Manual

Description, Installation, Maintenance and Trouble shooting

Marine Generator
Panda PMS AGT 6000

12-72V - 210A / 5,5kW

Fischer Panda

16.1.09

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Revision	**Page**

Contents

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 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!

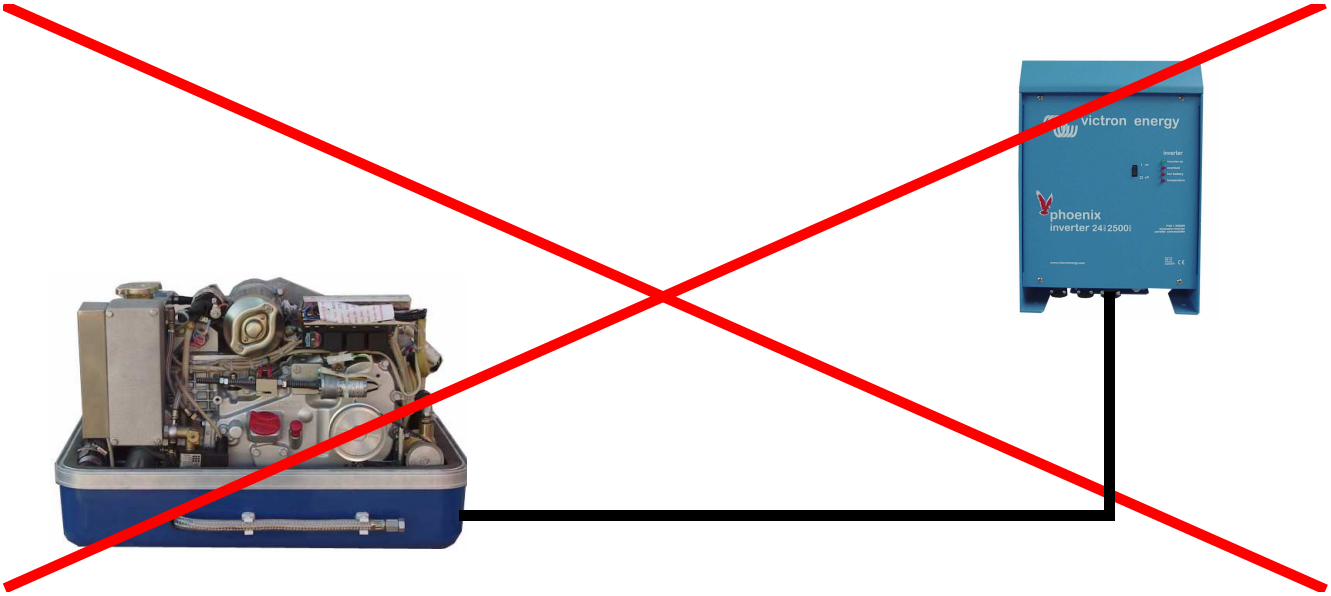
Never start the generator with the battery disconnected, the rectifiers will be damaged!

CAUTION!

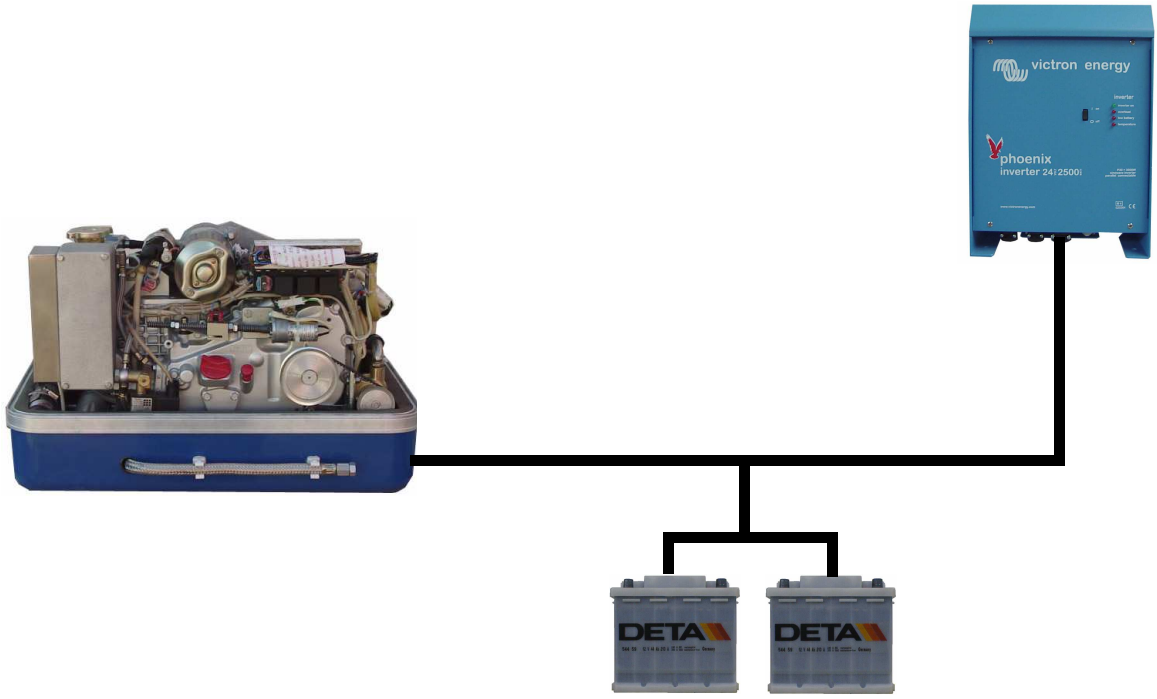
Contact of the electrical contacts may be DANGER TO LIVE!

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.

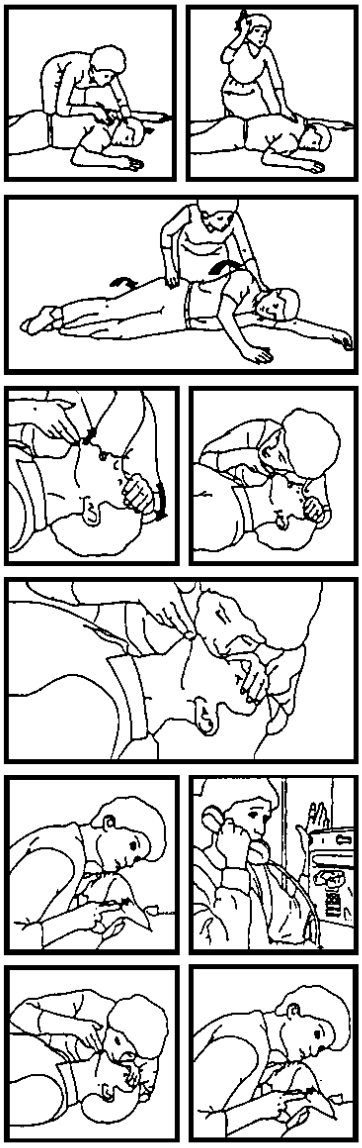
6 Give 2 Full Breaths.

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

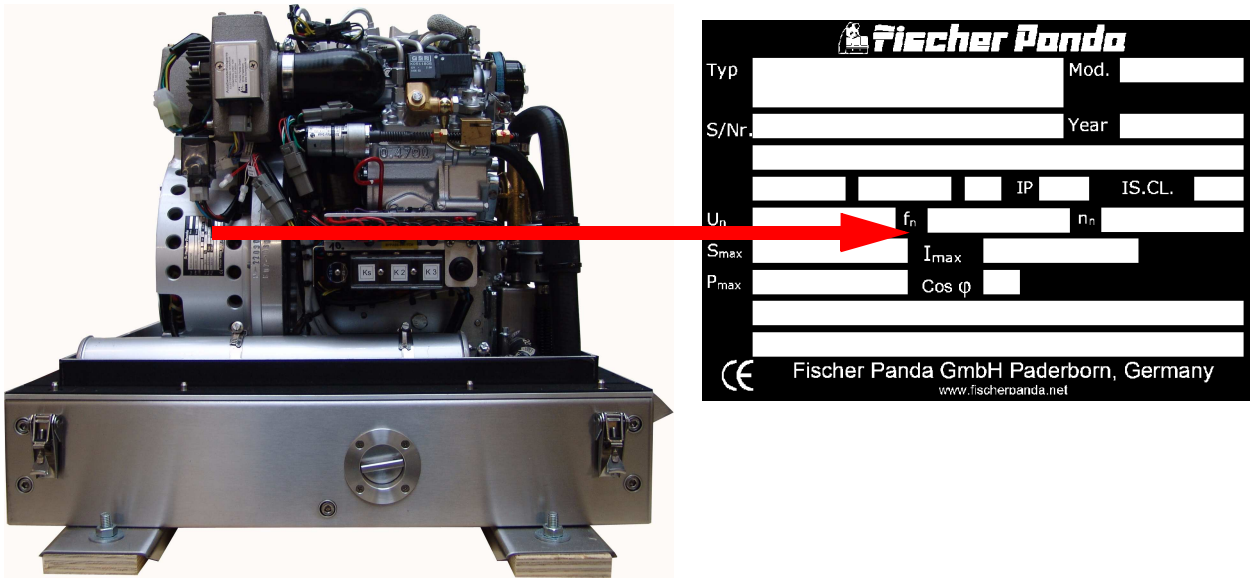


Fig. A.1-1: Type plate

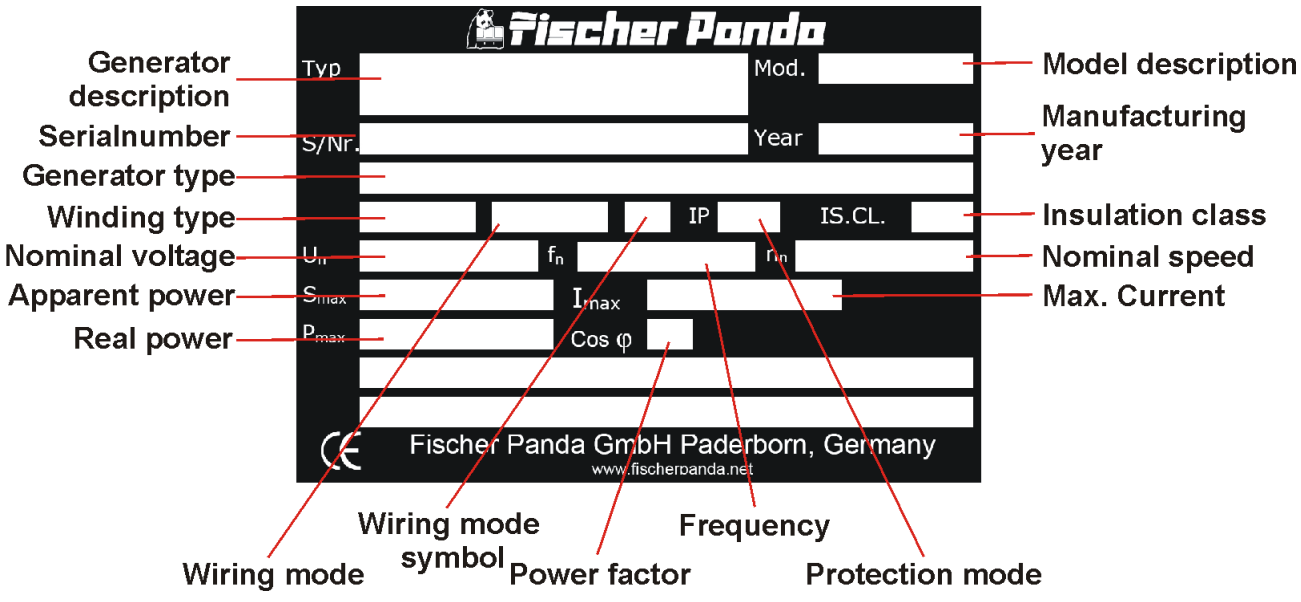
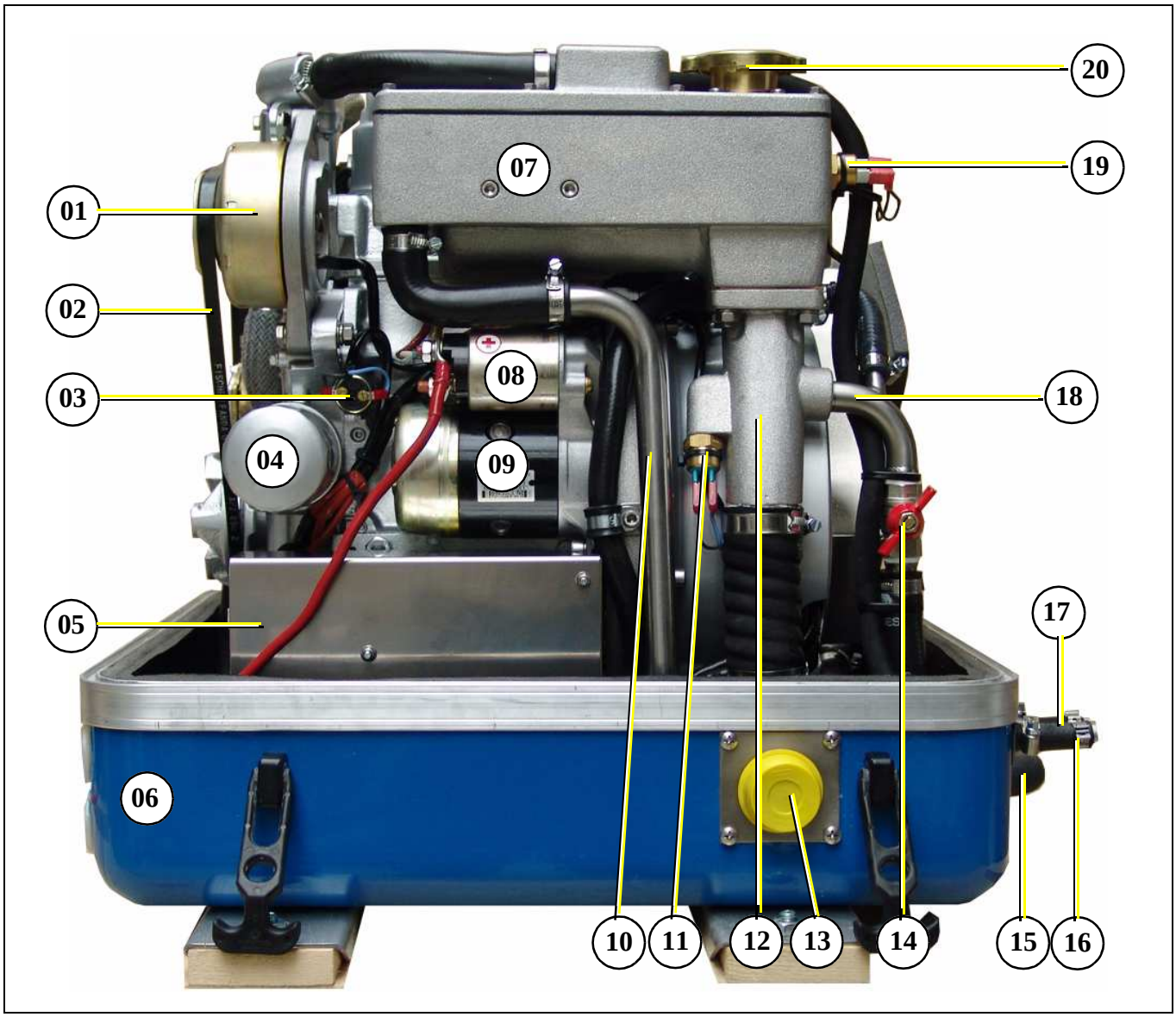


