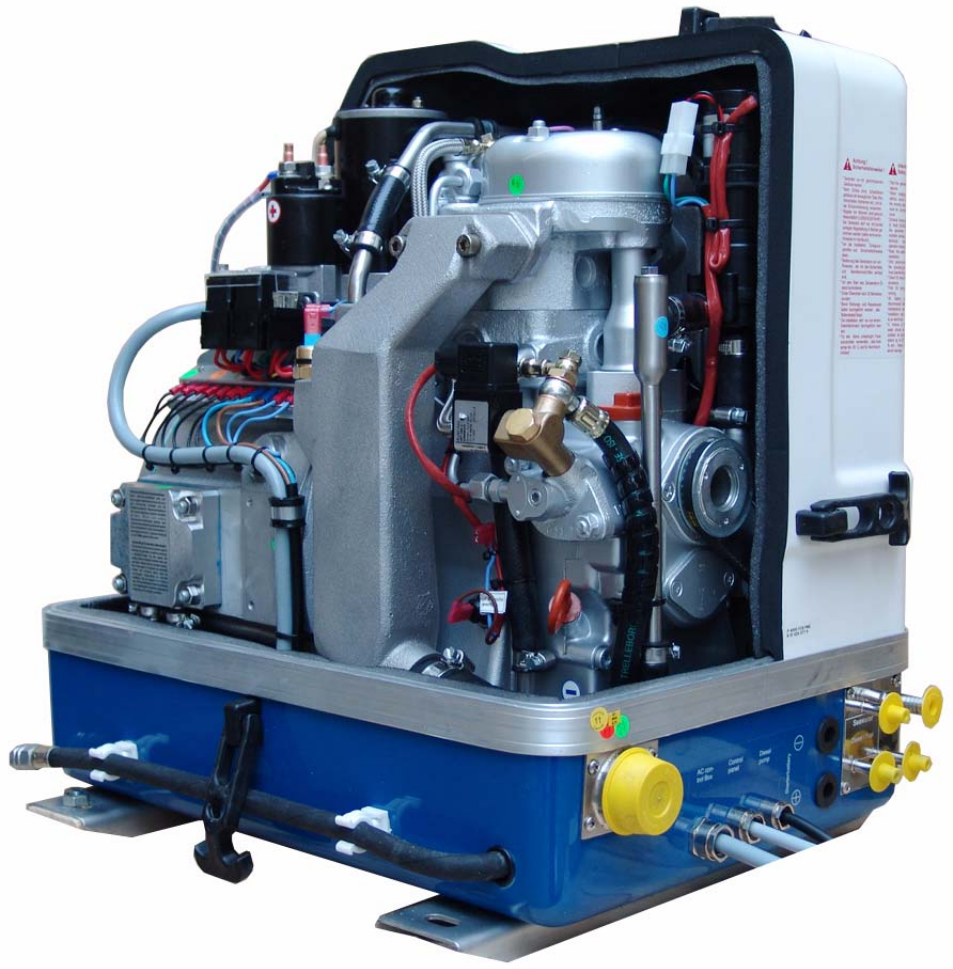
Operation manual

Description of the generator and operation manual



Marine Generator
Panda PMS 4500 FCB

Super silent technology

230 V - 50 Hz / 3,8 kW

Icemaster Fischer Panda

PMS_4500_FCB_operation instruction.V02 14.7.05

Current revision status

	Document
Actual:	PMS_4500_FCB_operation instruction.V02_14.7.05
Replace:	PMS_4500_FCB_operation instruction_28.10.04

Revision	**Page**
Fig. 45: Picture changed	24
Fig. 46: Picture and text changed	24

				
since 1977 Icemaster GmbH	**since 1978 Fischer Marine Generators**	**since 1988 Conclusion Fischer - Icemaster GmbH**	**since 1988 100 % water cooled Panda generators**	**since 1988 Panda Vehicle Generators**

Fischer Panda

FISCHER GENERATORS have been manufactured since 1978 and are a well-known brand for first class diesel generators with especially effective sound-insulation.

Fischer has been one of the leading manufacturers in respect of quality and know-how during this period.

FISCHER, as the worldwide manufacturer of modern marine diesel generators, developed the Sailor-Silent series for example and produced a GFK sound-insulated capsule as early as 1979 and the basis for new generator technology.

The companies Fischer and Icemaster amalgamated under the direction of Icemaster in 1988, in order to concentrate on the development of new products. Production was moved to Paderborn.

The amalgamation of the two qualified companies led to the development of a complete new programme within a short space of time. The gensets developed at that time set new technological standards worldwide.

The gensets became more efficient and powerful than other gensets in the same nominal performance range, because of the improved cooling. Panda generator demonstrated its superiority in several tests by renowned institutes and magazines during the past years. The patented VCS (voltage Control System) means it can meet all demands including motor speed. The start-booster (ASB) means Panda generators meet the highest demands in respect of voltage stability and starting values A Panda generator, with the same drive motor, produces 15% more effective output than the majority of conventional generators. This superiority in efficiency also ensures a fuel saving to the same extent.

The 100% water-cooled Panda gensets are currently manufactured in the performance range from 2 to 100 kW in various versions. Fast running motors are preferred for performances up to approx 30 kW (Nominal speed 3000 rpm). The heavier slow runners are preferred for the higher range. The fast running gensets have proved themselves many times for many uses, that they meet the demands in quality of yachts and vehicles, and offer space and weight saving of 50% compared to slow running generators.

In addition to the Panda series, Icemaster also supply the super compact high-tech sound-insulated battery charging genset from the DC/AC Panda AGT series, which is a very interesting solution for the production of mobile power.

The new HTG-alternators ensure that a charging rate of 285 amps is achieved that was scarcely thought possible for this compact construction. This alternator replaces a separate shipboard generators (constant 230 volts AC with up to 3500 kW from the main machine)

CALIFORNIA

Proposition 65 Warning

Diesel engine exhaust and some of its constituents are known to the State of California to cause cancer, birth defects, and other reproductive harm.

Attention, Important Directions regarding Operation!

1. The installation certificate must be completed when taken into use, and certified by a signature.
2. The installation certificate must be despatched within two weeks of use to ICEMASTER.
3. The official guaranty confirmation will be completed by ICEMASTER after receipt and sent to the customer.
4. A guaranty must be shown to make any claims.

Claims against the guaranty will not be accepted of the above said instructions are not, or only partially, carried out.

Manufacturer declaration in terms of the machine guideline 98/37/EG .

The generator is in such a way developed that all assembly groups correspond to the CE guidelines. If machine guideline 98/37/EG is applicable, then it is forbidden to bring the generator into operation until it has been determined that the system into which the generator is to be installed in also corresponds to the regulations of the machine guideline 98/37/EG. This concerns among other things the exhaust system, cooling system and the electrical installation.

The evaluation of the "protection against contact" can only be accomplished in connection with the respective system. Likewise among other things responsibility for correct electrical connections, a safe ground wire connection, foreign body and humidity protection, protection against humidity due to excessive condensation as well as the overheating through appropriate and inappropriate use in its installed state on the respective machine lies within the responsibility of those who undertake installation of the generator in the system.

Use the advantages of the customer registration:

- Thus you receive to extended product informations, which are sometimes safety-relevant
- you receive, if necessarily free Upgrades

Far advantages:

By your full information Fischer Panda technicians can give you fast assistance, since 90% of the disturbances result from errors in the periphery.

Problems due to errors in the installation can be recognized in the apron.

Technical Support by Internet: info@fischerpanda.com

Safety Instructions

The electrical Installations may only be carried out be trained and tested personnel!

The generator may not be taken into use with the cover removed.

The rotating parts (belt-pulley, belts, etc) must be so covered and protected do that there is no danger to life and body!
If a sound insulation covering must be produced at the place of installation, then well-placed signs must show that the generator can only be switched on with a closed capsule.
All servicing-, maintenance or repair work may only carried out, when the motor is not running.

Electrical voltages above 48 volts (battery chargers greater than 36 volts) are always dangerous to life). The rules of the respective regional authority must be adhered to. Only an electrician may carry out installation of the electrical connections for safety reasons.

Protective Conductor:

The generator is „earthed " as standard (The centre and earth are connected by means of a bridge in the generator terminal box). This is a basic safety function, which offers basic safety as long as no other component has been installed. It is, above all, conceived for supply and an eventual test run.

This "earth" (PEN) is only effective, if all parts of the electrical system is earthed, and has a common “potential”. The bridges can be removed, if this is required for technical reasons and another protection system has been installed.

The full voltage is exploited at the AC control box, when the generator is run. It must therefore be ensured that the control box is closed and cannot be tampered with, if the generator is running.

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.

It is not allowed to disconnect the battery during operation!

After the generator has stopped the battery can be disconnected!

Switch off all load when working on the generator

All load must be disconnected, in order to avoid damages to the devices. In addition the semi conductors in the AC control box must be disconnected in order to avoid the boat capacitors being activated. The minus pole of the battery ought to be removed.

Capacitors are required to run the generator. These have two varying functions:

A) The working capacitors

B) The (Booster) capacitors

Both Groups are located in a separate AC-Control box.

Capacitors are electrical stores. There could be a residual of high electrical current at the contacts for a period disconnection from the circuit. The contacts my not be touched for safety reasons, If the capacitors are to be exchanged or checked, then a short circuit between the contacts should be made so that the stored energy is discharged.

If the generator is switched off in the normal manner, the working capacitors are automatically discharged by means of the windings. The booster capacitors are discharged by means of internal discharge resistors.

