# Manual

**Description of the generator - Installation andd operation manual**


15.4.08

Panda_AGT-DC_13000_PMS_48V_s01710_Manual.R01

# Marine Generator
# Panda PMS AGT-DC 13000

Super silent technology

48V - 227A / 13,1kW

## Fischer Panda GmbH

# Current revision status

| | **Document** |
|---|---|
| Actual: | Panda_AGT-DC_13000_PMS_48V_s01710_Manual.R01_15.4.08 |
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| **Revision** | **Page** |
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|---|---|---|---|---|
| since 1977 | since 1978 | since 1988 | since 1988 | since 1988 |
| **Icemaster GmbH** | **Fischer Marine Generators** | **Conclusion Fischer - Icemaster GmbH** | **100 % water cooled Panda generators** | **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 aggregates developed at that time set new technological standards worldwide.

The aggregates became more efficient and powerful than other aggregates 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 Aggregate 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 aggregates 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, Fischer Panda also supply the super compact high-tech sound-insulated battery charging aggregate 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)

# Safety first

| | |
|---|---|
| These symbols are used throughout this manual and on labels on the maschine itself to warn of the possibility of personal injutry. Read these instructions carefully. It is essential that you read the instructions and safety regulations before you attempt to assemble or use unit. | |
|  | This danger symbol refers to toxic danger and draws attention to special warnings, instructions or procedures which, if not strictly observed, may result in severe personal injury or loss of life. |
|  | This danger symbol refers to electric danger and draws attention to special warnings, instructions or procedures which, if not strictly observed, may result in electrical shock which will result in severe personal injury or loss of life. |
|  | This danger symbol refers to electric danger and draws attention to special warnings, instructions or procedures which, if not strictly observed, may result in electrical shock which will result in severe personal injury or loss of life. |
|  | This warning symbol draws attention to special warnings, instructions or procedures which, if not strictly observed, may result in damage or destruction of equipment, severe personal injury or loss of life. |
|  | This warning symbol draws attention to special warnings, instructions or procedures which, if not strictly observed, may result in damage or destruction of equipment |

# Tools

| This symbols are used throughout this manual to show which tool must be used at maintenance or installation. | |
|---|---|
|  | Spanners<br>X = number of spanner |
|  | Hook wrench for oil filter |
|  | Screw driver, for slotted head screws and for recessed head screws |
|  | Multimeter, multimeter with capacitor measuring |
|  | Infrared temperature mesuring pistol |
|  | Current clamp (DC for synchron generators; AC for asynchron generators) |

| | |
|---|---|
|  | Socket wrench set |
|  | Hexagon wrench keys |

# 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 Fischer Panda.
3. The official guaranty confirmation will be completed by Fischer Panda 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 per Internet: info@fischerpanda.de

# Safety Precautions

**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.

**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!**

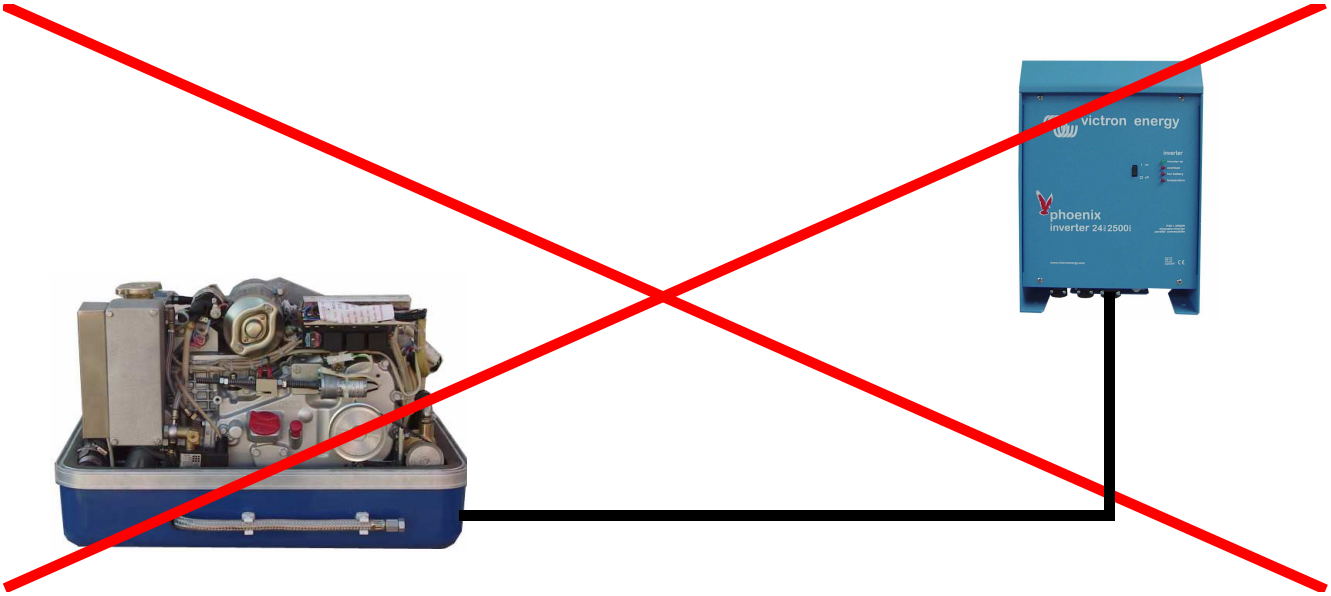
**Never start the generator with the battery disconnected, the rectifiers will be damaged!**

**CAUTION!**

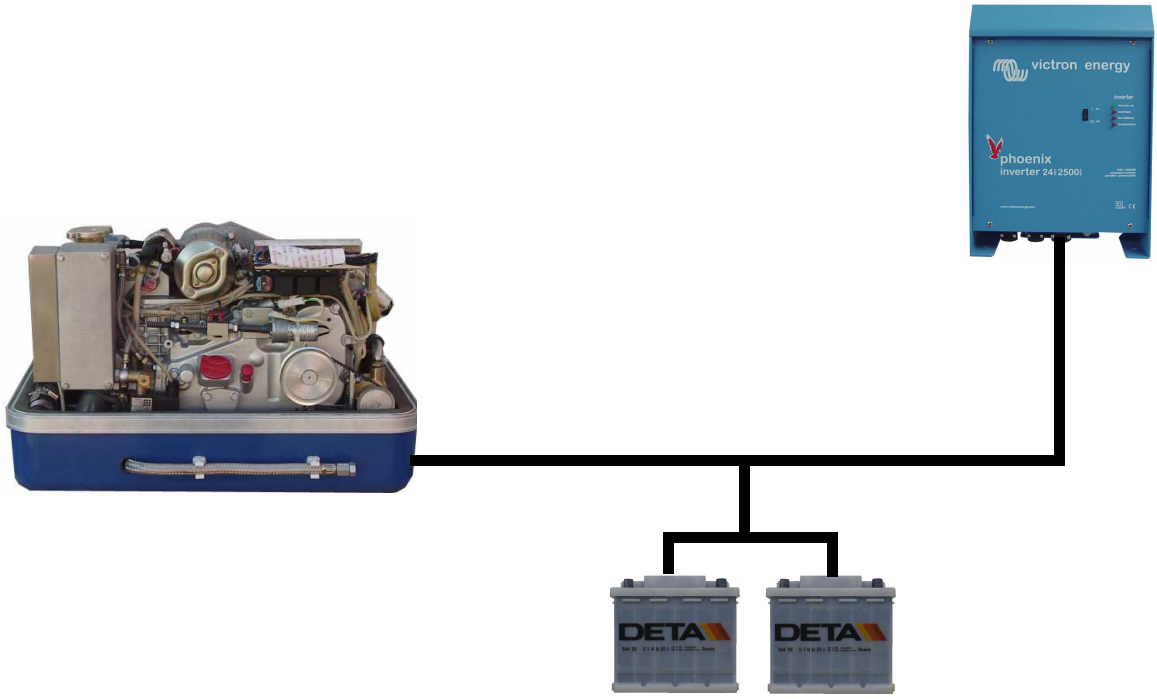
**Contact of the electrical contacts may be DANGER TO LIVE!**

**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).

**Safety Instrictions 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.



| | 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. | |

# 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?

Tap or gently shake victim.

Shout, "Are you OK?"

**2** Shout, "Help!"

Call people who can phone for help.

**3** Roll Person onto Back.

Roll victim toward you by pulling slowly.

**4** Open Airway.

Tilt head back, and lift chin.

Shout, "Are you OK?"

**5** Check for Breathing.

Look, listen, and feel for breathing for 3 to 5 seconds.

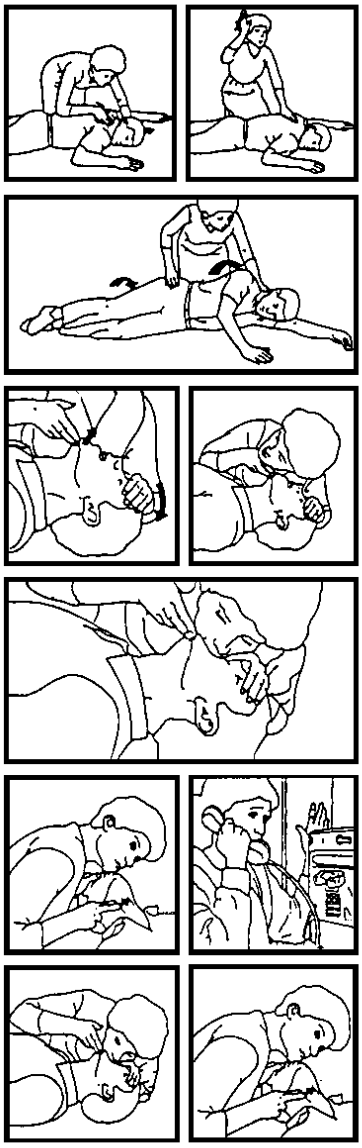
**6** Give 2 Full Breaths.

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.

Feel for pulse for 5 to 10 seconds.

**8** Phone EMS for Help.

Send someone to call an ambulance.

**9** Begin Rescue Breathing.

Keep head tilted back.

Lift chin.

Pinch nose shut.

Give 1 full breath every 5 seconds.

Look, listen, and feel for breathing between breaths.

**10** Recheck Pulse Every Minute.

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

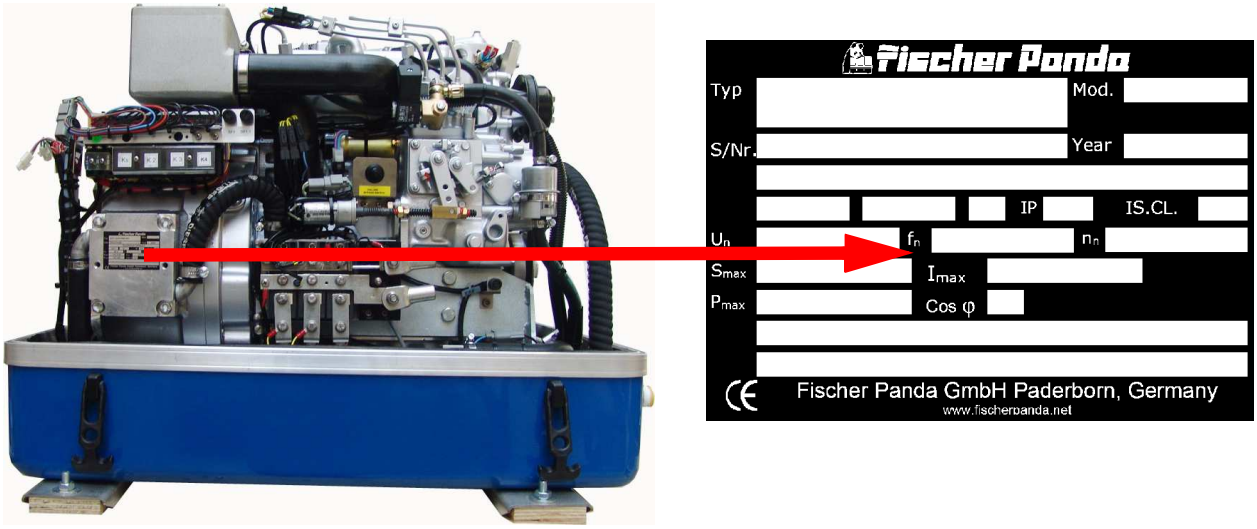



Fig. A.1-1: Type plate

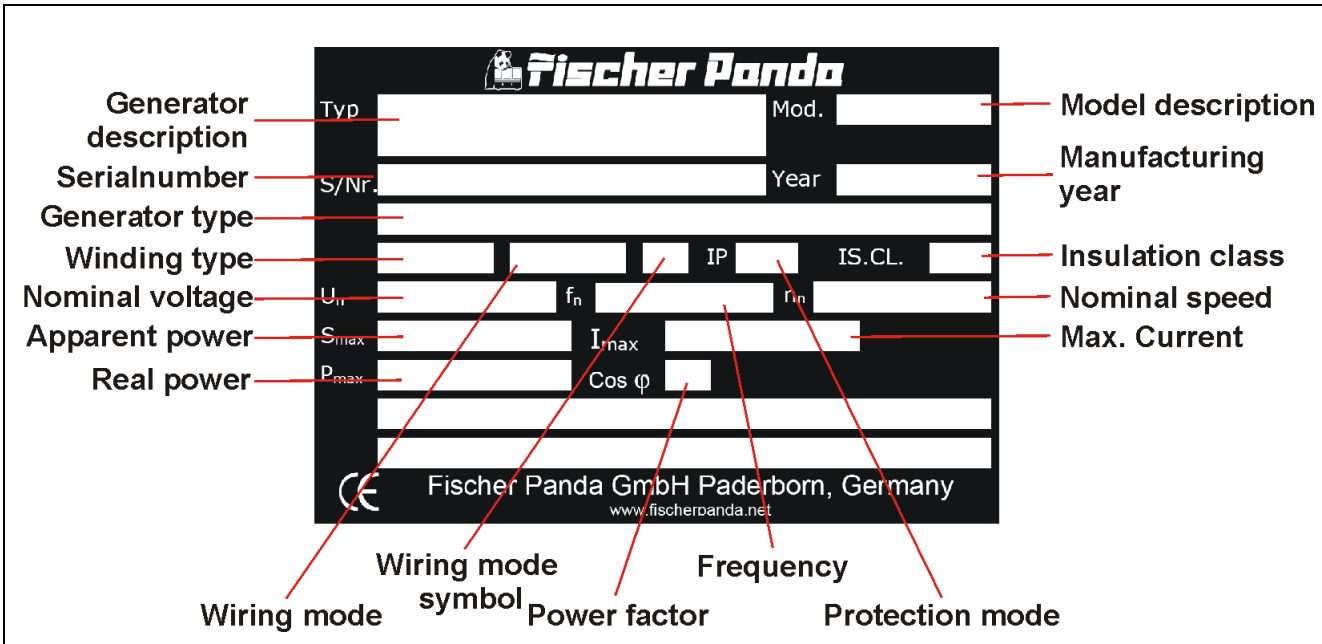
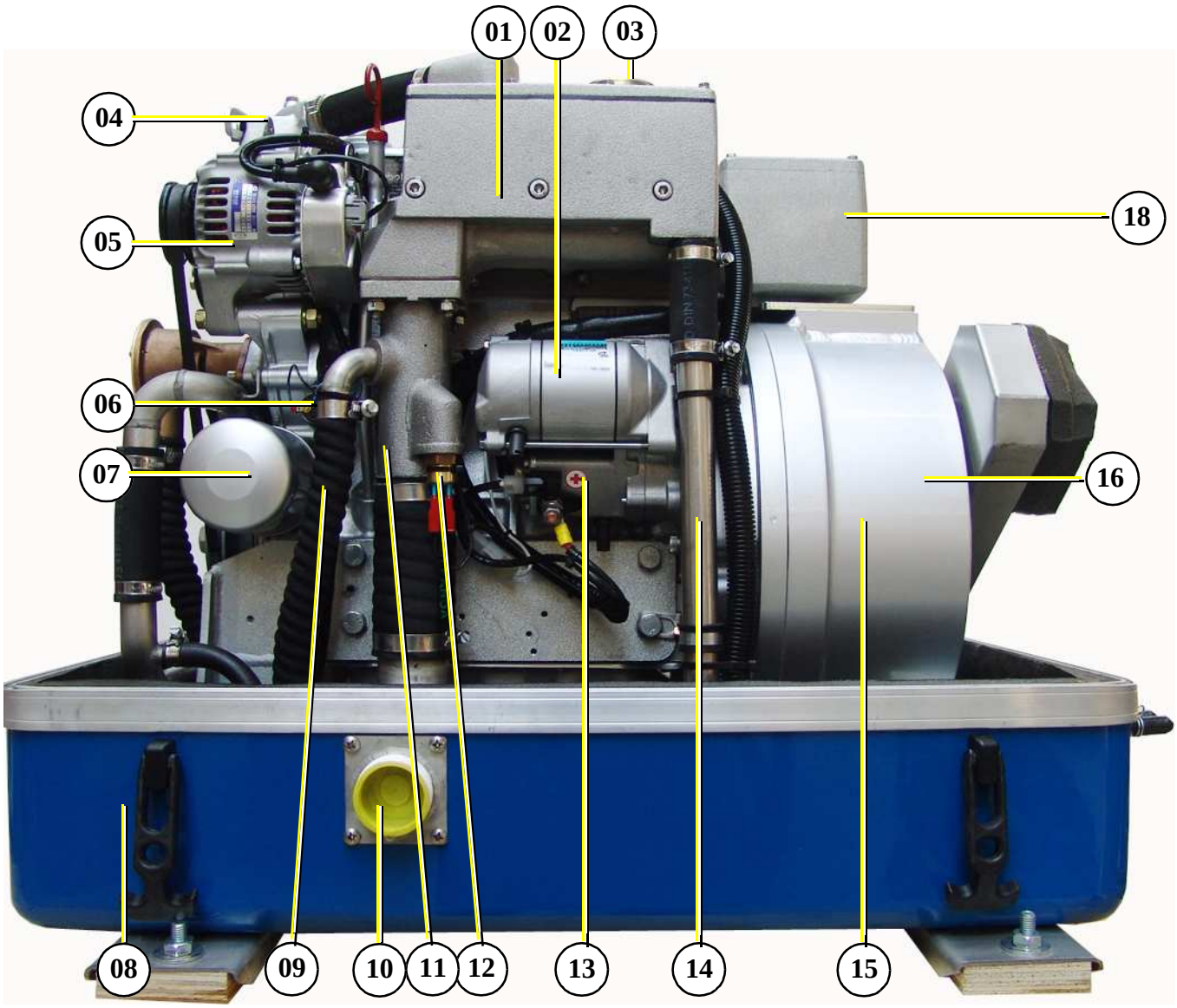



Fig. A.1-2: Discription type plate

# A.2 Description of the Generator

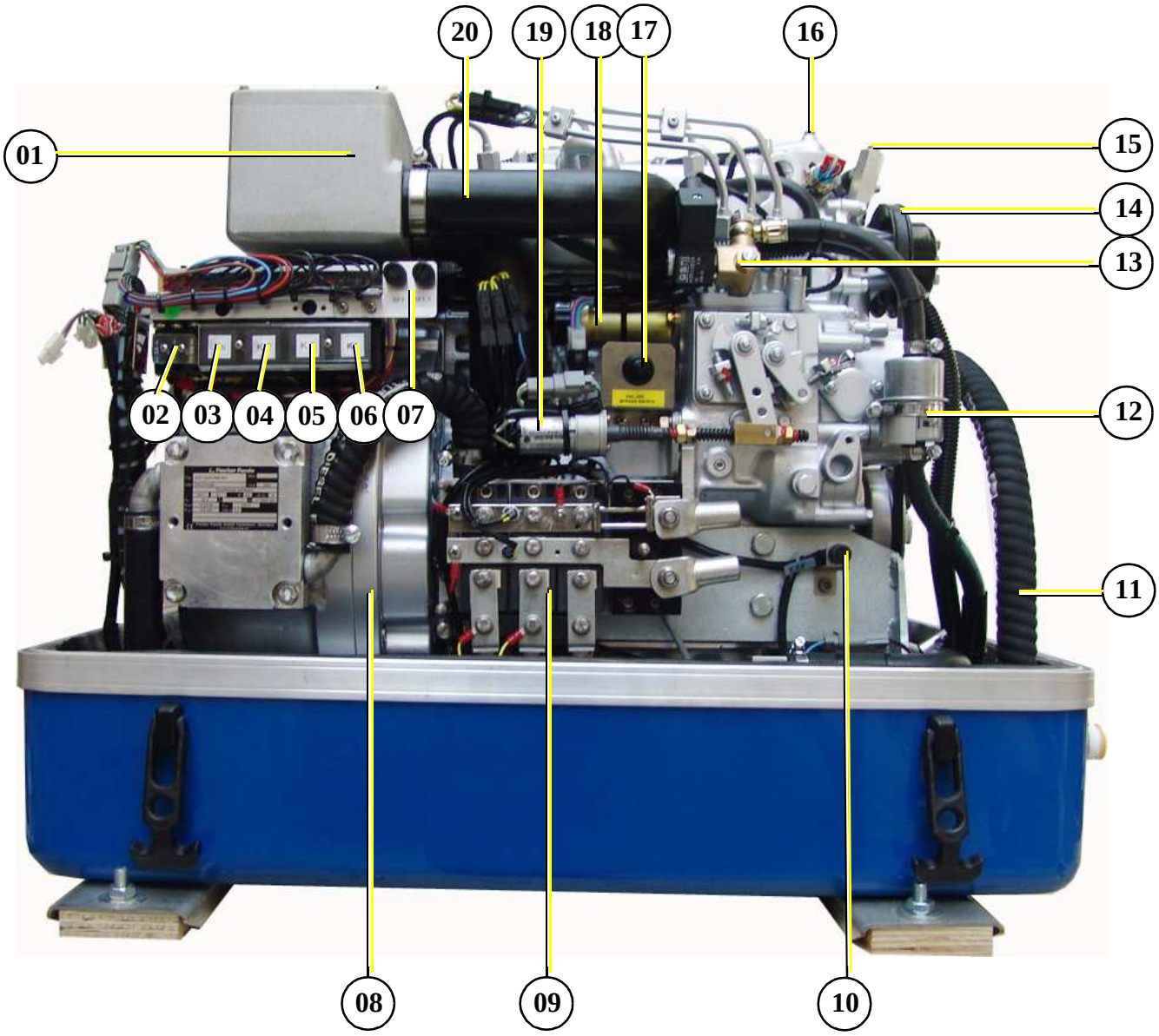
## A.2.1 Right Side View




01) Water-cooled exhaust elbow
02) Starter motor
03) Cooling water filler neck
04) Thermostat housing
05) DC-alternator 12V
06) Oil pressure switch
07) Oil filter
08) Sound cover base part
09) Injection hose raw water
10) Exhaust output
11) Exhaust pipe
12) Thermo-switch exhaust
13) Solenoid switch for starter motor
14) Cooling water return hose
15) Ventilation hose to external cooling water expansion tank
16) Generator housing with coil
17) Air suction housing with air filter

Fig. A.2.1-1: Right Side View

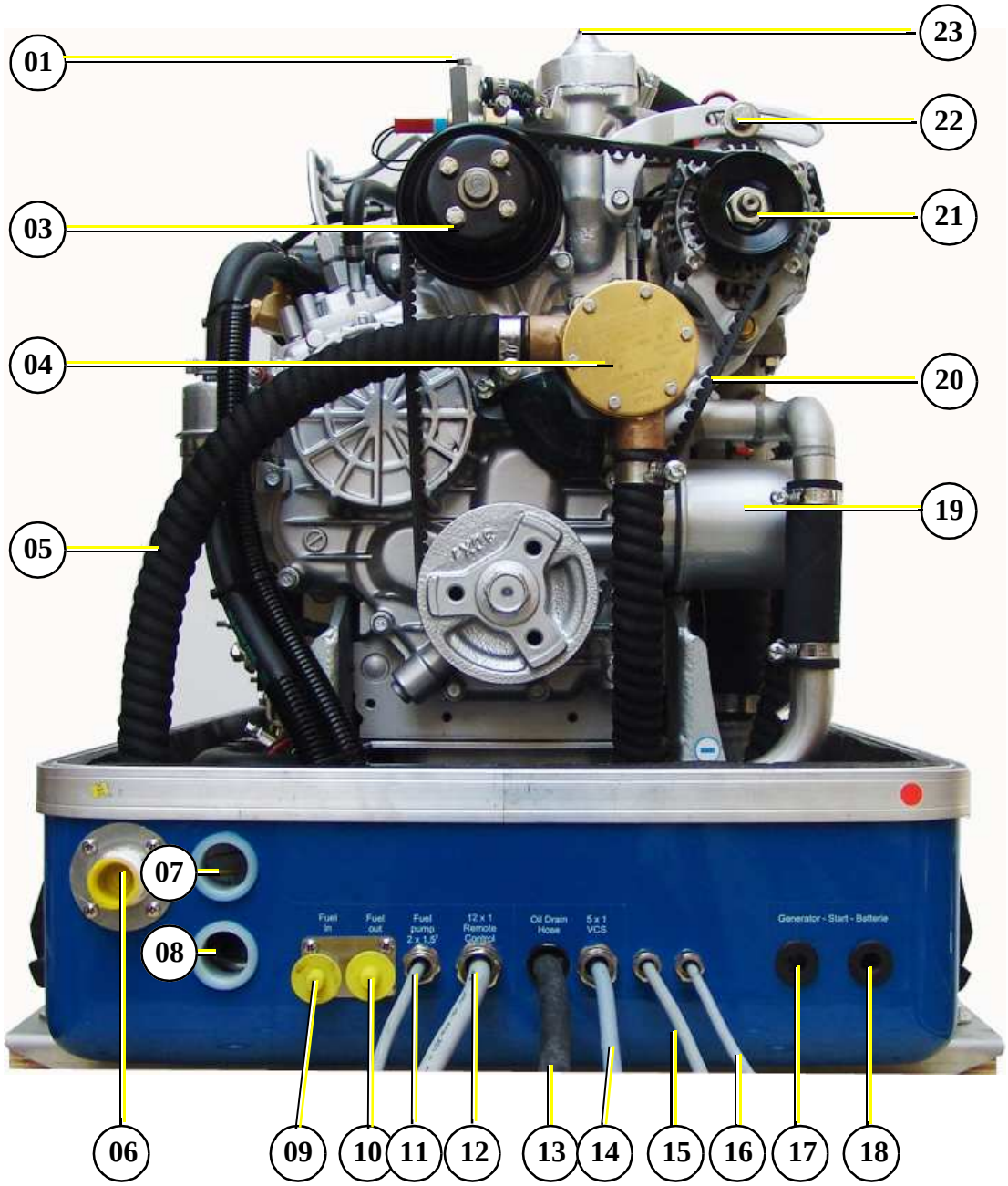
## A.2.2 Left Side View




01) Air suction housing with air filter
02) Electrical fuses
03) Starter-relay Ks
04) Pre-glow relay (glow plugs)
05) Fuel pump relay
06) Stop solonoid relay
07) Fuses for Remote control panel (2x1,6A)
08) Generator housing with coil
09) Rectifier
10) Fuse for voltage sense (1,6A)
11) Raw water intake hose
12) Fuel filter
13) Fuel solenoid valve
14) Pulley for internal cooling water pump
15) Ventilation screw internal cooling water pump
16) Ventilation screw thermotast housing
17) Failure bypass switch
18) Stop solenoid
19) Actuator for rpm-regulation
20) Suction hose, air suction housing - induction elbow

Fig. A.2.2-1: Left Side View

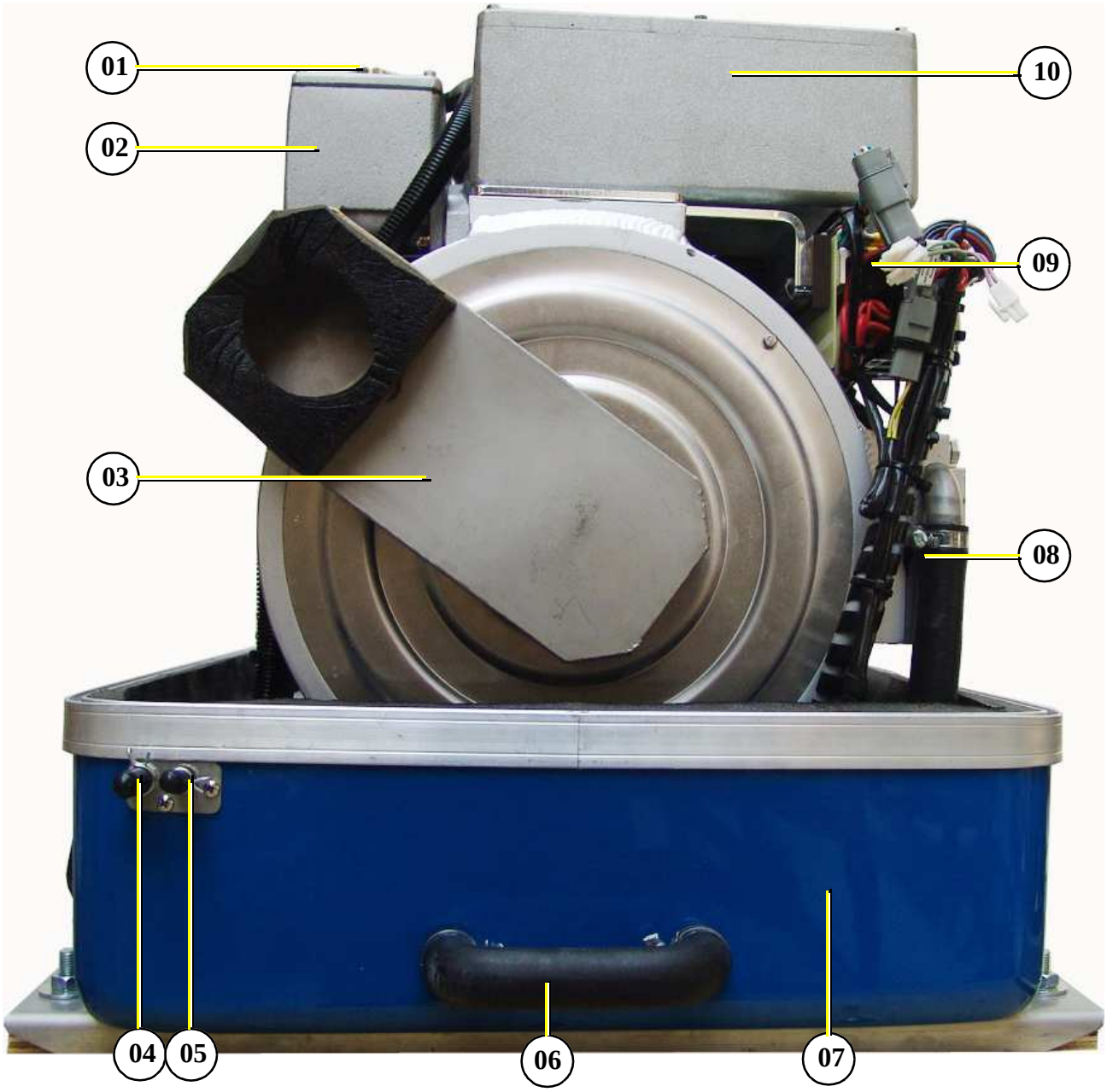
## A.2.3 Front View




01) Ventilation screw internal cooling water pump
03) Pulley for internal cooling water pump
04) Raw water pump
05) Raw water intake hose
06) Raw water intake
07) Passage for service battery cable
08) Passage for service battery cable
09) Connection fuel in
10) Connection fuel out
11) Cable fuel pump
12) Cable remote control panel
13) Oil drain hose
14) Cable voltage control VCS
15) Cable shunt measurement (clamp 9+10)
16) Cable voltage sense (clamp 7+8)
17) Starter battery minus (-)
18) Starter battery plus (+)
19) Oil filter
20) V-belt
21) DC-alternator 12V
22) Clamp device for DC-alternator
23) Ventilation screw thermostat housing

Fig. A.2.3-1: Front View

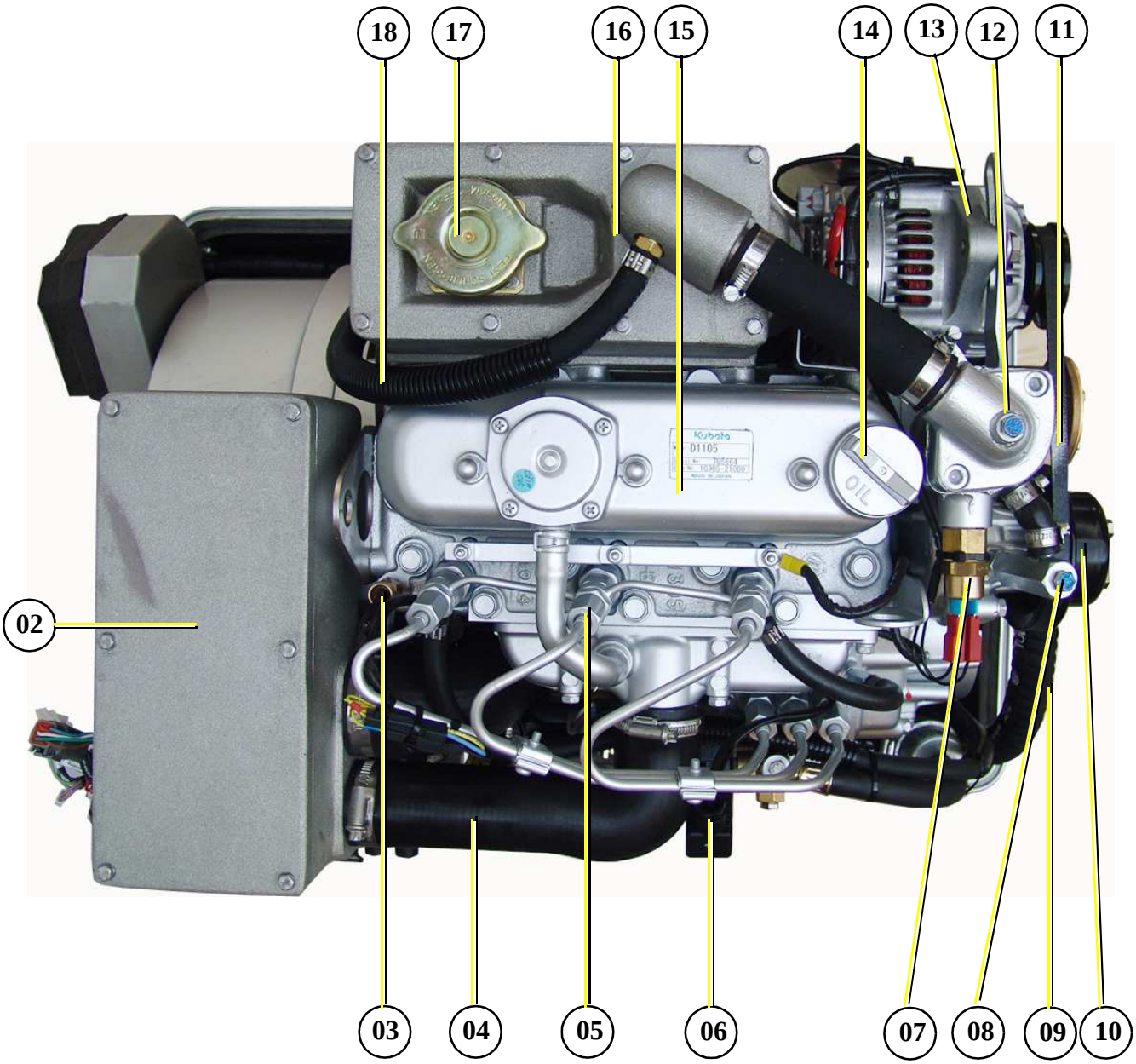
## A.2.4 Back View




01) Cooling water filler neck
02) Water-cooled exhaust elbow
03) Generator front cover
04) In-flow from external cooling water expansion tank
05) Return to external cooling water expansion tank
06) Connection external ventilation valve
07) Sound cover base part
08) Cooling water connection block
09) Terminal block for remote control cable with fuses and powere-lais
10) Air suction housing with air filter

Fig. A.2.4-1: Back View

## A.2.5 View from Above




02) Air suction housing with air filter
03) Thermo-switch cylinder head
04) Suction hose, air suction housing - induction elbow
05) Injection nozzle
06) Fuel solenoid valve
08) Ventilation screw internal cooling water pump
07) Thermoswitch thermostat housing
09) Raw water intake hose
10) Pulley for internal cooling water pump
11) V-belt
12) Ventilation screw thermostat housing
13) DC-alternator
14) Oil filler neck
15) Cylinder head
16) Water-cooled exhaust elbow
17) Cooling water filler neck
18) Ventilation hose to external expansion tank

Fig. A.2.5-1: View from above

# A.3 Details of functional units

## A.3.1 Remote control panel - see remote control panel datasheet

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.