Fig. A.1-2: Discription type plate

A.2 Description of the Generator

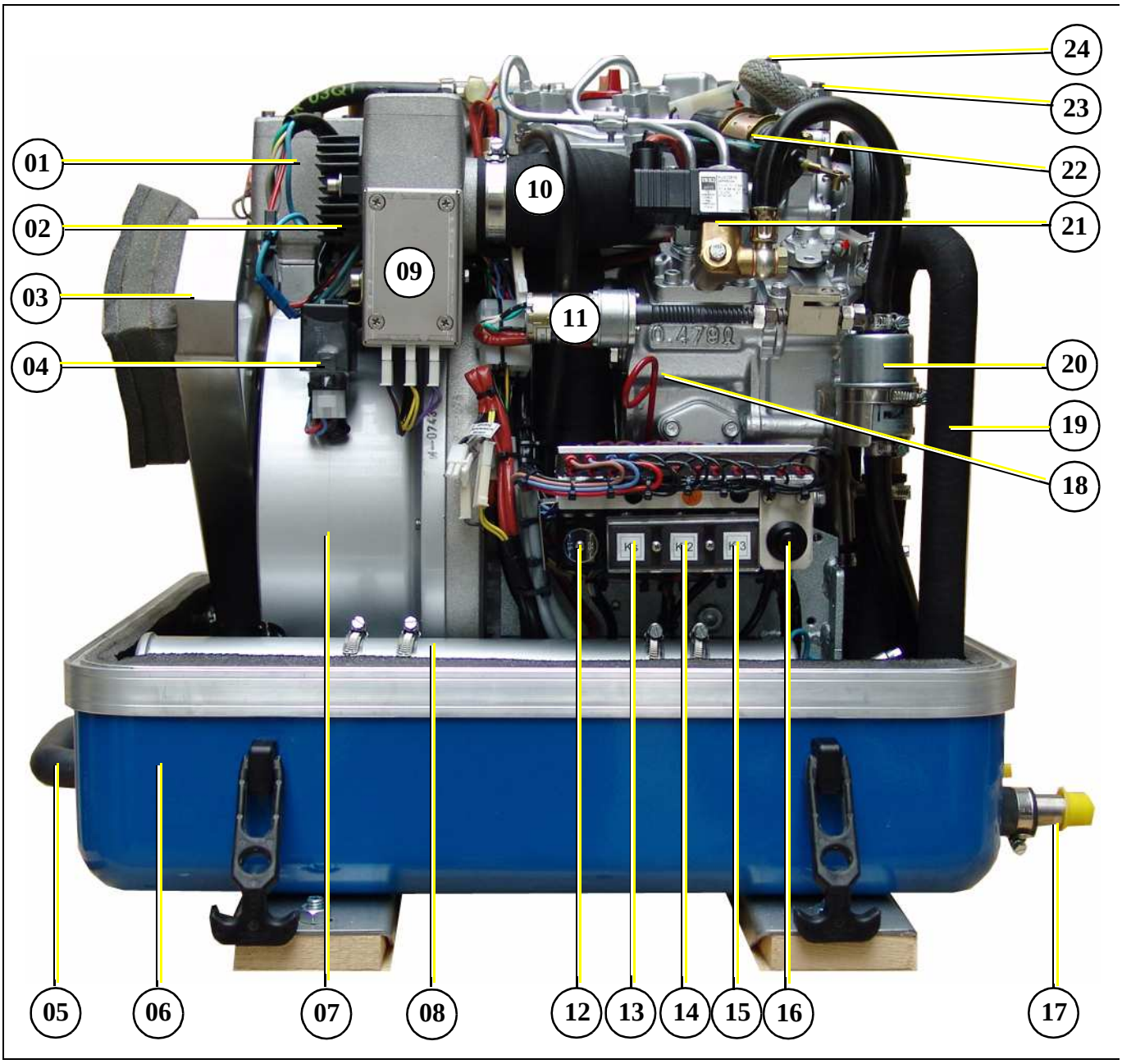
A.2.1 Right Side View



01) DC-alternator 12V
02) V-belt für DC-alternator and cooling water pump
03) Oil pressure switch
04) Oil filter
05) Diode block under protection cover
06) Sound cover base part
07) Water-cooled exhaust elbow
08) Solenoid for starter motor
09) Starter motor
10) Cooling water return pipe
11) Thermo-switch exhaust
12) Exhaust connection port
13) Exhaust output
14) Stop-cock (optional)
15) Connection external ventilation valve
16) In-flow from external cooling water expansion tank
17) Return external cooling water expansion tank
18) Injection port raw water

Fig. A.2.1-1: Right Side View

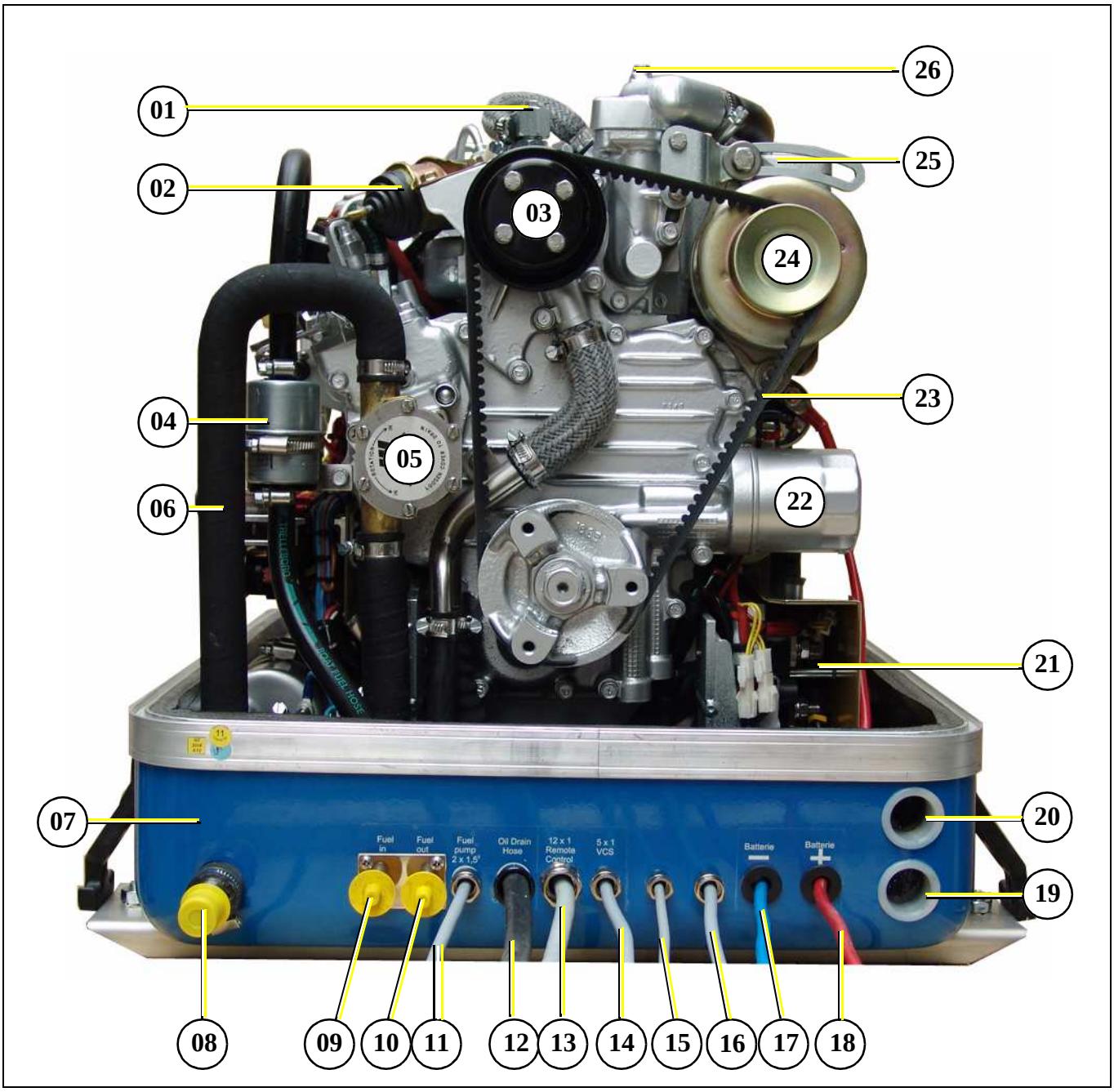
A.2.2 Left Side View



01) Air suction housing with air filter
02) Charge control for DC-alternator
03) Air suction port for coil cooling (GFK sound cover only)
04) Time relay for stop solenoid
05) Connection for external ventilation valve
06) Sound cover base part
07) Generator housing with coil
08) Heat exchanger
09) Electric starter control unit
10) Suction hose, air suction housing - induction elbow
11) Actuator for rpm-regulation
12) Electrical fuses (blue=15A, white=25A)
13) Starter-relay Ks
14) Pre-glow relay (glow plugs) K2
15) Fuel pump start relay K3
16) Failure bypass switch
17) Raw water intake
18) Oil dipstick
19) Raw water intake hose
20) Fuel filter
21) Fuel solenoid valve
22) Stop solenoid
23) Ventilation screw cooling water pump
24) Ventilation screw thermostat housing

Fig. A.2.2-1: Left Side View

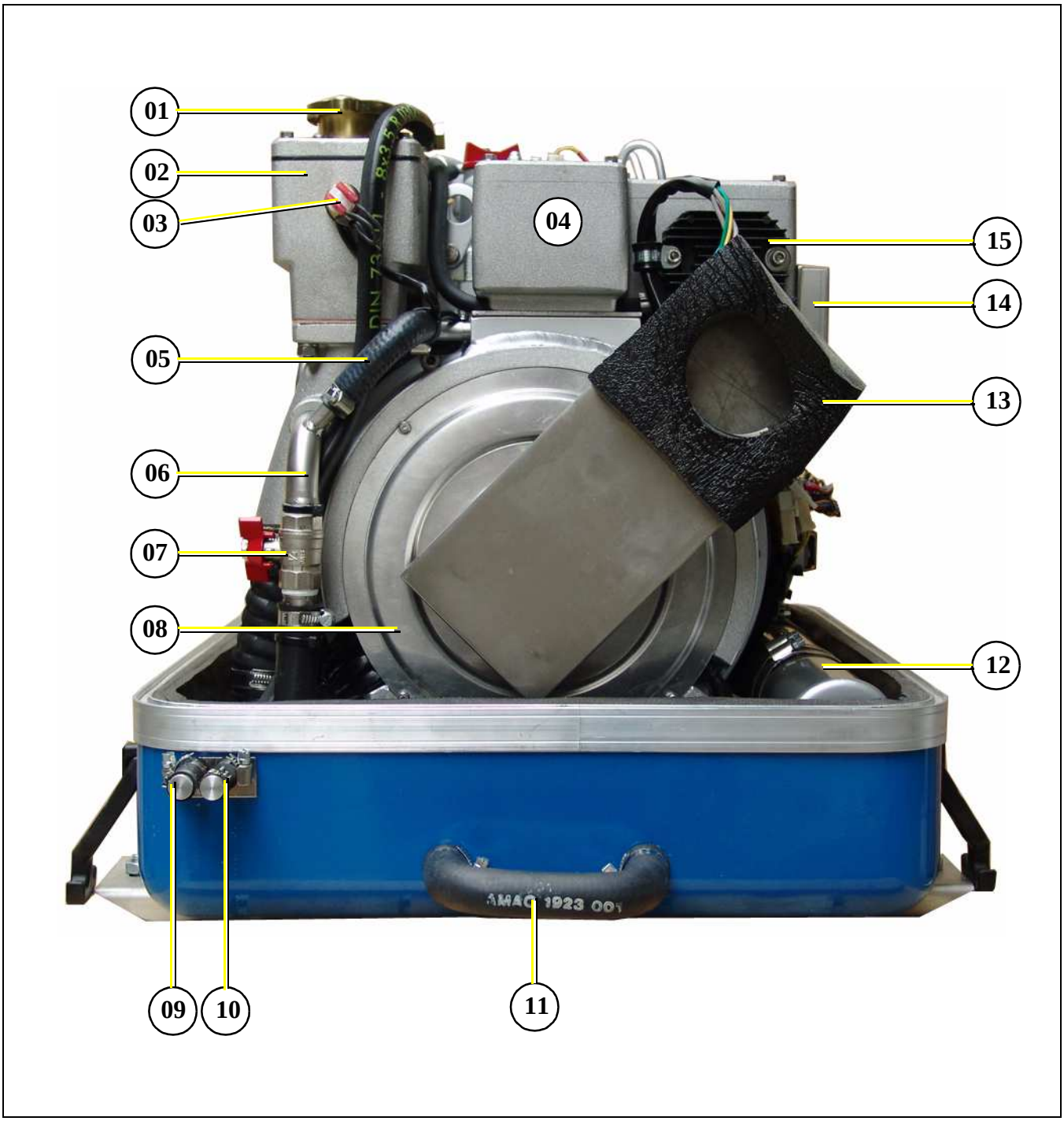
A.2.3 Front View



01) Ventilation screw internal cooling water pump
02) Stop solenoid
03) Pulley for internal cooling water pump
04) Fuel filter
05) Raw water pump
06) Raw water intake hose
07) Sound cover base part
08) Raw water intake
09) Connection fuel in
10) Connection fuel out
11) Cable fuel pump (2x1,5mm²)
12) Oil drain hose
13) Cable remote control panel (12x1mm²)
14) Cable voltage control VCS (5x1mm²)
15) Voltage sense 24 V
16) Shunt measurement
17) Starter battery minus (-)
18) Starter battery plus (+)
19) Passage for service battery cable
20) Passage for service battery cable
21) Diode block
22) Oil filter
23) V-belt
24) DC-alternator 12 V
25) Clamp device for DC-alternator
26) Ventilation screw thermotast housing