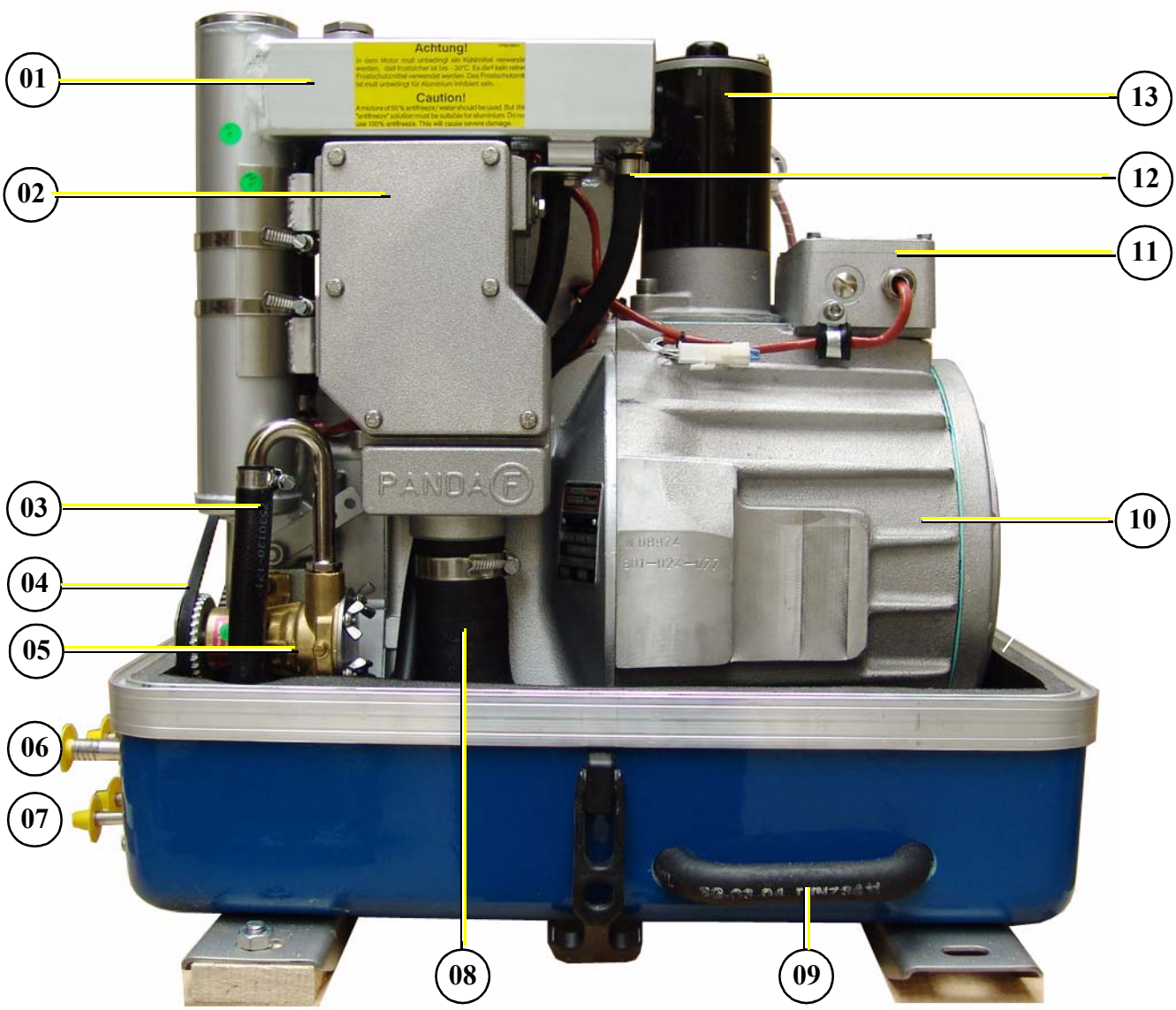
All capacitors must be short-circuited before work is carried out on the AC-Control box for safety reasons.

Table of contents

A. The Panda Generator

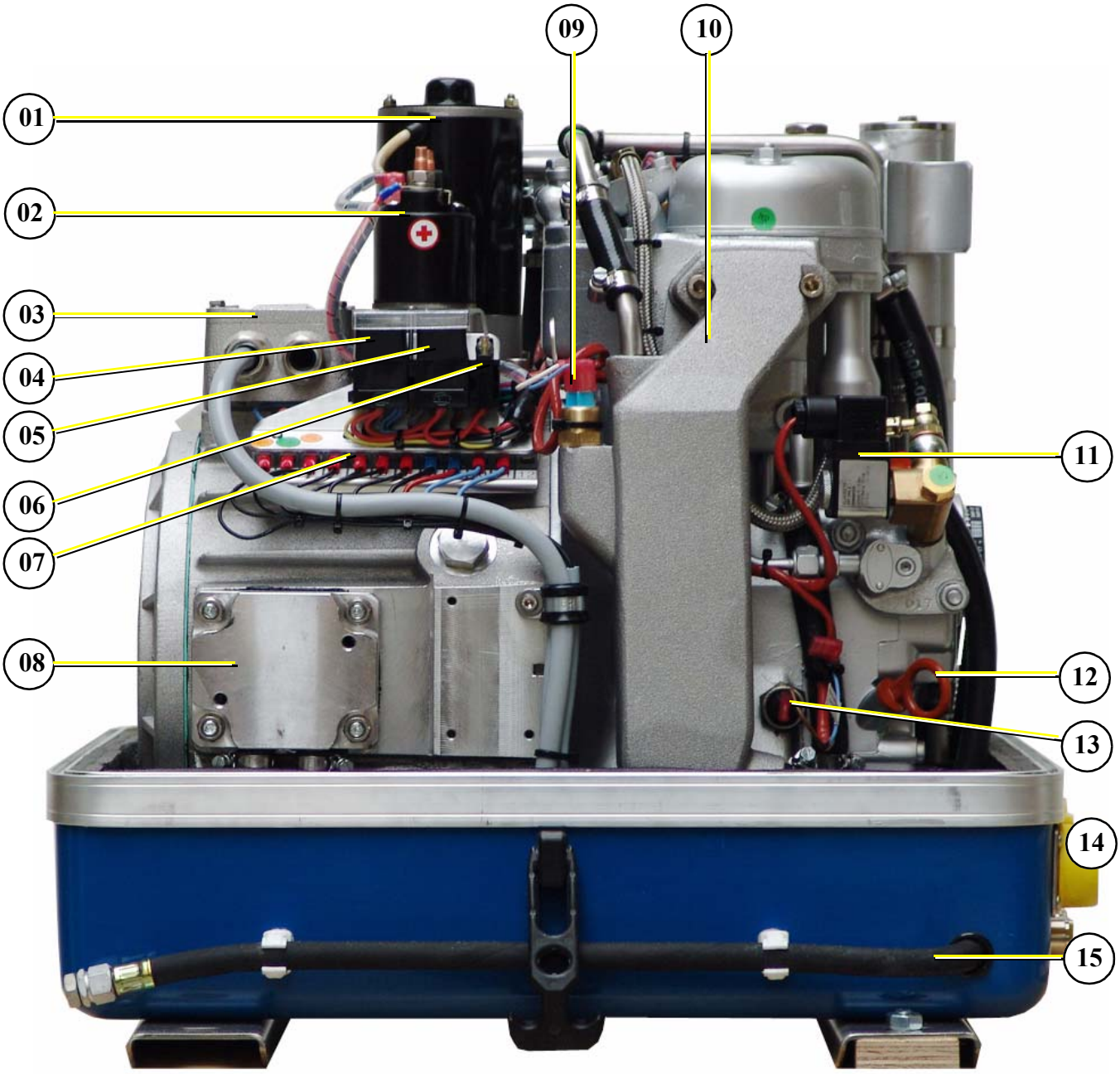
A.1 Description of the Generator

A.1.1 Right Side View



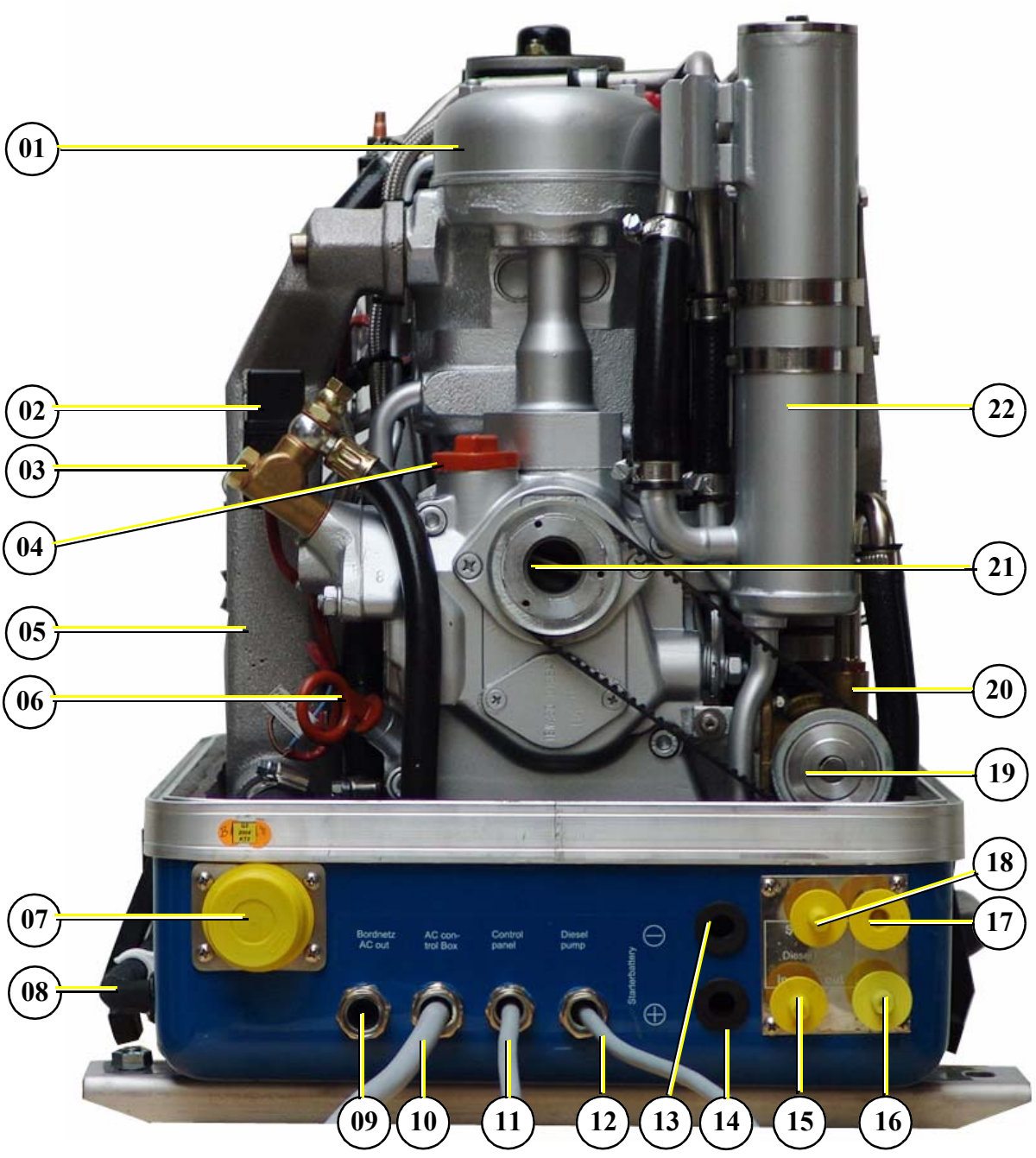
01) Heat exchanger
02) Air suction housing with air filter
03) Raw water inflow hose
04) Tooth belt
05) Raw water pump
06) Raw water intake
07) Fuel IN and OUT
08) Air suction hose
09) Connection external ventilation valve
10) Generator housing with coil
11) Generator power terminal box
12) Hose to the coolant expansion tank
13) Starter motor