## A.3.2 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 left hand side. The cross-section of the intake pipe should be nominally larger than the generator connection.

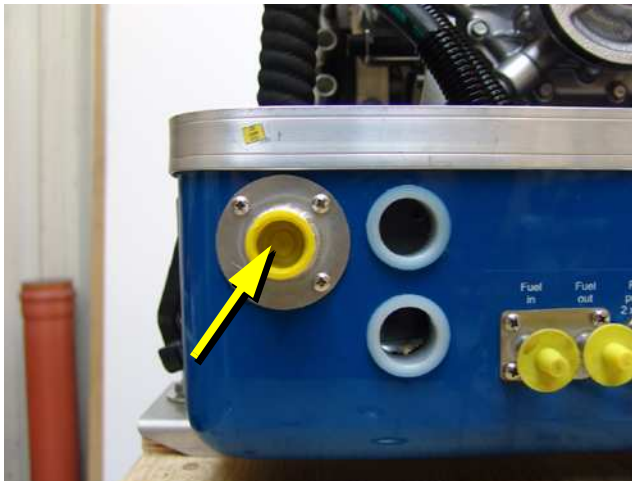


Fig. A.3.2-1: Raw water intake

**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.

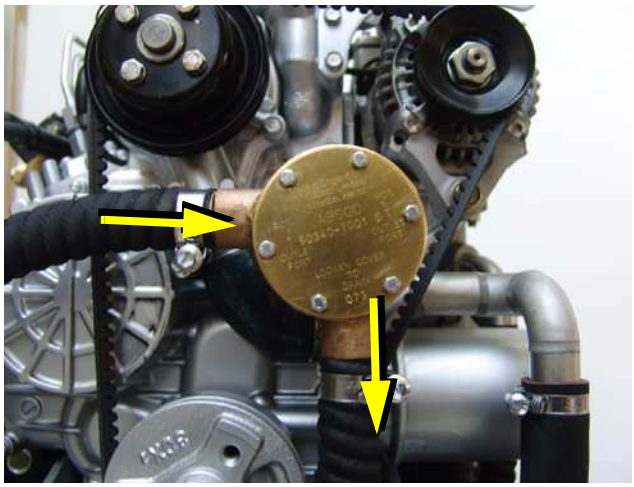


Fig. A.3.2-2: Raw water impeller pump

**Impellerfilter**

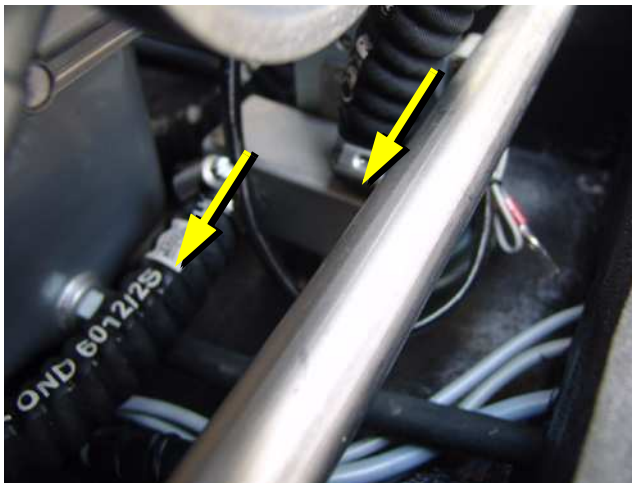


Fig. A.3.2-3: Bypass

**Rectifier**

The raw water gets into the rectifier and cooles the diodes.

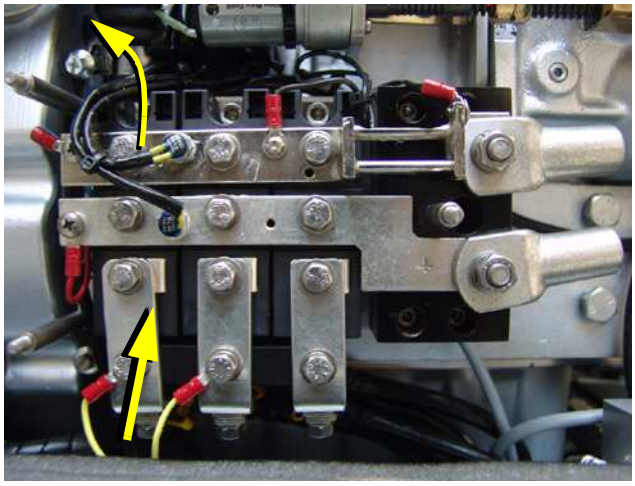


Fig. A.3.2-4: Bypass

**Coolant connection block**

The raw water is injected into the generator housing.

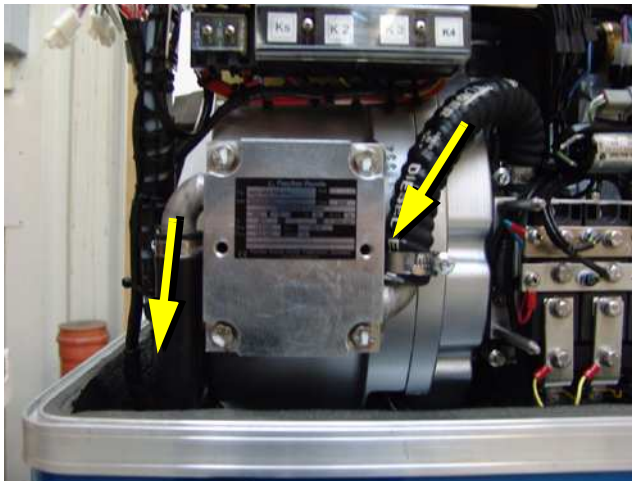


Fig. A.3.2-5: Coolant connection block

**Heat exchanger**

Separates the raw water system from the freshwater system.

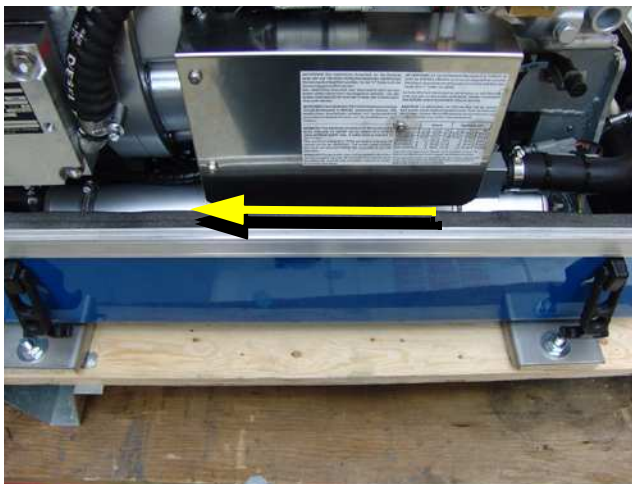


Fig. A.3.2-6: Heat exchanger

**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 hose.

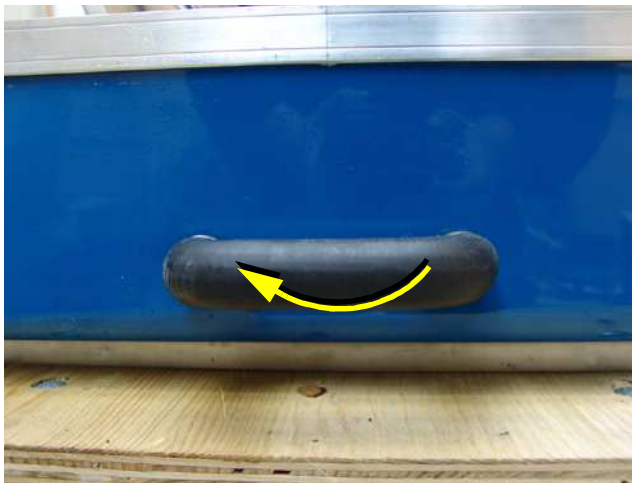


Fig. A.3.2-7: Connection ventilation valve

**Cooling water injector port**

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.

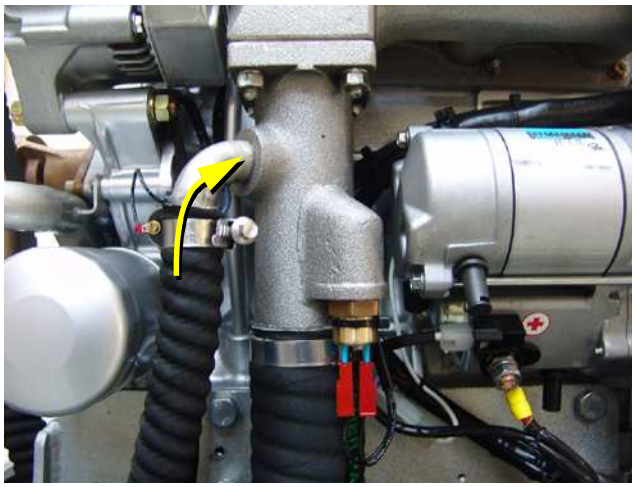


Fig. A.3.2-8: Cooling water injector port

## A.3.3 Components of Cooling System (Freshwater)

### Cooling water filler neck

The cooling water filler nck situated at the water-cooled manifold are 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 compensation tank. Note that the water level in the cooling water compensation tank is only 20% of the volume in a cold state.


Fig. A.3.3-1: Cooling water filler neck

### Freshwater backflow

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

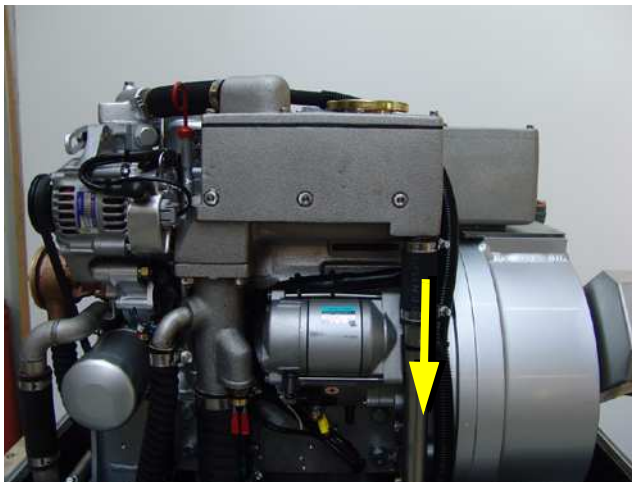


Fig. A.3.3-2: Freshwater backflow

### Ventilation pipe

The ventilation pipe at the water-cooled exhaust manifold leads to the external expansion tank. This pipe only serves as a ventilation pipe, if both pipes are to be connected to the external expansion tank (ventilation pipe and intake pipe).

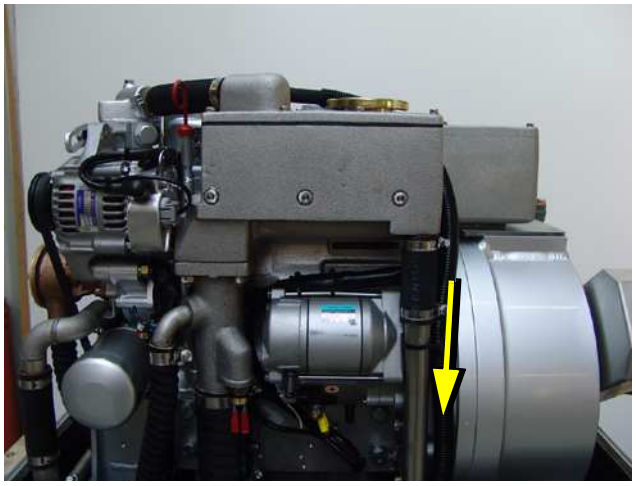


Fig. A.3.3-3: Ventilation pipe

**Hose connection pieces for the external expansion tank**

The external expansion tank is connected by two hose connections. The connecting pieces shown here serves as constant ventilation for the water-cooling system.

In case the external expansion tank is connected with two hoses, the system will ventilate itself. In this case, additional ventilation is only necessary when the generator is initially filled, or if the cooling water is not circulating.

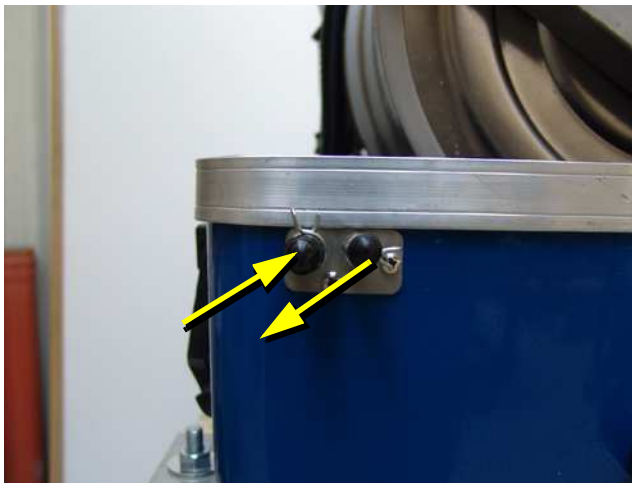


Fig. A.3.3-4: External expansion tank

**Heat exchanger**

Separates the raw water system from the freshwater system.

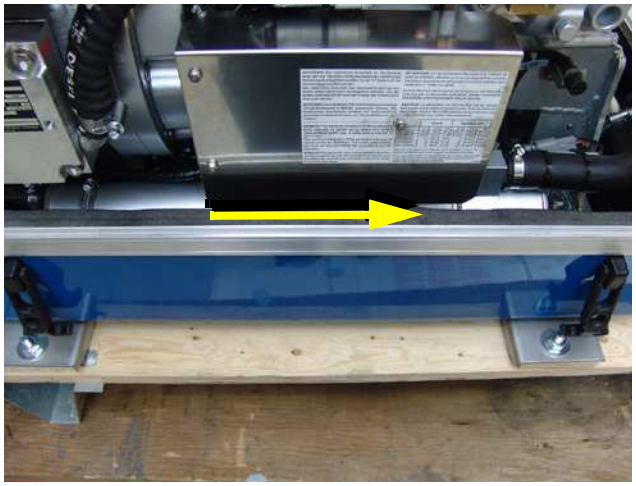


Fig. A.3.3-5: Heat exchanger

**Cooling water injection**

A.) To the thermostat housing

B.) From the external expansion tank

The intake pipe from the external cooling water expansion tank is connected to the point shown with „B“.

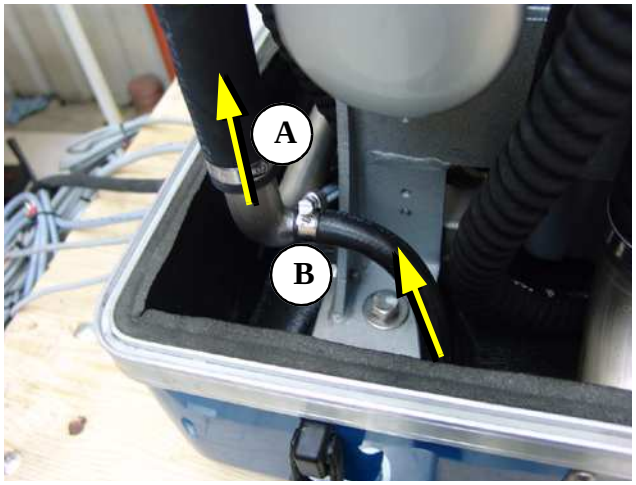



Fig. A.3.3-6: Cooling water injection

**Internal cooling water pump**

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

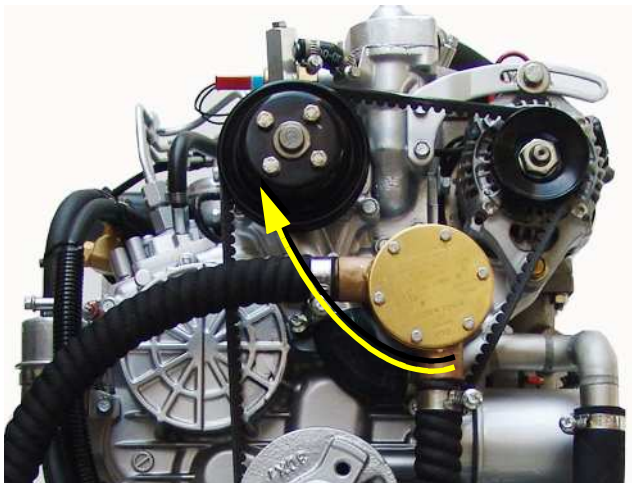


Fig. A.3.3-7: Internal cooling water pump

**Ventilation screw cooling water pump**

The ventilation screw above the cooling water pump casing may not be opened, whilst the generator is running. If this occurs by mistake, air will be drawn through the opening. Extensive ventilation of the whole system is then necessary.

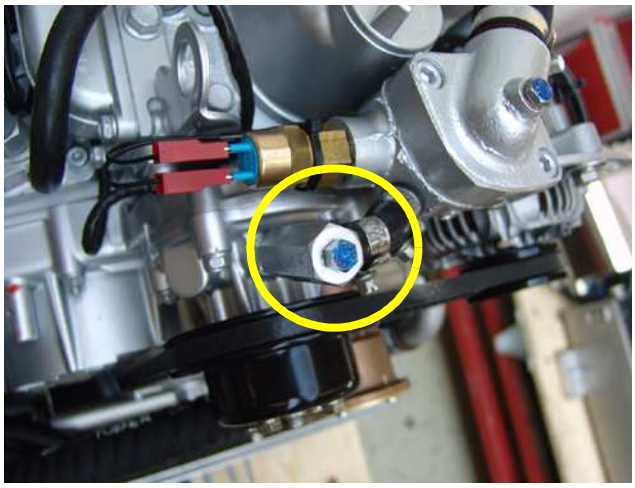


Fig. A.3.3-8: Ventilation screw cooling water pump

**Ventilation screw thermostat housing**

The ventilation screw on the thermostat housing should occasionally be opened for control purposes. Standing machinery should principally carry out ventilating.

Fig. A.3.3-9: Ventilation screw thermostat housing

### Water-cooled exhaust elbow

The manifold is cooled by means of the internal cooling system (freshwater). The cooling water filler necks on the casing of the elbow may not be opened. These cooling water necks are only required to fill the motor with cooling water in cases of repair. The normal cooling water controls may only be carried out at the external expansion tank.

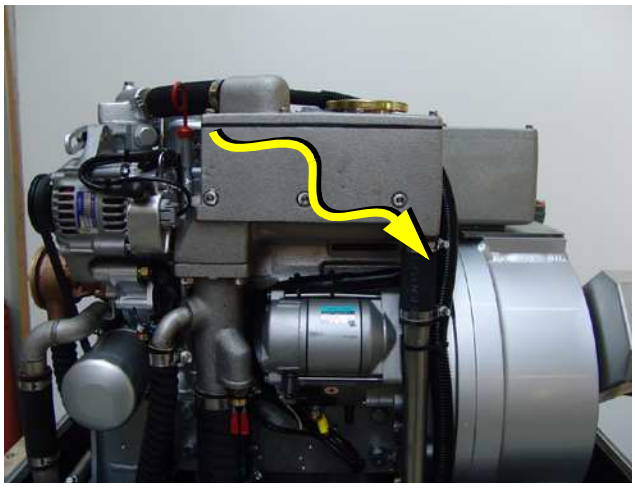


Fig. A.3.3-10: Water-cooled exhaust elbow

## A.3.4 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.

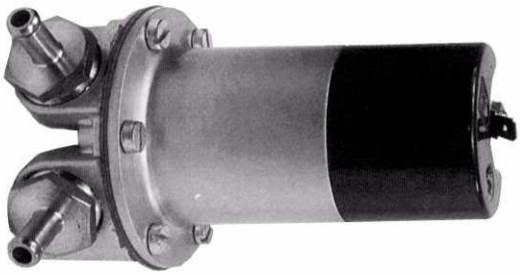


Fig. A.3.4-1: External fuel pump

### Connecting pieces for the fuel pipe

1. Fuel intake
2. Fuel backflow

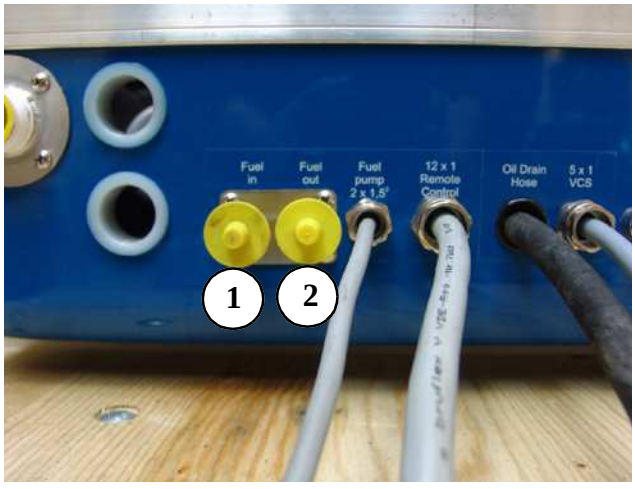



Fig. A.3.4-2: Fuel connections

**Fuel filter**

A consequential filtering of fuel is especially important for all marine systems. A fine filter, which is firmly attached to the inside of the sound insulation capsule for the marine version, is supplied on delivery, and loose for other makes. In all cases a further pre-filter with water separator must be installed. See directions for fuel filter installation.

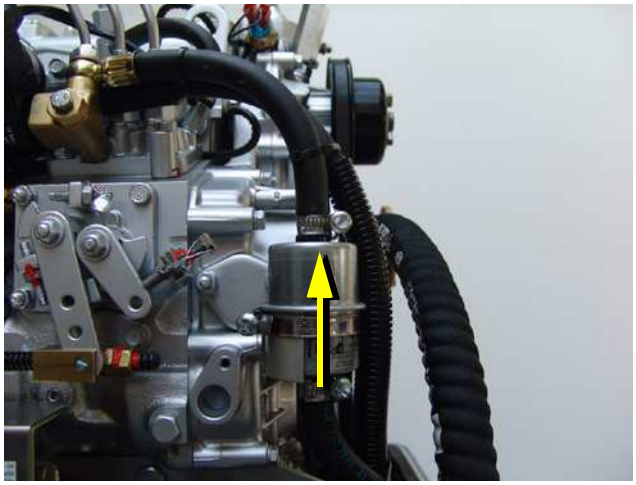


Fig. A.3.4-3: Fuel filter

**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.

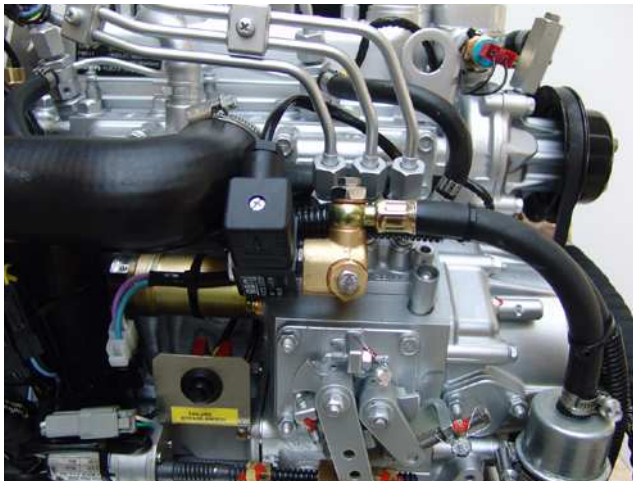


Fig. A.3.4-4: Fuel solenoid valve

**Injection nozzles**

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

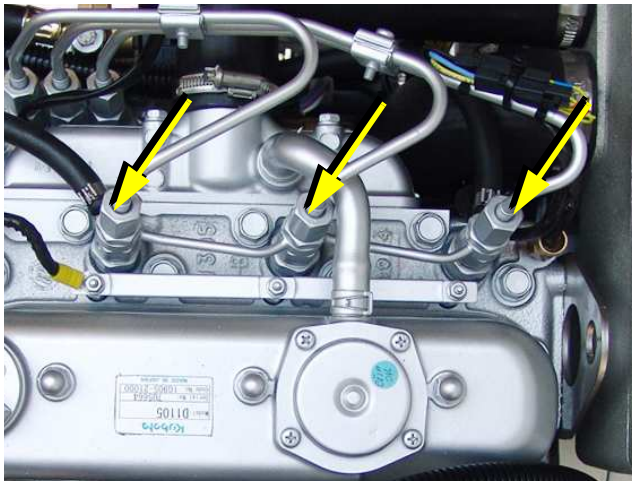


Fig. A.3.4-5: Injection nozzle

**Glow plugs**

The glow plugs 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.

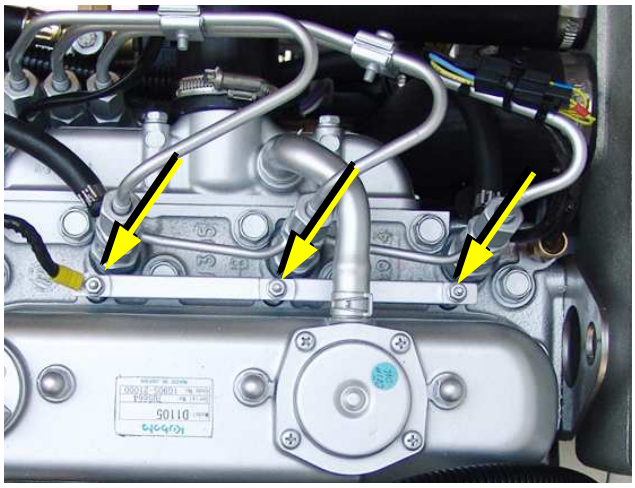


Fig. A.3.4-6: Glow plugs

**Stop solenoid for engine stop (optional)**

Some model are additional equipped with an stop solenoid. The generator is stopped by the co-operation of the stop solenoid immediately after switching off. The adjustment of the stop solenoid must always be checked, in order to be sure that the stop lever can move also during the operation freely and is not under prestressing.

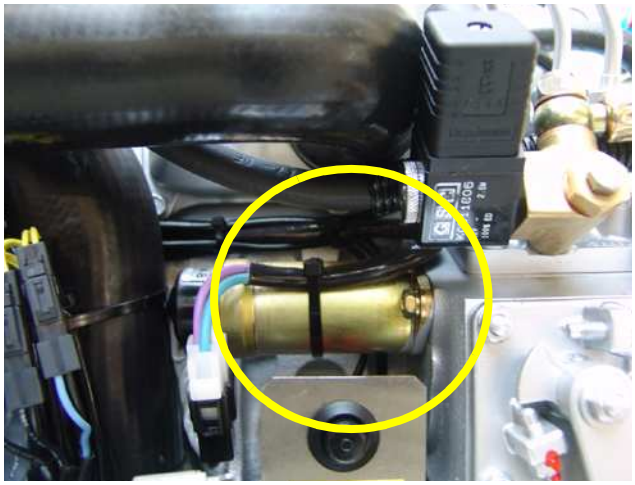


Fig. A.3.4-7: Stop solenoid

## A.3.5 Components of combustion air

**Air suction openings at the sound cover**

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. (minimum distance 150 mm)


Fig. A.3.5-1: 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.3.5-2: Air suction housing

### Air suction housing with air filter set

The figure shows the air filter element in the air suction housing.

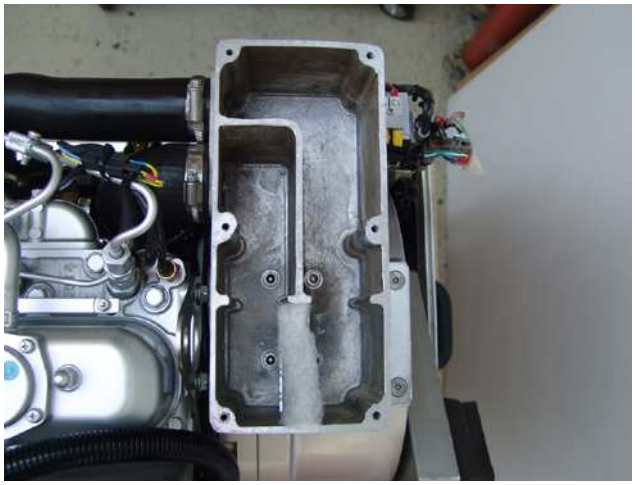


Fig. A.3.5-3: Air filter

### Induction elbow

The figure shows the induction elbow at the combustion engine. At the front of this induction elbow you can see the hose connection between air suction housings and induction elbow. The air filter must be checked, if this hose pulls together at operation.

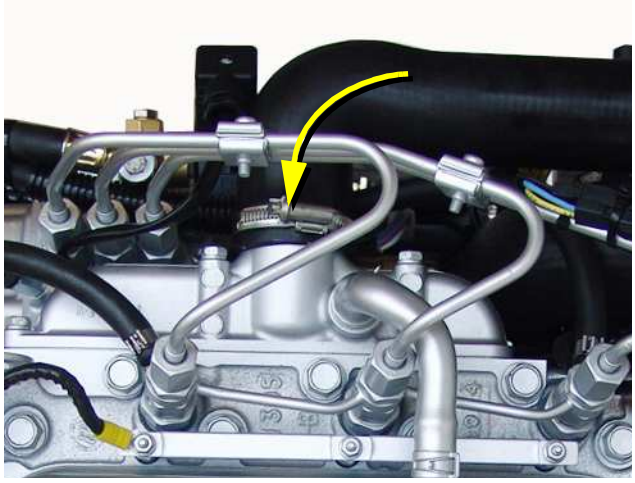


Fig. A.3.5-4: Induction elbow

**Valve cover**

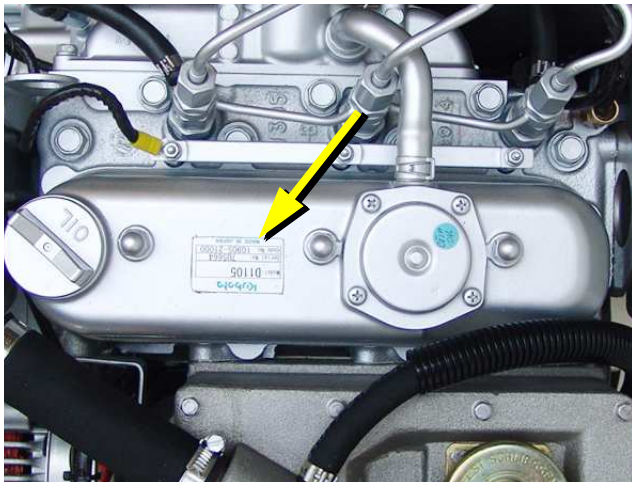


Fig. A.3.5-5: Valve cover

**Exhaust elbow**

On the back of the engine is the water-cooled exhaust elbow. On the top side the pipe union for the internal raw water circuit is to be seen and the filler neck for the cooling water. This cooling water filler neck is used only at first filling. Control of the cooling water and if necessary refill takes place at the external cooling water expansion tank.