Fig. A.2.3-1: Front View

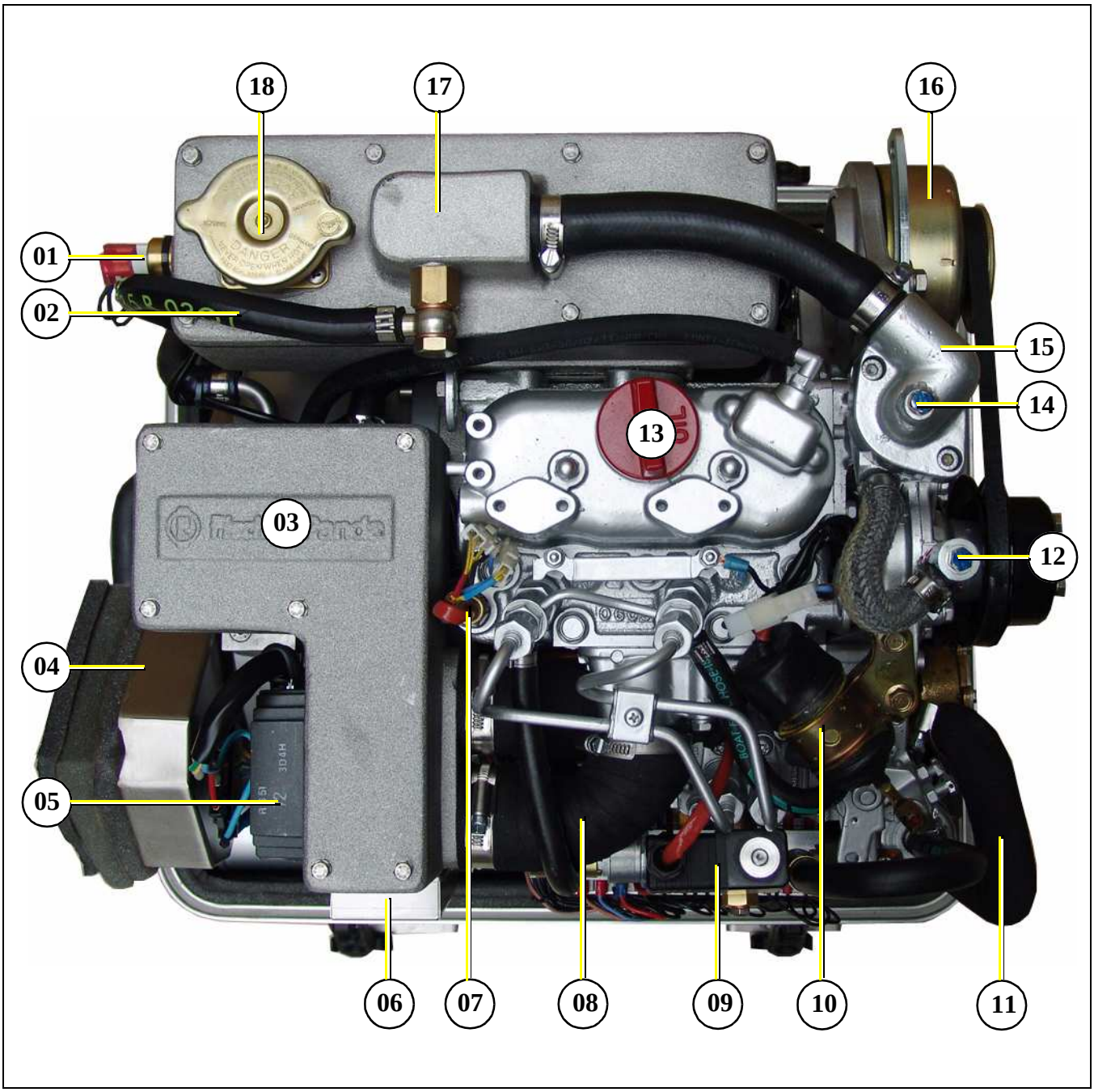
A.2.4 Back View



01) Cooling water filler neck
02) Water-cooled exhaust elbow
02) Thermo-switch exhaust elbow
04) Air suction housing with air filter
05) Bypass for generator housing cooling
06) Injection port raw water
07) Stop-cock (optional)
08) Generator front cover
09) In-flow from external cooling water expansion tank
10) Return to external cooling water expansion tank
11) Connection external ventilation valve
12) Heat exchanger
13) Suction port for coil cooling (GFK sound cover only)
14) Electric starter control unit
15) Charge control for DC-alternator

Fig. A.2.4-1: Back View

A.2.5 View from Above



01) Thermo-switch exhaust elbow
02) Ventilation hose to external expansion tank
03) Air suction housing with air filter
04) Suction port for coil cooling
05) Charge control for DC-alternator
06) Eletctric starter control unit
07) Thermo-switch cylinder head
08) Suction hose, air suction housing - induction elbow
09) Fuel solenoid valve
10) Thermostat housing with thermostat
11) Stop solenoid
12) Ventilation screw internal cooling water pump
13) Oil filler neck
14) Ventilation screw thermostat housing
15) Thermostat housing
16) DC-alternator
17) Water-cooled exhaust elbow
18) Cooling water filler neck

Fig. A.2.5-1: View from Above

A.3 Details of functional units

A.3.1 Components of Cooling System (Raw water)

Raw water intake

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

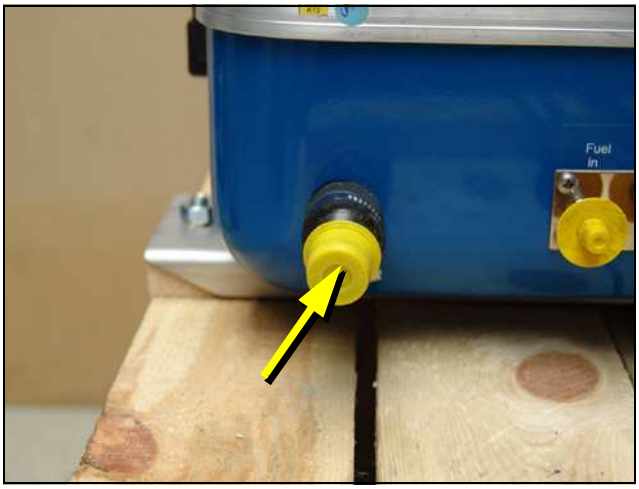


Fig. A.3.1-1: Raw Water Intake

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.

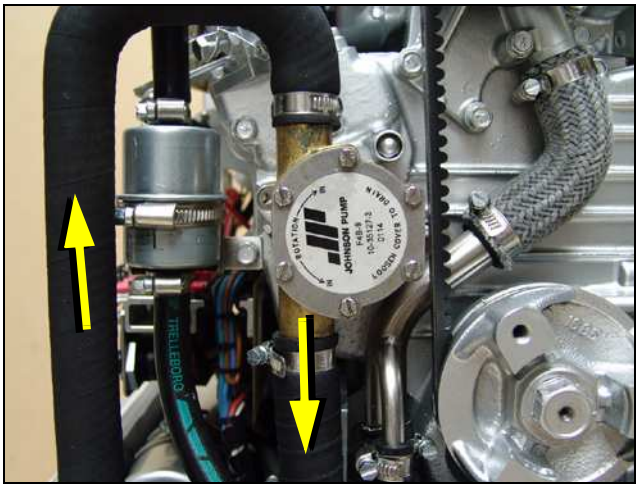


Fig. A.3.1-2: Raw Water Impeller Pump

Heat Exchanger

Separates the raw water system from the fresh water system, so that the generator components do not have contact with the raw water circulation system. The raw water is fed direct to the exhaust connection piece at the heat exchanger outlet.

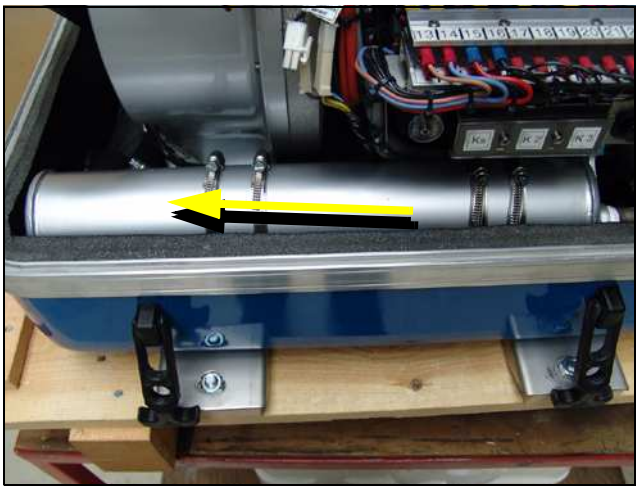


Fig. A.3.1-3: Heat Exchanger

Ventilation valve

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

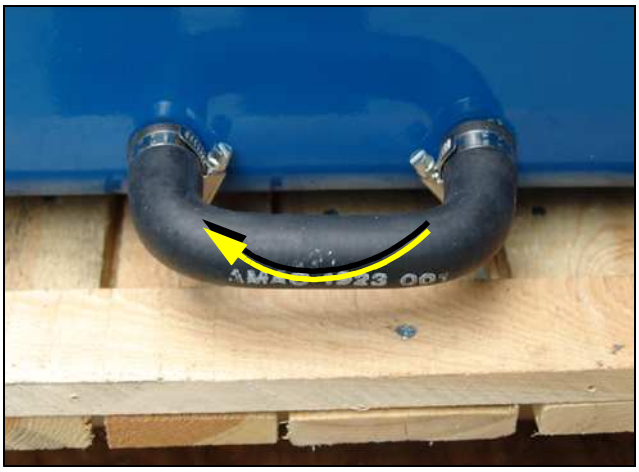


Fig. A.3.1-4: Connection for Ventilation Valve

Stop-cock

The raw water is injected into the exhaust connection (A). Also raw water is leading to the diode block (B).

Adjust with the stop-cock an inpression that raw water is lead to the diode block.

ATTENTION: The stop-cock may never be completely opened or closed, since otherwise the diode block or exhaust connection can become too hot.

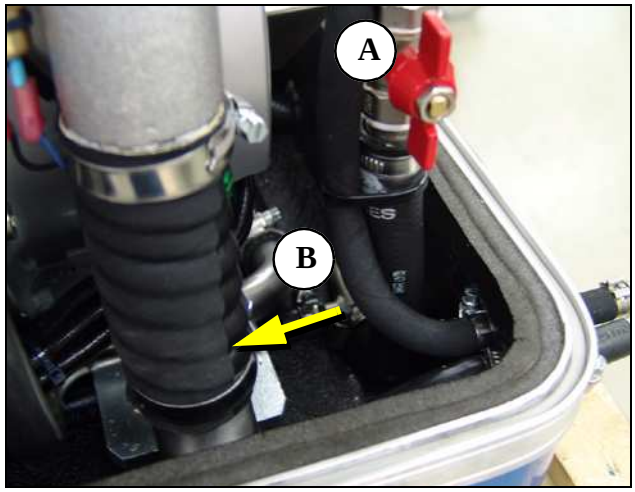


Fig. A.3.1-5: Stop-Cock

Raw water hose

After the raw water has passed the diode block it is lead to the generator housing

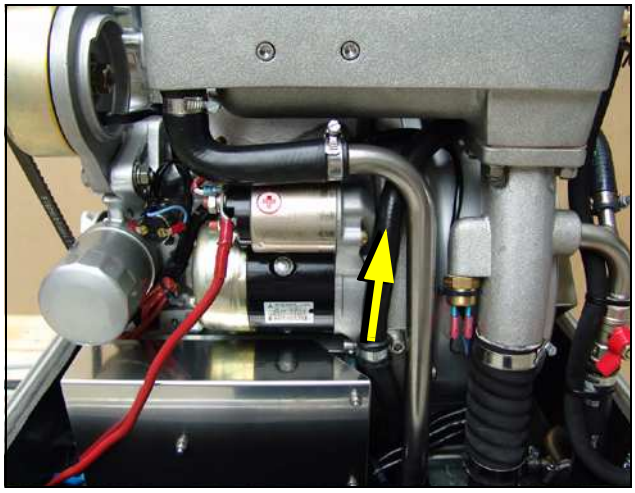


Fig. A.3.1-6: Raw Water Hose

IN/OUT generator housing

The raw water cooles the coil in the generator housing.

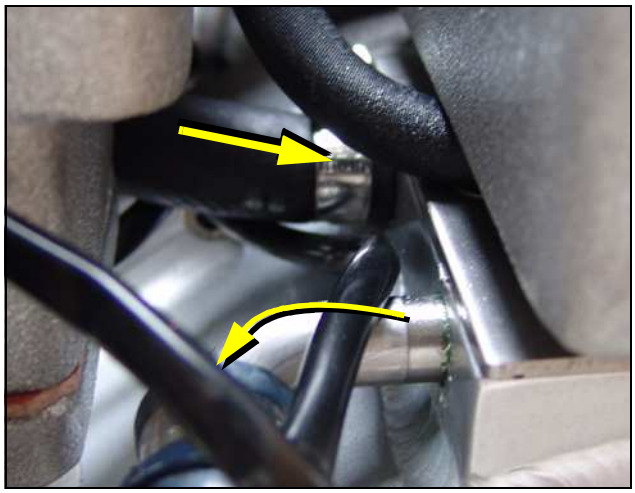


Fig. A.3.1-7: In/Out Generator Housing

Cooling water injector nozzle

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

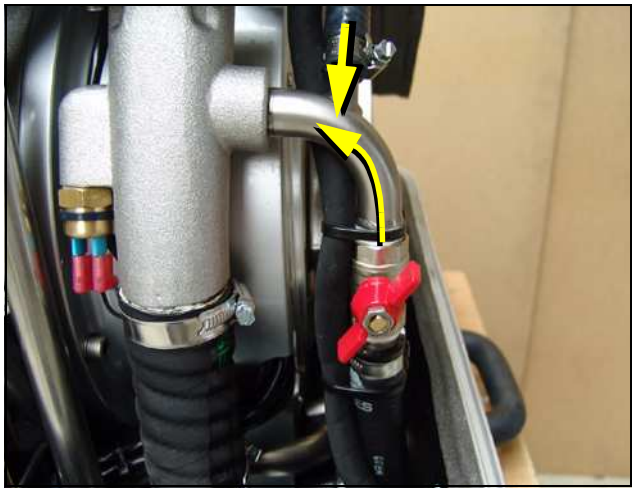


Fig. A.3.1-8: Injetion Nozzles for Cooling Water

A.3.2 Components of Cooling System (Freshwater)

Filler neck

The cooling water filler necks 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.