A.1.2 Left Side View



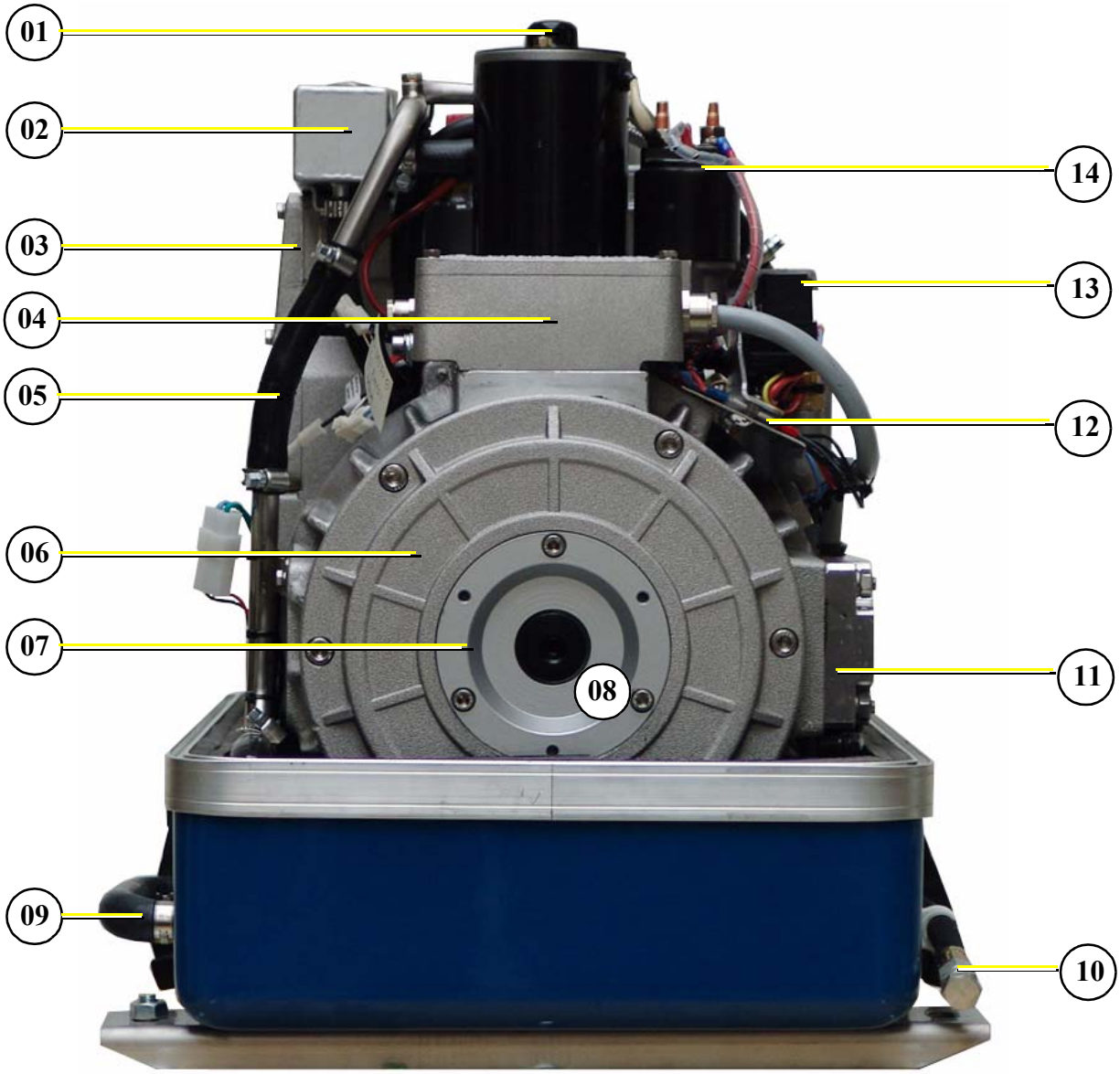
01) Starter motor
02) Solenoid switch for starter motor
03) Generator power terminal box
04) Starter relay K1
05) Fuel pump start relay K3
06) Electrical fuse (25 A)
07) Terminal block
08) Coolant connection block
09) Thermo-switch exhaust elbow
10) Water-cooled exhaust elbow
11) Fuel solenoid valve
12) Engine oil dipstick
13) Oil pressure switch
14) Connection exhaust hose
15) Oil drain hose

A.1.3 Front View



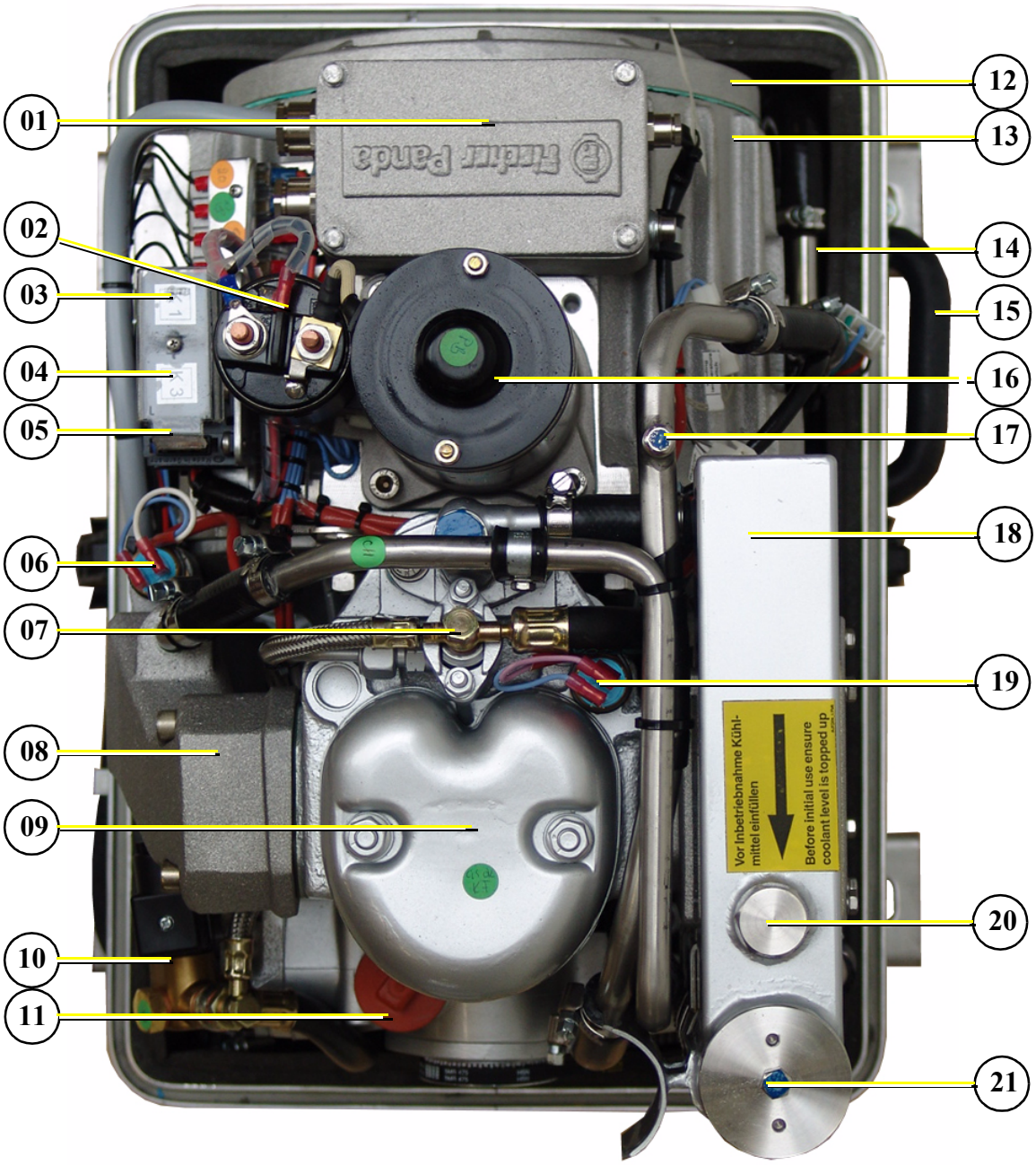
01) Cylinder head
02) Fuel solenoid valve
03) Ventilation screw solenoid valve
04) Engine oil filler neck
05) Water-cooled exhaust elbow
06) Engine oil dipstick
07) Connection exhaust hose
08) Oil drain hose
09) Load AC out
10) Cable for AC-Control box
11) Cable for remote control panel
12) Cable for fuel pump
13) Starter battery cable (-)
14) Starter battery cable (+)
15) Connection fuel IN
16) Connection fuel OUT
17) Raw water intake
18) Connection external coolant expansion tank
19) Pulley for raw water pump
20) Raw water pump
21) Pulley for engine drive
22) Heat exchanger

A.1.4 Back View



01) Starter motor
02) Heat exchanger
03) Air suction housing with air filter
04) Generator power ternimal box
05) Freshwater pipe
06) Generator front cover
07) Ball bearing
08) Grooved ball bearing
09) Connection external ventilation valve
10) Oil drain hose
11) Coolant connection block
12) Terminal block
13) Starter relay K1
14) Solanoid switch for starter motor