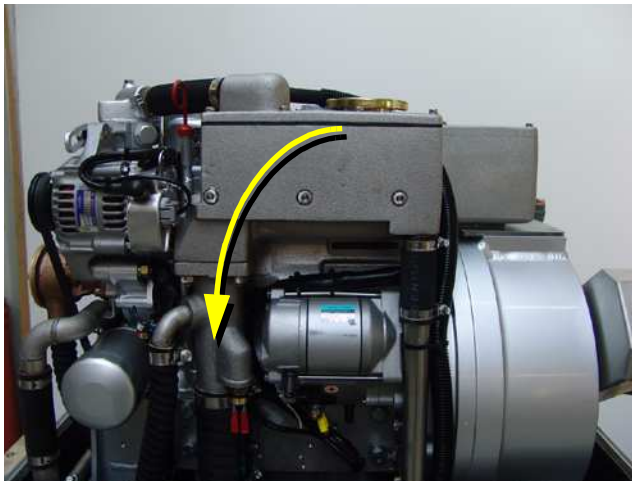


Fig. A.3.5-6: Water-cooled exhaust elbow

**Exhaust connection at the exhaust elbow**

Raw water from the external cooling circle is fed here.

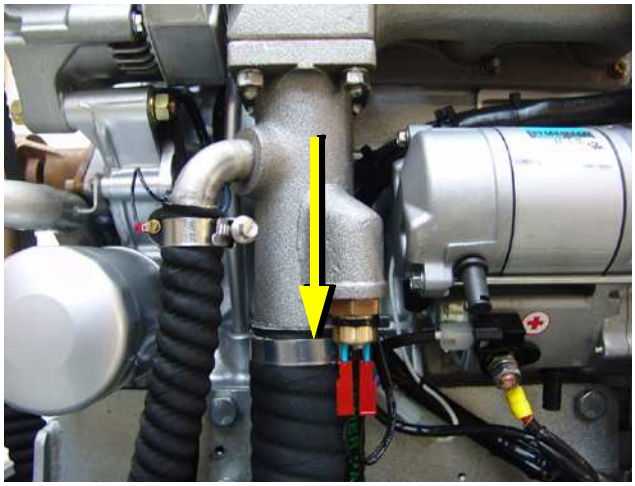


Fig. A.3.5-7: Exhaust port

**Exhaust outlet**

Connect the exhaust pipe with the water lock.

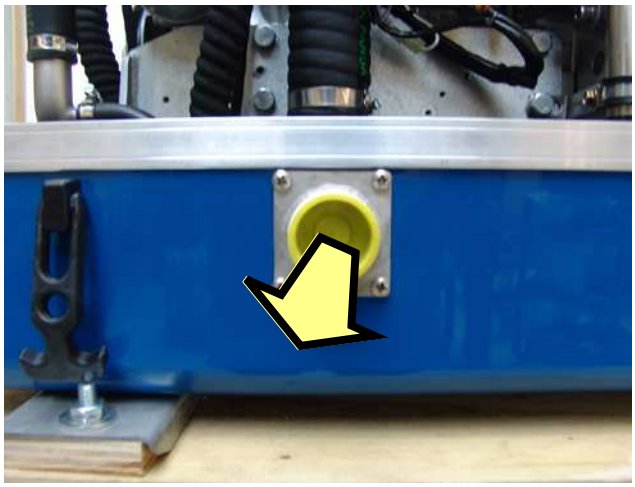


Fig. A.3.5-8: Exhaust outlet

## A.3.6 Components of the electrical system

**Connection starter battery**

1. Cable for starter battery (-)
2. Cable for starter battery (+)

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

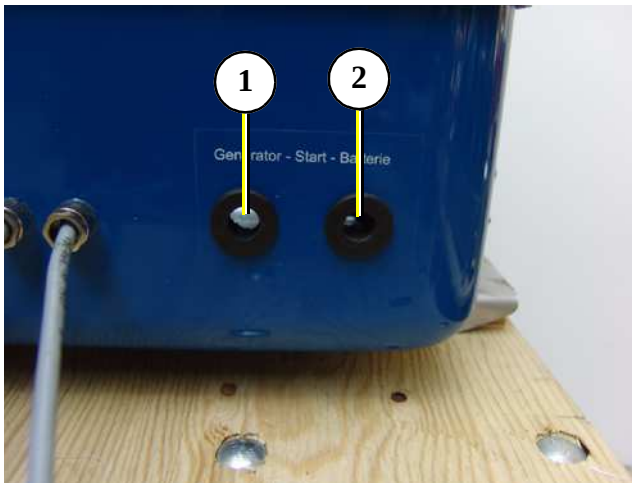



Fig. A.3.6-1: Cable for starter battery

**Service battery cables**

At the front of the sound cover is also the withdrawal for the cable for the service batteries.

1. Passage for service battery (-)-cable
2. Passage for service battery (+)-cable

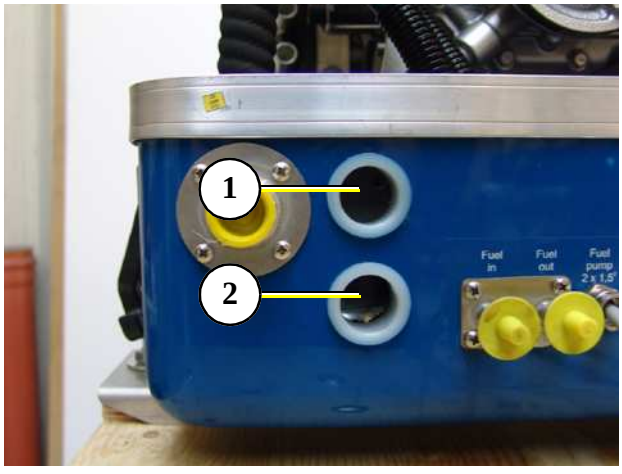



Fig. A.3.6-2: Service battery cables

### 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. Fuel pump
2. Remote control panel
3. VCS
4. Shunt measurement (clamp 9+10)
5. Voltage sense (clamp 7+8)

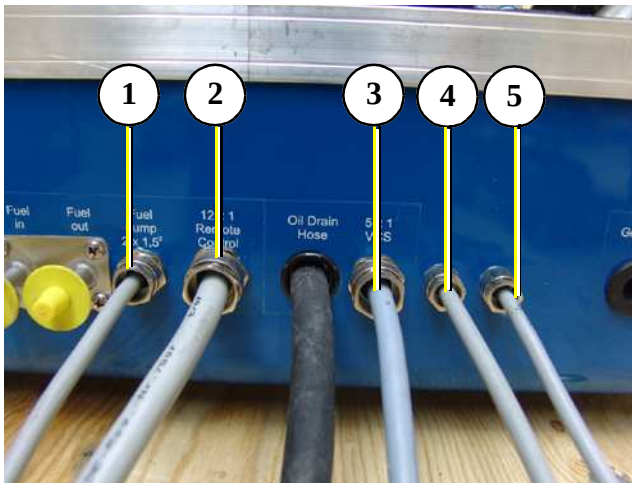



Fig. A.3.6-3: Electrical connections

### 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.

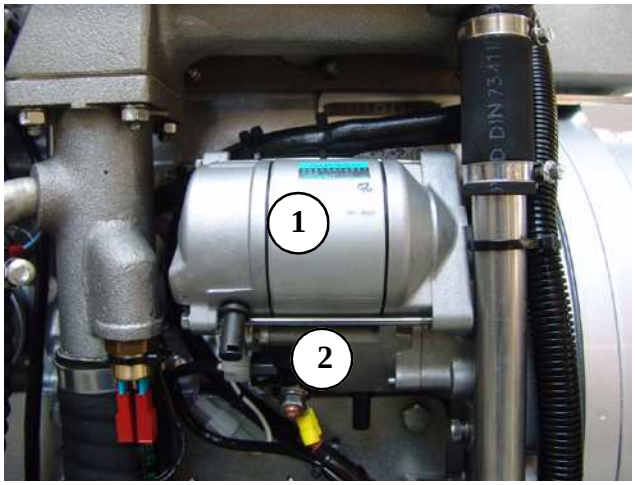



Fig. A.3.6-4: Starter motor

### 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.

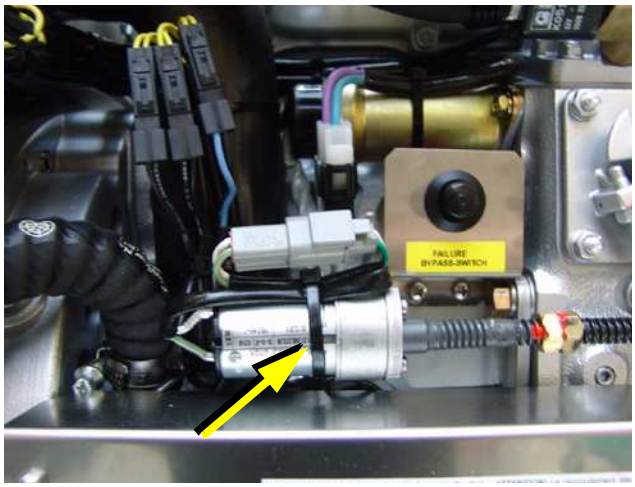


Fig. A.3.6-5: Actuator

### Alternator

All Panda generators from Panda 6.000 are provided with its own charge system for the 12V DC mains. This alternator is powered over a v-belt together with the internal cooling water pump.

The 12V charge system may be used only for the generator-own starter battery.

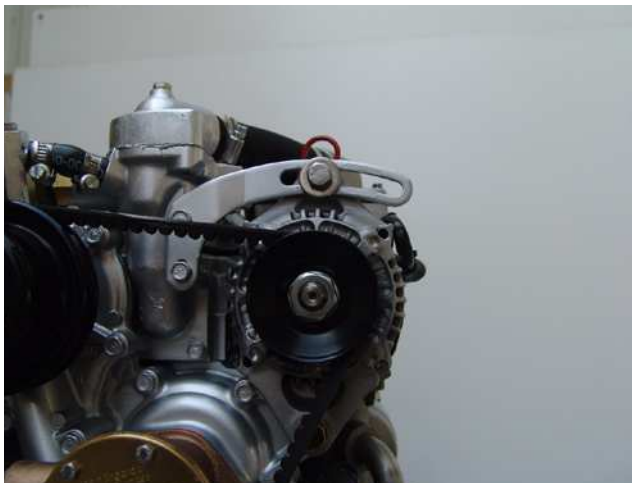


Fig. A.3.6-6: DC-alternator

### Charge control for DC-alternator

The voltage regulator for the 12V DC-alternator is on the back of the air suction housing. The housing is formed for cooling purposes. The voltage regulator may not be covered from the outside. The surface must be accessible for the cooling.

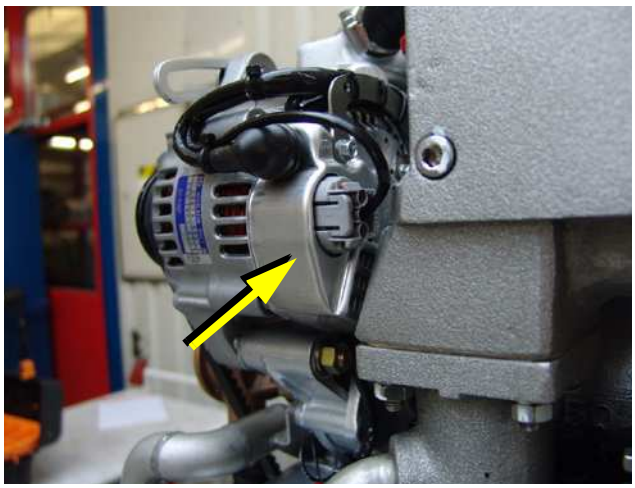


Fig. A.3.6-7: Charge control

### Rectifier

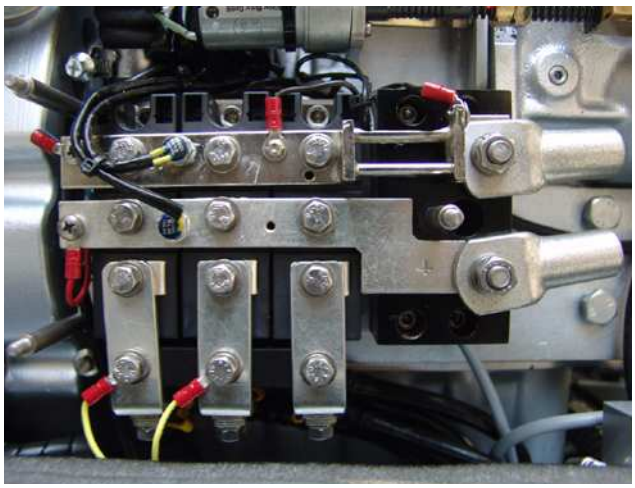


Fig. A.3.6-8: Rectifier

**Fuse for voltage sense**

1,6A

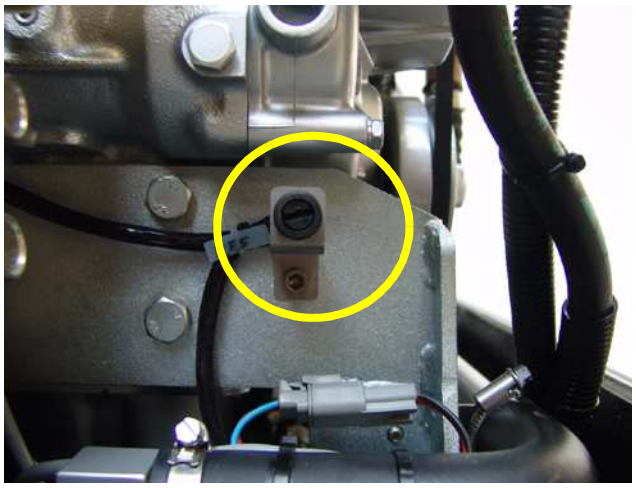


Fig. A.3.6-9: Fuse for voltage sense

**Terminal block for remote control cable with fuses and power relais**

01. Fuses

02. Relais

03. Fuses for remote control panel

see wiring diagram

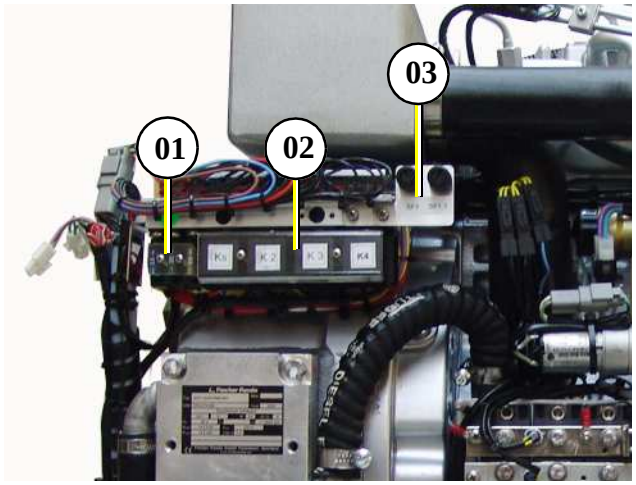



Fig. A.3.6-10: Terminal block

## A.3.7 Sensors and switches for operating surveillance

**Thermo-switch at cylinder head**

The thermo-switch at the cylinder head serves the monitoring of the generator temperature. All thermo-switches for the generators from Panda 6.000 upward are two-pole and laidout as "openers".

110℃

130℃

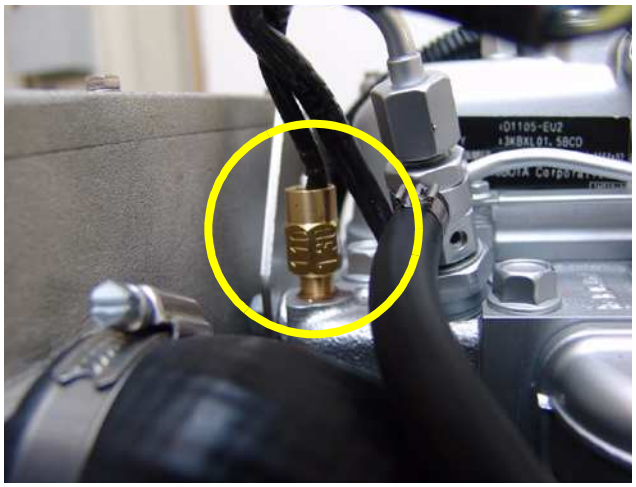


Fig. A.3.7-1: Thermo-switch at cylinder head

**Thermo-switch at Thermostat housing**

120/105℃

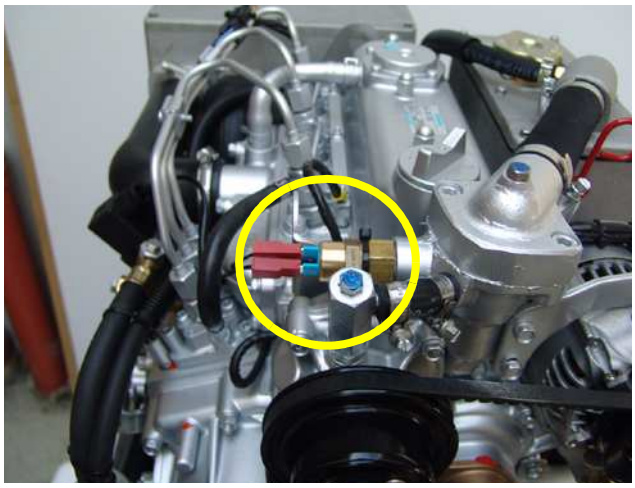


Fig. A.3.7-2: Thermo-switch at exhaust elbow

**Thermo-switch at exhaust connection**

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

98/83℃

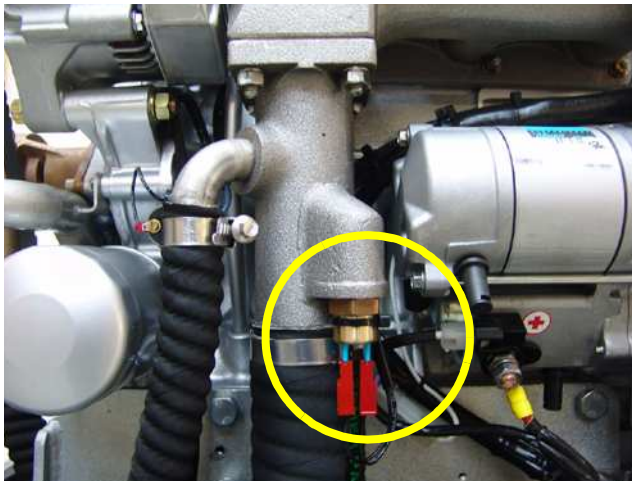


Fig. A.3.7-3: Thermo-switch at exhaust connection

**Thermo-switch coil**

1. Thermo-switch coil 4x130℃
2. Generator housing
3. Thermo-sensor NTC 981S

(for measuring)

Fig. A.3.7-4: Thermo-switch coil

**Thermo-switch on the (-)- connection bar**

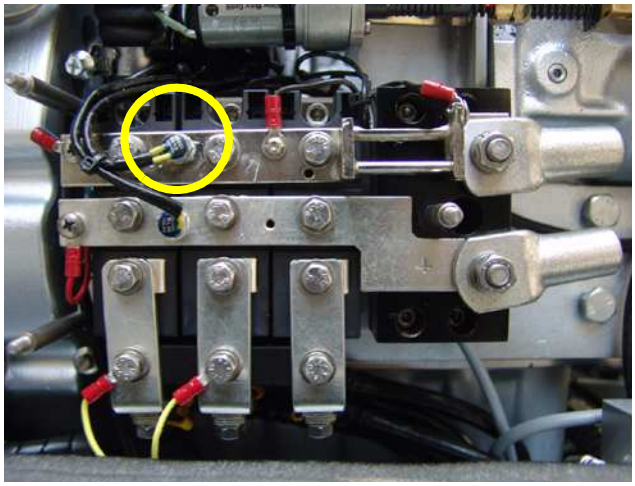


Fig. A.3.7-5: Thermo-switch on the (-)-connection bar

**Thermo-switch on the (+)-connection bar**

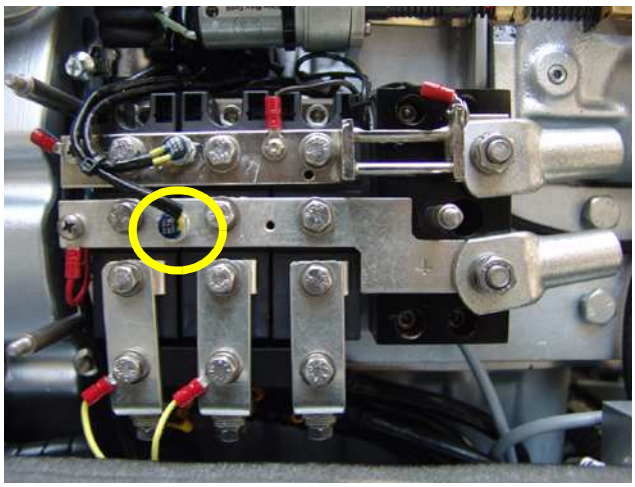


Fig. A.3.7-6: Thermo-switch on the (+)-connection bar

**Thermo-switch on the rectifier block**

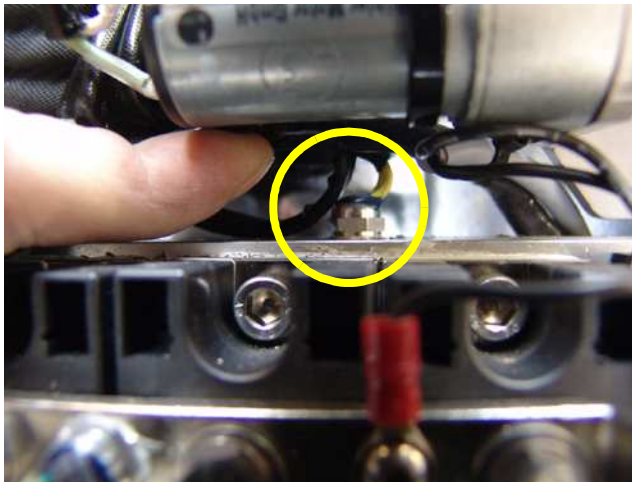


Fig. A.3.7-7: Thermo-switch on the rectifier block

**Oil pressure switch**

In order to be able to monitore the lubricating oil system, an oil pressure switch is built into the system. The oil pressure switch is on the back of the engine (before the electrical starter).

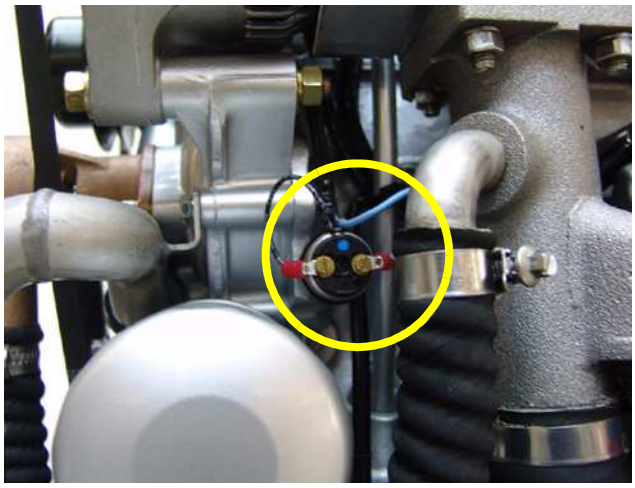


Fig. A.3.7-8: Oil pressure switch

**Failure bypass switch**

The failure bypass switch offers the possibility of starting the generator if the electrical control switched off due to an error in the cooling system by overheating.

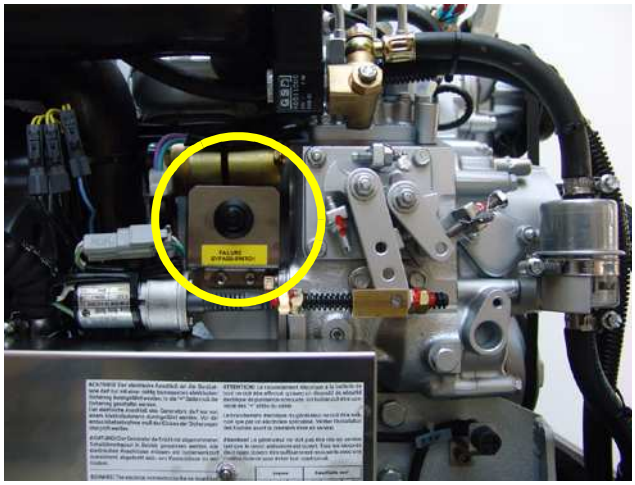


Fig. A.3.7-9: Failure bypass switch

## A.3.8 Components of the 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.

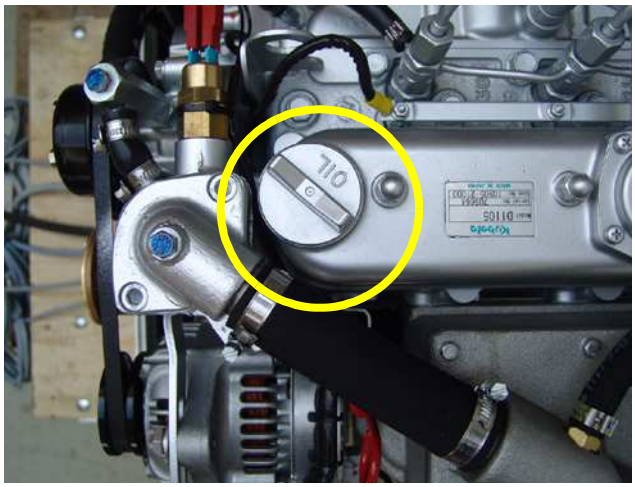



Fig. A.3.8-1: Oil filler neck

### 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.

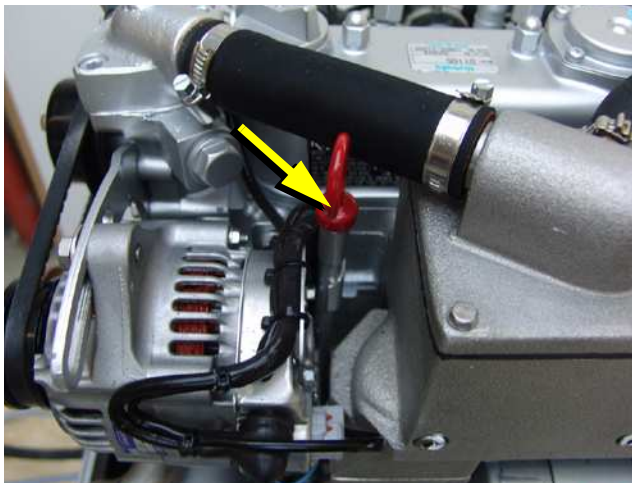


Fig. A.3.8-2: Oil dipstick

### Oil filter

The oil filter should be exchanged with an oil change.

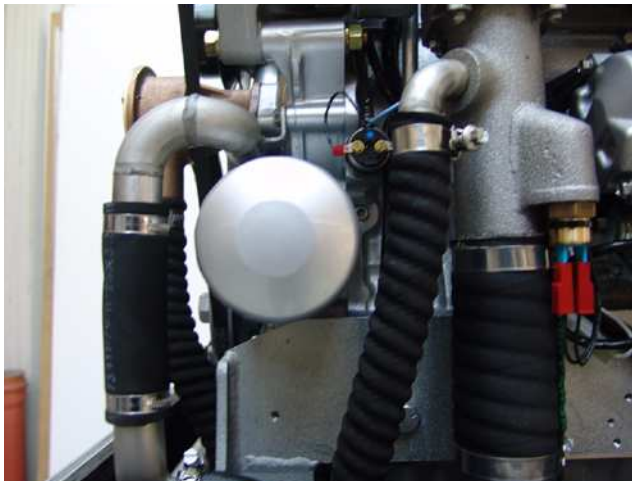


Fig. A.3.8-3: Oil filter

### 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!

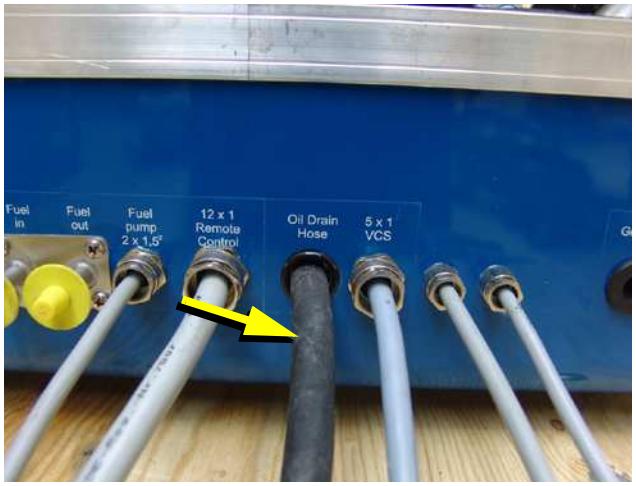



Fig. A.3.8-4: Oil drain hose

## A.3.9 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.


Fig. A.3.9-1: VCS

**Battery monitor**

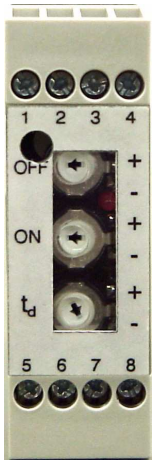



Fig. A.3.9-2: Batrtery monitor

# A.4 Operation Instructions

## A.4.1 Preliminary remark

**Pre-heating the diesel motor**

The motor must be pre-heated, if the diesel motor is designed as a "pre-combustion chamber motor" for indirect fuel injection. A quick glow fitting is used for all Kubota-diesel motors. This glow fitting may only be used for a maximum of 20 seconds without a pause. A pre-glow period of 5 - 6 seconds suffices for ambient temperatures above 20°C (plus). For lower temperatures the preglow period should be increased.

**Heat button**

*sample picture*

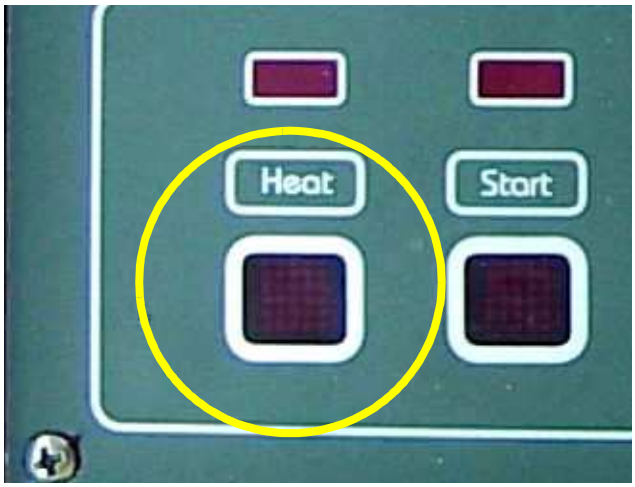



Fig. A.4.1-1: Heat button

**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.4.2 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 off the ambient temperature. See section F.5, “Engine oil,” on Page 119. Engine oil amounts see section F.2, “Technical Data Engine,” on Page 116.*

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.

## A.4.2 Daily routine checks before starting (Forts.)

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.

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 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.4.3 Starting Generator- see remote control panel datasheet

## A.4.4 Stopping the Generator- see remote control panel datasheet

## A.4.5 Starting the Generator by a „Failure bypass switch“

There is a "pressure switch" at the terminal block. Faults (e.g. caused by overheating) can be manually overcome by means of this switch. The generator can be started by using the remote control panel. The operating temperature can be reduced for a short period of time (without stress of course), so that the fault switch returns to the original position should overheating cause the generator to shut down because of overheating.

**ATTENTION: - Before using the failure bypass switch, it is important to check the oil level, since the oil gauge is deactivated by the switch. For a further reason it is important to switch off the generator electrical load before the generator is shut down:**

Before stopping the generator it is highly recommended that electrical devices (e.g. refrigerating compressors, air conditioning compressors etc) are switched off, because the voltage drops as the rotational speed (rpm) decreases as the engine comes to a halt.

(Also see information regarding voltage control with automatic shut-off for protection of load when over or undervoltage occurs).

This is also the case when the generator is started when load is switched on.

Normally the generator will no longer excitate if a certain amount of base load is stepped up. The electrical load should also be shut-off before starting the generator.

If started under electrical load, the engine will still run but the generator will not generate the proper voltage (or even no voltage) since the stator windings do not have the chance to reach full excitation. Electrical units which are switched on in this condition could possibly be damaged (special caution should be practised with electric motors to avoid burnout).