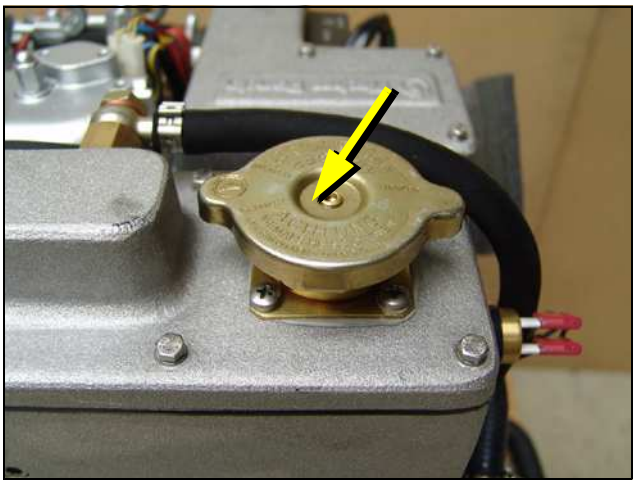


Fig. A.3.2-1: Cooling Water Filler Neck

Freshwater backflow

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

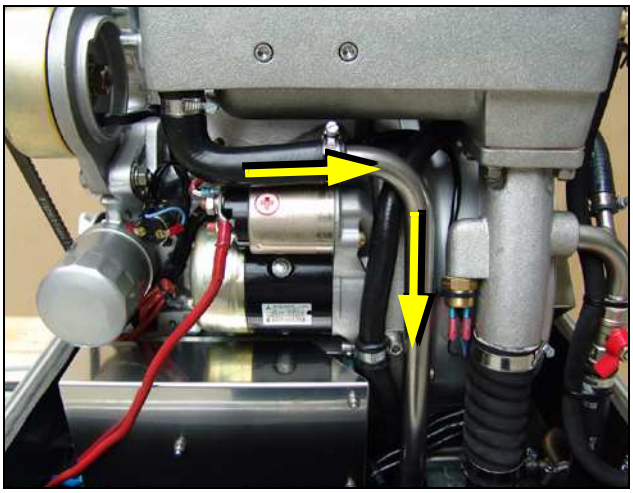


Fig. A.3.2-2: Freshwater Backflow

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).

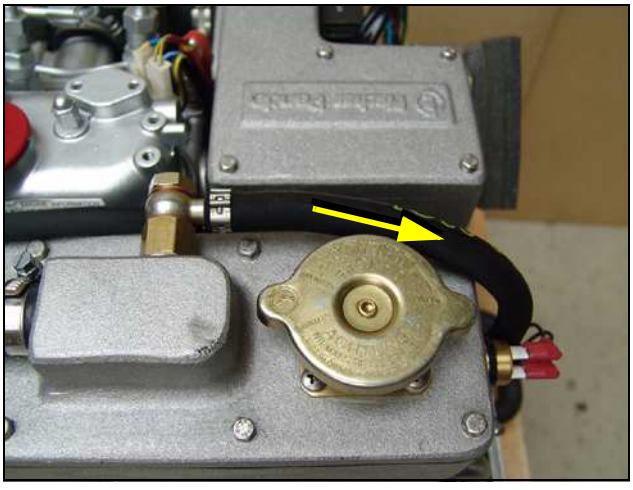


Fig. A.3.2-3: Ventilation Pipe

Hose connection pieces for the external expansion tank

The external expansion tank is connected by two hose connections. The connecting pieces showed 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.

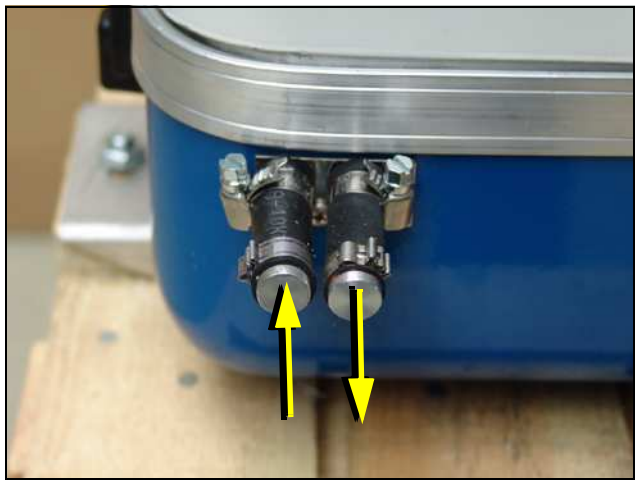


Fig. A.3.2-4: External Expansion Tank

Heat exchanger

The internal freshwater circulation system is separated from the Raw water circulation system by the heat exchanger. This means the Raw water circulation system does not come into contact with the generator components. The Raw water is fed directly to the exhaust connection at the heat exchanger outlet.

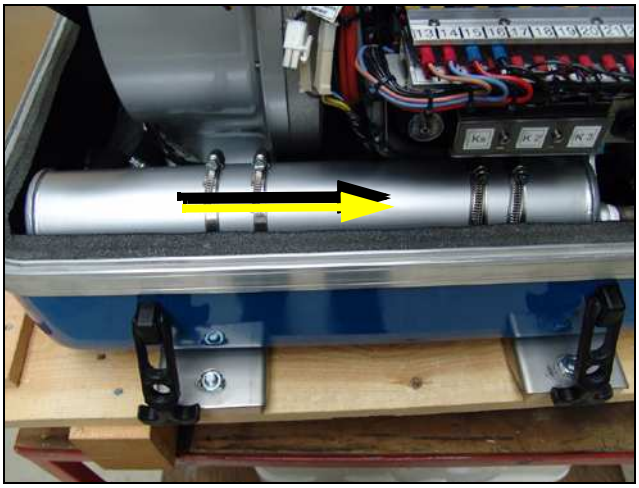


Fig. A.3.2-5: Heat Exchanger

Cooling water intake

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“.

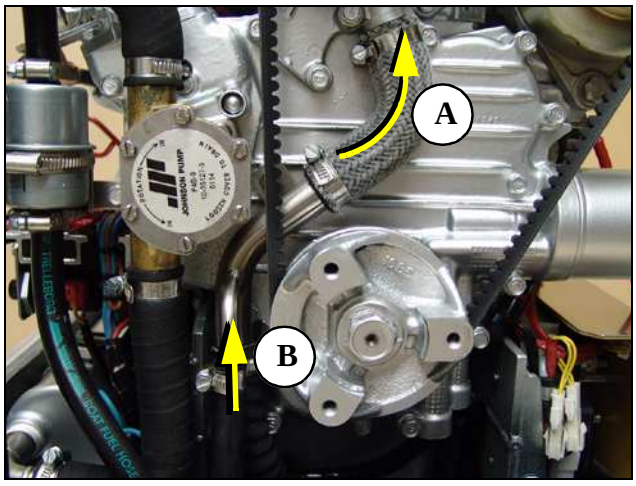


Fig. A.3.2-6: Cooling Water Intake

Internal cooling water pump

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

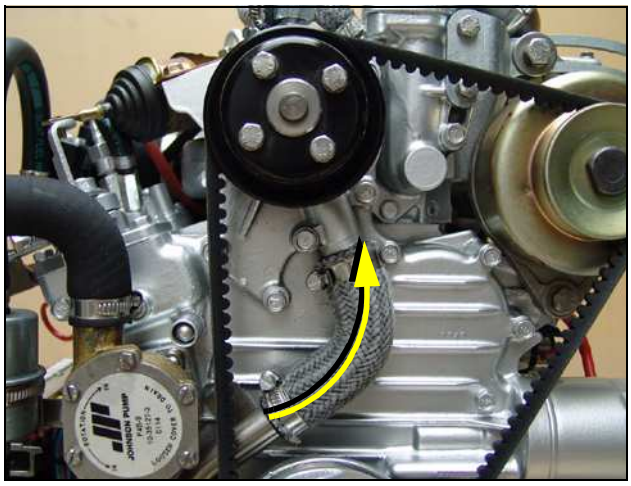


Fig. A.3.2-7: Internal Cooling Water Pump

Internal cooling water pump

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

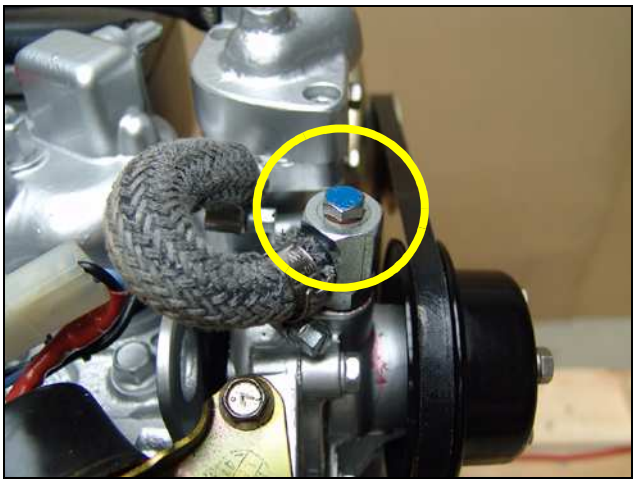


Fig. A.3.2-8: Internal Cooling Water Pump

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.3.2-9: Ventilation Screw Thermostat Housing

Water-cooled exhaust manifold

The manifold is cooled by means of the internal cooling system (freshwater). The cooling water filler necks on the casing of the manifold 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.

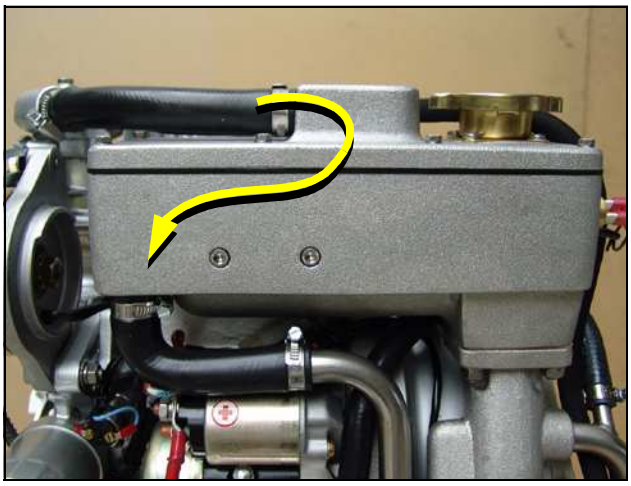


Fig. A.3.2-10: Water-Cooled Exhaust Manifold

A.3.3 Components of the Fuel System

External fuel pump

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

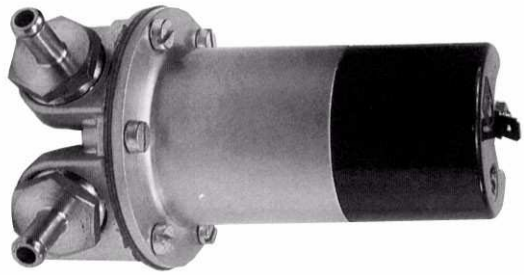


Fig. A.3.3-1: External Fuel Pump

Connecting Pieces for the Fuel Pipe

1. Fuel intake

2. Fuel backflow

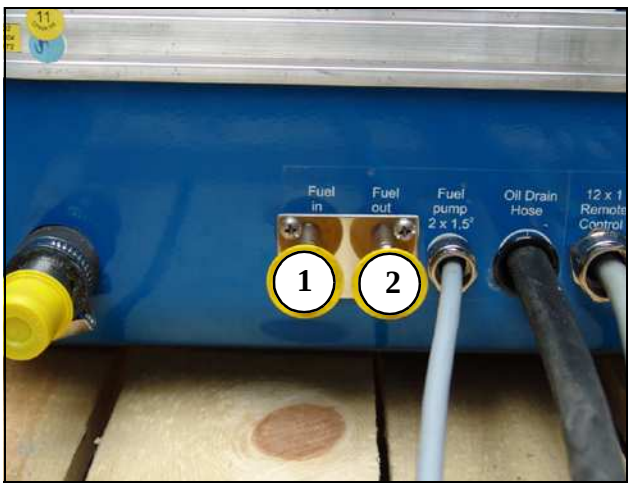


Fig. A.3.3-2: Connection Pieces for the Fuel Pipe

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.

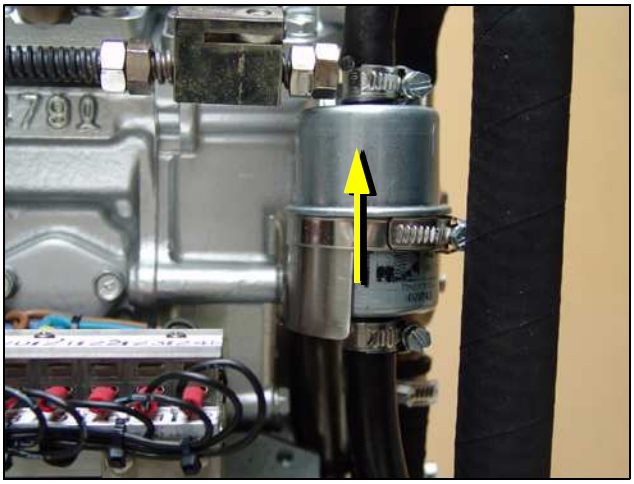


Fig. A.3.3-3: Fuel Filter

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.3.3-4: Fuel Solenoid Valve

Injection Nozzle

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

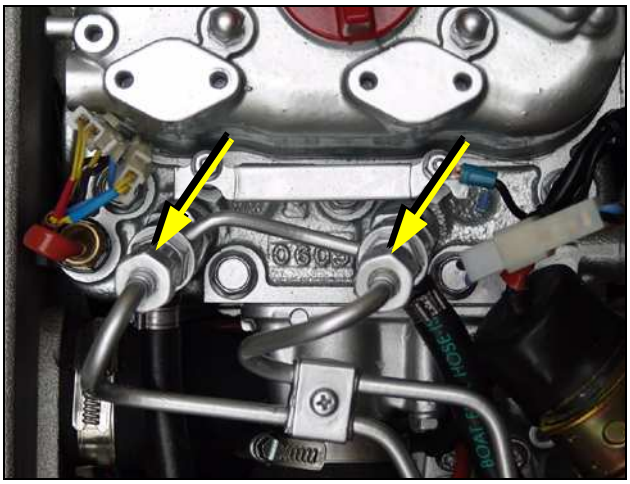


Fig. A.3.3-5: Injection Nozzles

Glow Plugs

The glow plugs serve the pre-chamber for the heating with cold start. The glow device must be operated, if the temperature of the generator is below 16 °C. This is practically the case with each start. The glow device and starter button are set so that neither may be used at the same time.

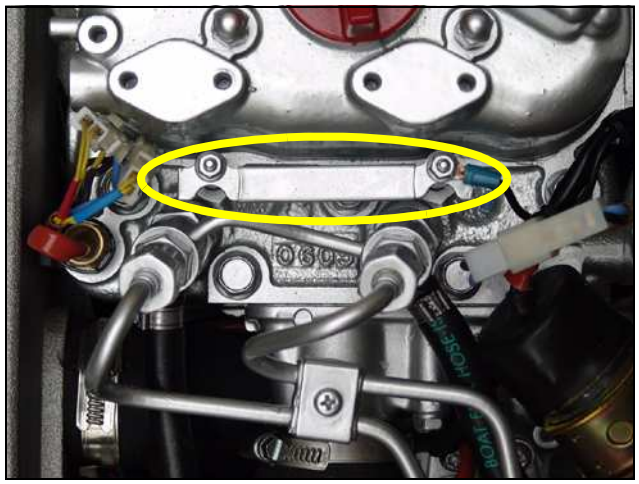


Fig. A.3.3-6: Glow Plugs

Stop Solenoid for Engine Stop

Some models are additional equipped with a 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 operate freely and is not placed under pre-stress.