A.1.5 View from above



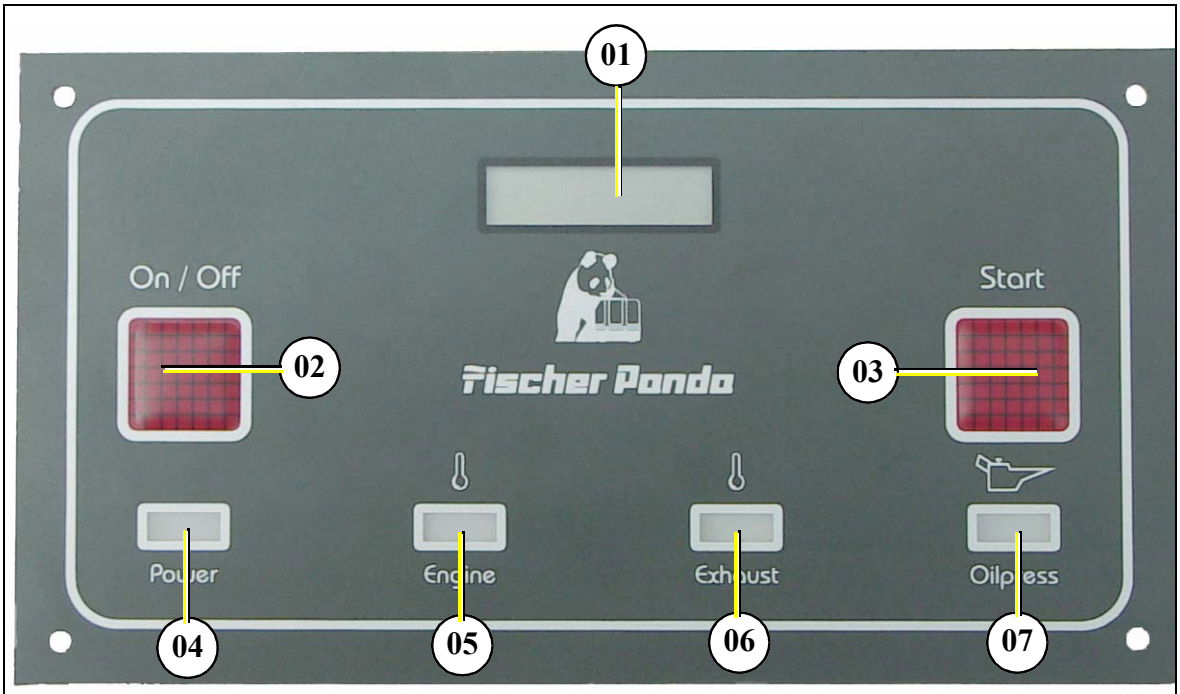
01) Generator power terminal box
02) Solenoid switch for starter motor
03) Starter relay K1
04) Fuel pump start relay K3
05) Elektrical fuse (25 A)
06) Thermo-switch exhaust elbow
07) Injection nozzle
08) Water-coooled exhaust elbow
09) Cylinder head
10) Fuel solenoid valve
11) Oil filler neck
12) Generator front cover
13) Generator housing with coil
14) Cooling water pump
15) Connection external ventilation valve
16) Starter motor
17) Ventilation screw freshwater circuit
18) Heat exchanger
19) Thermo-switch cylinder head
20) Filler screw fresh water
21) Ventilation screw fresh water

A.2 Details of functional units

A.2.1 Remote control panel

Remote control panel

The remote control panel is necessary to control the generator and to evaluate the motor/generator properties. The generators will automatically cutout if it does not run as required. The generator may not be run without the remote control panel.



01) Diplay operating hours
02) Power „ON/OFF“-button
03) Generator „Start“-button
04) Control light „Power ON/OFF“
05) Warning light for engine temperature
06) Warning light for exhaust temperature
07) Warning light for oil pressure

Fig. A.1: Remote control panel

A.2.2 Components of Cooling System (Raw water)

Raw water intake

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

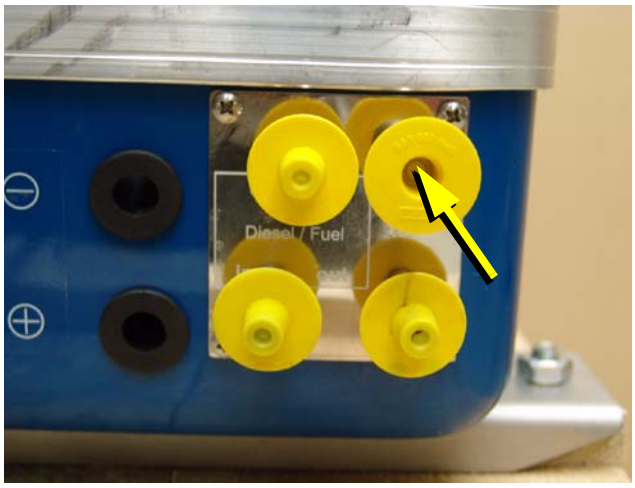


Fig. A.2: Raw water intake

Raw water 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.

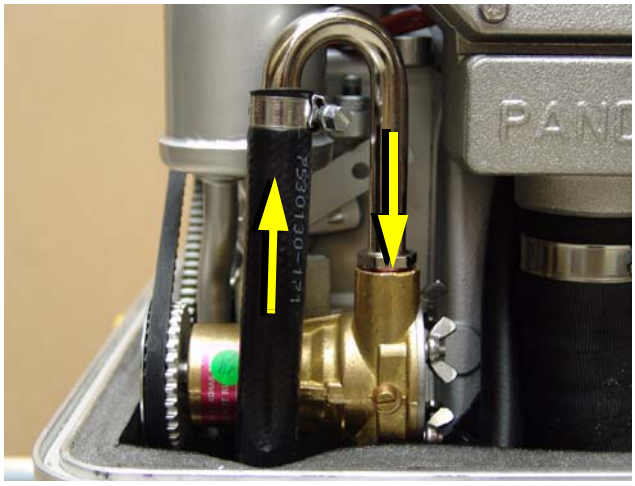
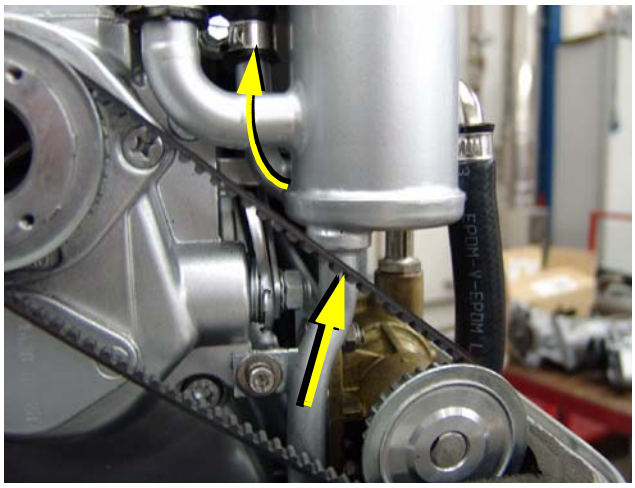


Fig. A.3: Raw water impeller pump

Ventilation valve

An appropriate ventilation line must be installed if the danger exists that the generator can stand only briefly by movements of the ship below the waterlinie. For this generally a hose line is prepared at the generator housing. The two pipe unions are bridged by a hose shaped part, which can be removed.

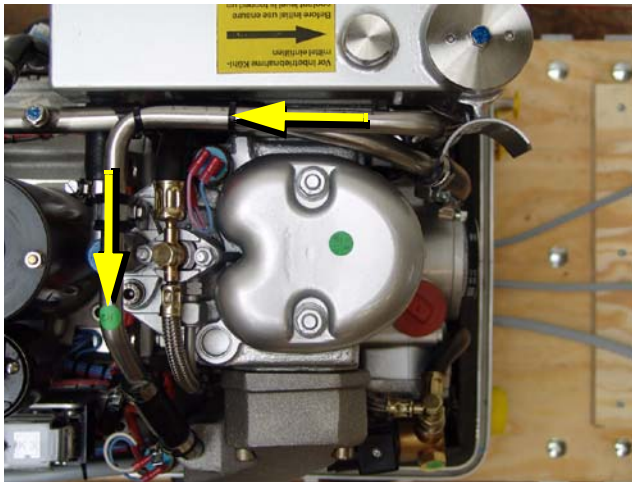
Fig. A.4: Connection external ventilation valve



Heat exchanger

The internal fresh water cooling circle is separated by the heat exchanger from the raw water cooling circle. It is reached that the raw water circle does not come with the construction units of the generator into contact. The raw water commes from the oil cooler and is led at the discharge of the heat exchanger directly into the exhaust elbow.

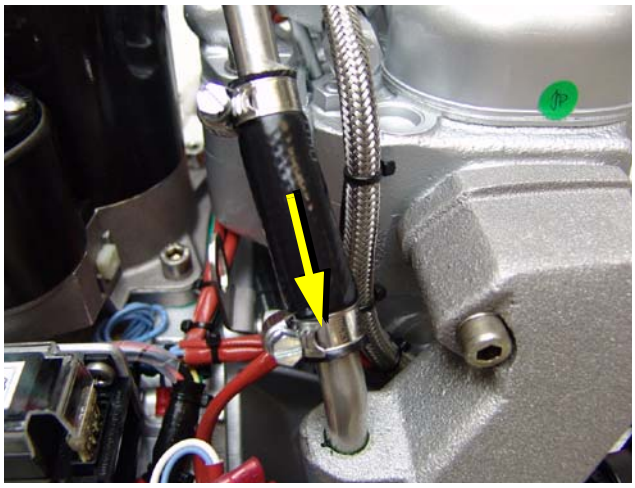
Fig. A.5: Heat exchanger



Raw water flow

Raw water pipe from the heat exchanger to the exhaust elbow.

Fig. A.6: Raw water pipe



Injection port raw water

The point of introduction (point of injecting) for the raw water-cooled exhaust system of the marine generator is at the exhaust elbow. The exhaust elbow must be checked regularly carefully for traces by corrosion.

Fig. A.7: Injection raw water

Raw water output

The raw water discharges together with the exhaust.

Fig. A.8: Raw water output

A.2.3 Components of Cooling System (Fresh water)

Cooling water filler neck

The cooling water filler neck situated at the heat exchanger is 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. Topping up with cooling water may only carried out at the external cooling water expansion tank. Note that the water level in the cooling water expansion tank is only 20% of the volume in a cold state.

Fig. A.9: Cooling water filler neck

Ventilation screw heat exchanger

The ventilation screw at the heat exchanger is to be opened occasionally as a check. In principle the ventilation is to be made only with standing machine.