**Failure bypass switch**

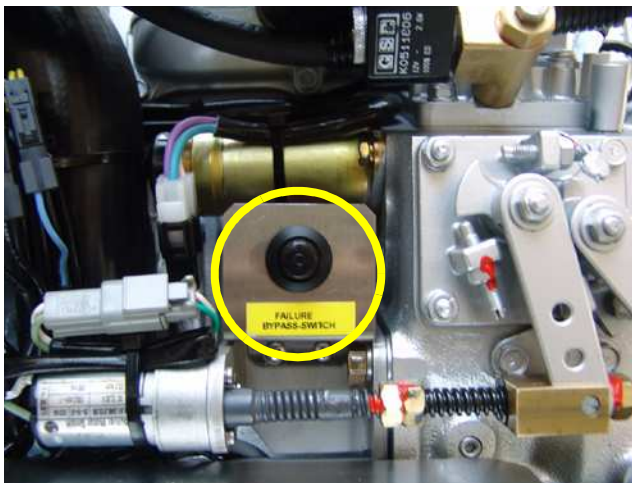



Fig. A.4.5-1: Failure bypass switch

Blank

# B. Installation Instructions

## B.1 Placement

### B.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 genset cannot overheat.

High temperature of the intake air decline the power of the genset 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 pos sible, the temperature in the engine room should not be higher than 15℃ in relation to the o utside temperature.

### B.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 genset is "free" downward, the combustion air can be sucked in unhindered.

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

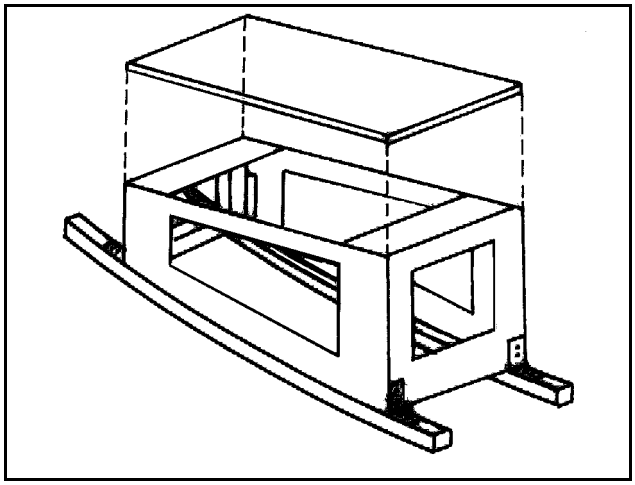


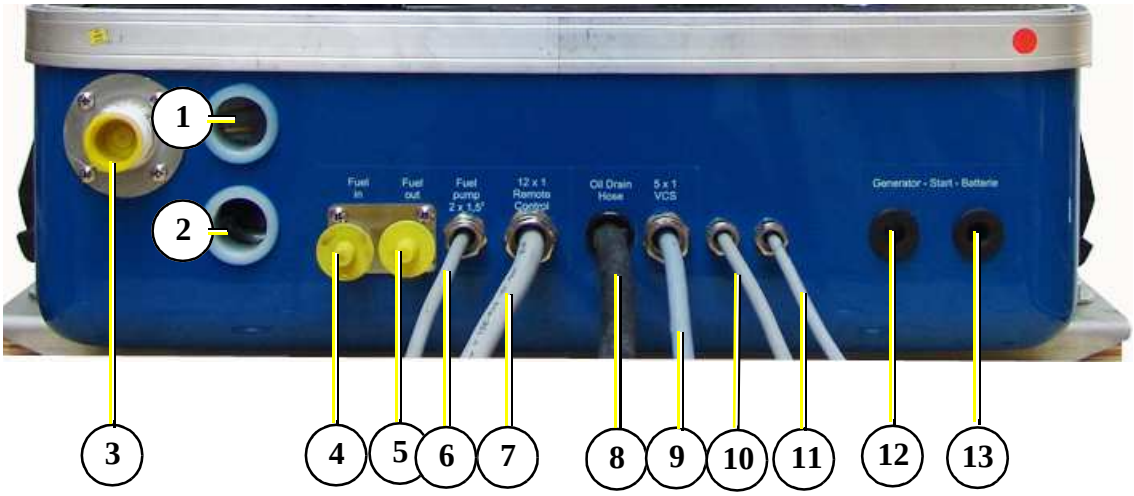
Fig. B.1.2-1: Convenient base

## B.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.

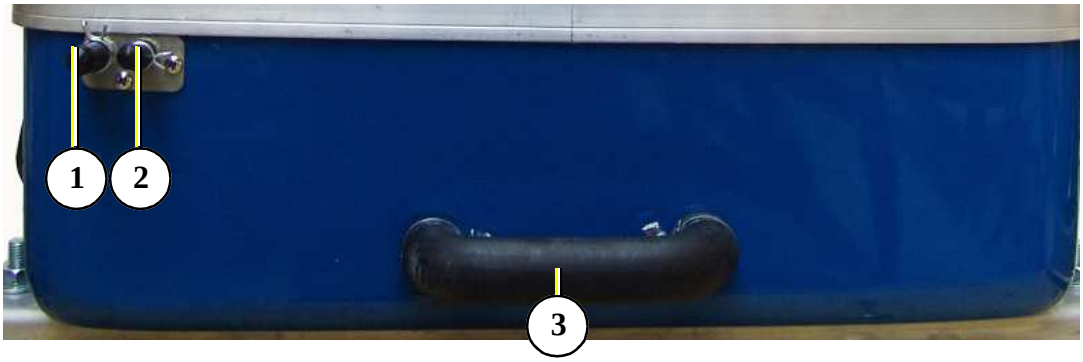
**All electrical connections, cable types and sizes must comply to the appropriate regulations. The supplied cables are rated for ambient temperatures up to 70℃ (160℉). If the cables are required to meet higher temperature requirements, they must be run through conduits.**

**ATTENTION! Before working (installation) on the System read the section see “Safety Precautions” on page 10 in this Manual.**




1. Passage for service batterie cable
2. Passage for service batterie cable
3. Raw water intake
4. Connection fuel IN
5. Connection fuel OUT
6. Cable for fuel pump
7. Cable for remote control panel
8. Oil drain hose
9. Cable for VCS
10. Cable for measuring shunt (clamp 9+10)
11. Cable for voltage sense (clamp 7+8)
12. Cable for starter battery minus (-)
13. Cable for starter battery plus (+)

Fig. B.2.0-1: Connections




1. In-flow from external cooling water expansion tank
2. Return to external cooling water expansion tank
3. Connection external ventilation valve

Fig. B.2.0-2: Connections

# B.3 Cooling System Installation - Raw water

## B.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 gensets (corrosion protection)“ is to be considered.

## B.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!

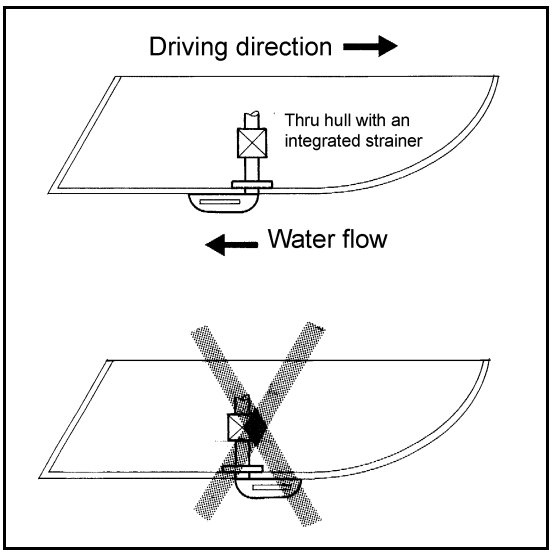



Fig. B.3.2-1: Thru/vessel fitting

## B.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 1, “Diameter of conduits,” on page 111.**

## B.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 generator (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, raw water runs into the sound cover of the genset. 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. Raw water filter
2. Water cock
3. Hull inlet

Make certain that the raw water filter lies above the water level, otherwise with cleaning water can penetrate by the hull inlet.

An external pre-pump can relieve the impeller.

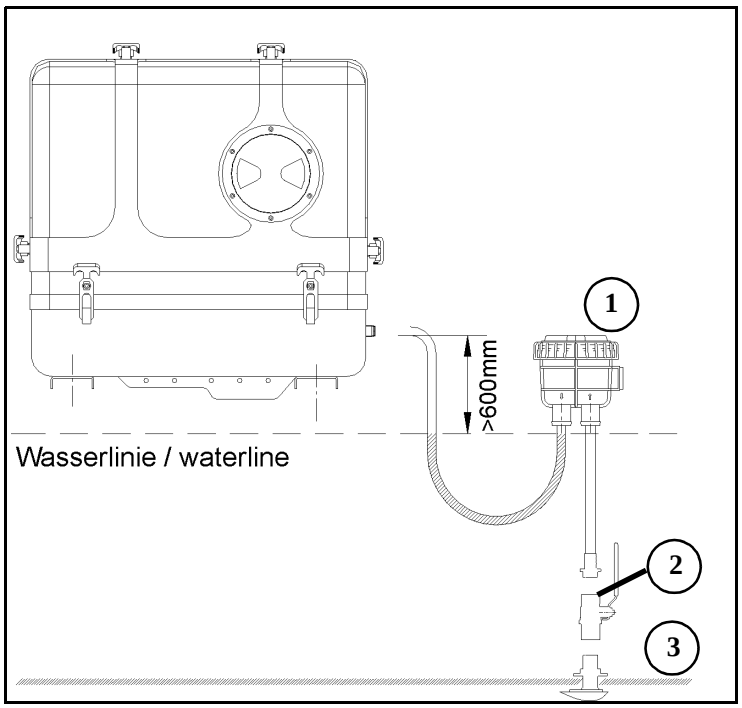



Fig. B.3.4-1: Raw water filter

## B.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 raw water 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!

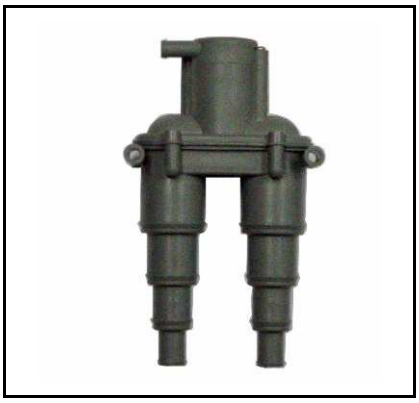
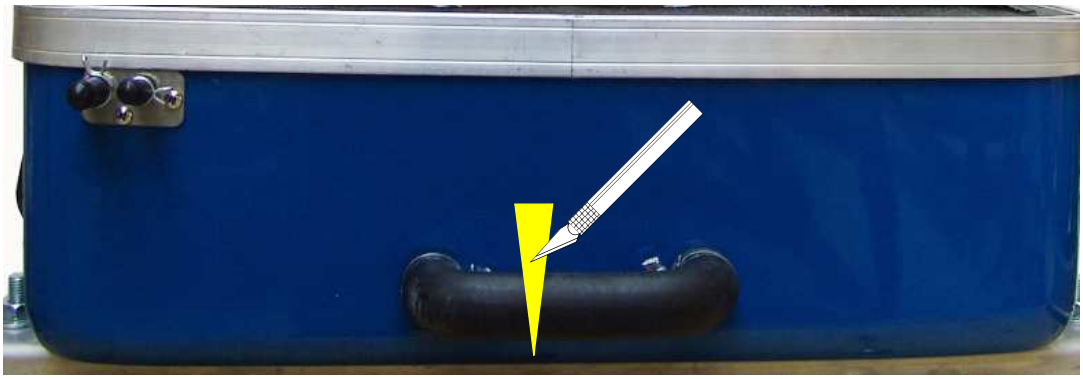


Fig. B.1: External ventilation valve



Cut the hose for the external vent valve...

Fig. B.3.5-1: External ventilation valve

...and bent it upwards.

Both hose ends must be led out outside of the sound cover to one point, if possible 600mm over the waterline in the midship line. The valve is connected at the highest place with the two hose ends.

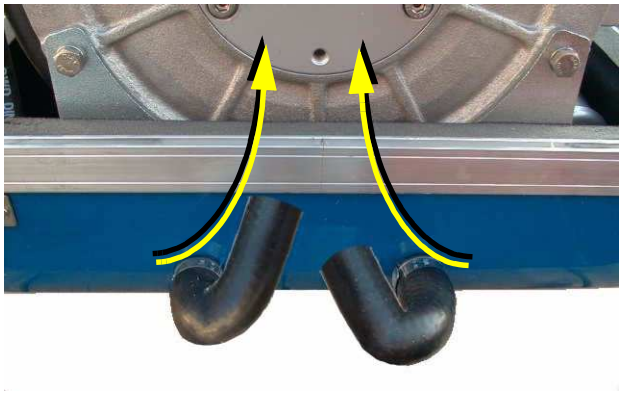
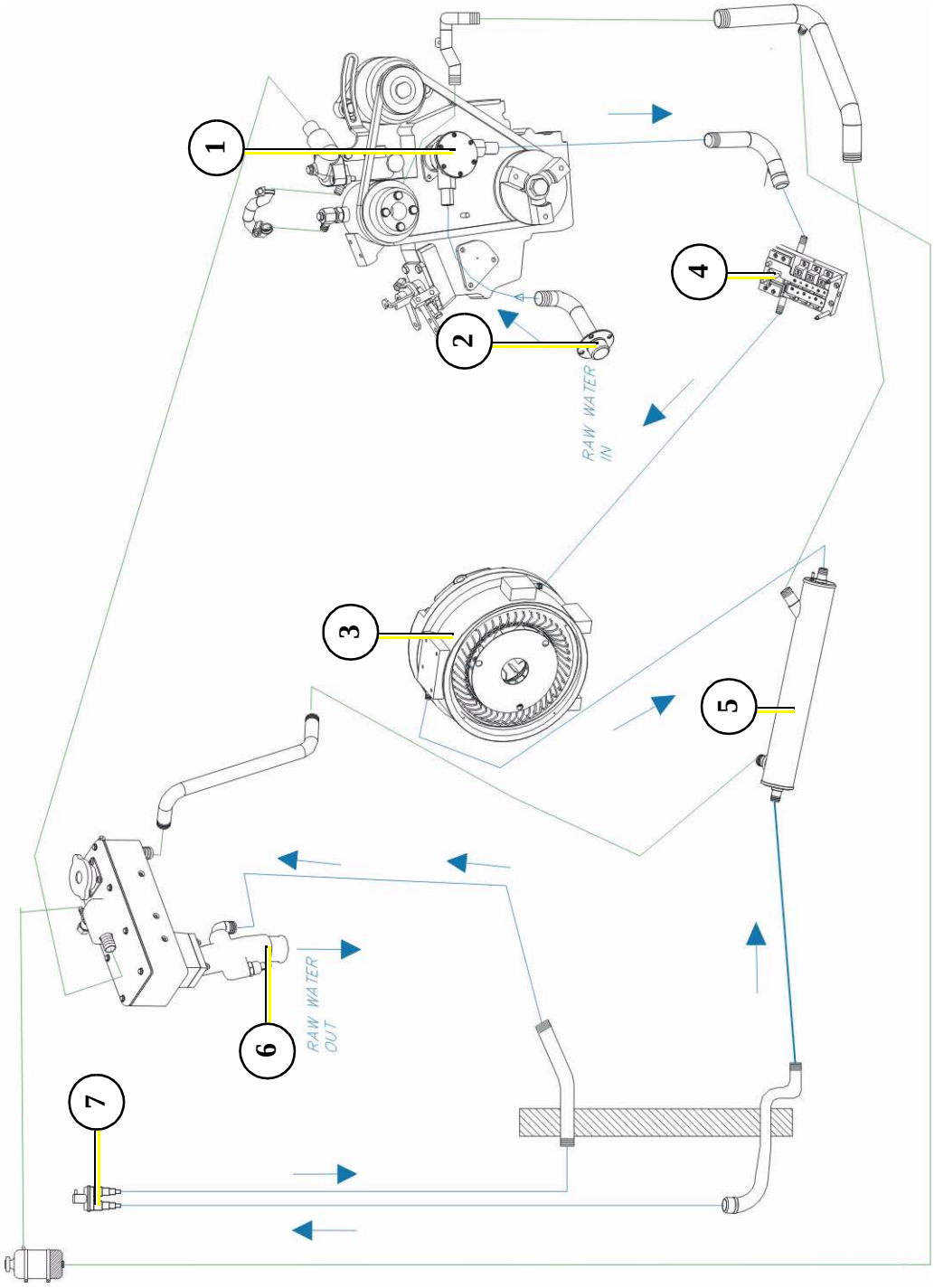


Fig. B.3.5-2: External ventilation valve

## B.3.6 Raw water cooling (Heat exchanger)




1. Raw water pump
2. Raw water in
3. Raw water-cooled housing with coil
4. Rectifier
5. Heat exchanger
6. Raw water out
7. External ventilation valve

Fig. B.3.6-1: Raw water cooling system

# B.4 The Freshwater - Coolant Circuit

## B.4.1 Position of the external Cooling Water Expansion Tank

The Panda generator is normally supplied with an additional, external cooling water expansion tank. This tank must be installed in such a way that its lower edge is at least 500mm more highly arranged than the upper edge of the sound cover.

If this 500mm should be fallen below, i.e. the cooling water expansion tank is lower installed, very large problems can occur with filling and ventilating. Extend and displace the hose lines to the outside or possibly even up to the deck.

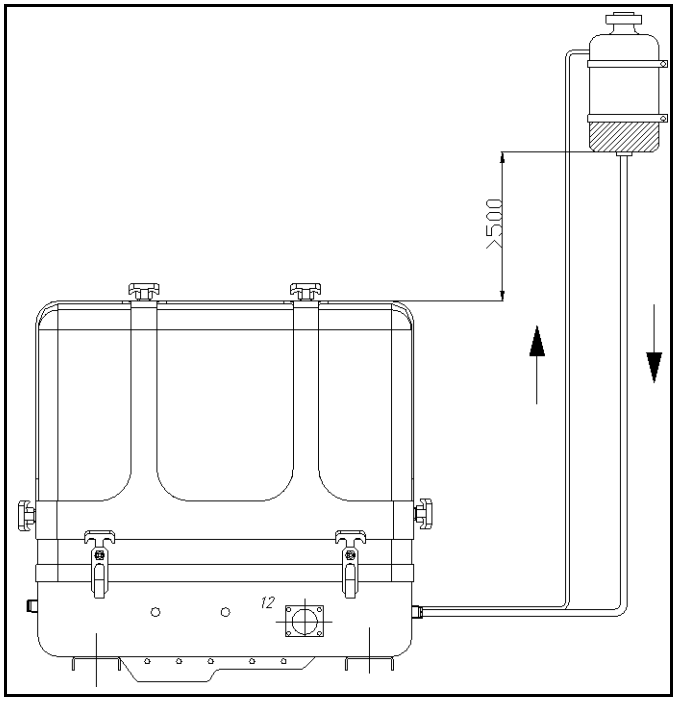



Fig. B.4.1-1: External cooling water expansion tank

**ATTENTION! The external cooling water expansion tank may be filled only up to the lower edge of the lower tension tape (see note "max") in the maximum filling level in cold condition.**

## B.4.2 Ventilation at the first filling of the internal cooling water circuit

**1. For the preparation of filling the following steps are to be undertaken:**

a. Open the cooling water cap on the housing of the water-cooled exhaust elbow union,


Fig. B.4.2-1: Cooling water filler neck

b. Ventilation screw on the thermostat housing,

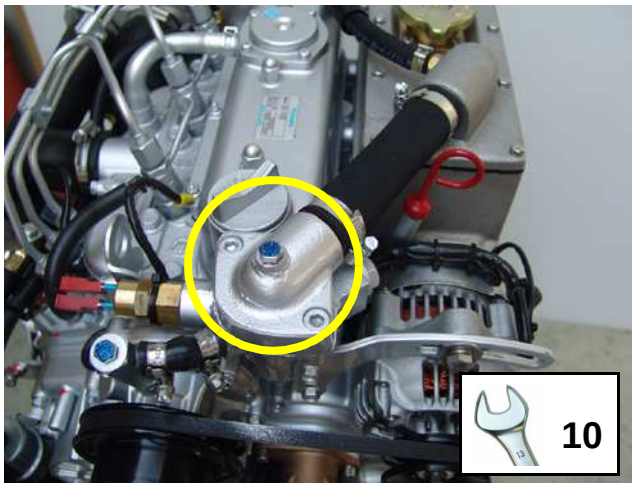



Fig. B.4.2-2: Ventilation screw -thermostat housing

c. Ventilation screw on the pipe socket of the internal cooling water pump.

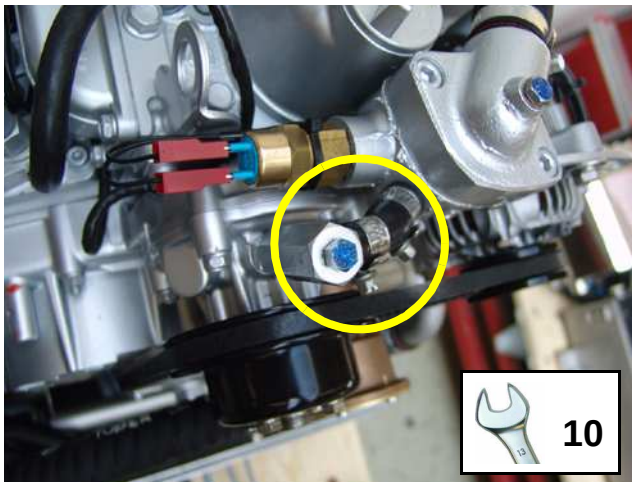



Fig. B.4.2-3: Ventilation screw - water pump

## 2. Filling the cooling water circle

a. Fill in the prepared mixture (cooling water with anti-freeze protection according to the intended mixture) at the filler neck at the housing of the water-cooled exhaust elbow union slowly so long, until cooling water leaks at the de-aerating screw of the thermostat housing.

b. Afterwards the cooling water cap must be screwed on firmly. Further both de-aerating screws at the thermostat housing and at the internal cooling water pump must be closed.

Fig. B.4.2-4: Cooling water filler neck

**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. Fill up the external cooling water expansion tank with coolant.

**ATTENTION: „maximum fill level = „max.“-mark.**

The cover of the external expansion tank temporary must be opened (all other closures are now closed!).

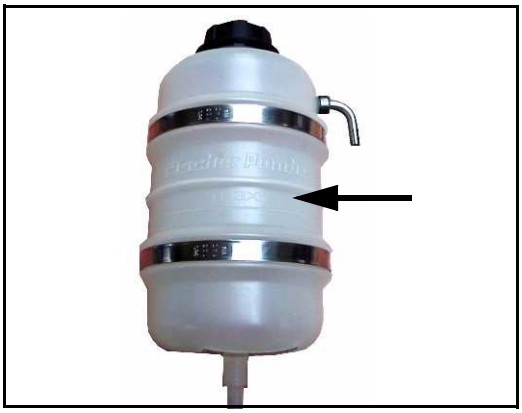


Fig. B.4.2-5: External cooling water expansion tank

**d. Start the generator**

After filling the generator this must be started. During this first phase of start-up, the generator may not be loaded. Switch the generator off after max. 2 minutes of operation!

**3. First de-aerating**

The cooling water circuit of the generator must be de-aerated now by multiple repeating of the de-aerating procedure. During the entire procedure the external cooling water expansion tank remains opened (i.e. the cap must be removed).

After the first stopping of the the generator wait about one minute until the air in the cooling water can be drop off and raise to the highest point (ventilation point).

Now open all three ventilation points one after another as long as cooling water exit. Then the closure screw must be closed immediately. (Turn on only lightly to treat the thread.)

Pay attention that the external cooling water expansion tank is filled with enough cooling water during the de-aerating. (If necessary refill over and over.)

One de-aerating step will be last as a rule max. 2 minutes and following steps contained:

1. The generator runs approx. 1 minute.
2. Stop the generator.
3. Hold on one minute for drop of air.
4. The collected air is led out over the two de-aeration points.

The ahead described de-aerating process must be repeated as long as after the stopping and drop off air none air exit out of the de-aerating ports, only cooling water.

**4. Again de-aerating process in the few days after the first startup**

Also after the first implementing a small amount of air can be reside in the cooling circuit. To ensure an imaculate und actual operating of the cooling system the de-aerating process must be repeated casual in the next few days (if necessary weaks). Small amount of air will be still exit out of the de-aerating openings especially if the generator stood still for a long time.

**ATTENTION! During the de-aerating process it must be checked again and again if the cooling water is indeed circulating. If air bubbles established in the internal cooling water pump, it could be, that the cooling water circuit is not circulate. Then the generator would be warming very fast and switched off by overheating.**

## B.4.3 Pressure test for control of cooling water circuit

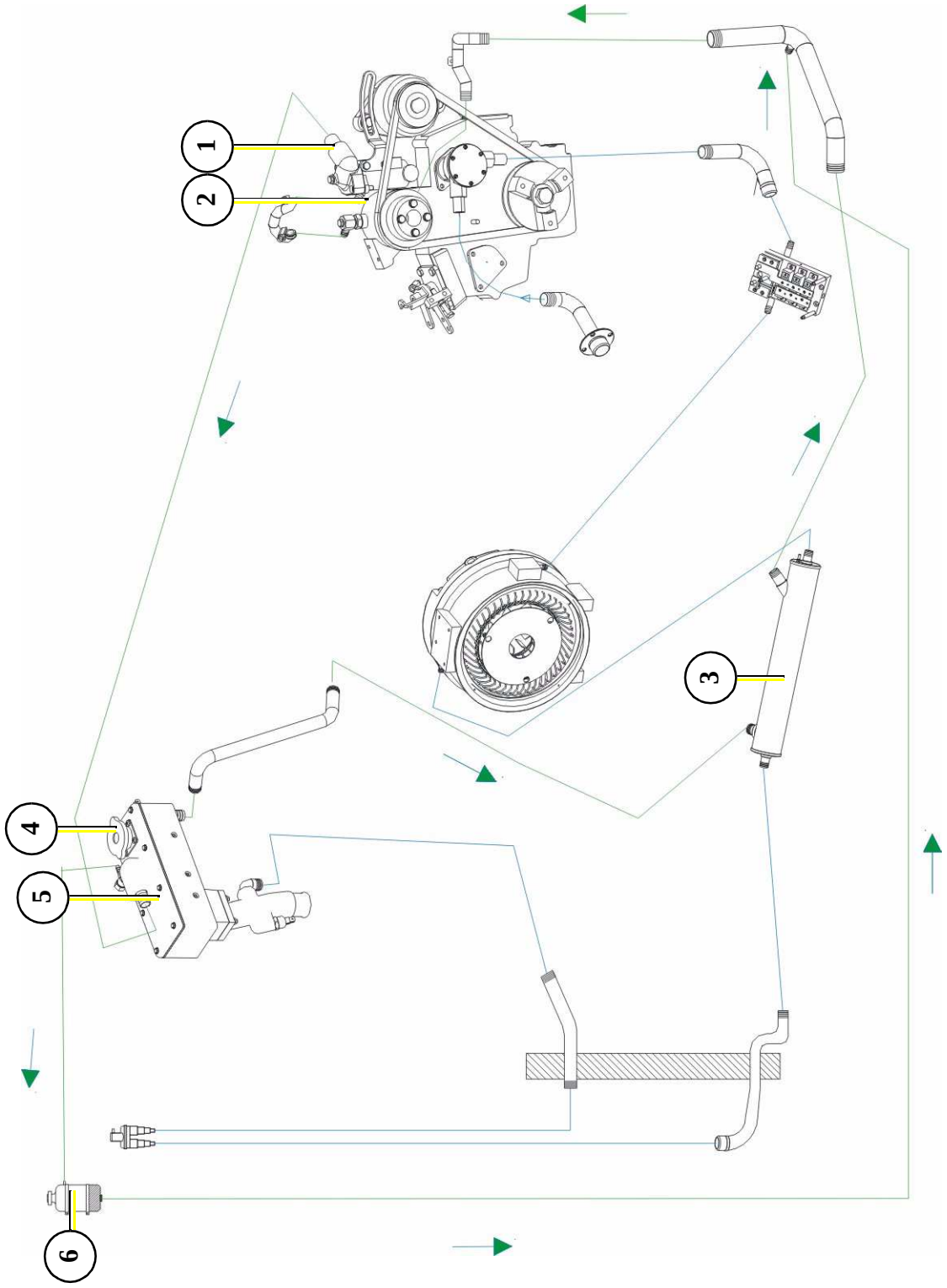
Check with the hand if a temperature difference exists whether between cooling water in-flow and cooling water return.

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.

## B.4.4 Scheme for freshwater circuit at two circuit cooling system




1. Thermostat housing
2. Internal water pump
3. Heat exchanger
4. Freshwater in
5. Freshwater-cooled exhaust elbow
6. External cooling water expansion tank

Fig. B.4.4-1: Fresh water cooling system

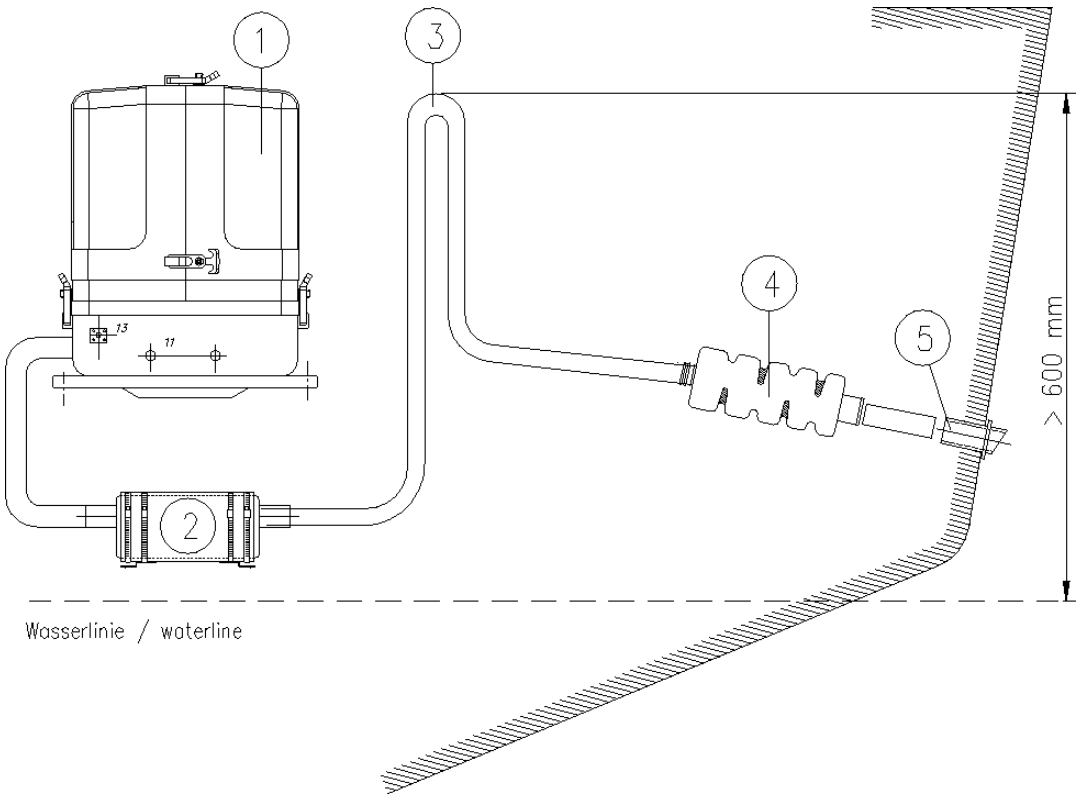
## B.5 Watercooled Exhaust System

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.

### B.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 *Table 1, "Diameter of conduits," on page 111.***




1. Generator
2. Water lock
3. Goose neck
4. Silencer (optional)
5. Hull inlet

Fig. B.5.1-1: Installation stanrd exhaust system - example

## B.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 raw water outlet is very short, the hose can be further reduced to 1" (25mm) ID.