Fig. A.3.3-7: Stop Solenoid for Engine Stop

A.3.4 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.3.4-1: Combustion Air Intake

Cooling air for coil cooling

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

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

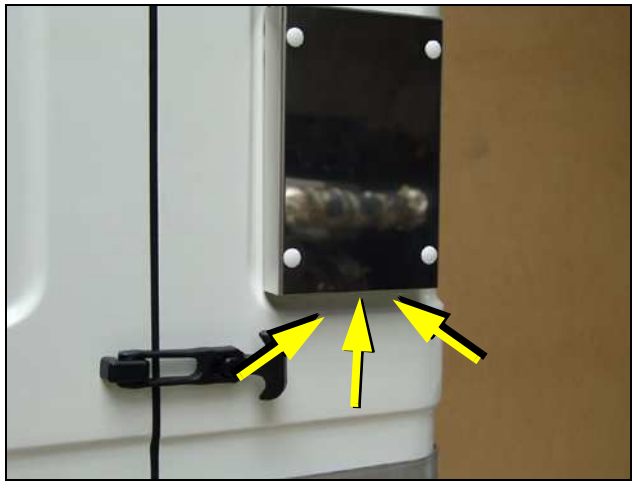


Fig. A.3.4-2: Freshwater Intake

Air suction housing

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

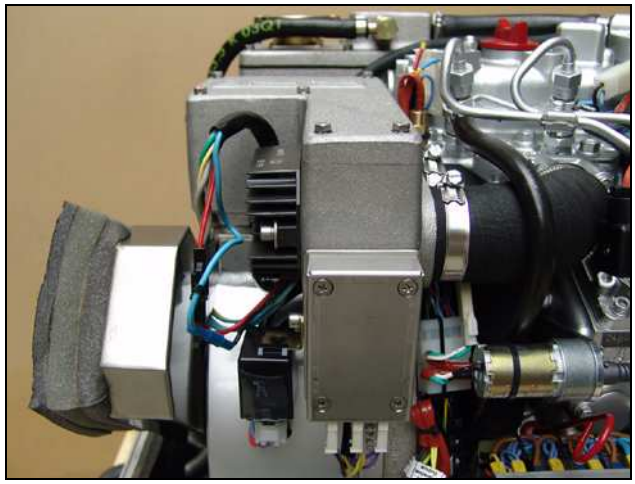


Fig. A.3.4-3: Air Suction Housing

Air suction housing with air filter set

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

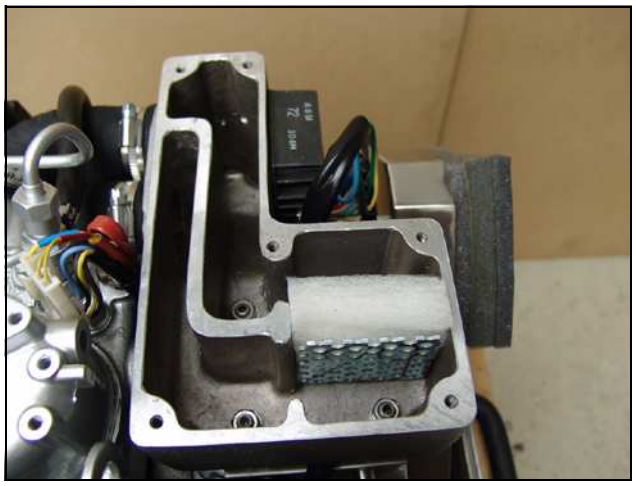


Fig. A.3.4-4: Air Filter Set

Combustion chamber intake 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 contracts during operation.

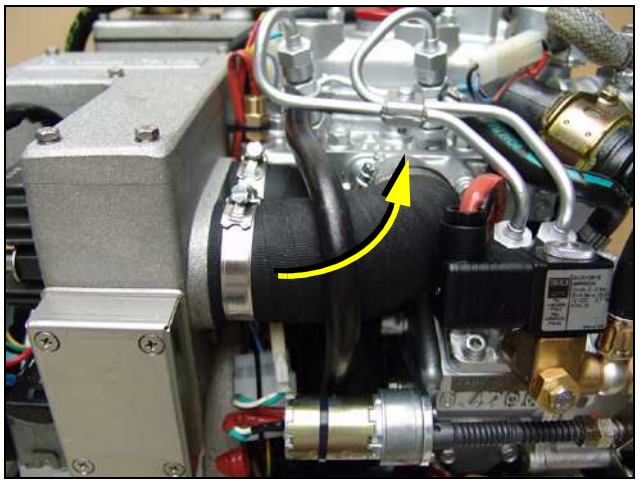


Fig. A.3.4-5: Combustion Chamber Intake Elbow

Exhaust elbow

At the back side of the engine is the water-cooled exhaust elbow.

Underneath the exhaust elbow, the raw water is injected into the exhaust

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.

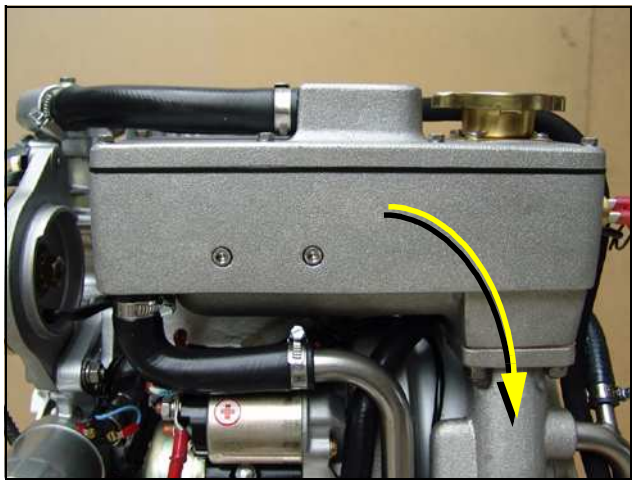


Fig. A.3.4-6: Exhaust Elbow

Exhaust connection at the exhaust elbow

Raw water from the external cooling circle is fed here.

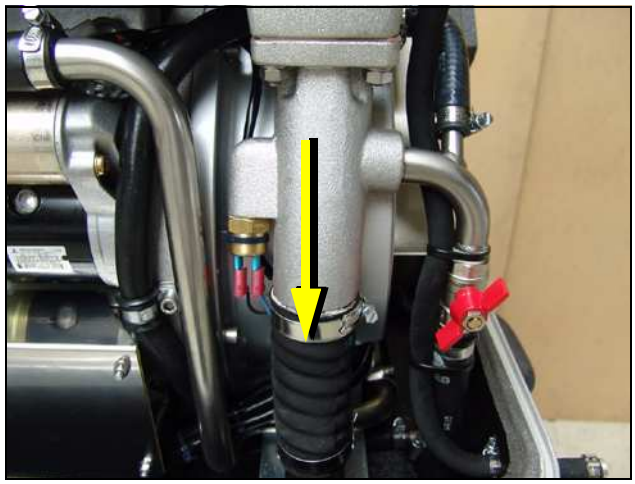


Fig. A.3.4-7: Exhaust Connection

Exhaust outlet

Connect the exhaust pipe with the water lock.

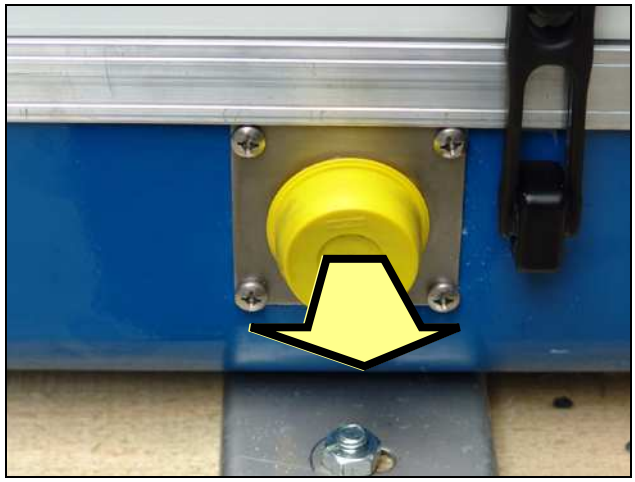


Fig. A.3.4-8: Exhaust Outlet

A.3.5 Components of the Electrical System

Connection starter battery

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

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

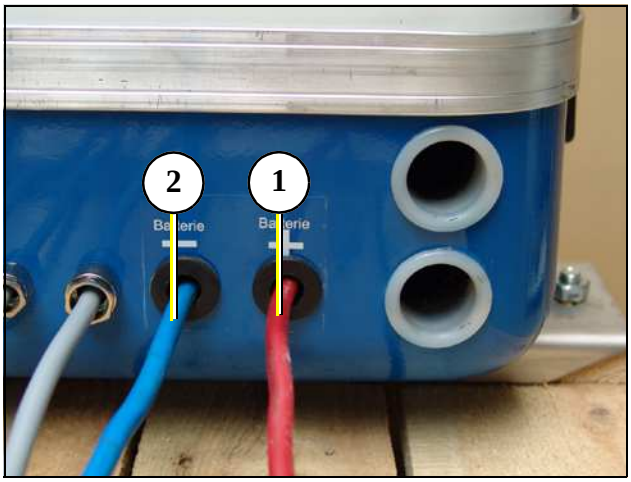


Fig. A.3.5-1: Connection Starter Battery

Main power

At the front of the sound insulation cover is also the outlet for the main power cable. Here are also the cables for external condensers connections, depending upon type of generator (see Connection Diagram for the AC-Control box!)

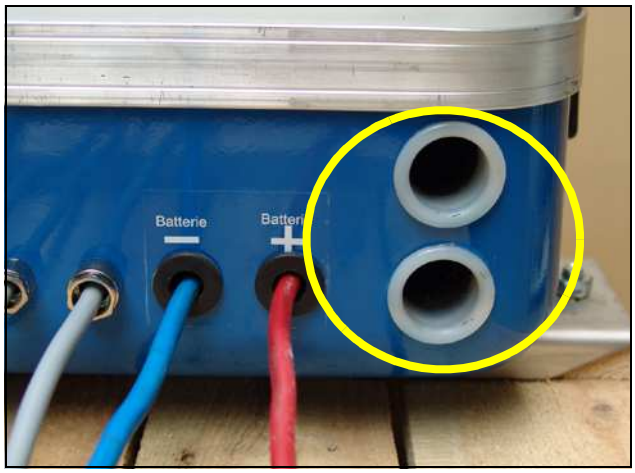


Fig. A.3.5-2: Main Power

Electrical connections for control

All remaining cables are located at the front end of the generator for electrical connections, depending upon type. The connections are taken from the AC-Control Box Plan. See here:

1. Fuel pump
2. Remote control panel
3. VCS
4. AC-Control-Box

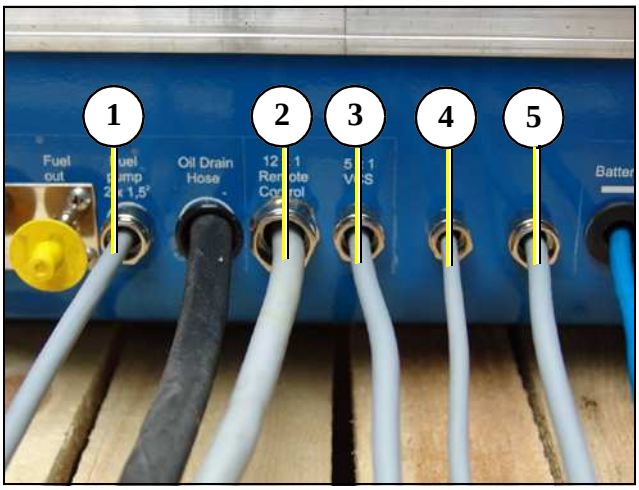


Fig. A.3.5-3: Electrical Connections

Starter motor

1. Starter motor and

2. Solenoid switch

The diesel engine is started electrically. The electrical starter with the solenoid switch is located at the rear of the engine.

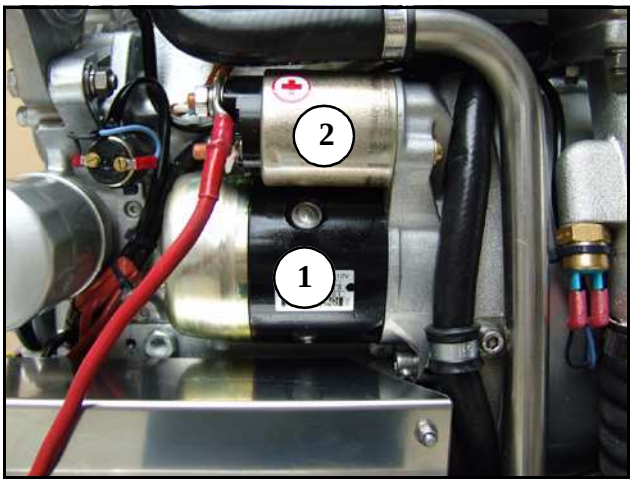


Fig. A.3.5-4: Starter Motor

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.

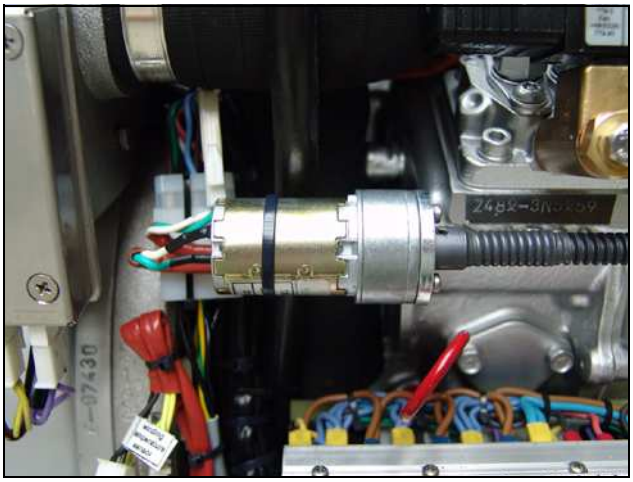


Fig. A.3.5-5: Actuator

Plug for speed sensor

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

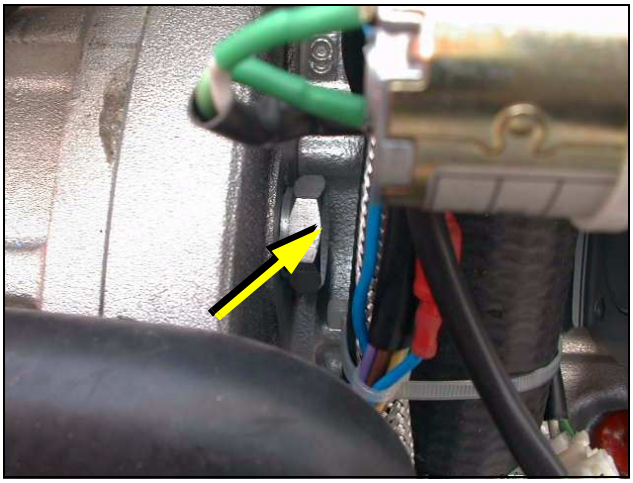


Fig. A.3.5-6: Plug for Speed Sensor

DC-alternator

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

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

Fig. A.3.5-7: Lichtmaschine

Charge control for DC-alternator

The voltage regulator for the 12 V DC-alternator is located at the back of the air suction housing. The housing is streamlined for cooling purposes. The voltage regulator may not be externally covered. The surface must be accessible for cooling.