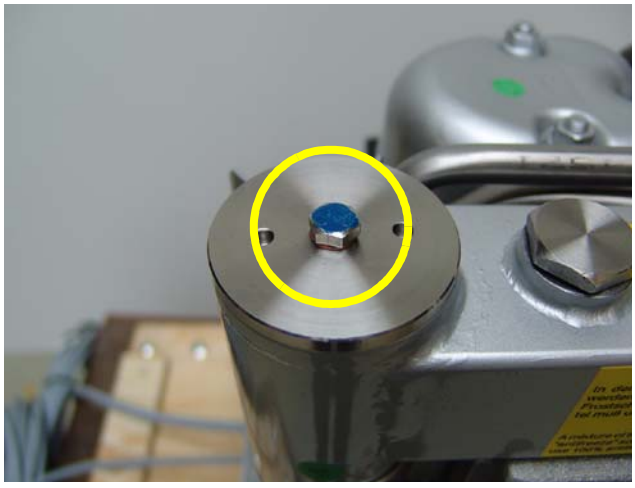
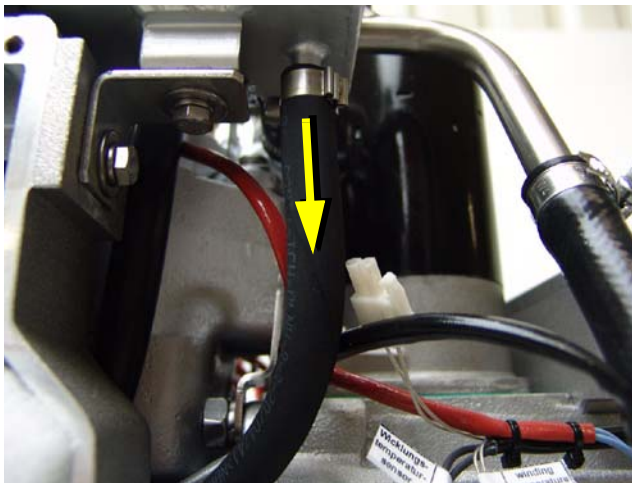


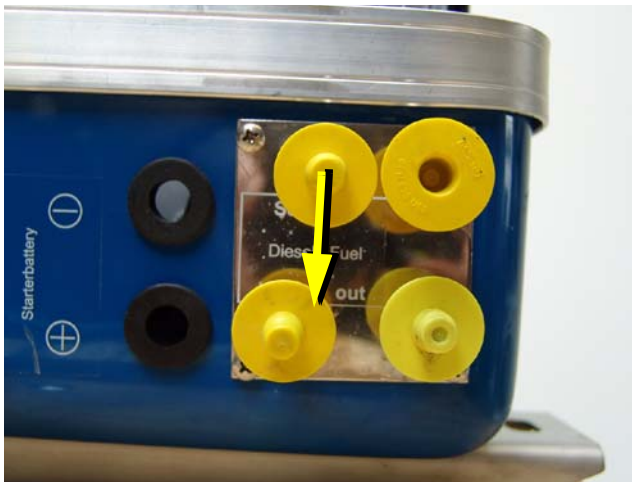
Fig. A.10: Ventilation screw heat exchanger



Fresh water flow to expansion tank

The ventilation pipe at the heat exchanger leads to the external expansion tank. This pipe only serves as a ventilation pipe, if it is connected to the external expansion tank.

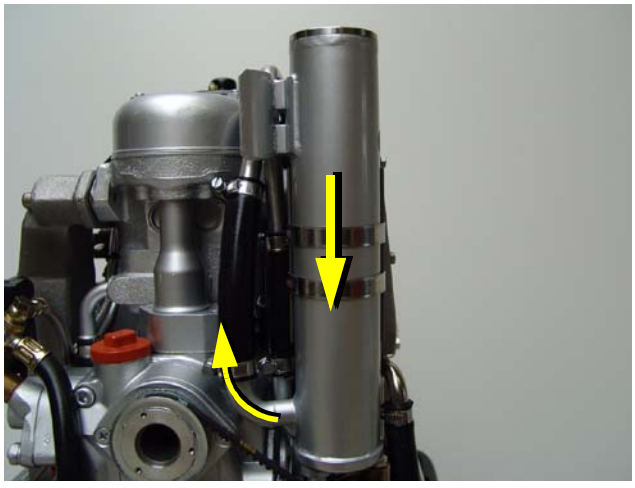
Fig. A.11: Fresh waterf low to expansion tank



Connection external expansion tank

The external expansion tank is connected by a hose connections.

Fig. A.12: Connection external expansion tank



Heat exchanger

The internal fresh water cooling circle is separated by the heat exchanger from the raw water cooling circle. It is reached that the raw water circle does not come with the construction units of the generator into contact. Raw water is led at the discharge of the heat exchanger directly into the exhaust pipe union.

Fig. A.13: Heat exchanger

Freshwater pipe

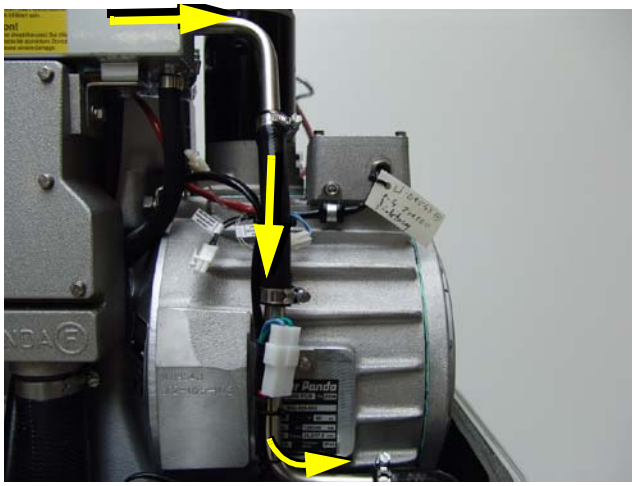


Fig. A.14: Freshwater pipe

Ventilation screw cooilng water pump

The ventilation screw at the housing in the cooling water pipe may not be opened, while the generator runs. If this happens inadvertently, air is sucked in by the opening. A very complex ventilation of the entire system is necessary thereafter.

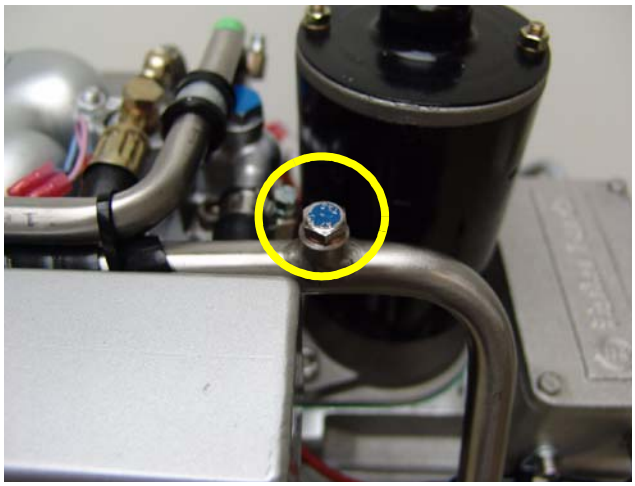


Fig. A.15: Ventilation screw cooling water pump

Cooling water pump

The cooling water pump pumps the fresh water from the heat exchanger to the generator housing.

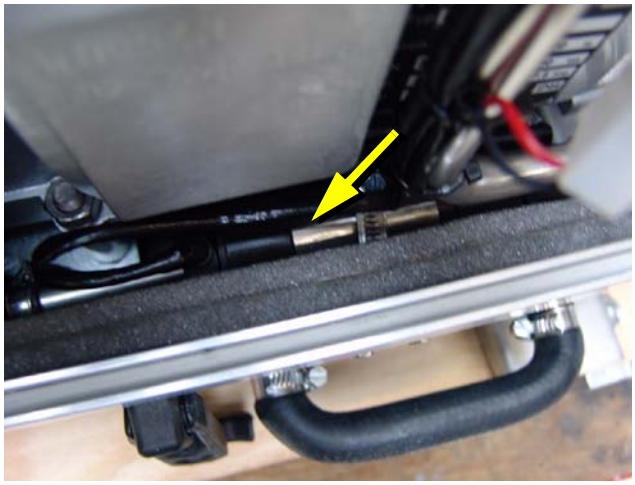
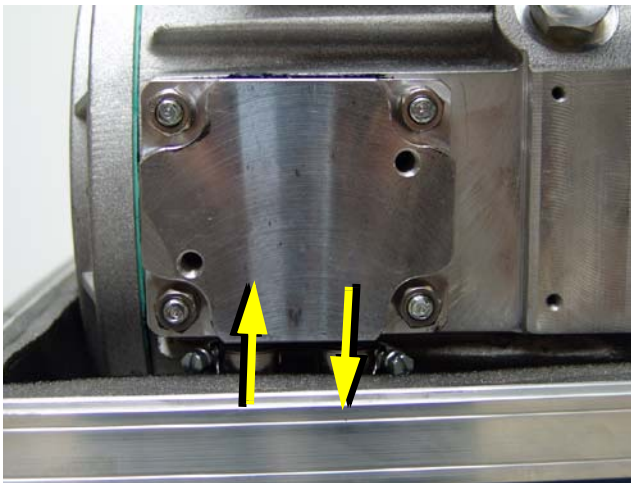


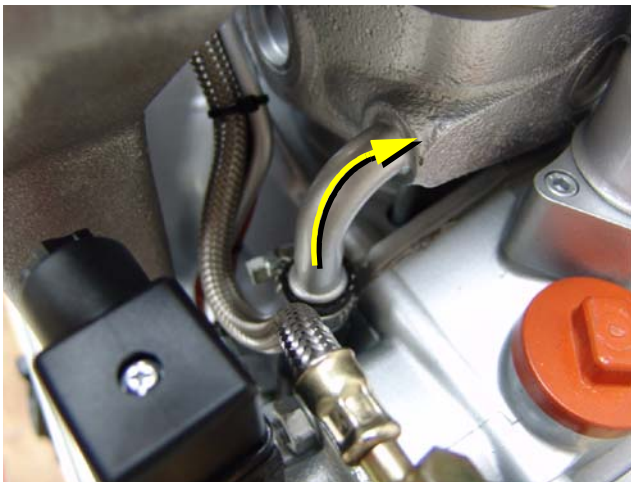
Fig. A.16: Cooling water pump



Cooling water connection block

From the connection block the freshwater flows to the engine.

Fig. A.17: Cooling water connection block



Engine IN

Over this connecting pieces the water coming from the connection block is led into the Diesel engine.

Fig. A.18: Engine IN

Ventilation screw cylinder head

Fig. A.19: Ventilation screw cylinder head

Back flow cylinder head

In the highest place of the cylinder head the cooling water leaves these, in order to then arrive again into the heat exchanger.