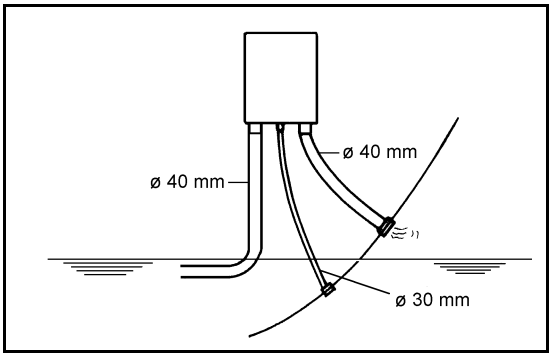



Fig. B.5.2-1: Exhaust/water separator

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

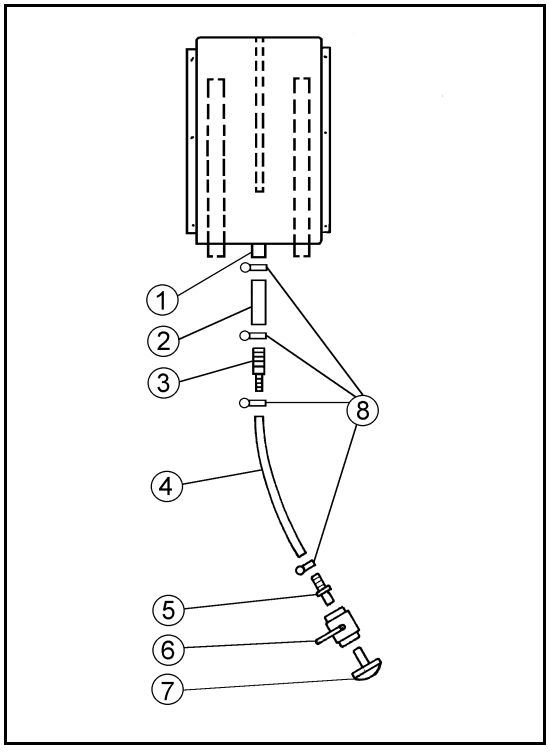
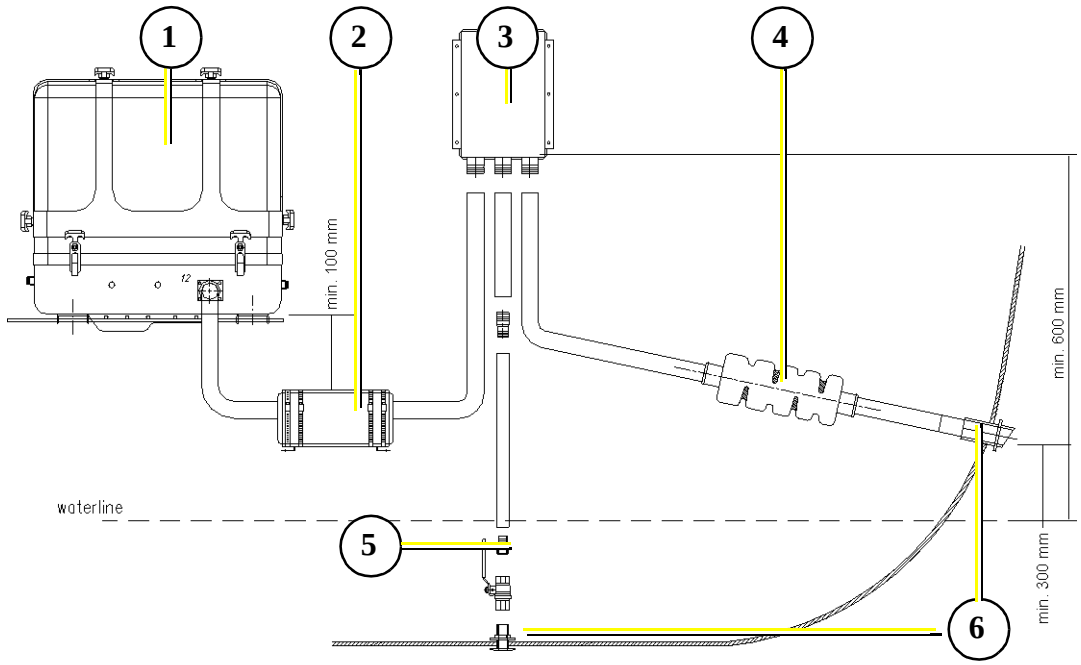



Fig. B.5.2-2: Exhaust/water separator

## B.5.3 Installation exhaust/water separator

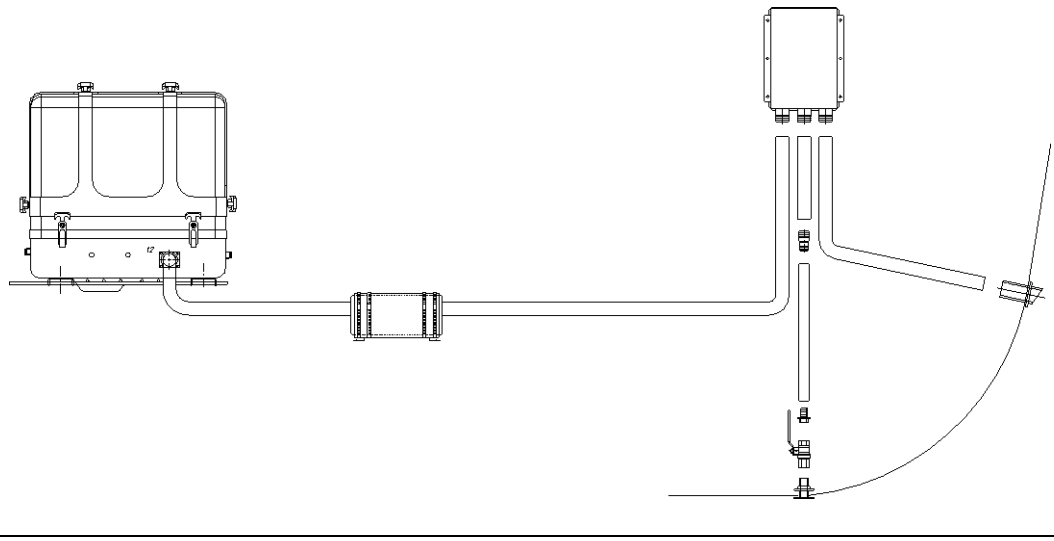
If the exhaust/water separator was sufficiently highly installed, a goose neck is no longer necessary. The exhaust/water separator fulfills the same function. If the "Supersilent" exhaust system were installed correctly, the generator will not disturb your boat neighbour. The exhaust noise should be 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. Silencer / Waterlock
3. Exhaust/water separator
4. Silencer (optional)
5. Sea valve
6. Hull outlet

Fig. B.5.3-1: Installation exhaust/water separator - example

If the thru-hull exhaust outlet has to be mounted far from the generator, an exhaust-water separator must definitely be installed. The raw 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. B.5.3-2: Unfavorable installation - example

# B.6 Fuel System Installation

## B.6.1 General References

Inside the generator capsule itself, there is the fuel filter installed (Exception Panda 4500). 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:

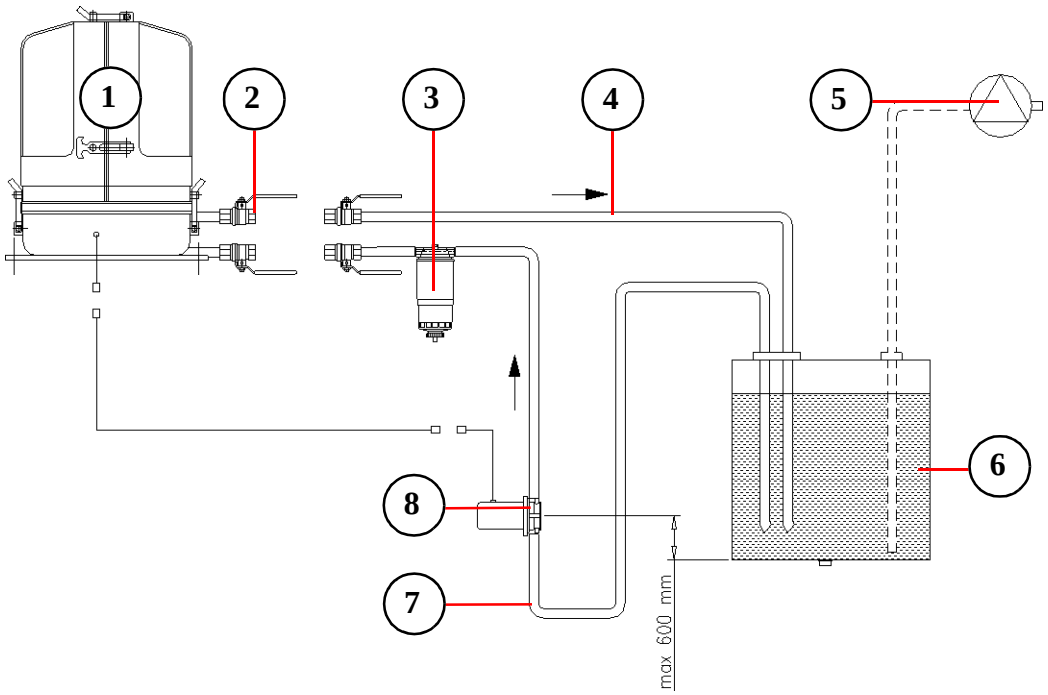
- Fuel supply pump (12V-DC)

- 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 stopcock
3. Fuel filter
4. Fuel return
5. Condensation water suction pump
6. Fuel tank
7. Fuel supply
8. Electrical fuel pump (12V-DC)

Fig. B.6.1-1: Installation fuel system - example

## B.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. B.6.2-1: Fuel pump

- Suction hight of the pump: max. 1,2m at 02, bar
- Diameter of fuel lines: Table 1, “Diameter of conduits,” on page 111.

## B.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.**

## B.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. B.6.4-1: Fuel filter

## B.6.5 Bleeding air from 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 air-bled after some time automatically. It is nevertheless essential to bleed the system as follows prior to the first operation (as all hoses are empty):

Switch main power switch on control panel "ON".

Push failure bypass switch and hold tight. The electric fuel pump has to be running audibly. By moving the failure bypass switch you can hear the solenoid valve of the generator starting and stopping (when the sound cover is taken off). After the fuel pump has been running 3 to 4 minutes because the failure bypass switch has been pushed down the bleeding screw of the solenoid valve has to be unscrewed. When opening the screw one has to carry on pushing the switch. To avoid fuel getting in the sound cover a piece of cloth or absorbent paper should be put under the connection. As soon as fuel is running out without bubbles the air bleeding screw can be screwed in again. Only now one can stop pushing the failure bypass switch.

Now the unit can be started by pushing the "START"-button. The unit should start after a short while. Should the unit not start one of the pipe union nuts of a injection hose has to be unscrewed and one has to try again to start the unit. After the unit has started the pipe union nut has to be tightened again.

Main power switch "OFF".

Fuel solenoid valve

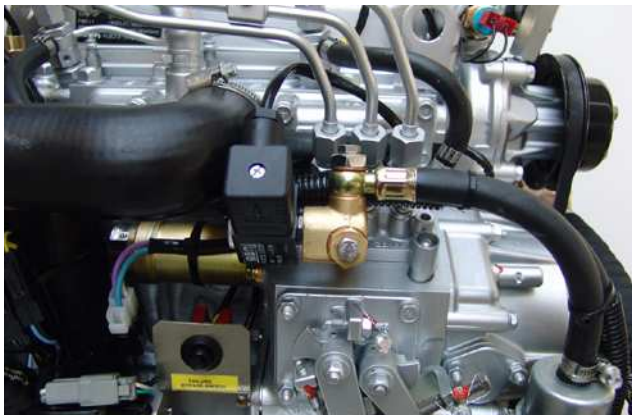


Fig. B.6.5-1: Fuel solenoid valve

## B.7 Generator 12V DC System-Installation

The Panda has its own dynamo to charge a 12V starter battery.

**It is recommended to install an additional starter battery for the generator.**

The generator is then independent from the remaining battery set. This enables you to start the genset at any time with its own starter battery even if the other batteries are discharged. A further advantage of a separate starter battery is that it isolates the generator's electric systemfrom the the rest of the boat's DC system, i.e. minus pole (-) is not conected electrically to Earth/Ground.

**The generator is then Earth/Ground free with regard to the rest of the boat.**

### B.7.1 Connection of the 12V starter battery

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

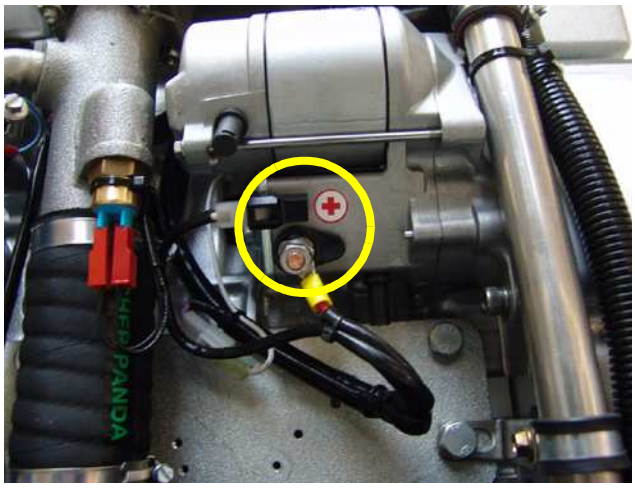



Fig. B.7.1-1: Connection positve battery cable

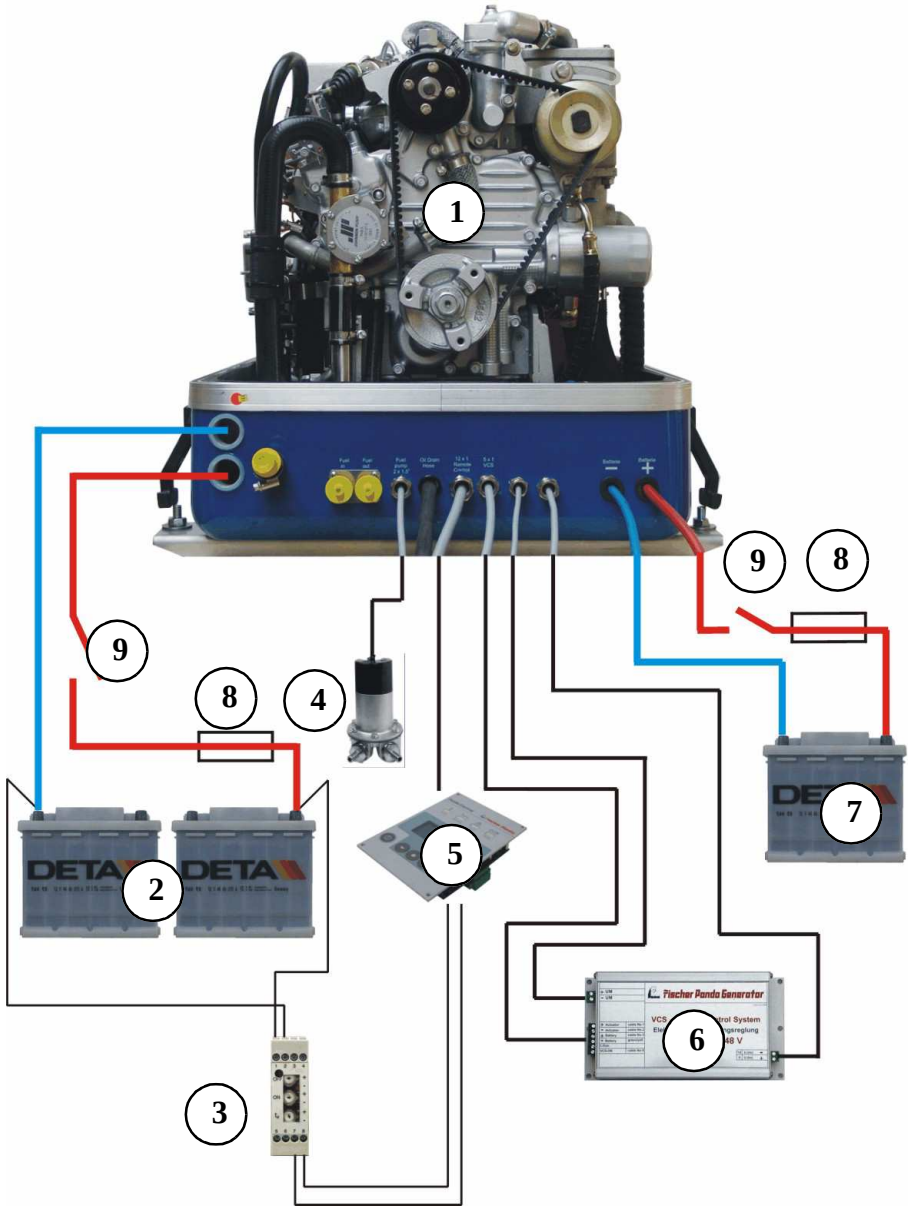
The negative (-) battery cable is connected to the engine foot.

Fig. B.7.1-2: Connection negative battery cable

## B.8 Generator DC System-Installation

**ATTENTION! Before the electrical system is installed, READ the SAFETY INSTRUCTIONS 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.**

### B.8.1 Installation Panda AGT 48V-system




1. Generator
2. Battery block 48V
3. Battery monitor
4. Fuel pump
5. Remote control panel
6. Voltage control VCS
7. Starter battery 12V
8. Fuse
9. Battery switch

Fig. B.8.1-1: Installation DC-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 Table 3, “Cable cross-section,” on page 111.)*

## B.9 Voltage Control System - See VCS datasheet

The VCS control is used for the adjustment of the number of revolutions of the engine and thus the voltage of the generator. It belongs to the accessories and is externally attached.

## B.10 Voltage controller

With a engine-operated generator set count always on the fact that through disturbances at the controlling of the diesel engine the control of the number of revolutions monitoring is lost. In this case the diesel engine could wind up without limitation and produce a voltage, which becomes substantially larger than the electrical load can process. This can destroy very expensive items of equipment. It must be take for granted that for the protection of the electrical load a voltage controller with isolating relays is used for a solid installation. The appropriate accessory components are available at Icemaster.

If it is about a duo combination generator, the voltage control for both output parts (single phase AC and three-phase AC) should be planned.

At different PANDA generators a voltage control is integrated. This voltage control affects only the diesel engine. If the rated voltage exceed approx. 15%, this voltage control is activated, as the diesel engine is turned off. This is only possible with the delay of some seconds, load could be damaged in the meantime. The only safe method for the protection of the electrical devices is the installation of an external voltage controller with separation contactor.

We recommend this measure with all reproduction and point out also that the generator manufacturer is not responsible for damage, which are caused by overvoltage at external devices.

Protect your valuable devices by an external voltage controller!

**Position of the external voltage controller**

Reasonable the external voltage controller is mounted in such a way it works not only for the generator but for all AC voltage supplies in the electrical system, also for shore power and inverter. In these cases usually a selector switch is intended, which can be determined, which voltage supply is switched to the electrical system. The voltage conteroller must be installed at the exit of the selector switch, thus in the electrical system.

### B.10.1Adjustment of the rated voltage

The voltage controller must be ordered for the appropriate rated voltage (12, 24, 32, 48, 72 V DC). Other voltage on request.

Changing between these voltages is not possible.

**Additional notes to the recommendation "External, electrical voltage controller"**

At Diesel engines count always on the fact that a diesel engine "revs up" due to special circumstances uncontrolled. This is the case if by damage to the system engine oil arrives into the sucking in way. This is possible at many engines by the crank case exhaust. A crank damage could cause for example that by overpressure too much oil is pressed into the crank case, so that this oil arrives into the sucking in way. The engine cannot switch off itself any longer. Usually then a damage to the engine is the result. It would be fatal, even if this damage to the engine were the cause of the destruction of all switched on electrical load, because uncontrolled revving up of the Diesel engine leads also to an extreme increase of the voltage. Only by an external voltage controller with separation contactor can be prevented such damage.

# C. Mode of Operation of the Generator

## C.1 Mode of Operation of Operating Surveillance

**Internal monitoring switches**

The generator is equipped about failure switches, which are indicated on the remote control panel, and also about failure switch, which switch-off the generator automatically without indicating a failure in the remote control panel:

The remote control panel supervised the following values. In the case of a disturbance the generator is switched off, in order to avoid damage to the genset:

1. Cooling water temperature at cylinder head, at exhaust manifold and exhaust connection
2. Coil temperature
3. Recttifier temperature
4. Oil pressure

The fault is transmitted, if one of these switches measures a value that exceeds the required value (all switches are openers). The current is switched off by the main relay. (Fuel magnet valve closes, the fuel suction pump is switched off, VCS is switched off).

The combustion engine possesses an oil pressure control switch, which switches the engine off if the oil pressure drops under a certain value.

The additional failure switch in the generator coil, it is not indicated at the remote control panel, interrupts directly the current supply to the main power relay. By this constellation it is guaranteed that the generator switches off in each case when an error is present.

This measure is, if possibly, a circuit at the remote control panel failed.

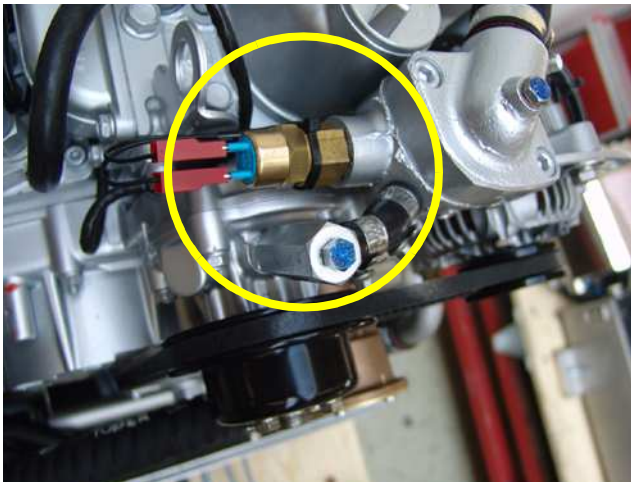
**Thermo-switch at cylinder head**

The thermo-switch at the cylinder head serves the monitoring of the generator temperature. All thermo-switches for the generators from Panda 6.000 upward are two-pole and laidout as "openers".

110℃

130℃

Fig. C.1-1: Thermo-switch at cylinder head

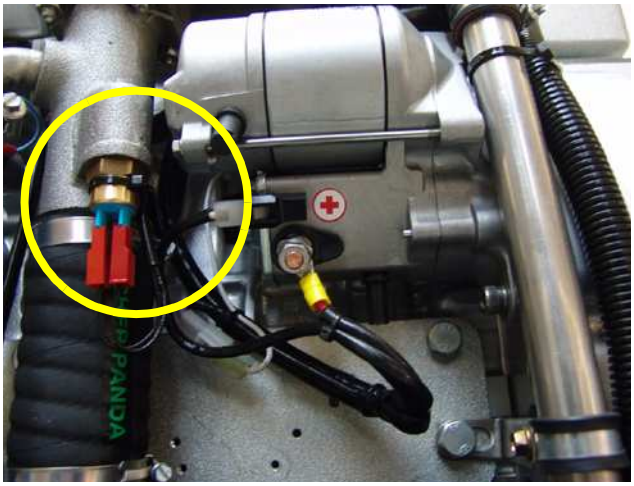


**Thermo-switch at thermostat housing**

**This thermo-swich is located at the thermostat housing and monitors the temperature of the fresh water circuit.**

**120/105℃**

Fig. C.1-2: Thermo-switch at exhaust elbow



**Thermo-switch at exhaust connection**

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

98/83℃

Fig. C.1-3: Thermo-switch at exhaust connection

**Thermo-switch coil**

1. Thermo-switch coil 4x130℃
2. Generator housing
3. Thermo-sensor NTC 981S

(for measuring)

Fig. C.1-4: Thermo-switch coil

**Thermo-switch on the (-)- connection bar**

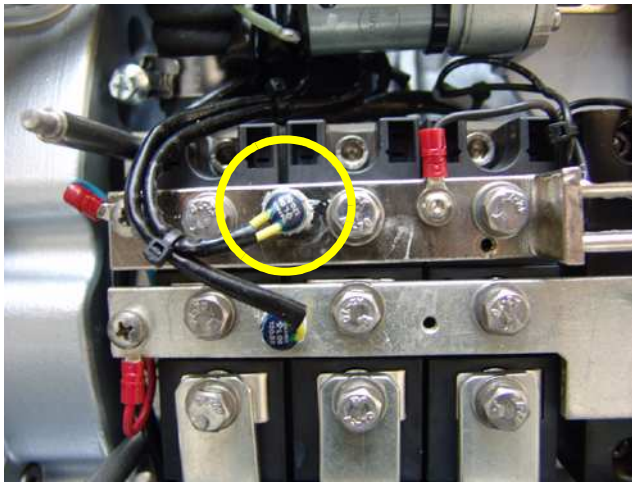


Fig. C.1-5: Thermo-switch on the (-)-connection bar

**Thermo-switch on the (+)-connection bar**

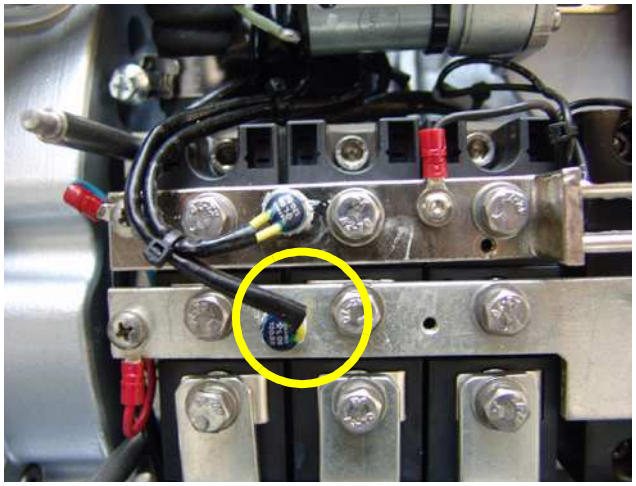


Fig. C.1-6: Thermo-switch on the (+)-connection bar

**Thermo-switch on the rectifier block**

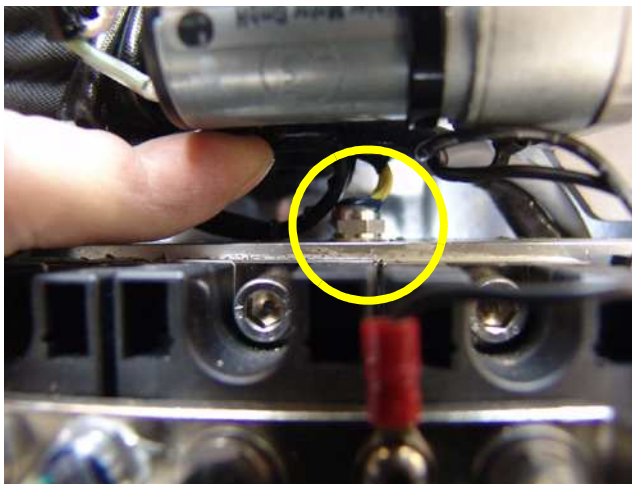
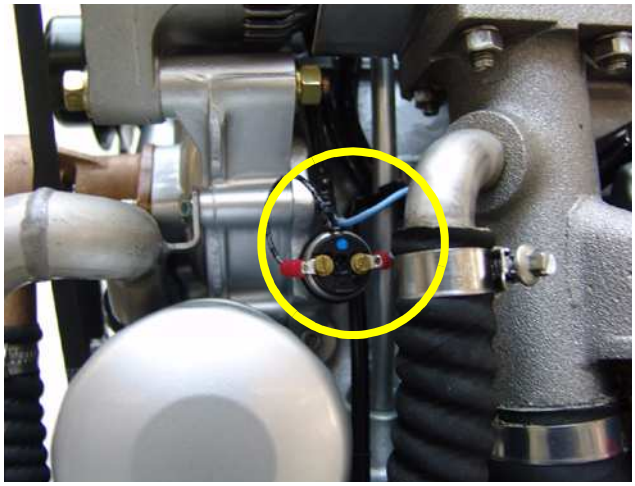


Fig. C.1-7: Thermo-switch on the rectifier block



**Oil pressure switch**

In order to be able to monitore the lubricating oil system, an oil pressure switch is built into the system. The oil pressure switch is on the back of the engine (before the electrical starter).

Fig. C.1-8: Oil pressure switch

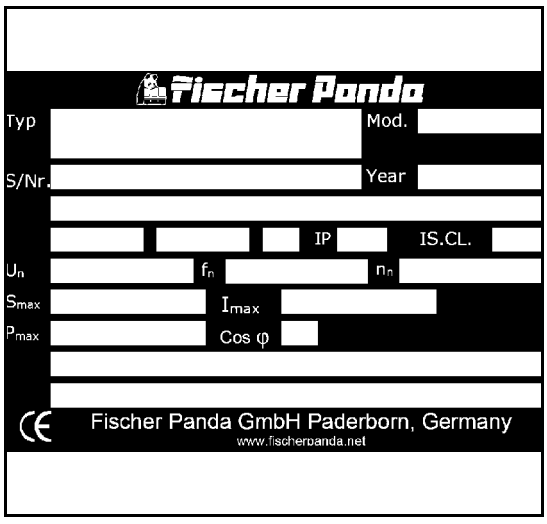
## C.1.1 Regulation of the generator voltage by the VCS

The output voltage of the generator is permanently measured by the VCS (approx. 20 times per second!). As soon as by a load the voltage is affected, the speed regulation provides to adapt to the changed power demand by appropriate change of the engine speed.

Not only by the excitation of the generator it is worked against to the initiating voltage drop, but also by the raising of the number of revolutions whereby the drive potential improves.

## C.1.2 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 housing.

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.

Fig. C.1: Identification plate

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).

### C.1.3 Use the failure bypass switch for the fuel delivery

**Failure bypass switch**

Switch the "ON" at the control panel. Functional elements must shine.

Press failure bypass switch and hold. The electrical fuel pump must run audibly. The pressing of the failure bypass switch become audible switching on and off of the fuel solenoid valve at the generator (with removed sound cover).

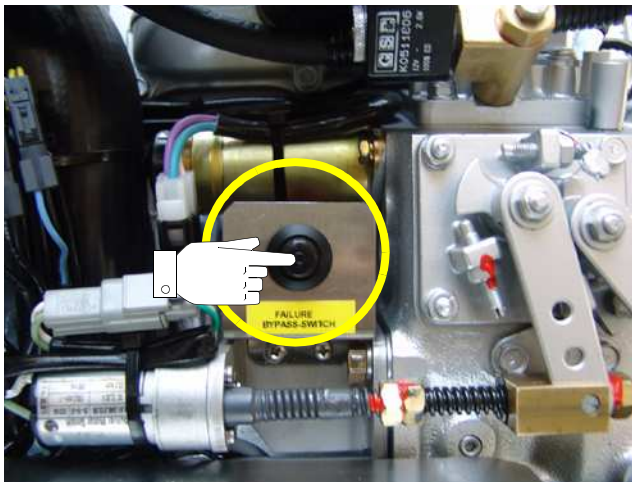



Fig. C.1.3-1: Failure bypass switch

## C.2 Operation of the generator with HTG generator

### C.2.1 General references

Beside the alternating current gensets ICEMASTER supplies also the super-compact High tech battery load gensets from the series of PANDA AGT in sound-insulated construction, which represent a very interesting alternative solution in a DC-AC power technology merged for generation of current within the mobile range.

The new HTG generators with 280 A charging current offer themselves a alternative for an on-board current generator, if a diesel set is not intended. These generators differ according to the technology very substantially from all conventional products. The size is so compact that you can exchange it also against a generator according to standard. This generator can ensure a 230V alternating current supply up to 3.000W power in connection with a PANDA HD inverter also in continuous operation.

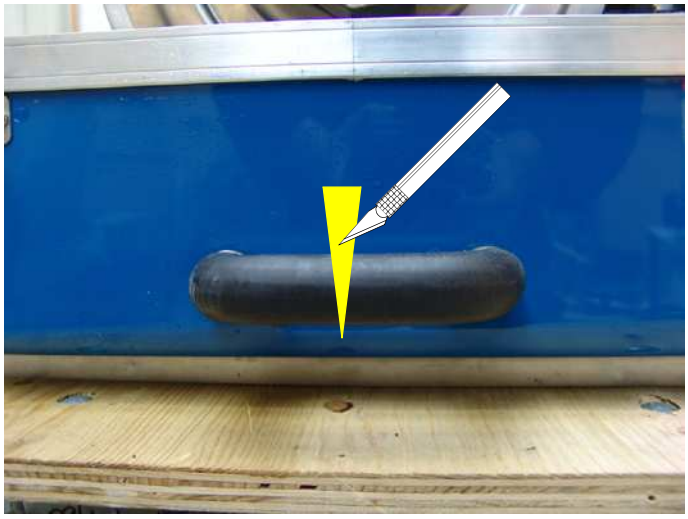
## C.3 Operation of the generator with automatic start

If the generator set were set up far away from the location of the remote control panel that the user cannot hear surely, whether the generator starts, a automatic starting option (accessories) should be installed. With this option the starter is disengaged automatically, if the starting speed is exceeded.

## C.4 Operation of the generator with installation under the waterline

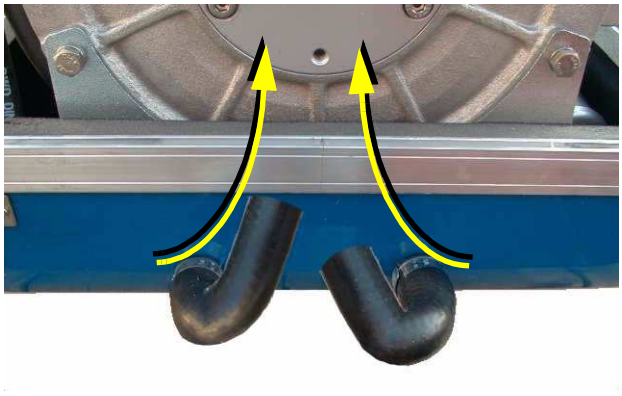
If the generator cannot be installed clearly at least 600mm over the waterline, a vent valve must be installed into the raw water line. At installation beside the "midship´s line" a possible heeling must be considered!

The water hose in the sound cover is split on the pressure side of the pump and extended in each case in the sound cover at both ends with a connecting nipple by a hose end. Both hose ends must led out from the sound cover to a point, which is at least for 600mm over the waterline (if possible in the midship´s line). The valve is inserted at the highest place, at least 600mm over the waterline.



Cut the hose rubber for the external valve vent.....

Fig. C.4.0-1: Ventilation valve connection



...and bent it upwards.

Both hose ends must be led out outside of the sound cover to one point, if possible 600mm over the waterline in the midship line. The valve is connected at the highest place with the two hose ends.

Fig. C.4.0-2: Ventilation valve connection

### C.4.1 Control of the vent valve

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 lead to destruction of the engine!

## C.5 Operation of the generator with installation over the water-line

**Generator over the waterline:**

If the generator is installed over the waterline, a stronger impeller wear is possible, the pump can run after the start some seconds dry.

It is very important that the impeller is exchanged every few months. When starting the generator attention should be always paid and heard to it, when raw water withdraws from the exhaust neck. If this takes longer than 5 seconds the impeller must exchanged, he sucks in air before raw water reaches the impeller (see picture below) and the impeller then wears strongly. In this case the impeller loses his effect and raw water can penetrate into the engine as well as substantially destroy it. If the impeller is not exchanged early enough, the entire pump must be replaced. Otherwise the impeller wings breaks in pieces and it stresses some time to remove these again. Replacement impeller should always be on board.