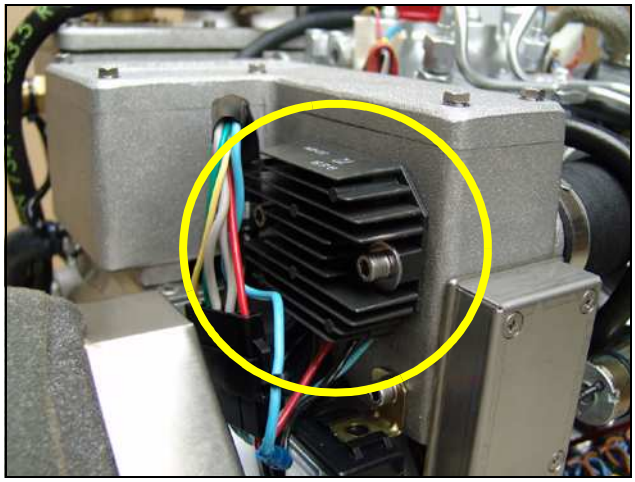


Fig. A.3.5-8: Charge Control

Restart Protection

If there is an automatic starting requirement and the remote control panel is switched off, then this automatic starting requirement will be ignored. Automatic starting is only possible after switching on the remote control panel.

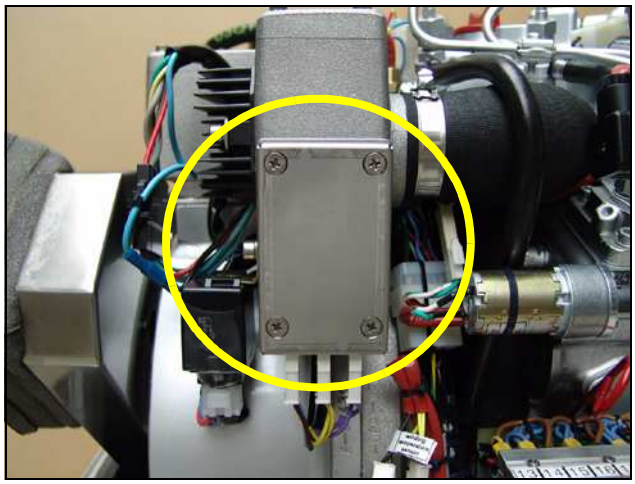


Fig. A.1: Restart Protection

Time relay for stop solenoid

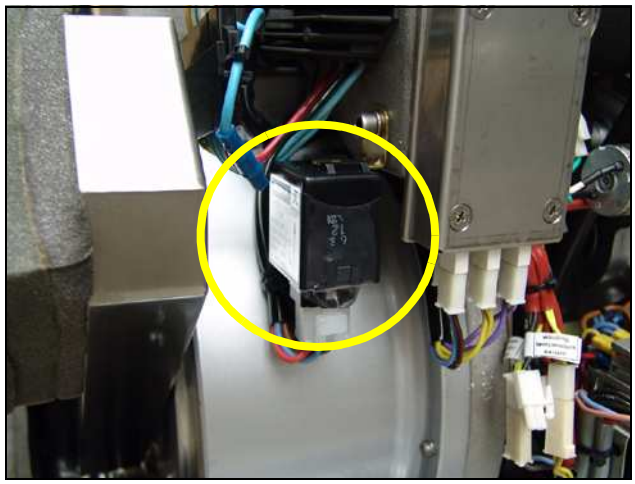


Fig. A.3.5-9: Time Relay for Stop Solenoid

Diode plate

Fig. A.3.5-10: Diode plate

Fuse for measurement voltage

Fig. A.3.5-11: Fuse for Measurement Voltage

Terminal block for remote control cable with fuses and power relais

F1 fuse 15 A for DC wiring

F2 fuse 25 A for starter relay

Ks power relais for Starter

K2 power relais for Glow plugs

K3 power relais for Fuel pump

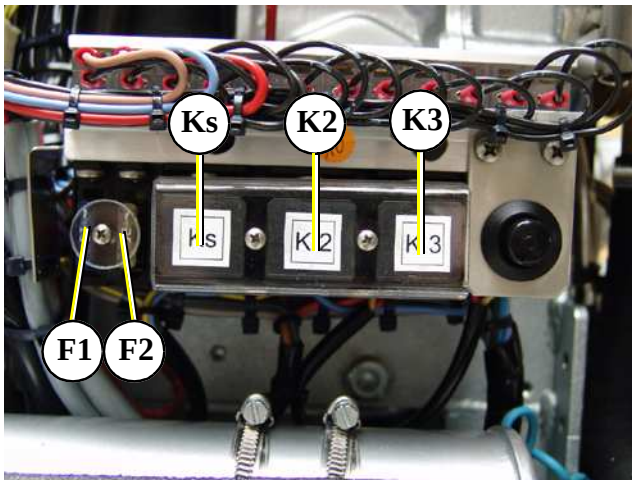


Fig. A.3.5-12: Terminal block

A.3.6 Sensors and Switches for Operating Surveillance

Thermo-switch at cylinder head

The thermo-switch at the cylinder head serves to monitor the generator temperature. All thermo-switches for the generators from Panda 6.000 upward are two-pole (earthed), so called "openers". This means the contacts are open in normal cases and close only when the limits have been exceeded.

Fig. A.3.6-1: Thermo-switch at Cylinder Head

Thermo-switch at watercooled exhaust elbow

This thermo switch is located at the water-cooled exhaust elbow and serves to monitor the freshwater circulation system. It takes a measurement at the warmest spot, since the combustion gases are guided from the cylinder head to the exhaust elbow.

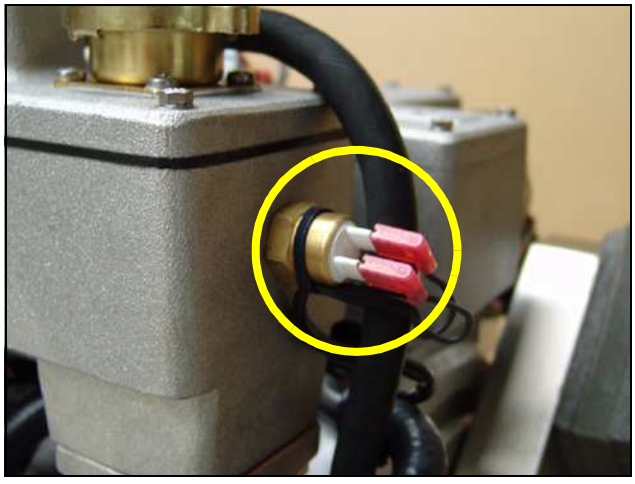


Fig. A.3.6-2: Thermo-switch at Watercooled Exhaust Elbow

Thermo-switch at exhaust connection

If the impeller pump stops and delivers no more seawater, the exhaust connection becomes extremely hot. The thermo-switch controls the raw water circuit.

Fig. A.3.6-3: Thermo-switch at Exhaust Connection

Thermo-switch in the Generator Winding

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

Two thermo-switches inside the windings to protect the generator winding, which for safety reasons are installed independently in parallel.

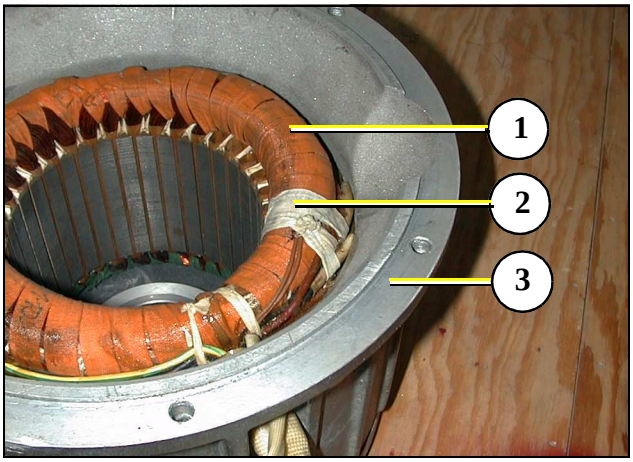


Fig. A.3.6-4: Thermo-switch in the Generator Winding

Thermo-switch on the (-)-bar

(-)-bar at the diode block

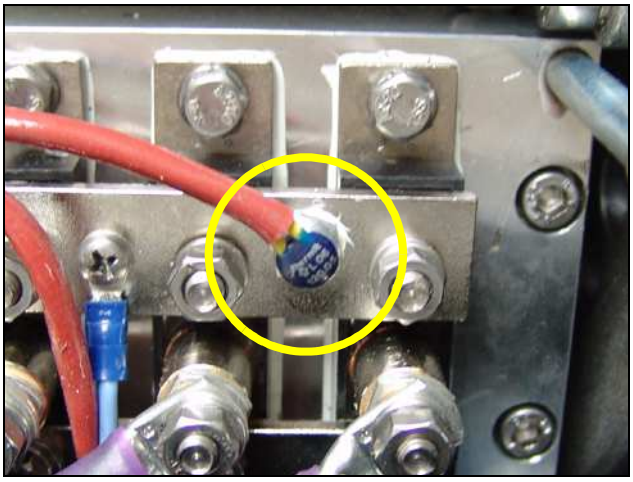


Fig. A.3.6-5: Thermo-switch on the (-)-bar

Thermo-switch on the (+)-bar

(+)-bar at the diode block

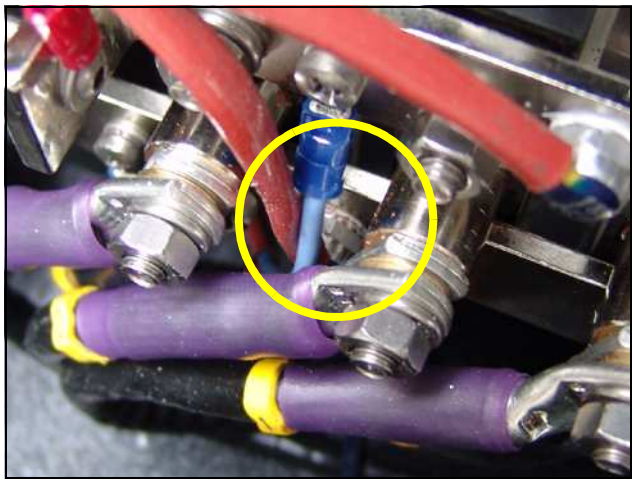


Fig. A.3.6-6: Themo-switch at the (+)-bar

Oil pressure switch at the diesel engine

In order to be able to monitor the lubricating oil system, an oil pressure switch is built into the system. The oil pressure switch is at the rear of the engine (In front of the electrical starter).

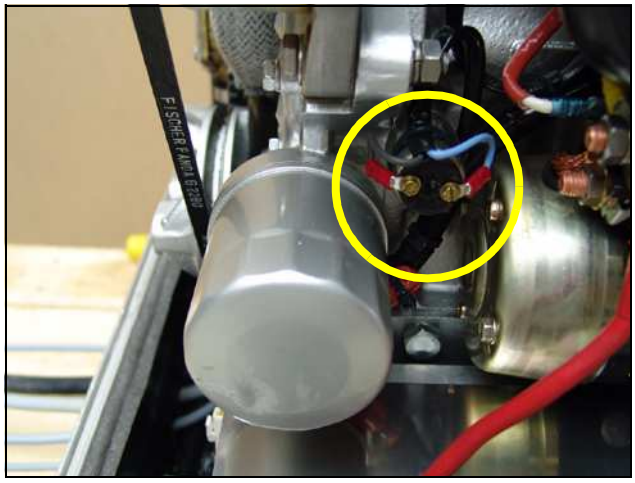


Fig. A.3.6-7: Oil pressure switch

Failure Bypass Switch

The failure bypass switch offers the possibility of starting the generator if the electrical control switches off due to overheating of the cooling system.

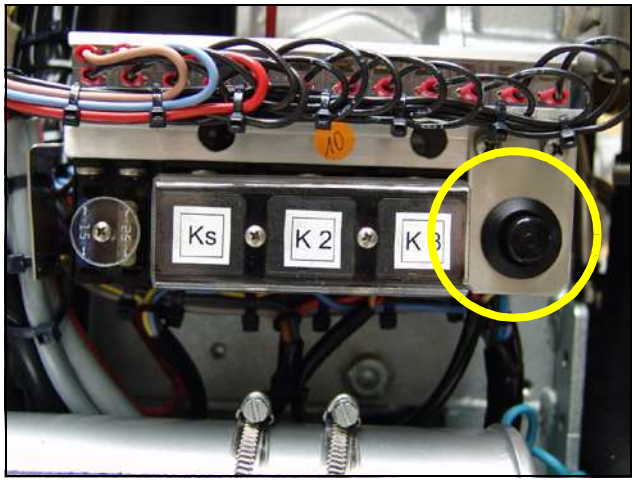


Fig. A.3.6-8: Failure Bypass Switch

A.3.7 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. A second filler neck is additionally attached at the operating side for numerous generator types. Please ensure the filler necks are always well secured after filling with engine oil.

Consider also the references to the engine oil specification.

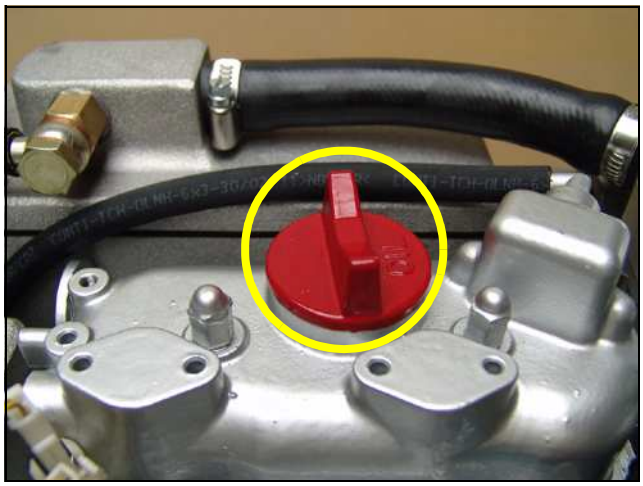


Fig. A.3.7-1: Oil Filler Neck with Cap

Oil dipstick

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

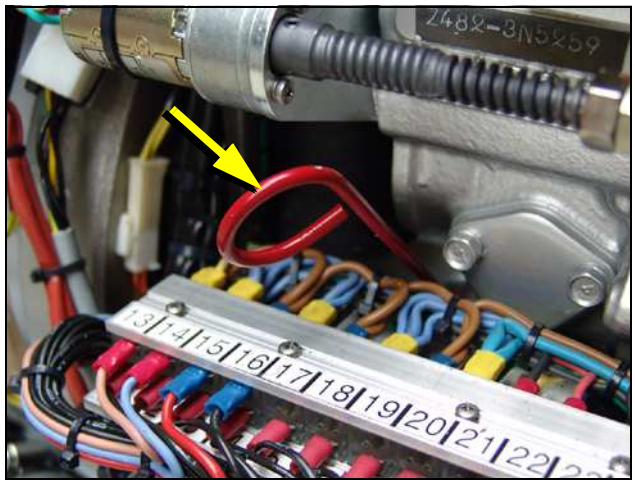


Fig. A.3.7-2: Oil Dipstick

Oil filter

The oil filter should also be replaced, when an oil change is carried out.