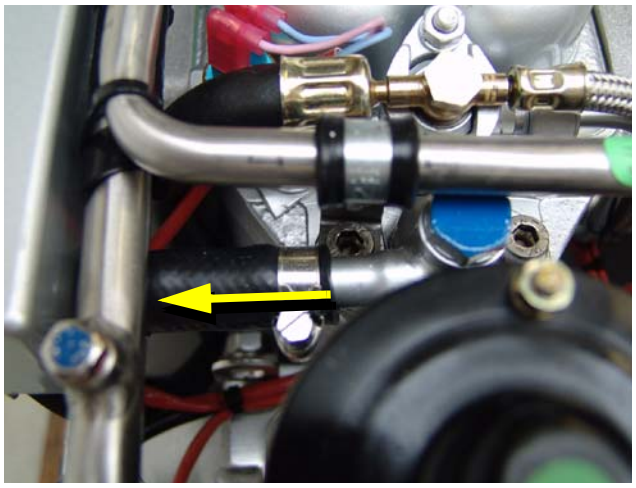


Fig. A.20: Back flow cylinder head

A.2.4 Components of 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.

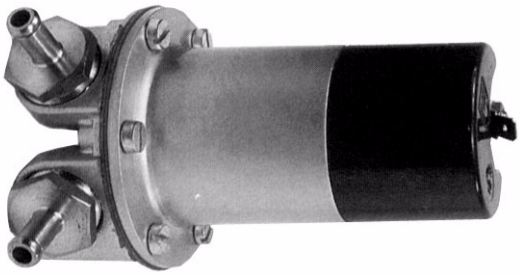


Fig. A.21: External fuel pump

Connecting pieces for the fuel pipes

1. Fuel IN

2. Fuel OUT

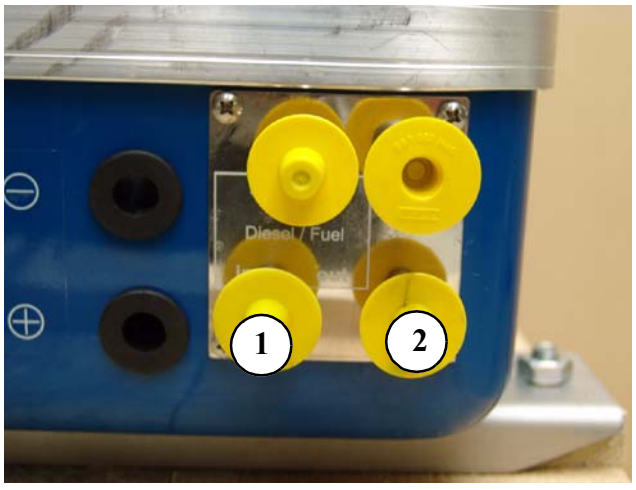
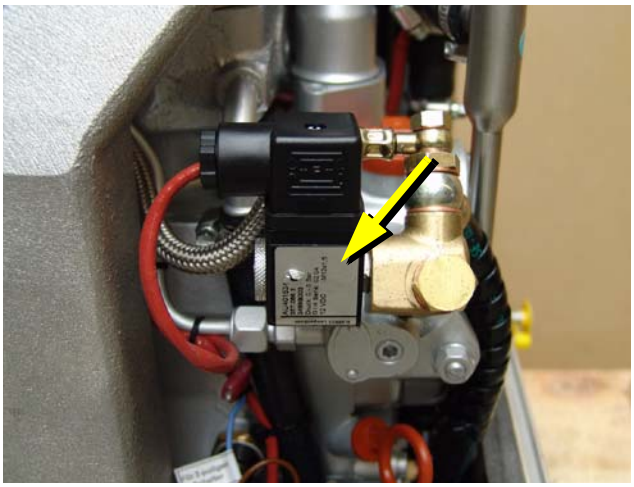


Fig. A.22: Fuel connections

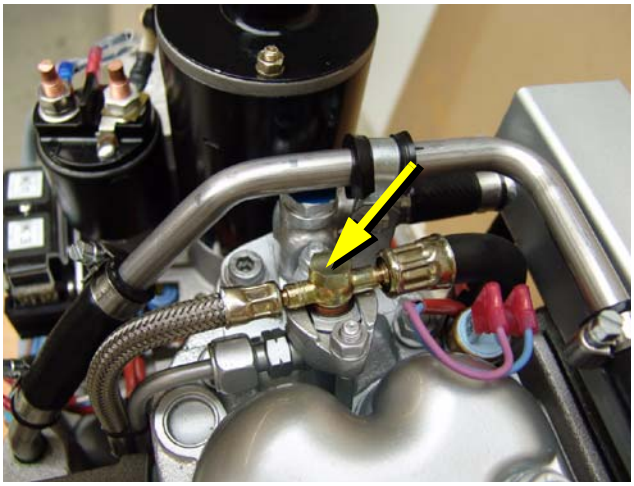


Fuel solenoid valve

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 foremostly the solenoid.

Fig. A.23: Fuel solenoid valve



Injection nozzle

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

Fig. A.24: Injection nozzle

A.2.5 Components of Combustion Air

Combustion air intake

The sound cover for the marine generator is normally provided at the side surface with drillings, through which the combustion air can influx.

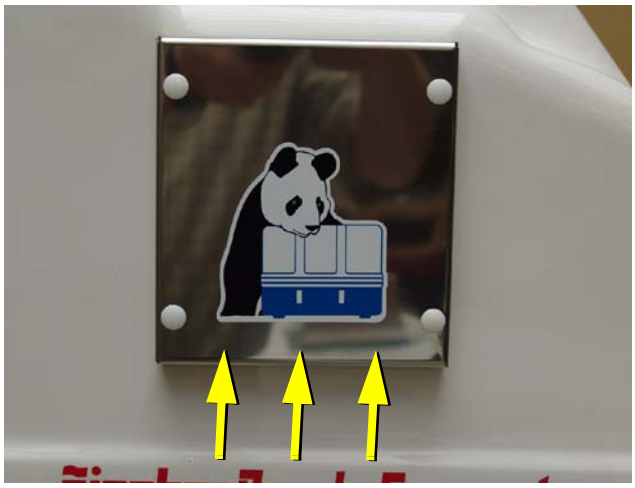


Fig. A.25: Combustion air intake

Air suction housing

If the cover is removed, the inside of the air suction housing becomes visible. In these air suction housings is a filter element. At the marine version the filter is normally not changed. It should be chekked once in a while.

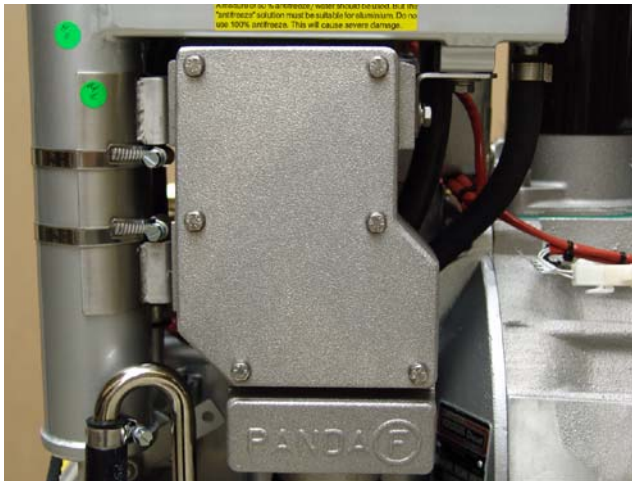


Fig. A.26: Air suction housing

Exhaust elbow

On the bach side of the engine the water-cooled exhaust elbow ist situated.

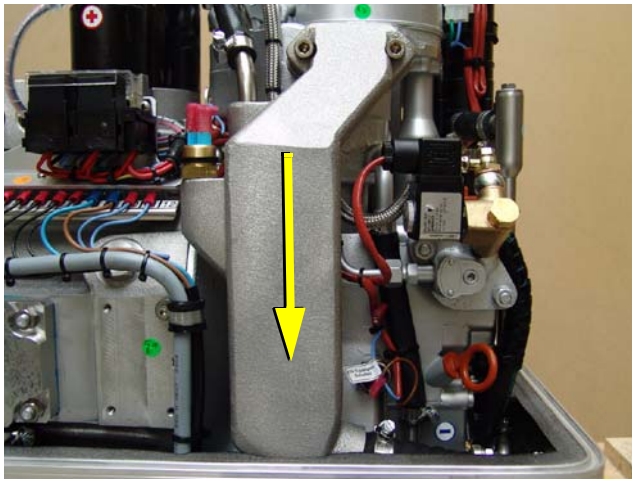
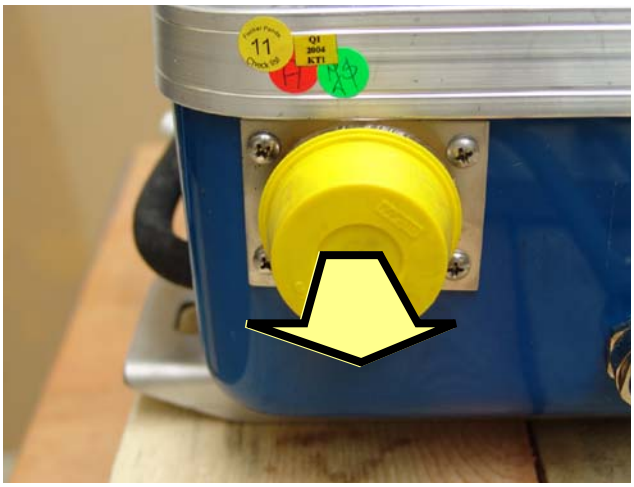


Fig. A.27: Exhaust elbow

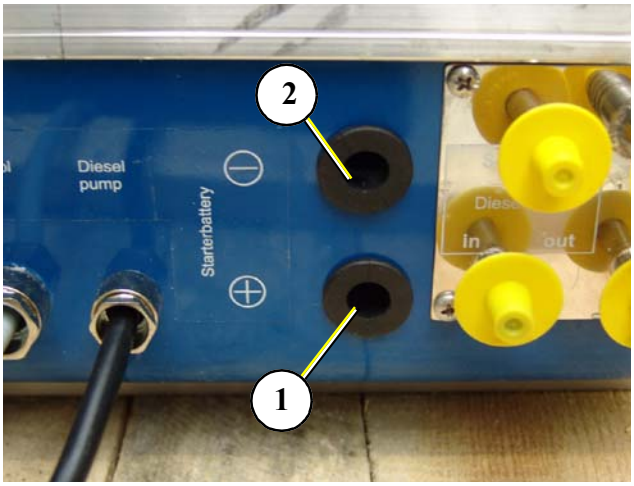


Exhaust outlet

Connect the exhaust pipe with the water lock.