With the installation of the generator it must be paid attention that the impeller pump is well accessible, since the impeller is a wearing part. If this place at the location can be reached not well, an external pump with electric drive can be used instead of the pump built firmly in the sound cover, which should be installed in a well accessible place.

1. Raw water filter
2. Water cock
3. Hull inlet

Make certain that the raw water filter lies above the water level, otherwise with cleaning water can penetrate by the hull inlet.

An external pre-pump can relieve the impeller.

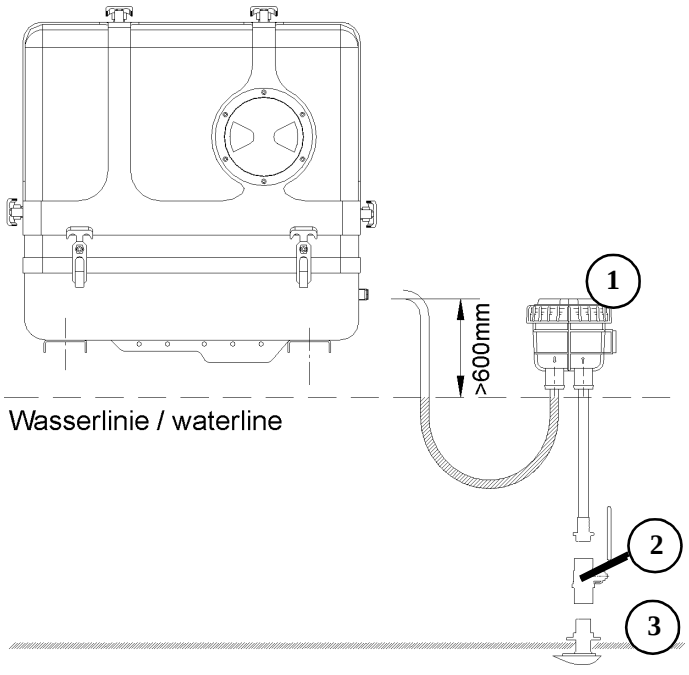



Fig. C.5.0-1: Raw water filter

# 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**<br>• Lubrication of actuator-trapezoid thread spindle |

**For Maintenance Intervalls see section F.4, “Inspection checklist for services,” on Page 118.**

### 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 gensets. It belongs control of the sacrificial anode (cooling water connection block) and the front seal cover at the generator. |

## 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:

See section F.5, “Engine oil,” on Page 119 and section F.2, “Technical Data Engine,” on Page 116.

## D.3 Execution of an oil change

**Oil drain hose**

Open the passage for the oil drain hose and pull out the hose.

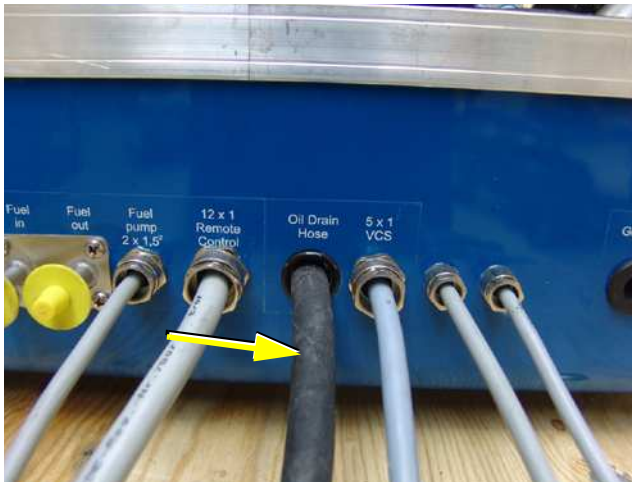



Fig. D.3-1: Oil drain hose

**Oil drain screw**

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

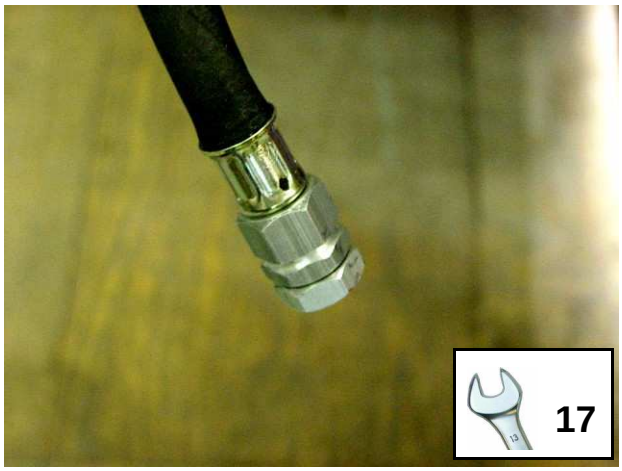



Fig. D.3-2: Oil drain screw

**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.

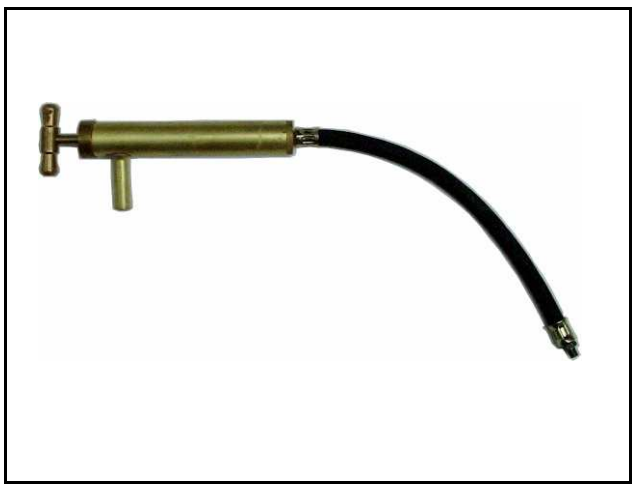


Fig. D.3-3: Oil drain pump

**Oil filter change**

The oil filter can be loosen with an oil filter strap.

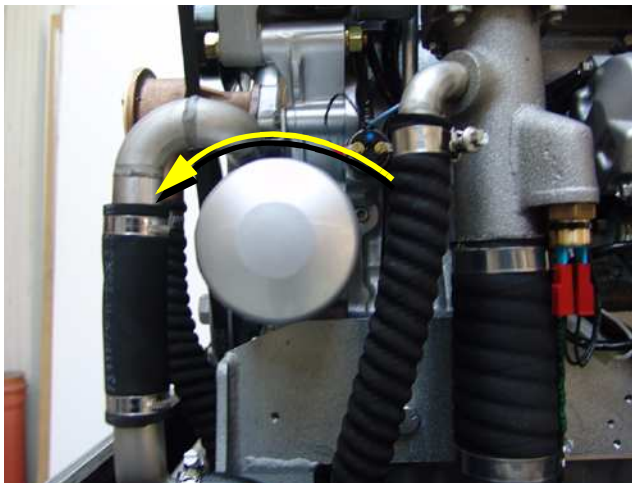


Fig. D.3-4: Oil filter

**Oil filter gasket**

Before the insertation of the new oil filter the gasket should be coated with some-thing oil.

Tighten the oil filter only by hand.

Fig. D.3-5: Oil filter

**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.

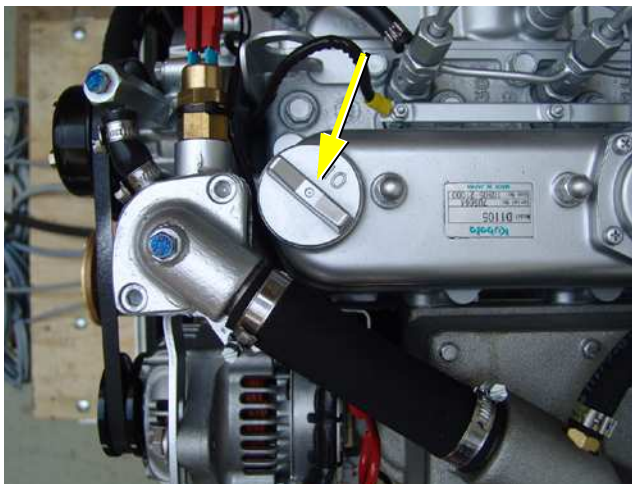


Fig. D.3-6: Oil filler neck

**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.

We recommend 2/3 oil level.

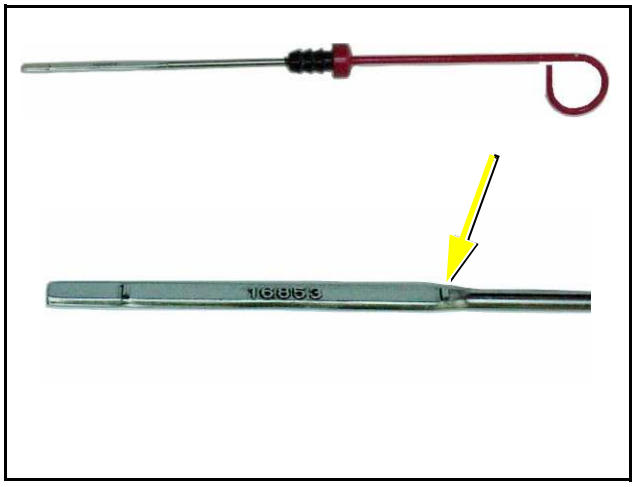


Fig. D.3-7: Oil dipstick

## D.4 Ventilating 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. Switch the main power switch on control panel to „ON“. Functional components must illuminate.

2. Push failure bypass switch and hold tight. The electric fuel pump has to be running audibly. By moving the failure bypass switch you can hear the solenoid valve of the generator starting and stopping (when the sound cover is taken off).

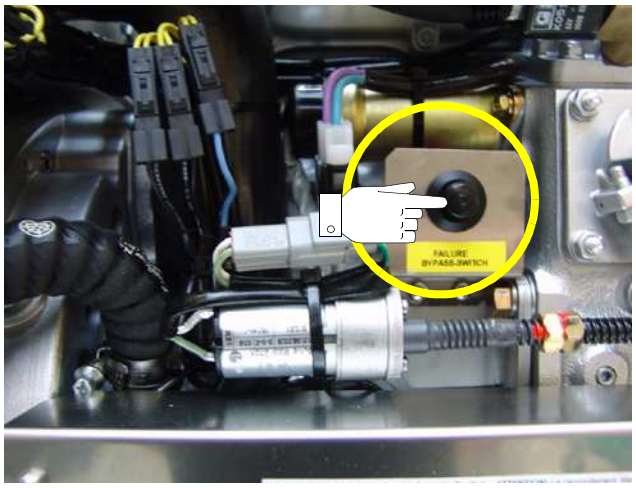


Fig. D.4-1: Failure bypass switch

3. After the fuel pump has been running 3 to 4 minutes because the failure bypass switch has been pushed down the ventilation screw of the solenoid valve has to be unscrewed. When opening the screw one has to carry on pushing the switch. To avoid fuel getting in the sound cover a piece of cloth or absorbent paper should be put under the connection. As soon as fuel is running out without bubbles the ventilation screw can be screwed in again. Now stop pushing the failure bypass switch.

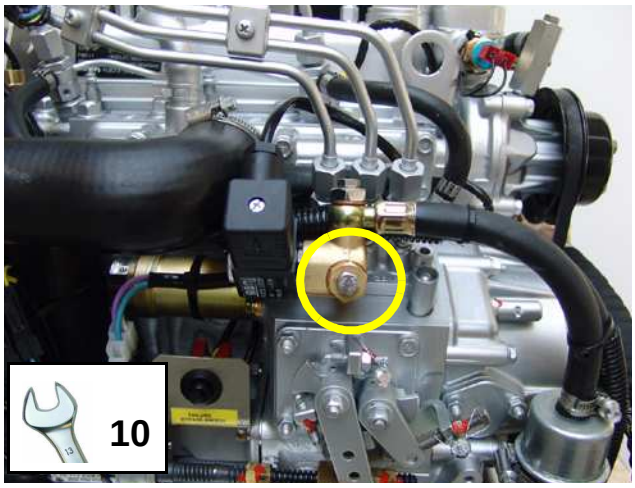



Fig. D.4-2: Ventilation screw - fuel solenoid valve

4. Now the unit can be started by pushing the "START"-button. The unit should start after a short while.
5. Should the unit not start the pipe union nuts of the injection nozzles has to be loosen and try again to start the unit. After the unit has started the pipe union nut has to be tightened again.
6. Main power switch "OFF".

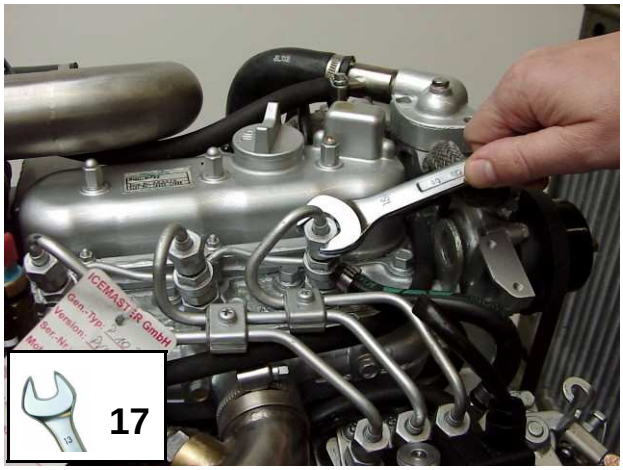



Fig. D.4-3: Injection nozzle

## D.4.1 Replace of the fuel filter

The replace of the filter depends on the contamination of the fuel, should take place at least all 300 operation hours. Before the replace of the filter the inlet must be clamped.

Remove the hoses from the used filter and fasten them to the new filter. The arrow on the filter housing indicates the direction of the fuel flow. A clogged filter causes a decreased power output of the generator.

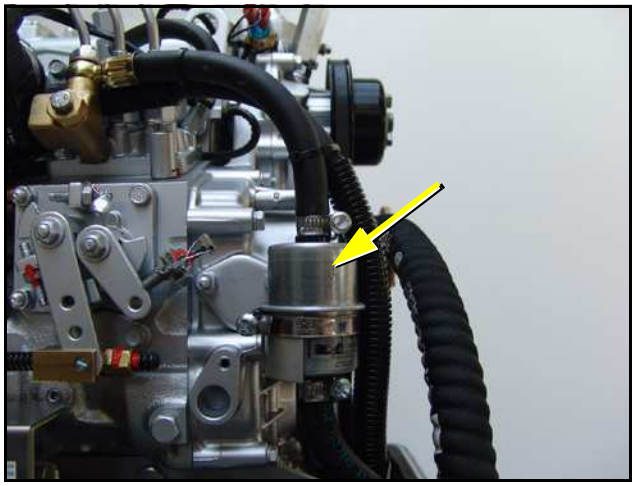


Fig. D.4-1: Fuel filter

## D.4.2 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.4-1: External fuel filter with water separator

## D.5 Replace the air filter

Open the air suction housing by losen the six screws of the air suction housing.

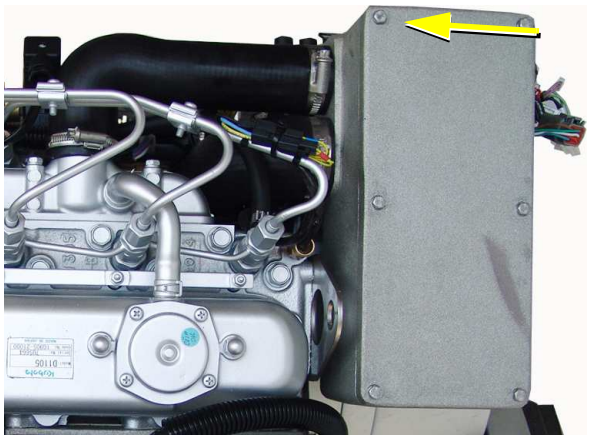


Fig. D.5-1: Air suction housing

Reolace the Air filter element

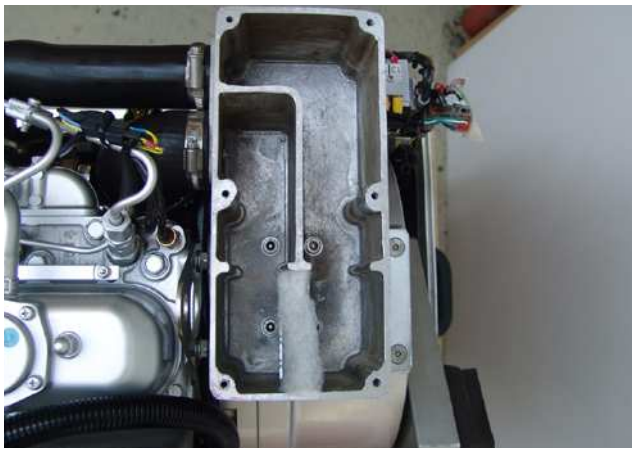


Fig. D.5-2: Air suction housing

## D.6 Ventilating 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 venilation points the generator must be stagnant !!!**

**Pay attention that the external coolant expansion tank is connected with the generator by the two intended connection points.**

**Further it should be guatanteed that the expansion tank is attached in sufficient height (600mm) over the level of the generator exhaust elbow union.**

Fig. D.6-1: External coolant expansion tank

Open ventilation screw at the cooling water pump.

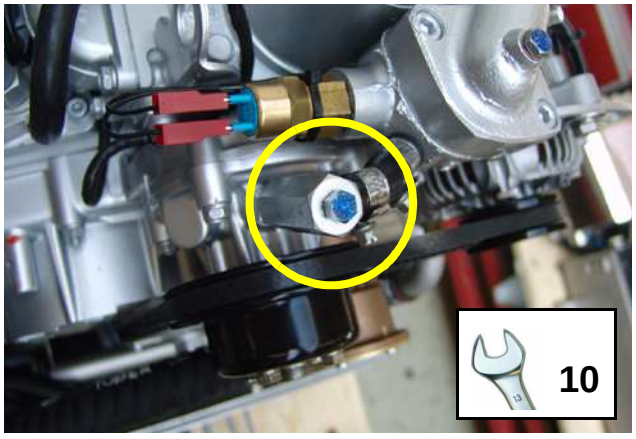



Fig. D.6-2: Ventilation screw - water pump

Open venlation screw at the thermostat housing.

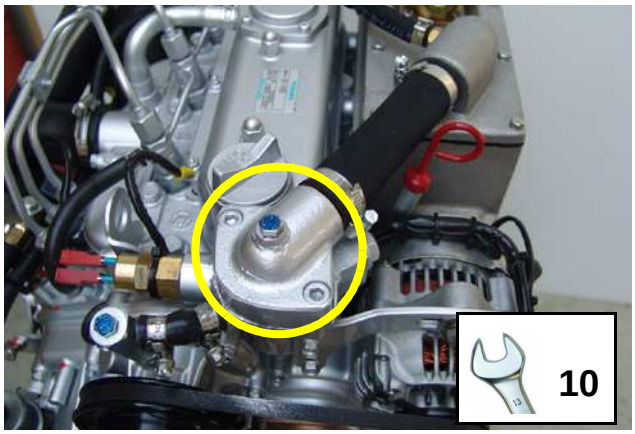



Fig. D.6-3: Ventilation screw - thermostat housing

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 ventilation screws and start the generator.

Run the generator for max. 60 seconds.

Stop the generator.

Fig. D.6-4: Cooling water filler neck

Now the cooling water is only filled over the external expansion tank. This is connected by 2 hoses with the genset.

**The external expansion tank should be filled in the cold condition only up to maximally 20%. It is very important that a large extension space over the cooling water level remains.**

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 ventilation two - three times.

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

The ventilation screw over the housing of the cooling water pump may be opened under no circumstances, while the generator runs. If this happens inadvertently, through the opening air is sucked in. A very complex ventilation of the entire system is necessary thereafter.

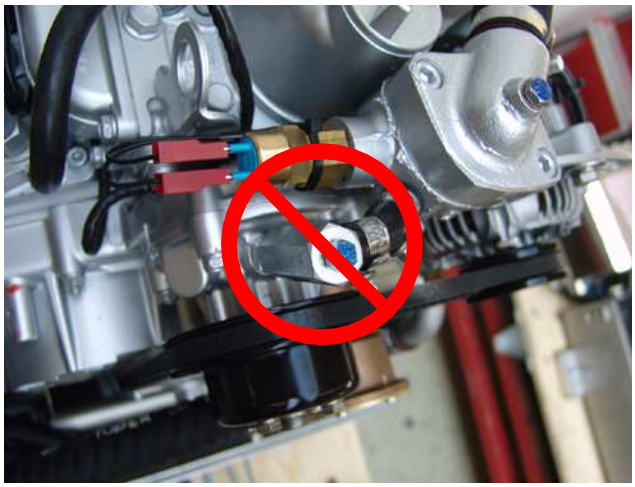


Fig. D.6-5: entilation screw - water pump

## D.6.1 Draining the coolant

In principle only describes here, how the cooling water of the raw water cycle can be drained. The mixture of the fresh water circuit should not be drained in principle. See measures for the preparation of the winter storage.

The simplest and cleanest method consists of the fact to bring the external vent valve below the generator level and hold over a collecting basin. Open the valve now, the water from the raw water circuit flows downward into the container.

## D.7 Replace of the v-belt for the internal cooling 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 v-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 v-belt must be controlled in a very short time interval. It can be happen to change the v-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 v-belts on board. We suggest to stand by the according service-packet.

Loosen the fixing screw above the alternator.

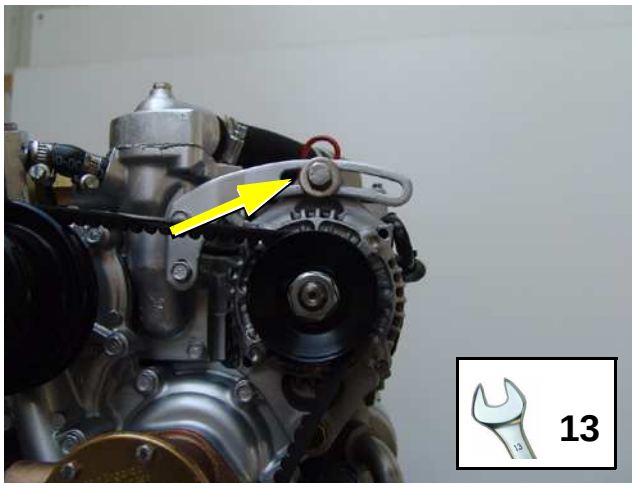



Fig. D.7-1: Fixing screw - DC-alternator

Fig. D.7-2:

Loosen the fixing screw below the alternator only a little bit.

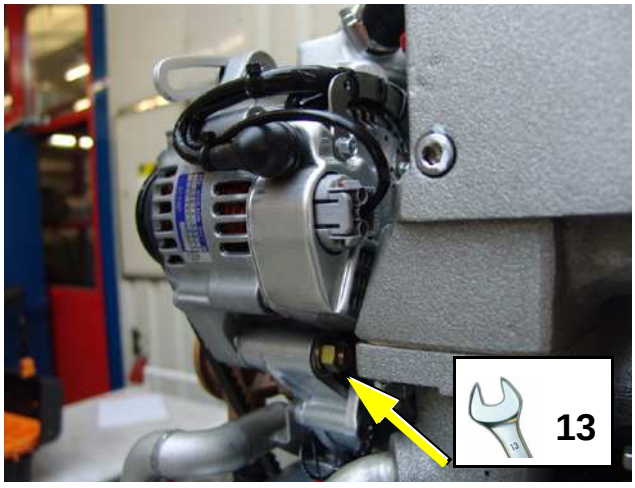



Fig. D.7-3: Fixing screw - DC-alternator

Press the alternator to the direction of the thermostat housing.

Now the v-belt can be changed (type: XPZ 850-2).

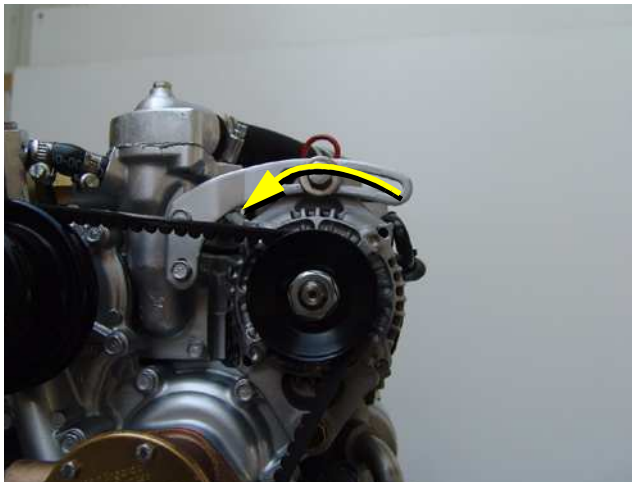


Fig. D.7-4: V-belt

Stretch the v-belt by pulling the alternator back. The v-belt should be able to be pressing approx. 1cm with the thumb.

Tighten the fixing srews above and below the alternator.

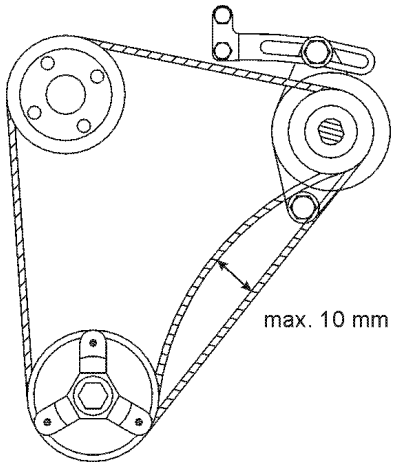



Fig. D.7-5: V-belt

## 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.9 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 gensets. 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.9.1 Exchange of the impeller

Close the raw water stop cock.

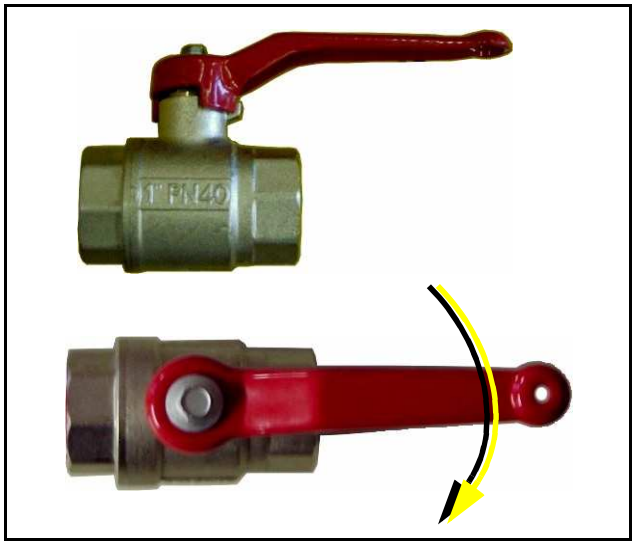



Fig. D.9.1-1: Raw water stop cock

Raw water pump on the front side of the genset.

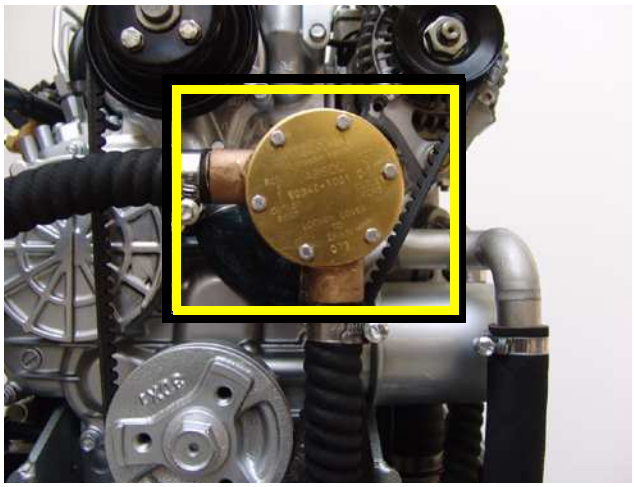


Fig. D.9.1-2: Raw water pump

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

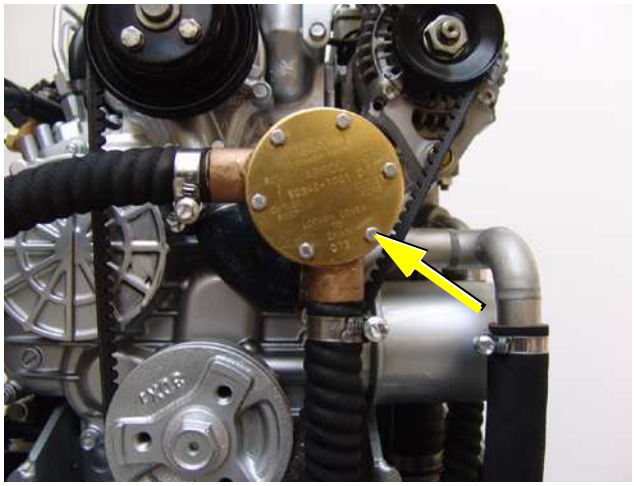
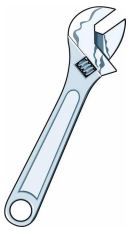


Fig. D.9.1-3: Raw water pump



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.

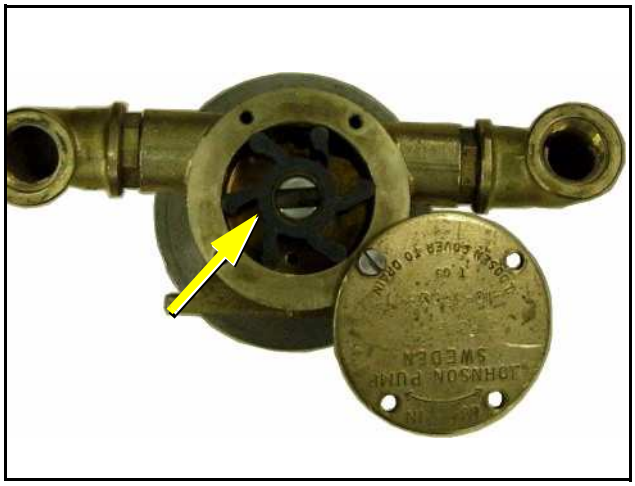



Fig. D.9.1-4: Impeller

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.9.1-5: 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.9.1-6: Gasket

## D.10 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.

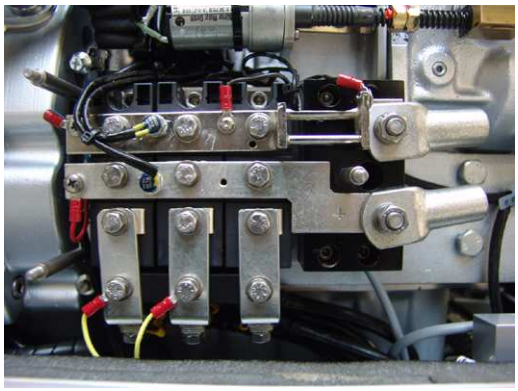


Fig. D.10-1: Rectifier

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.

- 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℃

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

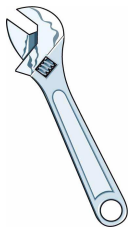
Ensure that a battery switch is installed in the battery line. Never leave the generator behind without the cover mounted over the heat sink and capsule not closed.

Remind the customer

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

# D.11 Conservation at longer operation interruption

## D.11.1Measures 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 genset 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.11.1Measures on preparation of the winter storage (Forts.)

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. Check cooling water connection block at the generator housing on traces of corrosion and if necessary renew. (only such traces are to be considered, which refer to clear "blossoming" of the material. If the surface is only grey coated, this is only an indication for the fact that aluminum came into contact with condensed moisture.)
17. 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.11.2Initiation 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.

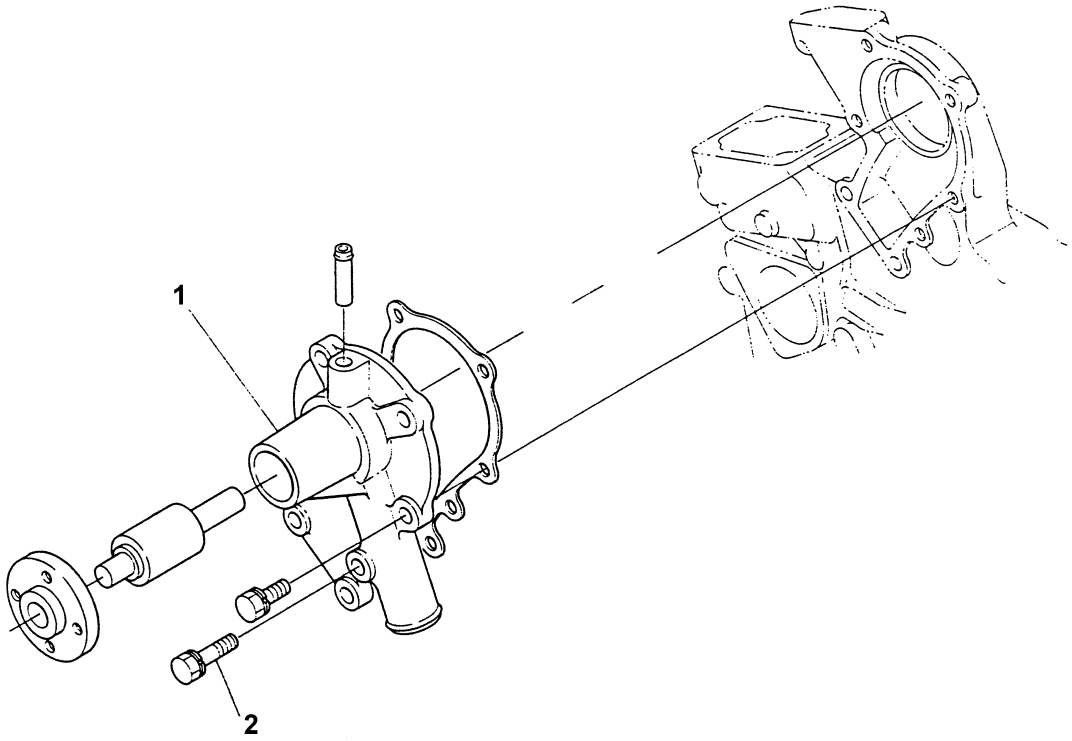
**Icemaster does not take over adhesion for possible damages!**

## D.12 Replacing Water pump

1. Drain the freshwater circuit.
2. Unscrew the water pump mounting screws (2), and remove the water pump (1) from the gear case cover. Use a spanner size 10mm.