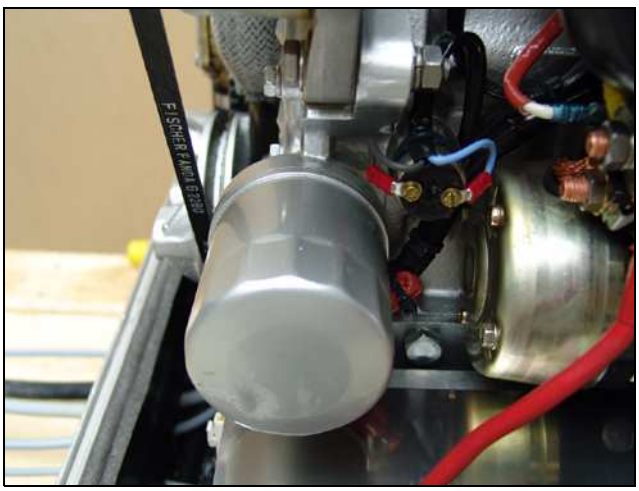


Fig. A.3.7-3: Oil Filter

Oil drain hose

The Panda generator is equipped so that the engine oil can be drained by means of a hose. The generator should be installed in such a way, that a collecting basin can be placed deeply enough. If this is not possible, an electrical oil drain pump must be installed.

Note: Lubricating oil should be drained warm!

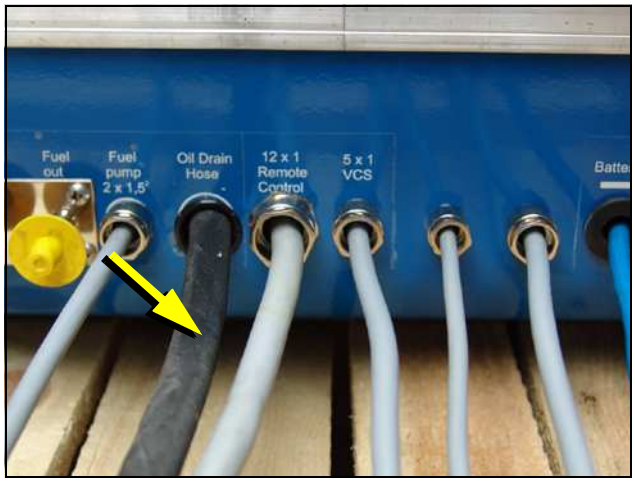


Fig. A.3.7-4: Oil Drain Hose

A.3.8 External Components

Voltage control VCS

The diagram shows the control circuit board for the VCS. The control signals are passed to the actuator for speed regulation by means of this circuit control board. The VCS board allows for voltage adjustment.

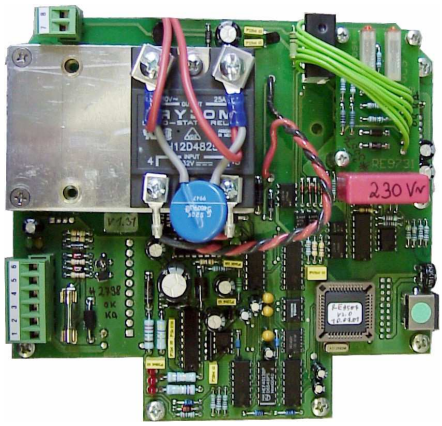


Fig. A.3.8-1: VCS

Battey Monitor

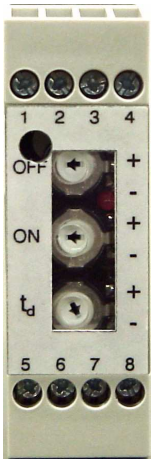


Fig. A.3.8-2: Battery Monitor

A. Mode of Operation of the Generator

A.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. Diode block 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.

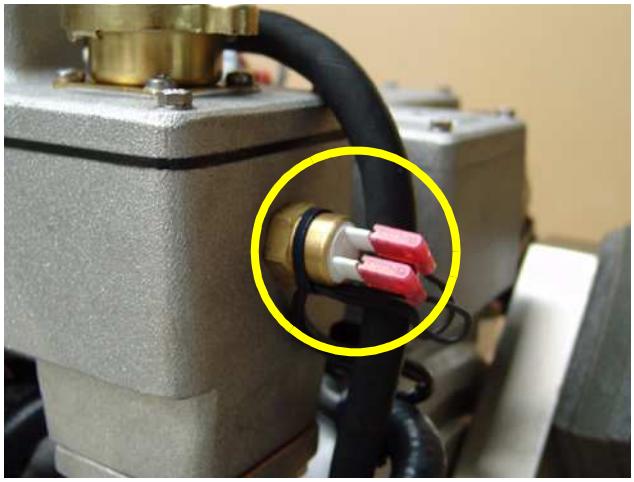
The additional failure switch in the generator coil, it is not indicated at the remote control panel, interrupts directly the current supply to the main power relay. By this constellation it is guaranteed that the generator switches off in each case when an error is present.

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".

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



Thermo-switch at watercooled exhaust elbow

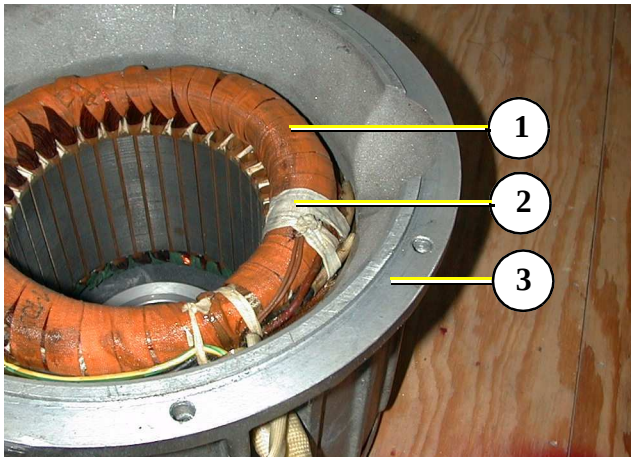
This thermo-swich is located at the water-cooled exhaust elbow and monitors the temperature of the fresh water circuit. The switch measures at the hottest place, because the flue gases lead from the cylinder head into the exhaust elbow.

Fig. A.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.

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



Thermo-switch in the generator coil

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

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

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

Thermo-switch on the (-)- connection bar

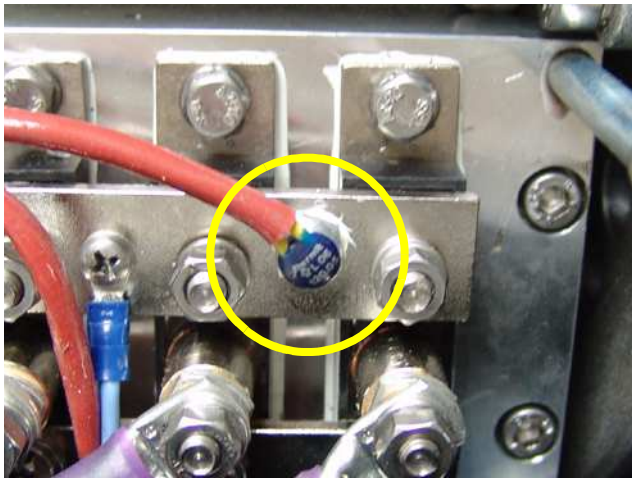


Fig. A.1-5: Thermo-switch on the (-)-connection bar

Thermo-switch on the (+)-connection bar

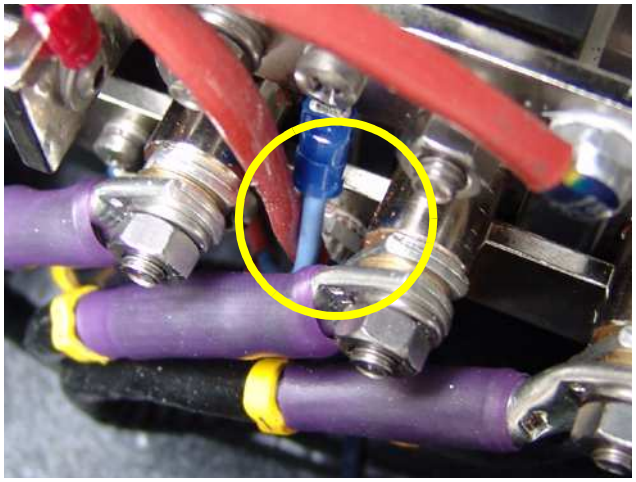


Fig. A.1-6: Thermo-switch on the (+)-connection bar

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).

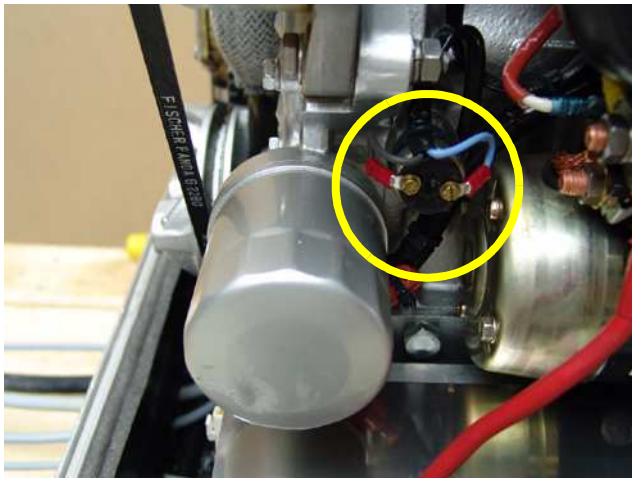


Fig. A.1-7: Oil pressure switch

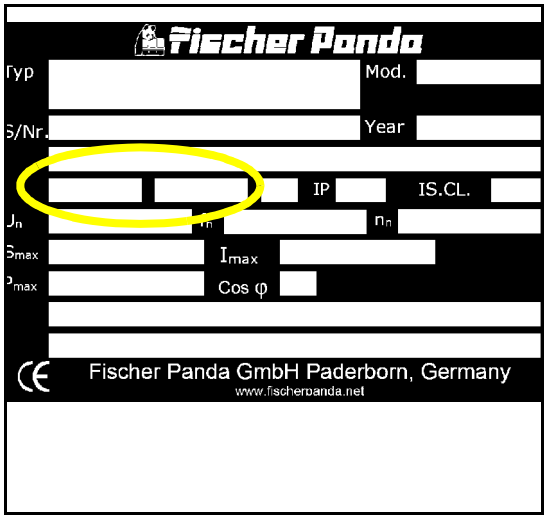
A.1.1 Regulation of the generator voltage by the VCS

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.

A.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.

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).

A.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).

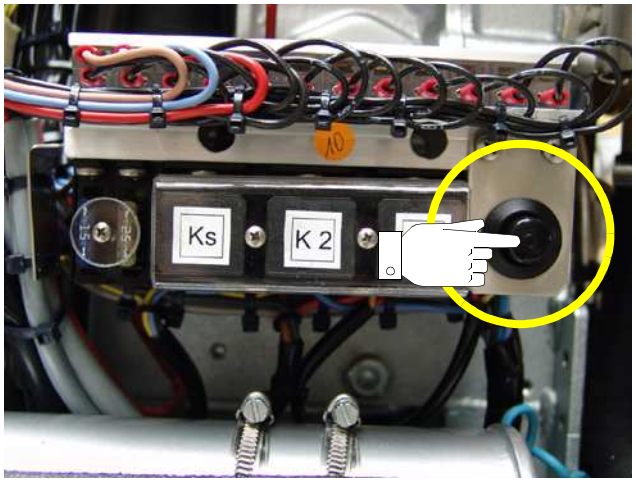


Fig. A.1.3-1: Failure bypass switch

A.2 Operation of the generator with HTG generator

A.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.

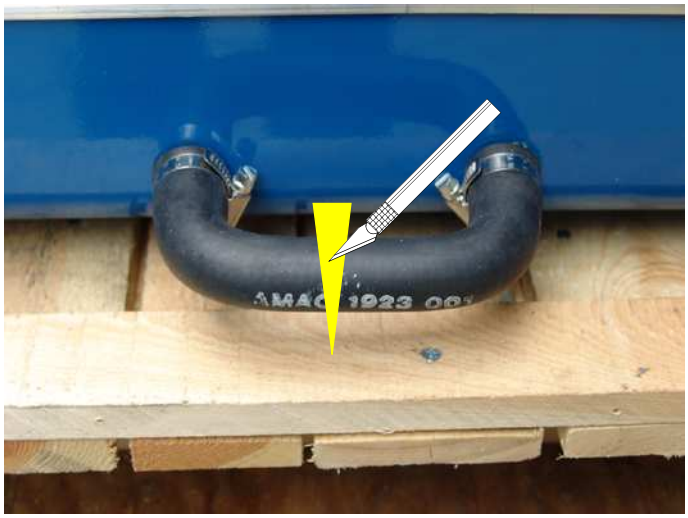
A.3 Operation of the generator with automatic start

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.

A.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.....

...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.

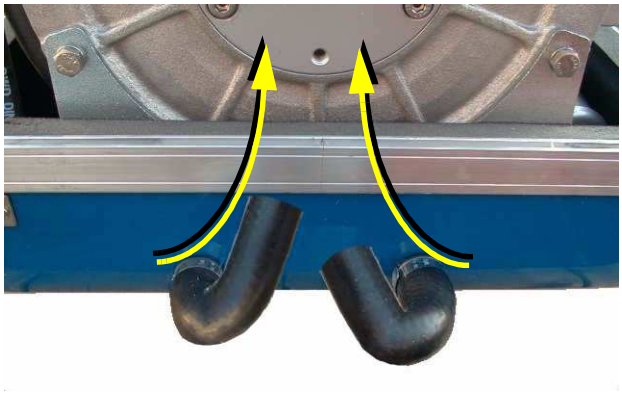


Fig. A.4-1: Ventilation valve connection

A.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!

A.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.