Fig. A.28: Exhaust output

A.2.6 Components of Electrical System

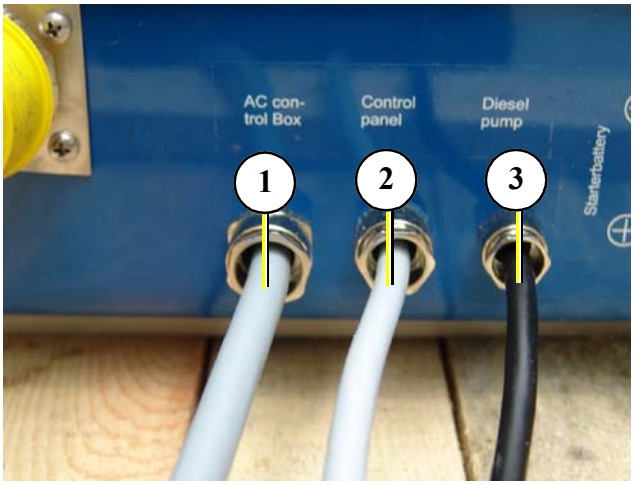


Connection starter battery

1. Cable for starter battery (plus)
2. Cable for starter battery (minus)

During the connection to the starter battery it must be always ensured that the contact is perfectly guaranteed.

Fig. A.29: Connections for starter battery



Electrical connections for control

At the front of the generator also all remaining cables for the electrical connections are depending upon type. The allocation of the connections result from the plan for the AC-Control box. See here:

1. AC-Control box
2. Remote control panel
3. Fuel pump

Fig. A.30: Electrical connections

Starter motor

1. Starter motor and

2. Solenoid switch

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

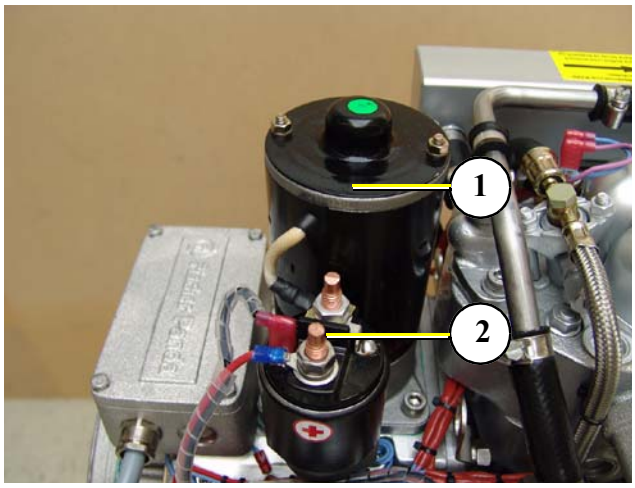


Fig. A.31: Starter motor

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. At other models the opening for the speed sensor is locked by a plug.

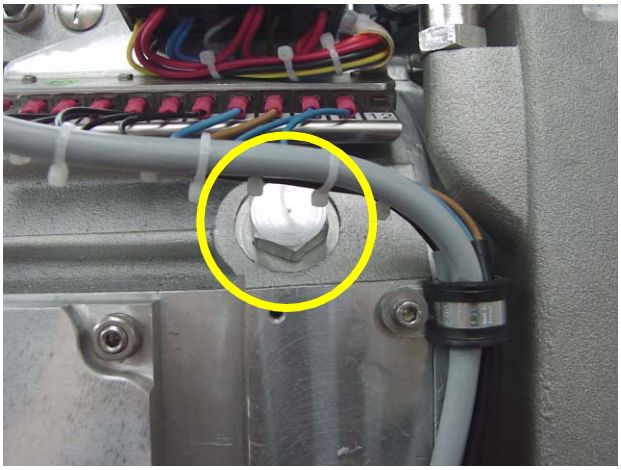


Fig. A.32: Plug for speed sensor

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. At other models the opening for the speed sensor is locked by a plug.

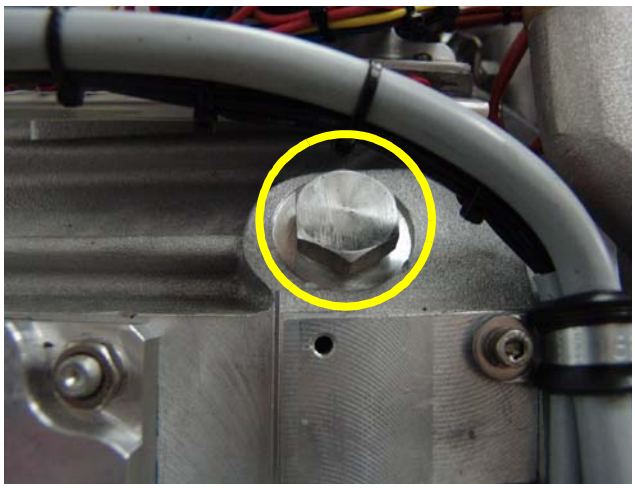
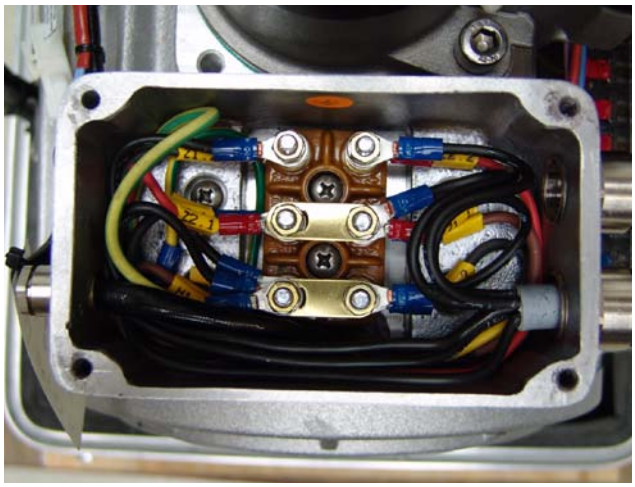


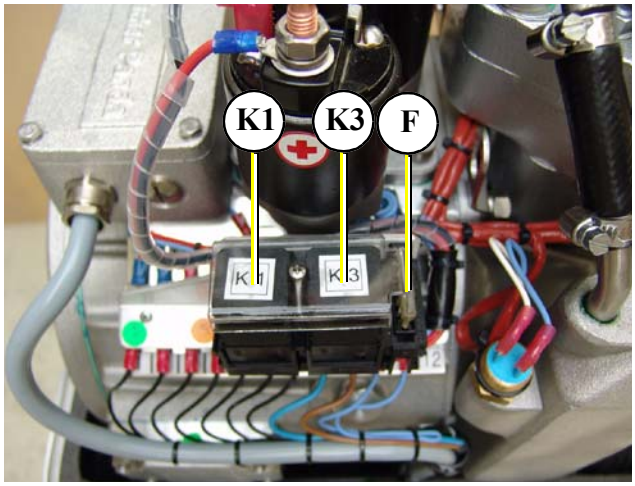
Fig. A.33: Plug for speed sensor



Generator power terminal box

Above the coil housing is the generator power terminal box. In this box the electrical connection points of the AC generator are blocked. Here is also the bridge for the protective grounding of the generator. The cover may be only removed, if it is guaranteed that the generator cannot be inadvertently started.

Fig. A.34: Generator power terminal box



Terminal block for remote control cable with fuses and power relais

K1 Relay for starter motor

K3 Relay for fuel pump

F fuse 25A for starter motor

Fig. A.35: Terminal block

A.2.7 Sensors and Switches for Operation Surveillance

Thermo-switch at cylinder head

The thermo-switch at the cylinder head serves the generator temperature for the monitoring.

Fig. A.36: Thermo-switch at cylinder head

Thermo-switch at wyter-cooled exhaust elbow

This thermo-switch is at the water-cooled exhaust elbow union and serves for the monitoring of the temperature of the fresh water cycle. It measures at the hottest place, since the incineration gases from the cylinder head are led here into the exhaust elbow union.

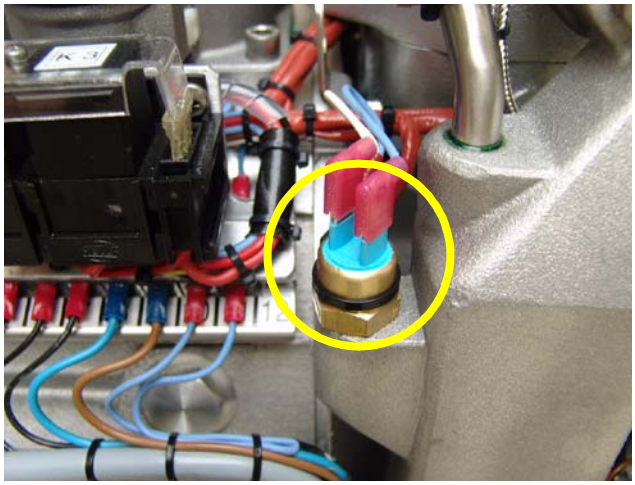


Fig. A.37: Thermo-switch at exhaust elbow

Thermo-switch in the generator coil

1. Generator coil
2. Thermo-switch
3. Housing

For the protection of the generator coil there are two thermo-switches inside the coil, which are for inserted parallel and safety's sake independently from each other.