**When reassembling**

- Apply liquid-type gasket (Three Bond 1215 or its equivalent) to both sides of the new water pump gasket.

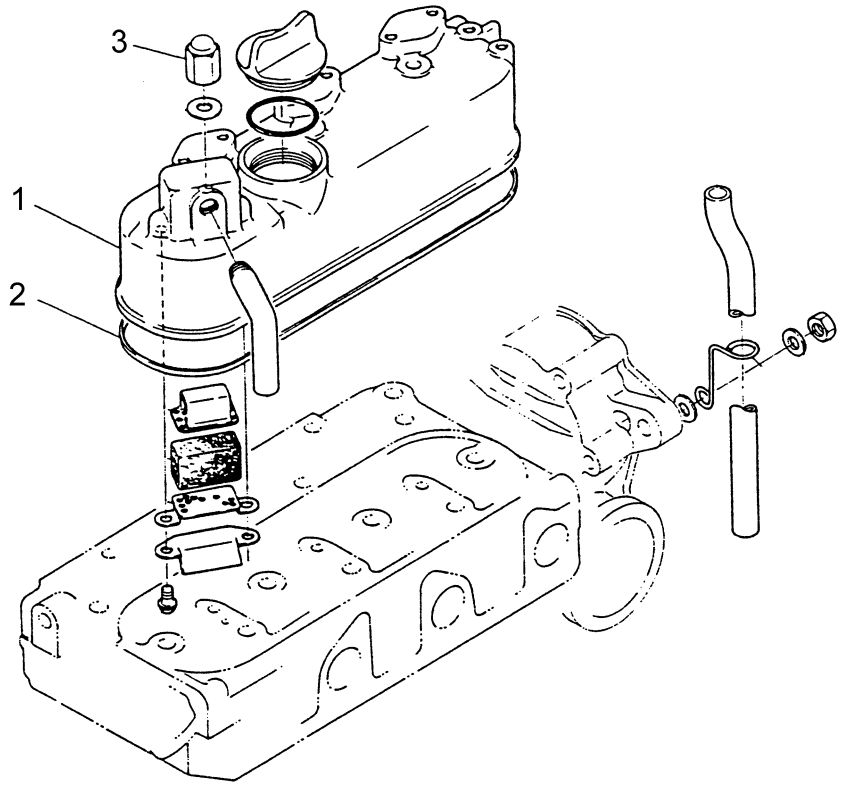



1. Water pump body
2. Hexagon head screw

Fig. D.12-1: Water pump

## D.13 Replacing Valve cover gasket

1. Remove the valve cover cap nuts (3). Use a spanner size 10mm.
2. Remove the valve cover (1).
3. Check to see that the valve cover gasket (2) is defective.
4. Replace the valve cover gasket (2) with a new one.
5. Install the valve cover (1), using care not to damage the o-ring.
6. Tighten the valve cover cap nuts (3). Tighten torque: 3,9 to 5,9Nm.




1. Valve cover
2. Valve cover gasket
3. Hexagon cap nut

Fig. D.13-1: Valve cover

# D.14 Adjustment of the valve clearance

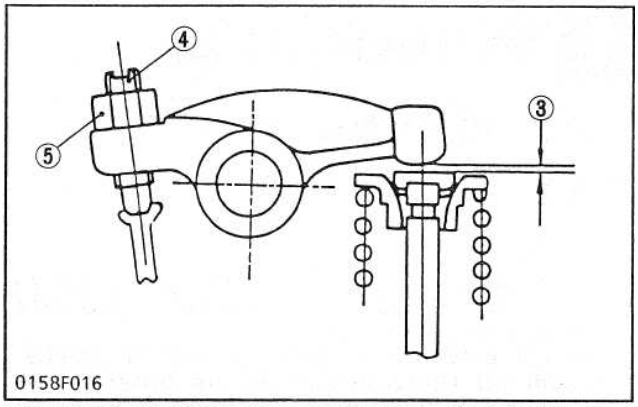
**Tools:**

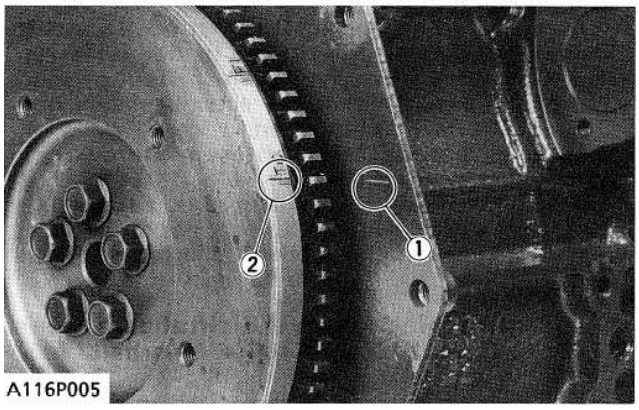
- Spanner for valve cover, spanner size 10mm
- Spanner for counter-nut, spanner size 11mm
- Screw driver for adjusting screw
- Thickness sheet gauge (sliding suction must be between rocker arm and valveshaft)

**Valve Clearance**

1. Loose the lock nut (5) and the adjusting screw (4) on the rocker arm.
2. Turn the adjusting screw to adjust the valve clearance.
3. Tighten the lock nut (5) and check the valve clearance again after several turns of the flywheel.

| | | |
|---|---|---|
| Valce clearance | Factory spec. | 0.145 to 0.185 mm<br>0.0059 to 0.0073 |




1. Notched Portion
2. TC Mark Line
3. Valce Clearance
4. Adjusting Screw
5. Lock Nut

Fig. D.14-1: Valve Clearance

**Note:**

- The „TC“ marking on the flywheel is just for No. 1 cylinder. There is no „TC“ marking for the other cylinders.
- No. 1 piston comes to the T.D.C. position when the „TC“ marking is aligned with the punch mark of the rear end plate. Turn the flywheel 15 °(0.26 rad.) clockwise and counter-clockwise to see if the piston is at the compression top dead center or the overlap position. Now referring to the table below, readjust the valve clearance. (The piston is at the top dead center when both the IN. and EX. valve do not move; it is at the overlap position when both the valves move.)

Finally turn the flywheel 360 °(6.28 rad.) to make sure the „TC“ marking and the punch mark are perfectly aligned. Adjust all the other valve clearances as required.

**D782-B**

| Cylinder No. | 1 | | 2 | | 3 | |
|---|---|---|---|---|---|---|
| Valve arrangement | IN. | EX. | IN. | EX. | IN. | EX. |
| When No. 1 piston compression top dead center | O | O | | O | O | |
| When No. 1 piston is overlap position | | | O | | | O |

# E. Generator Failure

## E.1 Tools and measuring instruments

**In order to be able to manage disturbances while driving, following tools and measuring instruments should belong to the equipment on board:**

- Multimeter for voltage (AC), frequency and resistance
- Measuring instrument for inductance
- Measuring instrument for capacity
- Current absorbing clamps
- Thermometer (ideal is a infrared thermometer)
- Pressure device (pincer) für coolant circuit

## E.2 Overloading the Generator

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).

**In order to prolong the genset´s life expectancy, the nominal electrical demand on the system should not be more than 70% of the rated genset peak load.**

Keep PEAK LOADING demand in mind when switching on electrical devices (esp. fridge compressors, electric motors, battery chargers, kettles, etc.) which are fed by the generator. Careful "powering up" (gradual loading) of the electrical demand on the generator will help prolong the life of your genset! The genset can be run for several hours at partial load (i.e. 2/3 of rated power), however it is not advised that it is run for more than 2-3 hours at full load. The Panda is designed so as not to overheat even under extreme conditions. Note: The exhaust gas will become sooty during peak-load operation.

**Effects of Short Circuiting and Overloading on the Generator**

The generator **cannot** be damaged by short circuiting or overloading. Short circuiting and overloading suppress the magnetic excitation of the generator, thus, no current is generated and the voltage will collapse. This condition is immediately offset once the short-circuit has been eliminated and/or the electrical overload removed.

## E.3 Adjusting the nominal charge current

**ATTENTION! Before working on the System read the section “Safety Precautions” on Page 10.**

These adjustments may not be changed, they are sealed. The adjustments should be changed expires the warranty.

The adjustments of the nominal charging current is made at the actuator. By the nuts on the left and on the right at the spindle of the actuator the adjustment is limited.

The generator must be started and loaaded with the nominal dates. The engine adjusts the speed regulator lever after a short time in such a way that the generator supplies appropriate nominal dates. The adjusting nuts must be fixed to this point. This delimitation serves for the protection of the generator, so that it is not overloaded.

01. Actuator
02. Spiral thread spindle
03. Regulating nuts for max. speed
04. Spindle nut with speed regulator level
05. Regulating nuts for min. speed

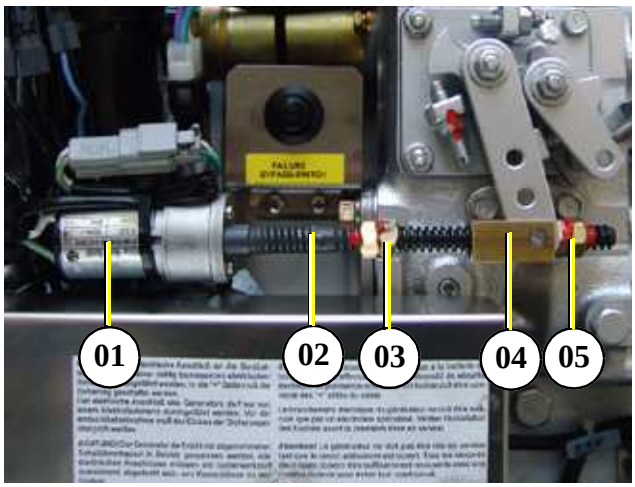



Fig. E.3.0-1: Actuator mechanism

During any operation at the generator all load have to be switched off to avoid damages at the equipments.

## E.3.1 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.

## E.3.2 Effects of a overload to the actuator

If the generator is overloaded the voltage falls on account of a not adequate motor power under the nominal value. The actuator stays at the upper keystroke and tries to rev up the diesel engine. An internal regulation limits the current to the actuator, nevertheless a longer overload can damage the winding of the actuator. (short of the winding). The motor gets not strictly inoperative but it can happen that the cranking torque of the actuator is getting weak. This has the consecuence that the rev spindle can not be turned to all positions faultless. Therefore the voltage of the generator is regulated not good or sometimes not at all.

If you notice that the spindle of the actuator doesn´t run faultless, first check if the genset was overloaded for a short time and if thereby the winding of the actuator was damaged. Then the actuator has to be changed.

**Check the electrical fuse (miniature slow-to-blow fuse 1,6A) on the control printed circuit board if the actuator will not turn at all.**

Change this fuse

(1,6A slow to blow)

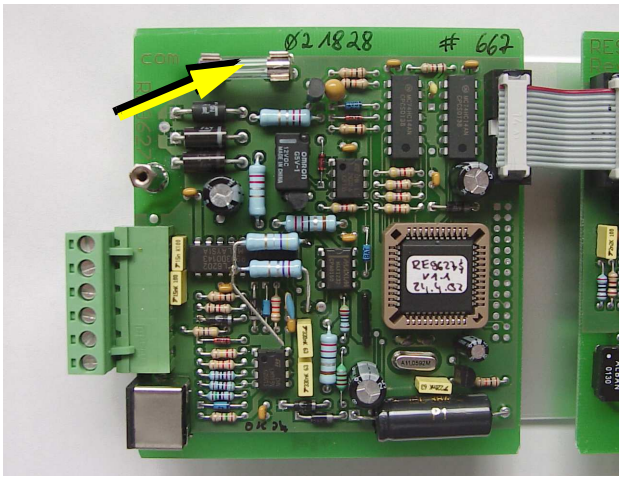


Fig. E.3.2-1: Fuse on VCS board

The generator can't be damaged by an overload because the winding is overload- and short-circuit safety. But damages are possible in the periphery. Especially connected load are endangered because a lower voltage can damage them by order.

**Possible disturbances in the area of the rev regulation "VCS"**

| Failure | Cause |
|---|---|
| The spindle of the actuator jams | • not regularly lubricated.<br>• surface is mechanical damaged.<br>• actuator is defect.<br>• defect of the VCS control (short of winding).<br>• signal DC missing.<br>• limiting nut jams the spindle. |
| Fuse on the printed circuit board of the VCS control is melted. | • constant overload of the generator. |

**Steps to check the voltage control by a disturbance:**

1. Switch off all electrical load.
2. Disconnect the plug of the actuator.
3. Turn the actuator manually to check if the adjusting nut is jamed to the limit stop points.
4. Turn the actuator manually to check if the adjusting nut on the spindel runs faultless.

If there is no result by these steps the actuator is working mechanically correct. After this the electrical components must be checked:

1. Connect the plug of the actuator.
2. Start the generator.
3. Turn the actuator by hand and check if the spindle turns back by the motor.
4. If the motor react on the turn by manual strongly (the motor can normally hold with the fingers) the drive will be working faultless. If there are nevertheless faults in the voltage control there is a fault in the control VCS.

**If the actuator is not moving the following points are necessary:**

1. The motor turns not strongly rather weak:

- The actuator has shorts in the winding and must be changed. (pay attention that the generator is not overloaded anymore.)

2. The actuator does not move but the spindle can be turned manually. Disconnect the plug of the actuator. Connect provisional an external voltage source 12V-DC to the motor.

- The actuator don't turns with the external voltage source. The actuator is defect and have to be changed.
- The control must be inspected by the following steps if the actuator turns und works faultless with the external voltage source:

1. Check the fuse on the VCS printed circuit board.

2. Check if the sense voltage is wired to the VCS printed circuit board.

3. Check if the VCS supply voltage is wired to the VCS.

4. Check if the VCS outlet signal for the actuator is wired.

Change the VCS printed circiut board if the points above carries no clearance.

Change the VCS printed circiut board if the points above carries no clearance.

**Checking the limitation of the generator voltage**

The mechanical voltage limitation must be checked regularly. The following steps have to be done:

1. Disconnect the plug of the actuator.

Lower suspension point:

2. Switch off all load.
3. Connect an electrical ammeter.
4. Start the generator.
5. Turn the actuator manually to the lower suspension point.
6. Charge current must be <10 A, at U=$U_{Nenn}$.

Upper suspension point:

7. Connect the load.
8. Turn the actuator by hand gradually the insertable load up to the upper susoension point. Charge current must not lay over 140A, at U=$U_{Nenn}$
9. If deviations are determined, a new adjustment is necessary.

## E.3.3 Low Generator-Output Voltage

If the produced alternating voltage is too low, switch the load off, in order to relieve the generator. Mostly the problem already solved. If the output voltage is still too low, even if all load are switched off, the generator runs without load, you can assume one or more condensers are defective.

# E.4 Testing Generator Stator Windings

**ATTENTION! Before working on the system read the see “Safety Precautions” on page 10.**

## E.4.1 Testing Generator Stator Winding for "Shorts" to Ground

The generator stator windings can be tested as follows:

1. Ensure that the generator is "OFF" and cannot be accidentally started. Disconnect the battery.
2. Remove the cover of the power treminal box.
3. All terminal box connections are to be removed. (See appropriate circuit diagram.)
4. Remove all cables.
5. A check of the power terminal box is made by means of a multimeter to determine whether there is continuity between the individual windings connections.

If continuity is detected for any of the combinations, the generator must be sent to the factory for inspection and repair. If this is not possible, the stator can be rewound by a qualified tradesperson/technician. Winding diagrams can be obtained from ICEMASTER GmbH, Germany.

This test, unfortunately, is carried out at very low voltage (9V) when a normal multimeter is used. Therefore only positive short circuits will be displayed. There is the possibility that a short circuit will occur in spite of a negative test result (i.e. moisture). A reliable check can only be carried by using an essentially higher voltage (approx 500V). This type of measuring instrument is normally only used by experts.

If in doubt an electrician must check the winding for a short circuit with an isolation meter.

Rectifier at the Panda generator

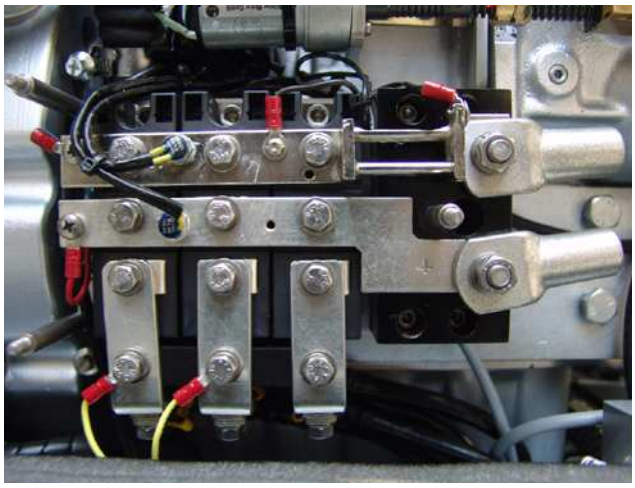


Fig. E.4.1-1: Rectifier

Wiring diagram

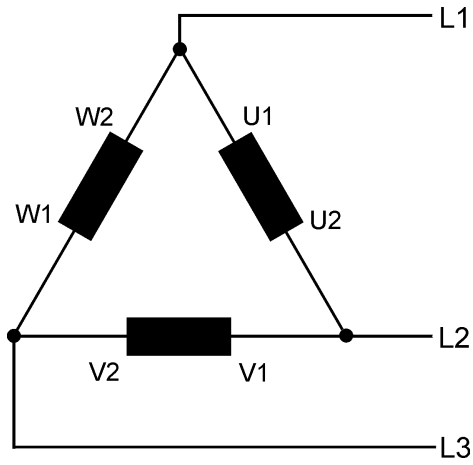



Fig. E.4.1-2: Wiring diagram

## E.4.2 Coil Resistance Measurements in Stator Windings

If the testing set determined no earthing, the coil windings of the generator must be controlled with a resistance measuring instrument (ohm meter). To measure coil resistance a meter capable of measuring low resistances (Milli-Ohm resolution if possible) accurately. The measured resistance values should be close to the same between the following terminals:

U1-U2, V1-V2, W1-W2

**Checking windings.**

- Disconnect all connections from the power terminal box. Loose the nuts and deduct the cables.
- Remove all winding connections from the power terminal box.
- Switch your meter in resistance range. When you put the probes of you meter together, you should get a reading of 0.00Ohm. When you isolate the probes, the reading will be Overflow. Please do this tests to check your meter.
- Measure of the resistance within the individual windings. The values should be very small. It mainly depends on the relation between the values. Some measuring instruments operate very inaccurately, if the measured values are very small.
- Resistance measure between different windings. If the value is in the Giga ohm area, the coil is correct.

If you find any anormality, when doing this test, please ask your Fischer Panda dealer.

If strong deviations are measured in the individual coil windings, there is a coil short-cut in one coil. No voltage is induced.

The actual values between the coil windings are not determined so exactly. It depends on the fact that the values of all three measurements are as alike as possible. Deviations among themselves refer to a coil short-cut. In this case the generator must be newly wound by a specialist.

## E.4.3 Measuring the Coil Inductive Resistance

Unfortunately the checking of the ohmic resistance permits still no reliable statement about the condition of the coil. If the ohmic resistance values arise inequalities between the coils, that is a safe indication for the fact that the coil is defective. To be exactly sure the inductive resistance of the coil have to be measured. For this a special measuring instrument is necessary, which measures the inductance of a coil.

Inductance is measured in the same way as the ohmic resistance, i.e. the coils are compared. The value is indicated in mH (milli Henry).

Note: These values depends strongly from the measuring method (kind of the measuring instrument)

**An alternative test method to check the stator windings can be performed as follows:**

1. Ensure that the connection to the circuit system is disconnected.
2. All electrical wires in the power terminal box must be disconnected.
3. Reconnect the battery connections.
4. Start the generator.
5. Measure the voltages between the following terminals and compare for symmetry:

U1-U2, V1-V2, W1-W2

# E.5 Starting Problems

## E.5.1 VCS does not work

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

Is the voltage sense connecttion ok? Check polatrity!

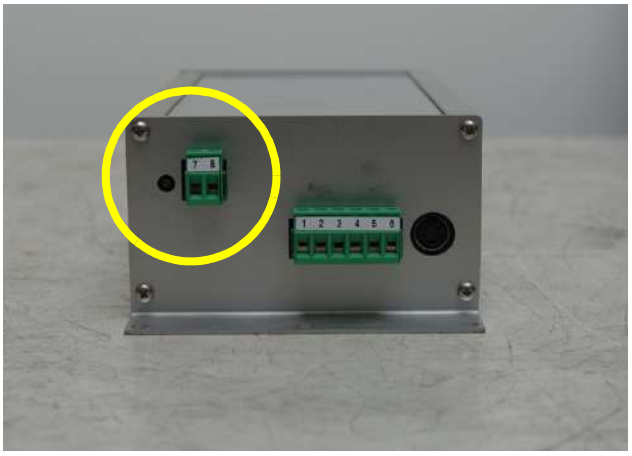


Fig. E.5.1-1: Clamp 7+8 on VCS

Is the shunt connection ok? Check polatrity!

Fig. E.5.1-2: Clamp 9+10 on VCS

Is the main supply connection ok? Check polatrity!

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

Fig. E.5.1-3: Clamp 1-6 on VCS

Checking the fuse on the VCS printed circuit board.

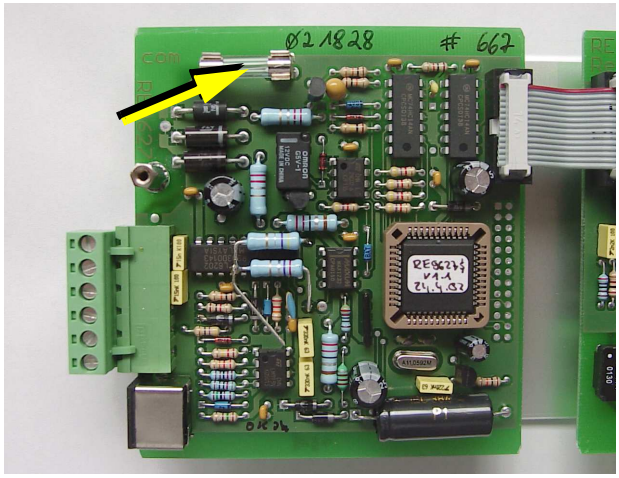



Fig. E.5.1-4:

## E.5.2 Fuel Solenoid Valve and Stop solenoid

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.

**1. Fuel solenoid valve**

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.

**2. Solenoid for engine stop**

The solenoid for engine stop is located at the injection pump.

1. Energized to stop

By pressing the "OFF"-button on the remote control panel, the solenoid is supplied with voltage and attracts, whereby the fuel injection pump resets to the zero position and the generator stops.

2. Energized to run

This version is equipped with two solenoids an actuating and a stop solenoid. After being fed with current, the actuating solenoid attracts the adjusting lever of the fuel injection pump, through which the fuel can flow. The actuating solenoid is switched parallel to the starter motor, the stop solenoid is switched parallel to the fuel pump. The position is held by the stop solenoid as long as the generator is running.

01. Fuel solenoid valve
02. Fuel injector nozzles
03. Ventilation screw

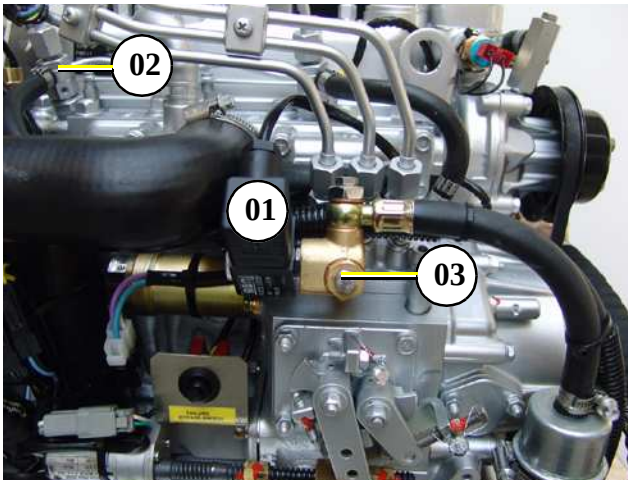



Fig. E.5.2-1: Fuel solenoid valve

Stop solenoid for engine stop

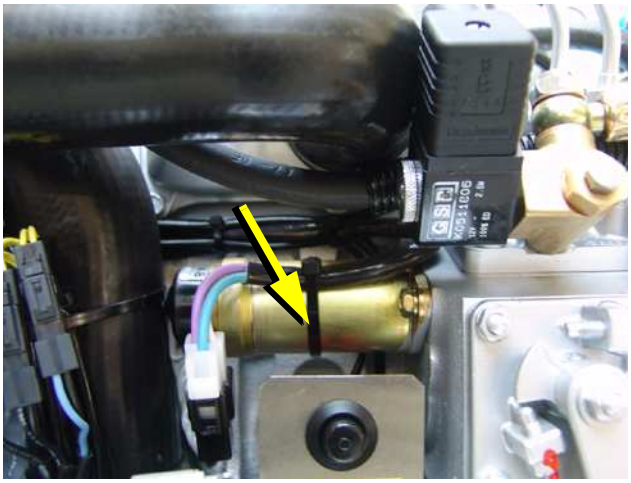


Fig. E.5.2-2: Stop solenoid

## E.5.3 Failure Bypass Switch

The start-failure bypass switch enables an immediate restart facility of the generator, should it cut out, even if this was caused by over-heating. There is normally a requirement to wait until the motor has cooled down to the correct temperature. This can last for several hours in certain circumstances, since the generator is enclosed in a sound-insulated casing, which prevents heat loss.

Failure bypass switch

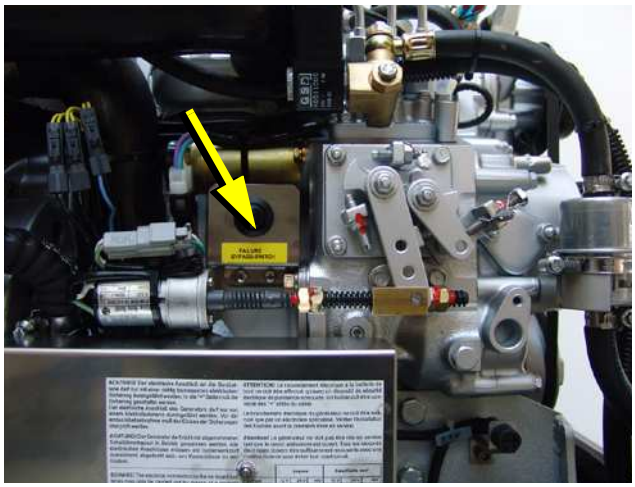


Fig. E.5.3-1: Failure bypass switch

This period can be reduced by pushing the button on the front of the generator. The generator can be started by means of the remote control as long as the button is depressed. The switch/button bypasses any faults allowing the generator to run.

Before depressing the button, a manual check of the oil dip stick must be carried out to determine whether the generator has sufficient oil, as it is possible that the oil pressure switch causes the generator to cut out. If it has been ascertained that the reason for the motor cutting out is overheating and not lack of oil, the generator can be run for several minutes without load, so that the motor is cooled by the circulating coolant.

**BEWARE:**

If the temperature is the reason for the generator cutting out when it is running under load, then an immediate check must be made to determine the cause. It could be a fault with the cooling system, one of the fans, the air-intake or a fault with the external cooling system.

Continual use of the starter-failure bypass switch should be avoided, while the generator cuts out during operation.

The generator must always run without load for several minutes before being switched off, so that a temperature compensation occurs. Heat accumulation can cause the generator to overheat, even after ist has been switched off.

Should the overheating alarm be set off, caused by heat accumulation, after the generator has been switched off, then this can also be bypassed using the switch.

## E.5.4 Dirty fuel filter

If the fuel filter is dirty change the filter element.

For replacing the filter element see section E.6.1, “Replacing fuel filter” on page 103.

01. Filter element

This protects the injection pump. No water will go thru the filter. If water reaches the filter it will block the fuel flow even if the filter looks clean

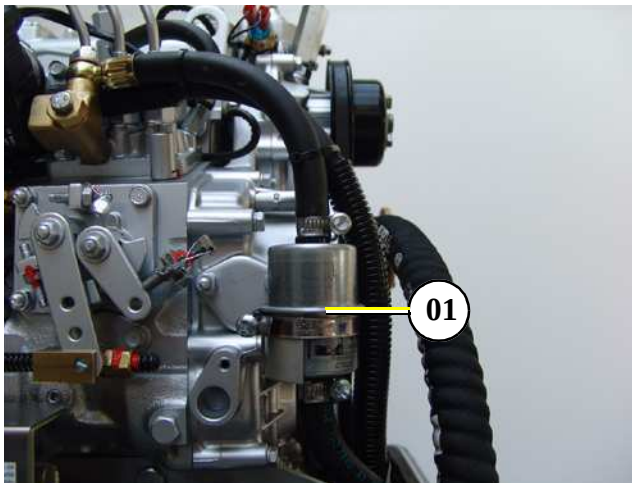



Fig. E.5.4-1: Fuel filter

## E.5.5 Troubleshooting Table

*For Troubleshooting see section F.1, “Trouble shooting” on page 112.*

# F. Tables

| Generatortype | Ø Cooling water conduit | | Ø Exhaust conduit | Ø Fuel conduit | |
|---|---|---|---|---|---|
| | Fresh water [mm] | Raw water [mm] | [mm] | Supply [mm] | Return [mm] |
| Panda PMS AGT 12000 | 20 | 20 | 40 | 8 | 8 |

**Tabelle 1: Diameter of conduits**

| Type | Nominal power [kW] | Continuous power [kW] | Nominal voltage [VDC] | Continuous charging current[A] | Nominal charging current [A] |
|---|---|---|---|---|---|
| AGT 12000-48 | 12 | 10,2 | 48 | 170 | 200 |

**Tabelle 2: Technical Data**

| **Wiring for vehicle.**<br>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 |

**Tabelle 3: Cable cross-section**

a. DIN VDE 0298, part 4.

## F.1 Trouble shooting

| GENERATOR OUTPUT VOLTAGE TOO LOW<br>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)<br>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.<br>2. A motor fault. | 1. Check if the power requirement of the load fluctuates.<br>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. Bleed air from fuel system (refer to section "Air-bleeding of the 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.<br>2. Remove the glow plug (see Kubota-manual).<br>3. Rotate the motor by hand carefully.<br>4. Check if there is water in the oil and change both oil and filter if necessary.<br>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. | Bleed air from fuel system. |

| DROP IN THE SPEED OF THE MOTOR | |
|---|---|
| **Cause** | **Solution** |
| Too much oil. | Drain oil. |
| Lack of fuel. | Check fuel supply system:<br>- fuel filter, renew if necessary<br>- check fuel pump<br>- check fuel lines (bleed if necessary) |
| Lack of intake air. | Check air intake paths.<br>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.<br>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<br>- unusual noise comes from genset<br>- exhaust colour suddenly becomes dark<br>- motor overheats<br>- 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.<br>Motor connected?<br>Check connection to VCS. |
| Actuator sets throttle too high or too low. | Check that the wires to the actuator are connected properly (±).<br>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.<br>Loosen the connecting rods motor from the injection pump regulator and turn screw to a max. voltage of 33V. | |

## F.2 Technical Data Engine

| | **Panda AGT-DC13000 PMS 48V** |
|---|---|
| Type | D1105 |
| Govenour | VCS |
| Automatic startbooster | yes |
| Cylinder | 3 |
| Bore | 78mm |
| Stroke | 78,4mm |
| Stroke volume | 1123cm$^3$ |
| max- power (DIN 6271-NB) at 3000 rpm | 17,6kW |
| Rated speed 50Hz | 3000rpm |
| Idle running speed [a] | 2900rpm |
| Valve clearance (engine cold) | 0,145 - 0,75mm |
| Cylinder head torque | 63,7 - 68,6Nm |
| Compression ratio | 23:1 |
| Lubrication oil capacity | 5,1l |
| Fuel consumption [b] | ca. 1,6 - 4,2 l |
| Oil consumption | max. 1% of fuel consumption |
| Cooling water requirement for raw water circuit | 28-40l/min |

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

## F.3 Types of Coil

**HP3 delta-connection**

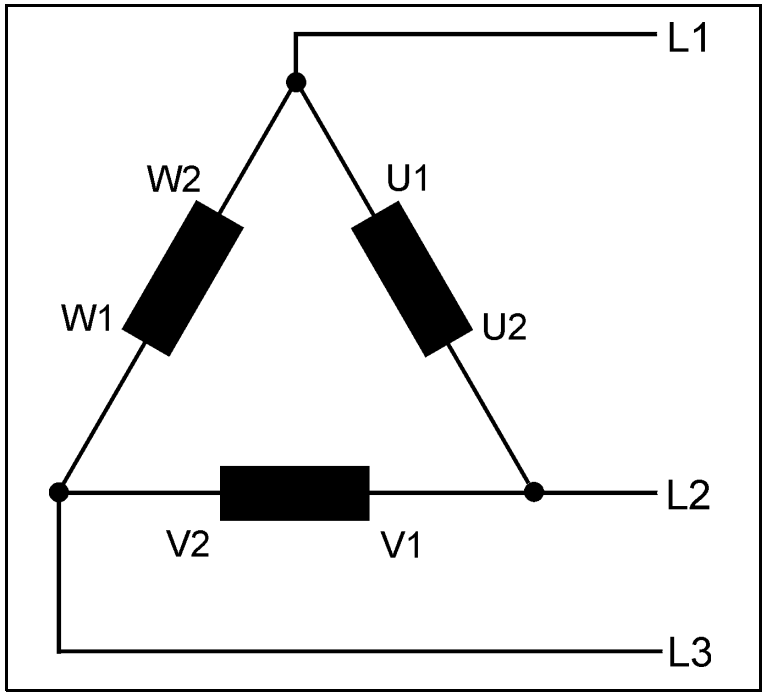



Fig. F.1: HP3 delta-connection

**HP3 star-connection**

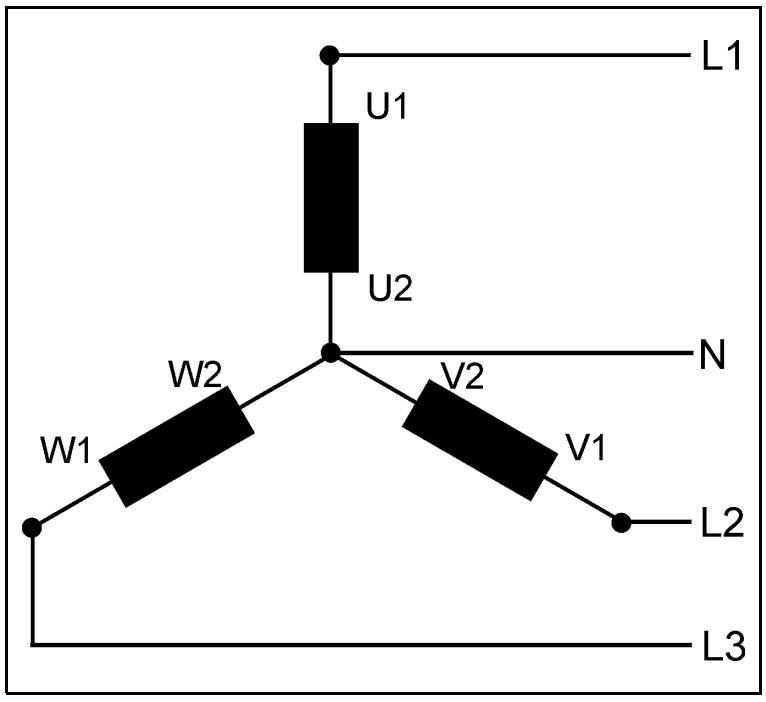



Fig. F.2: HP3 star-connection

## F.4 Inspection checklist for services

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

| Durchzuführende Inspektionsarbeiten / Inspection work | | | |
|---|---|---|---|
| 1) | prüfen / check | 4) | erneuern / change |
| 2) | messen / measure | 5) | Dichtheit / sealing |
| 3) | reinigen / clean | 6) | Isolation prüf. / 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. | | | 4) | 4) | 4) | 4) | 4) | oil filter |
| 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. | 1) | 1) | 1) | 1) | 1) | 1) | 1) | voltage output of alternator 12 V |
| 25. | 2) | | 2) | 2) | 2) | 2) | 2) | input temp of coolant under load |
| 26. | 2) | | 2) | 2) | 2) | 2) | 2) | outlet temp of coolant under load |
| 27. | | | | | | 4) | 4) | generator rotor bearing |
| 28. | | | 1) | 1) | 1) | 1) | 1) | signs of corrosion to generator |
| 29. | | | 1) | 1) | 1) | 1) | 1) | check generator coolant block |
| 30. | 1) | | 1) | 1) | 1) | 1) | 1) | VCS function test |
| 31. | 2) | | 2) | 2) | 2) | 2) | 2) | voltage without load |
| 32. | 2) | | 2) | 2) | 2) | 2) | 2) | voltage under load |
| 33. | 2) | | 2) | 2) | 2) | 2) | 2) | engine speed (rpm) |
| 34. | | | | | | 1) | 4) | injector test |
| 35. | | | | | | 1) | 1) | compression |
| 36. | 1) | 1) | 1) | 1) | 1) | 1) | 1) | hose clips |
| 37. | 1) | 1) | 1) | 1) | 1) | 1) | 1) | recifier |
| 38. | 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 quality.

Examples for diesel engine oil:

API CG  Engine oil for highest demands, turbo-tested

| Engine oil types | |
|---|---|
| above 25℃ | SAE30 or SAE10W-30<br>SAE10W-40 |
| 0℃ to 25℃ | SAE20 or SAE10W-30<br>SAE10W-40 |
| below 0℃ | SAE10W or SAE10W-30<br>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.

ICEMASTER 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℃ |

## Measurements

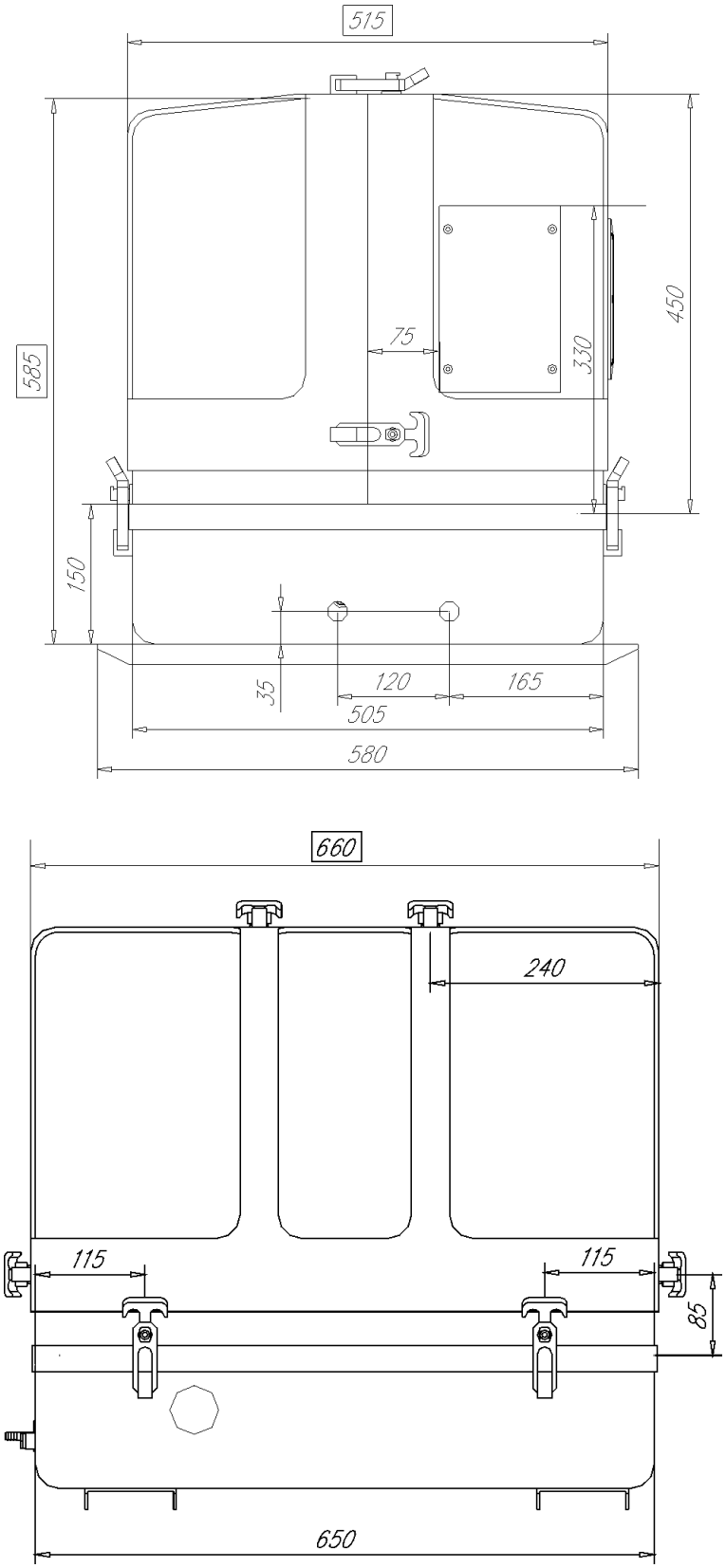



Fig. F.3: Measurements

# G. Panda Control Panel

## G.1 Panda Control Panel AGT (long version)


01. Warning led water temperature
02. Warning led oil pressure
03. Warning LED general failure
04. Control LED atomatik mode/manual mode
05. Display
06. Main switch ON/OFF
07. Button „Menue down“
08. Button „Enter“
09. Button „Menue up“
10. Button Generator „start/stop“

Fig. G.1-1: Front Panda Control Panel (long version)

## G.1.1 Panda Control Panel AGT (wide version)


01. Warning led water temperature
02. Warning led oil pressure
03. Warning LED general failure
04. Control LED atomatik mode/manual mode
05. Display
06. Main switch ON/OFF
07. Button „Menue down“
08. Button „Enter“
09. Button „Menue up“
10. Button Generator „start/stop“

Fig. G.1.1-1: Front Panda Control Panel (wide version)

**Caution!!: Before starting work at the Generator or the components please see “Safety Precautions” on Page 10.**

## G.1.2 Starting Generator

1. If necessary, open the fuel valve.
2. If necessary, close the main battery switch.
3. Press the „ON“ button.

The remote control panel comes up in the “Automatic mode“. That means that if there is an start request (from the battery monitor or external) the Generator will be started automaticly. Following steps will be done by the panel.
- Pre-heating (0-15 seconds according to the settings)
- starting the generator
- check if the generator is running
- driving the generator at suitable working conditions

by pressing ste „Start/Stop“ butten the generator will be switched off. The panel leaves the „Automatic mode“ and switch to „Normal mode“.

If there is no automatik start request, you can start the generator by manual.
Press the „Start/Stop“ button. Following steps will be done by the panel.
- Pre-heating (0-15 seconds according to the settings)
- starting the generator
- check if the generator is running
- driving the generator at suitable working conditions

After the generator is running the panel falls back into „Normal mode“. „Automatik mode“ is deactivated.
To activate the „Automatik mode“ again , please switch the panel off and on again.

LED is glowing yellow => „Automatic Mode“
LED is glowing green => „Normal Mode“


Errors will be collected and displayed only when the generator is running. The first encounting errors displayed in the panel. All other errors will be collectet and can be seen under the menue point „Errors“.

## G.1.3 Stopping the Generator

1. In „Normal mode“ switch off the generator by pressing the „Start/Stop“ button.
2. In „Automatic mode“ the generater will be switched off by an stop request (from battery monitor or external).
3. Activate additonal switches (Battery switch, fuel stop valve etc.).

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

4. If necessary, close sea cock.

## G.1.4 Turn on the panel

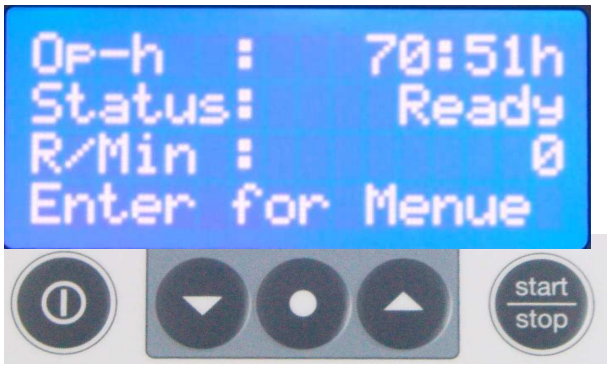

**Turn on the panel**

Turn on the panel by pushing the ON/OFF button.

optionel: +12V on clamp 16

Fig. G.1.4-1: Turn on Panel

## G.1.5 Overview




**Overview**

The Overview shows you the main information

Op-h - running time of the generator since last inpection

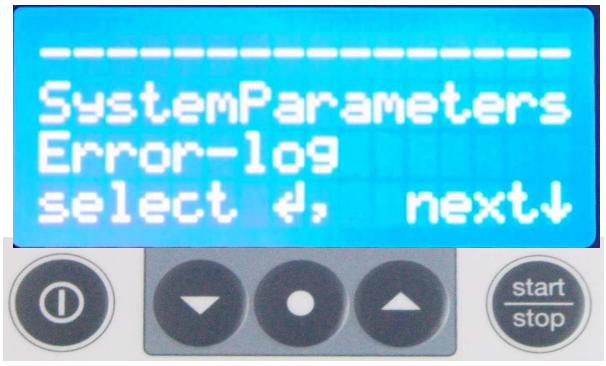
Status - status of the generator

R/Min - Round per minuteof the generator

Press the „ENTER“ to jump to the main menue

Fig. G.1.5-1: Overview

## G.1.6 Main menue




**Main menue with options**

-System Parameters *see 2.0*

-Error-log (Fehlerspeicher) *see 3.0*

-Clock settings *see 4.0*

scroll throug the menue with the up and down buttons - select with „Enter“

Fig. G.1.6-1: Main menue

## G.2 Sytem Parameters

**System Parameters**

The Parameters Menue has the options

- Light-Contrast
- Standby Time
- Standby Light
- Power Save time
- LED Light
- LED Light Standby
- Sprache (Language)
- back

scroll throug the menue with the up and down buttons - select with „Enter“


Fig. G.2-1: System Parameters

## G.2.1 Light

**Light**

min. : 0 (%)

max.: 100 (%)

adjust with the up and down - buttons select with enter

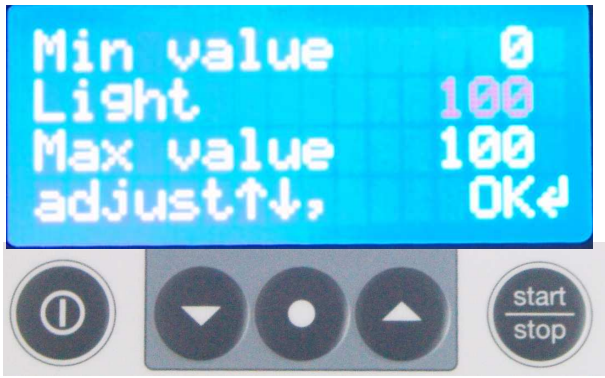



Fig. G.2.1-1: Light

## G.2.2 Contrast

**Contrast**

min. : 0 (%)

max.: 100 (%)

adjust with the up and down - buttons select with enter

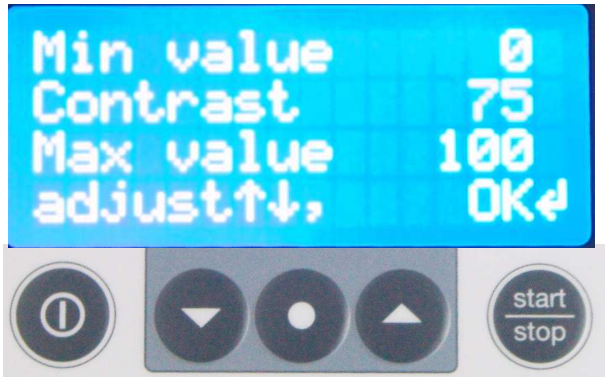
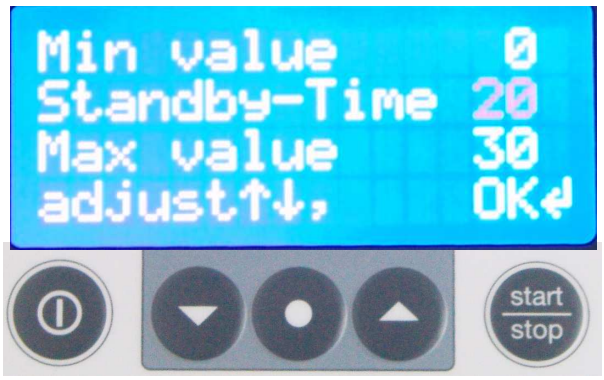



Fig. G.2.2-1: Contrast

## G.2.3 Standby time




**Standby time**

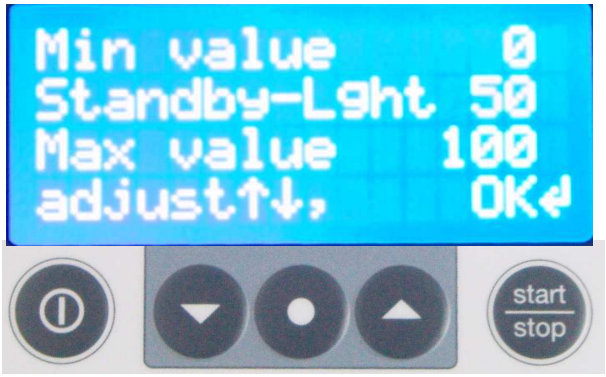
min. : 0 (sec)

max.: 30 (sec)

adjust with the up and down - buttons select with enter

Fig. G.2.3-1: Standby time

## G.2.4 Standby light




**Standby light**

min. : 0 (%)

max.: 100 (%)

adjust with the up and down buttons - select with enter

Fig. G.2.4-1: Standby light

## G.2.5 Power save time


**Power save time**

min. : 0 (sec)

max.: 240 (sec)

adjust with the up and down buttons - select with enter

Fig. G.2.5-1: Power save time

## G.2.6 LED light

**LED light**

min. : 0 (%)

max.: 100 (%)

adjust with the up and down buttons - select with enter

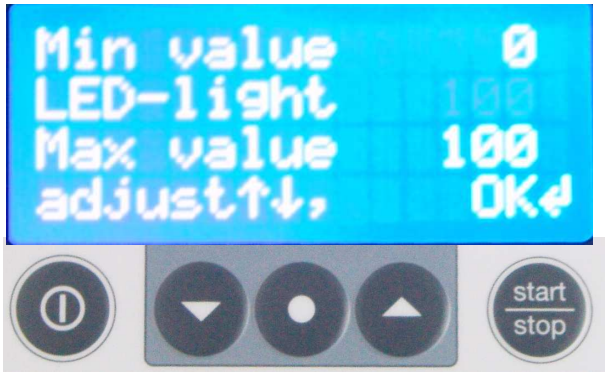



Fig. G.2.6-1: LED light

## G.2.7 LED standby light

**LED standby light**

min. : 0 (%)

max.: 100 (%)

adjust with the up and down buttons - select with enter


Fig. G.2.7-1: LED standby light

## G.2.8 Sprache (Language)

**Language**

1: English

2: Deutsch

adjust with the up and down buttons - select with enter

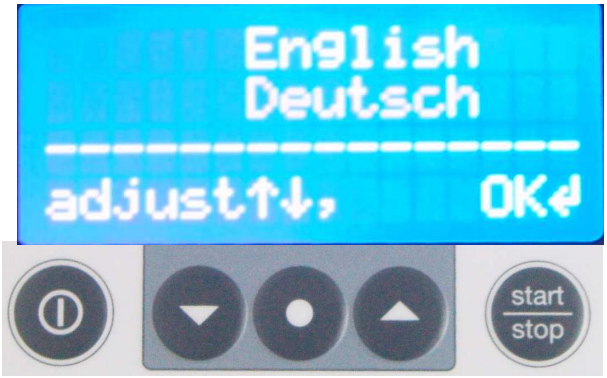



Fig. G.2.8-1: Language

**with the option „back“ you go to the main menue**

## G.3 Error Log

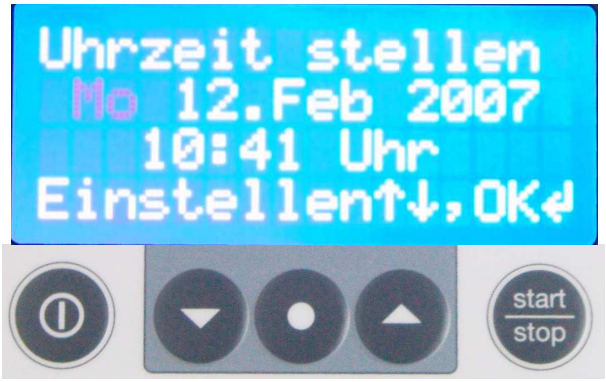

**Error Log**

It shows you the saved errors.

scroll with the up and down buttons - go back witn enter

Fig. G.3-1: Error log

## G.4 Clock




**Clock**

adjust with the up and down buttons - select with enter

Fig. G.4-1: Clock

**After 30 sec. without pressing any button the panel will fall back into the overview.**

Fischer Panda Datasheet

# H. Impellerfilter

| | |
|---|---|
| Art Nr.. | **31.06.03.003P** |
| Bez. | **Impellerfilter for Marine Panda P6, P8, P9, P10, P12 and P14**<br>since March 2007 |

| | Dokument | Hardware | Software |
|---|---|---|---|
| Aktuell: | R2 04.05.07 | 12.04.07 | ---------- |
| Replace: | V1 12.04.07 | | ---------- |

Tested for a flow rate up to 22l/min

# Fischer Panda Datasheet

## H.1 General

Starting with March 2007 the Fischer Panda generators type 6, 8, 9, 10, 12 and 14 has got an extra impellerfilter.

## H.2 How it works

When the impeller breaks, pieces of rubber will penetrate into the cooling system. This pieces can stock in the pipes with lower diameter (such as the heat exchanger) and reduce the cooling water flow. Expensive reconstruction and cleaning of the raw water circle is necessary.

The Fischer Panda impellerfilter hold this pieces of rubber back, so they can be easely removed. The flow through diameter of the cooling water is expanded in the impellerfilter, in emergency situation (like heavy sea) it is possible to change only the impeller itself and clean the impellerfilter afterwards at a better time. an emergency stop of the generator in fact of a to low cooling water flow and an overheating will be nearly banned. The impellefilter must be cleaned after each impeller break. If you are not sure that every piece of rubber is removed at the cleaning we recommend to change the impellerfilter.

## H.3 Cleaning and replacement of the impellerfilter

**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.**

**Seawater valve must be shut.**

Open the generator sound cover like it is explained in the generator manual

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

# Fischer Panda Datasheet

Impellerfilter

The impellerfilter is mounted at the right front motorbase.

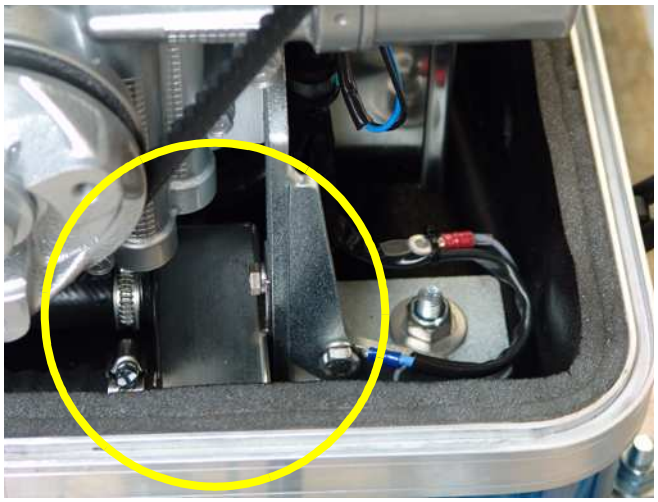


Fig. H.3-1: Impellerfilter

Loose holding screw

Loose the holding srew two turns

Srew M6 (*SW 10)

*SW 10 = wrench size 10mm

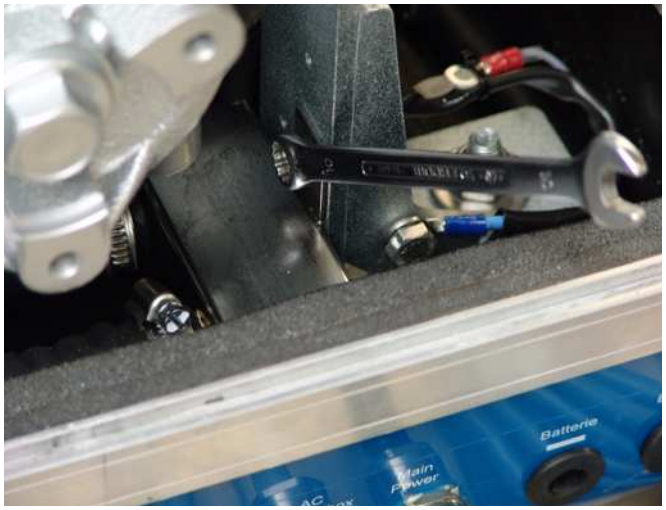



Fig. H.3-2: Holding screw

# Fischer Panda Datasheet

First hose clamp

Loose the front hose clamp.

Use a screwdriver, or better a wrench SW 7mm

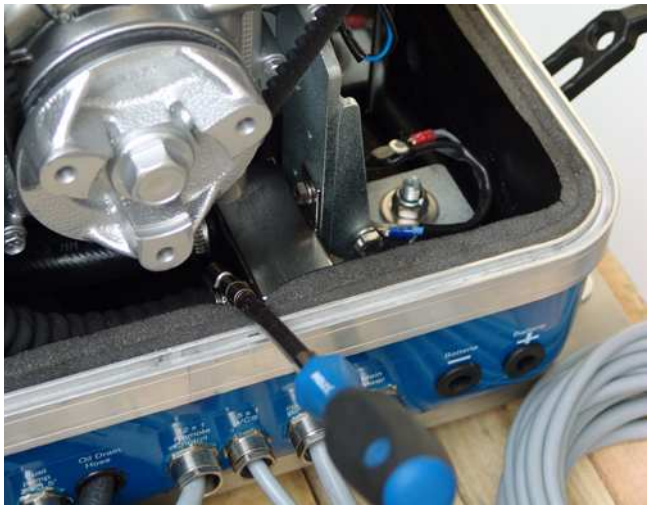


Fig. H.3-3: First hose clamp

Second hose clamp

Loose the second hose clamp

Use a srew driver, or better a wrench SW 7mm

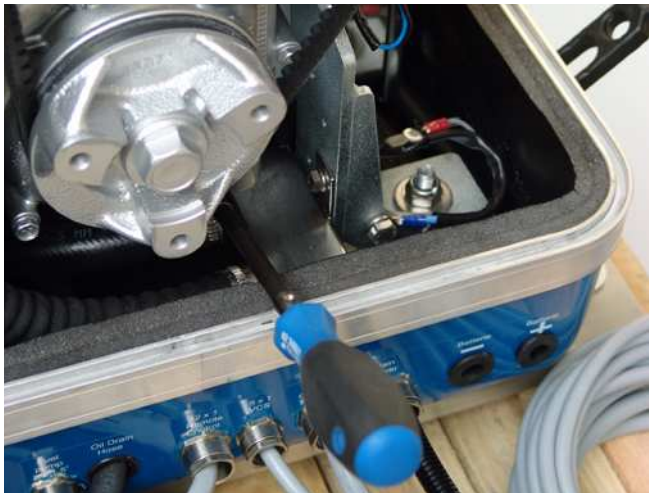


Fig. H.3-4: Second hose clamp

Remove the cooling water hose

remove the first cooling water hose

Some raw water may flow out of the hose or the impeller-filter

**The hose can be closed with the cap you get together with the impellerfilter spare part pack.**

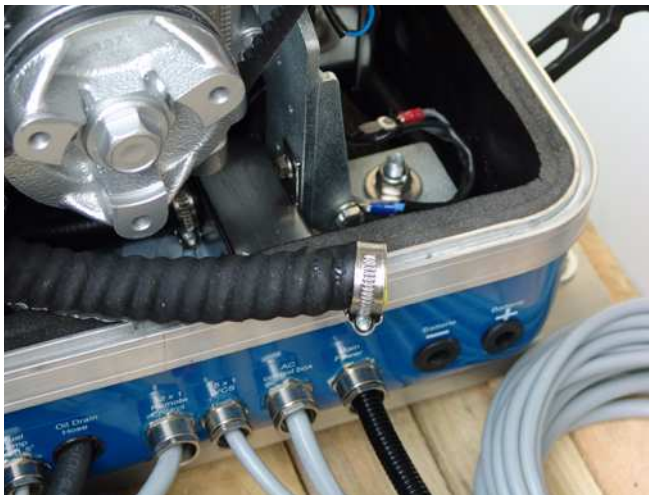


Fig. H.3-5: cooling hose

# Fischer Panda Datasheet

Remove the holding srew

Remove the impellerfilter holding screw

Fig. H.3-6: Holding screw

Pull the Impellerfilter out of the capsule

The second cooling water hose can be removed within these procedure.

Some raw water may flow out of the hose or the impeller-filter

**The hose can be closed with the cap you get together with the impellerfilter spare part pack.**

Fig. H.3-7: Remove Impellerfilter

Clening of the impellerfilter with water

The best cleanind will be to flush the filter against the flow direction

Fig. H.3-8: Cleaning with water

# Fischer Panda Datasheet

Option: Cleaning of the impellerfilter with air pressure

Fig. H.3-9: Cleaning with air

Replace the cleaned/new filter in reverse procedure..

Fig. H.3-10: Replace

## H.4 Spare part kit

**Fischer Panda Art Nr. 21.03.02.005S**

Impellerfilter Art. No. 31.06.03.003P
Screw M6x10 Art. No. G3A20093306010
with spring ring Art.No. G3A20012706
cap 19mm (2x) Art.No. PMGPN610U19

Fischer Panda Datasheet

## H.5 Dimensions

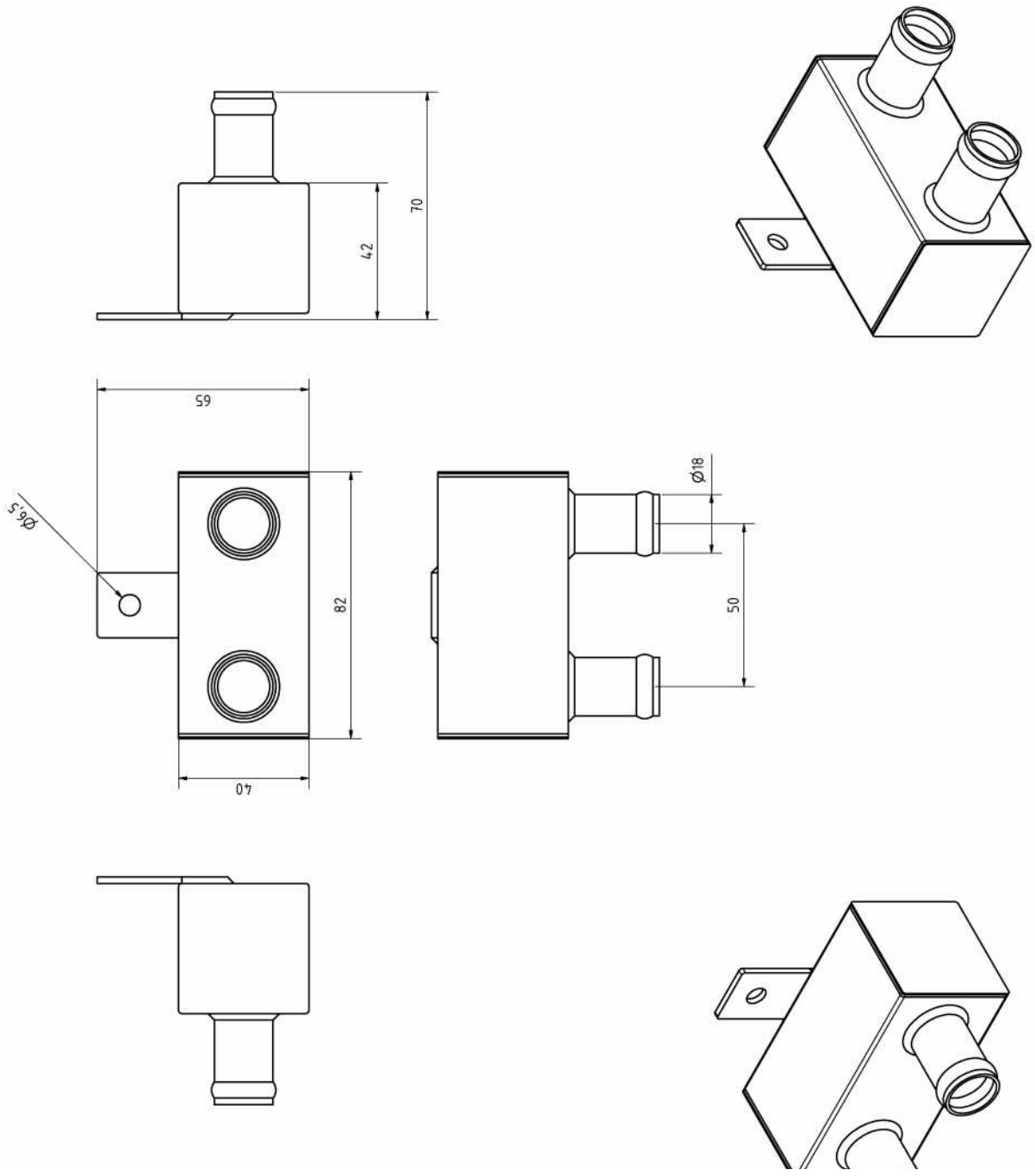



Fig. H.5-1: Dimensions

Fischer Panda Datasheet