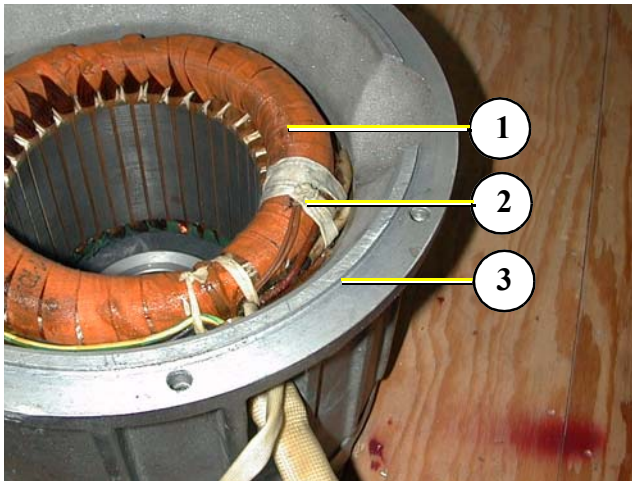
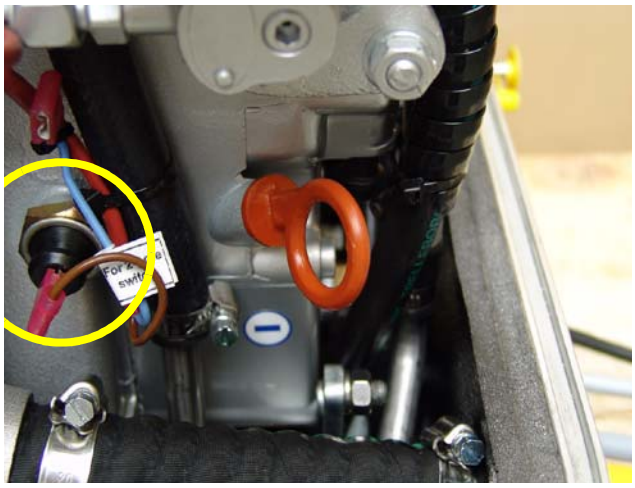


Fig. A.38: Thermo-switch coil

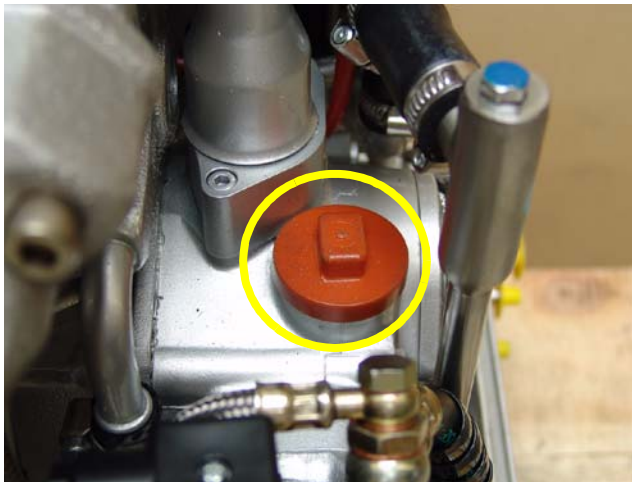


Oil pressure switch

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

Fig. A.39: Oil pressure switch

A.2.8 Components of Oil Circuit

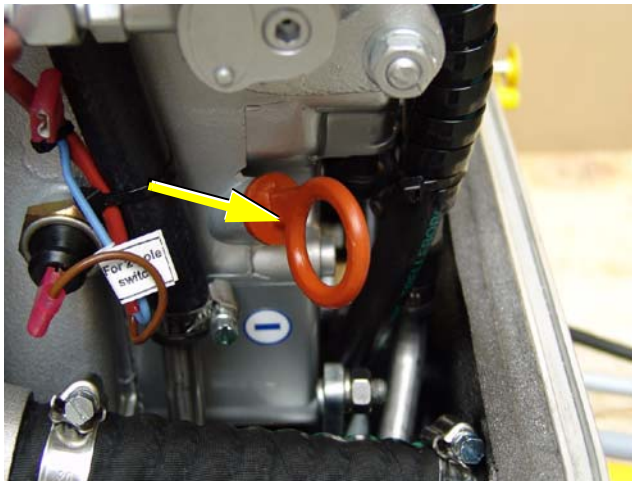


Oil filler neck with cap

Normally the filler neck for the engine oil is on the top side of the valve cover. At numerous generator types a second filler neck is attached additionally at the operating side. 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.40: Engine 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.

Fig. A.41: Engine oil dipstick

Engine oil strainer

The oil strainer is normally maintenance-free; presupposed, the oil change intervals are kept.

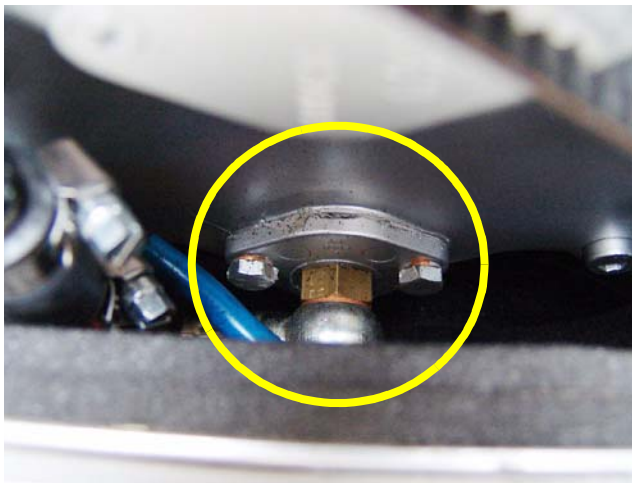


Fig. A.42: Engine oil strainer

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!

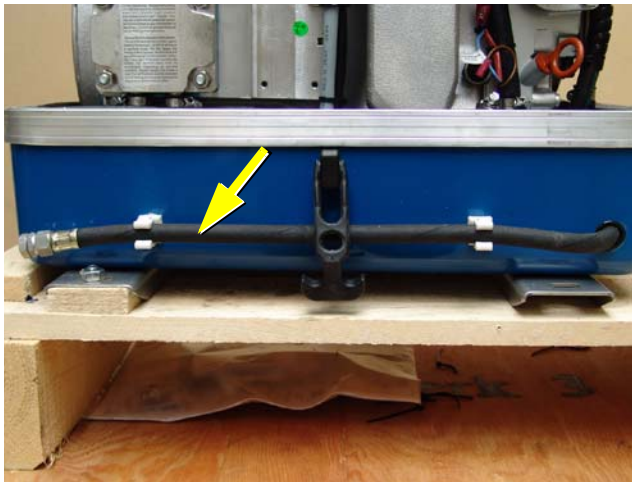
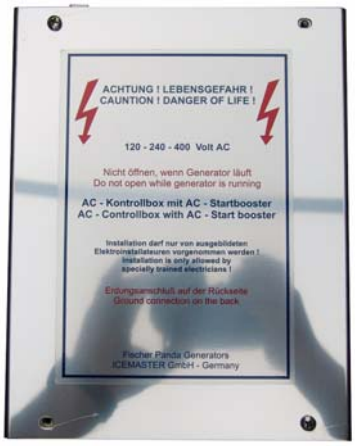


Fig. A.43: Engine oil drain hose

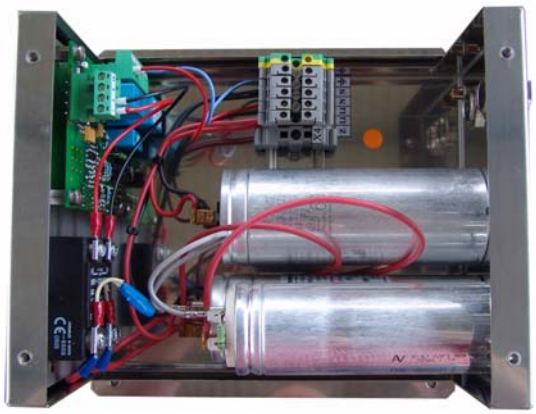
A.2.9 External Components



AC-Control box

For the operation of the generator a AC-Control box is necessary. This AC-Control box contains electronics for the VCS control as well as different monitoring elements and the capacitors necessary for the excitation of the generator.

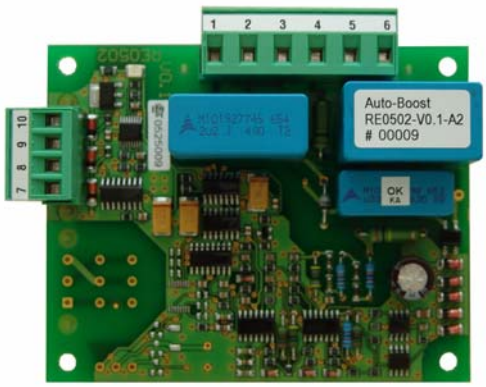
Fig. A.44: AC-Control box



AC-Control box open

At operating the generator the operating voltage of 120/230 and/or 230/400V lies at the AC-Control box. It must be guaranteed that the generator cannot be inadvertently started, if the Control box is opened. For this reason the negative pole of the starter battery is to be disclamped with all work on the electrical system.

Fig. A.45: AC-Control box open



Booster electronic

The figure shows the control board for the booster electronic regulation. On the booster elektronc board are also adjustment possibilities for the control parameters.

Fig. A.46: Booster elektronic

A.3 Operation manual

A.3.1 Preliminary remarks

Tips regarding Starter Battery

Fischer Panda recommends normal starter battery use. If an genset is required for extreme winter conditions, then the starter battery capacity should be doubled. It is recommended that the starter battery be regularly charged by a suitable battery-charging device (i.e., at least every 2 Months). A correctly charged starter battery is necessary for low temperatures.

A.3.2 Daily routine checks before starting

1. Oil Level Control (ideal level: MAX).

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 maximum level, if the level drops below the mark between maximum und minimum levels.

You should change the oil, regardless of the ambient temperatureseeTable F.6, “Engine oil,” on Page IX. Engine oil amounts see Table F.2, “Technical Data Engine,” on Page V.

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 Raw water Filter.

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

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

Leaks at hose connections must be immediately repaired, especially the raw water impeller pump. It is certainly possible that the raw water impeller pump will produce leaks, depending upon the situation. (This can be caused by sand particles in the raw water 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.

A.3.2 Daily routine checks before starting

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

The generator should only be started when all the load have been switched off. The excitation of the generator will be suppressed, if the generator is switched off with load 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.3.3 Starting Generator

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.

Control light for "Power" button must light up.

5. Press „START“ button.

The electric starter may only be used for a maximum of 20 seconds. Thereafter, a pause of, at least, 60 seconds is required. If the genset does not immediately start, then the fuel intake should be checked to ensure it is flowing freely. (For temperatures below - 8°C check whether there is winter fuel)

6. Check circuit-voltmeter, to test whether there is AC-voltage and is within the tolerance rage (Frequency and voltage).

The AC voltage should be within a tolerance of ± 3 Volt without load at the nominal voltage. When running without load, the generator frequency should be 4% below the nominal voltage. The generator should be checked, before the load is switched on, if the current remain at this level.

7. Switch on load.

The load should only be switched on if the generator voltage is within the permissible range. Parallel connection of several load should be avoided, especially if there is load with electric motors, such as air-conditioning units in the system. In this case, the load must be connected Step by Step.

A.3.4 Stopping Generator

1. Switch off load.
2. If the load is higher than 70% of the nominal load, the generator temperatures should be stabilised by switching off the loag for at least 5 minutes.

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

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

NOTE: Never switch off the battery until the generator has stopped.

5. If necessary, close sea cock.

ATTENTION

NOTE: If the generator switches itself off with the operation with load for temperature reasons, must be examined immediately, which the cause is. That can be an error at the cooling system or any error in the range of the outside cooling system.