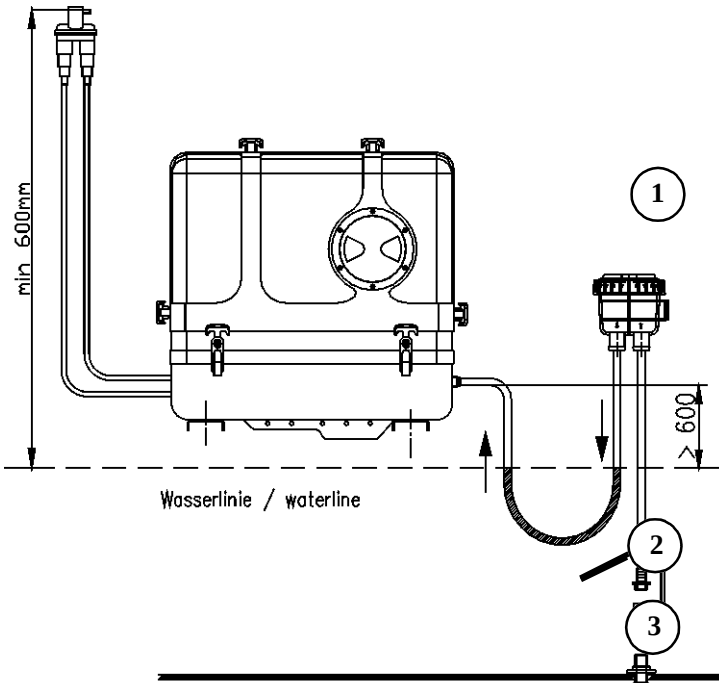
It is very important that the impeller is exchanged every few months. When starting the generator attention should be always paid and heard to it, when raw water withdraws from the exhaust neck. If this takes longer than 5 seconds the impeller must exchanged, he sucks in air before raw water reaches 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.



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.

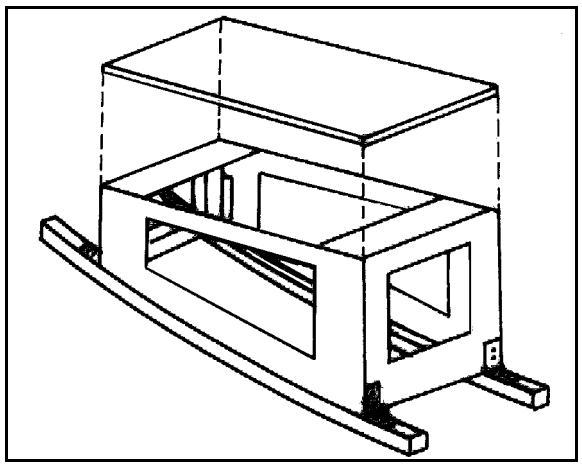


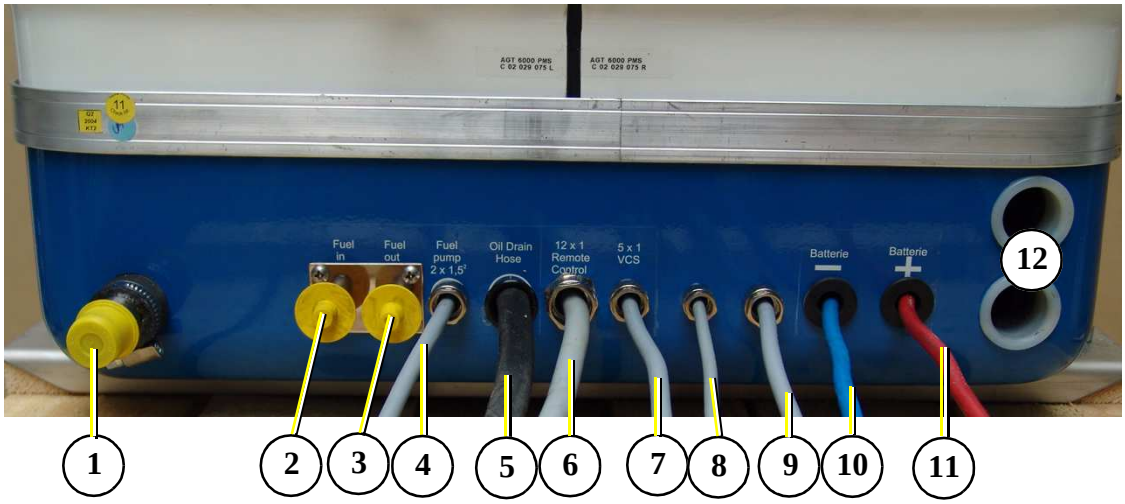
Fig. B.1.2-1: Base

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.

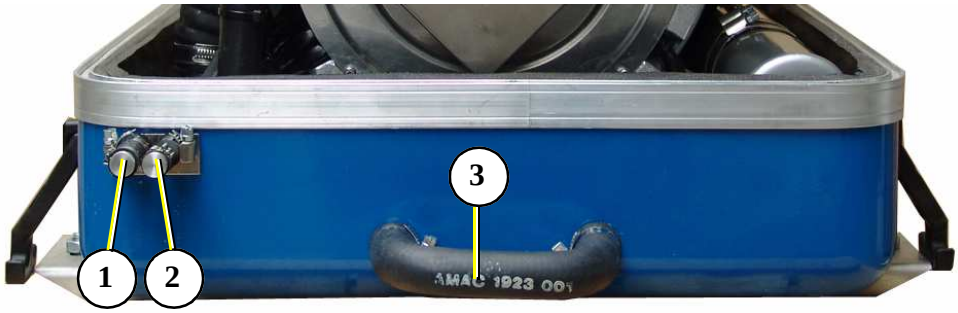
All electrical connections, cable types and sizes must comply to the appropriate regulations. The supplied cables are rated for ambient temperatures up to 70℃ (160℉). If the cables are required to meet higher temperature requirements, they must be run through conduits.

ATTENTION! Before working (installation) on the System read the section see "Safety Instructions" on page iv in this Manual.



1. Raw water inlet
2. Fuel supply (in)
3. Fuel return line (out)
4. Electrical cable for external fuel pump
5. Oil drain hose
6. Electrical cable to remote control panel
7. Cable to VCS-control
8. Cable for voltage sense 24V
9. Cable for shunt measurement
10. Generator starter-battery negative (-)
11. Generator starter-battery positive (+)
12. Passage for service battery cable

Fig. B.2-1: Generator Connections



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

Fig. B.2-2: Gemerator 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:

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!

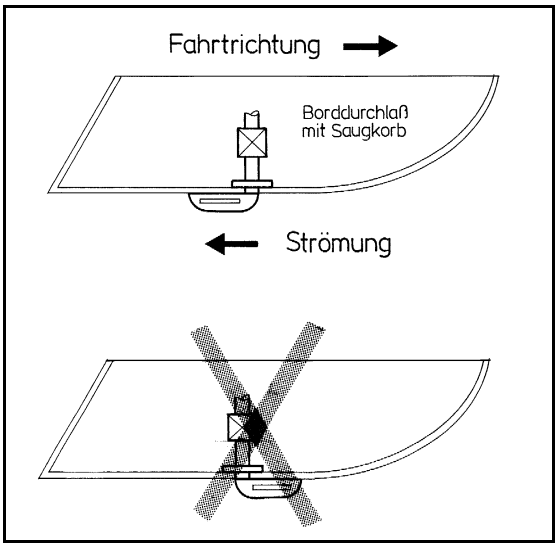


Fig. B.3.2-1: Borddurchführung

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 I

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 .

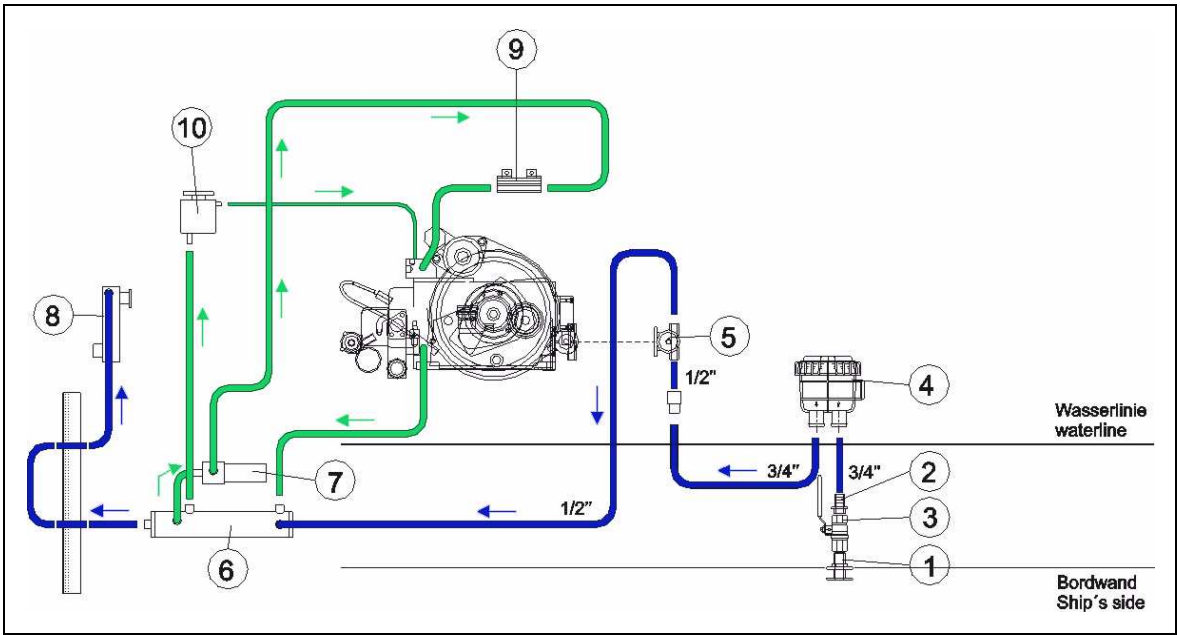
It is very important to change the impeller every few month. When starting the generator you should pay attention and listen when raw water comes out from the exhaust. If this lasts longer than 5 seconds the impeller has to be changed, because he sucks to much air before raw water reaches the impeller 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 Fischer Panda, where it is then economically overhauled completely.



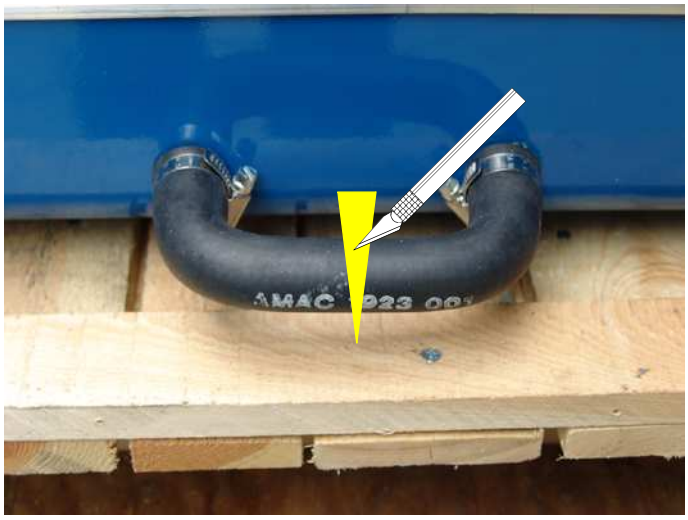
1) Thru-hull fitting
2) Hose nozzle
3) Seavalve
4) Raw Water Strainer
5) Raw Water Pump
6) Heat Exchanger
7) Fresh Water Pump
8) Watercooled Exhaust Elbow
9) Watercooled Diode Block
10) Cooling Water Box

Fig. B.3.4-1: Installation Scheme

B.3.5 Installation below waterline

f 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.3.5-1: Vent Valve



Cut the hose for the external vent valve...

Fig. B.3.5-2: Hose for External Vent 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.

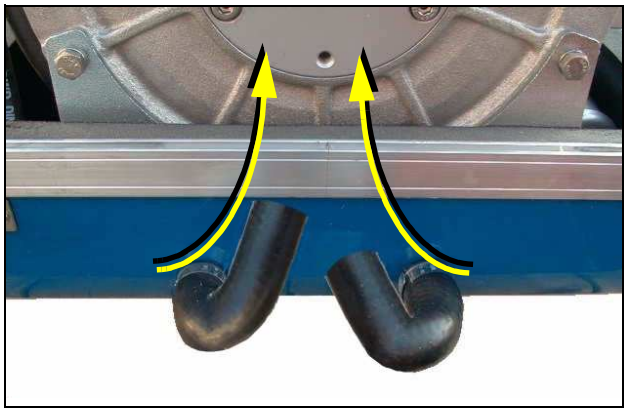
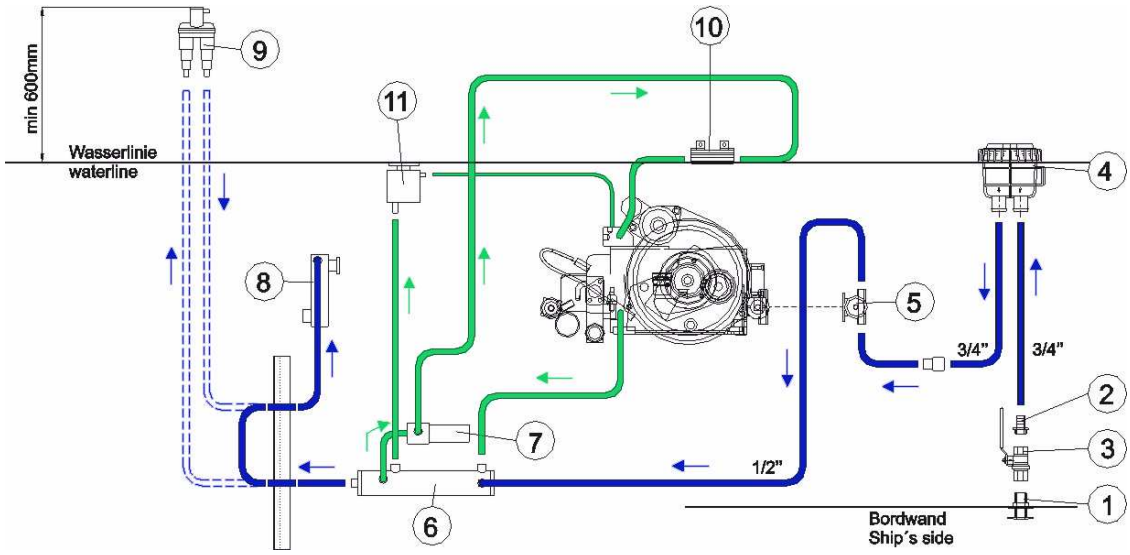


Fig. B.3.5-3: Cut Hose for Connection External Vent Valve



1. Thru-Hull Fitting
2. Hose Nozzle
3. Seawalve
4. Raw Water Filter
5. Raw Water Impeller Pump
6. Heat Exchanger
7. Fresh Water Pump
8. Water Cooled Exhaust Elbow
9. Vent Valve
10. Water Cooled Diode Block
11. Expansion Tankl

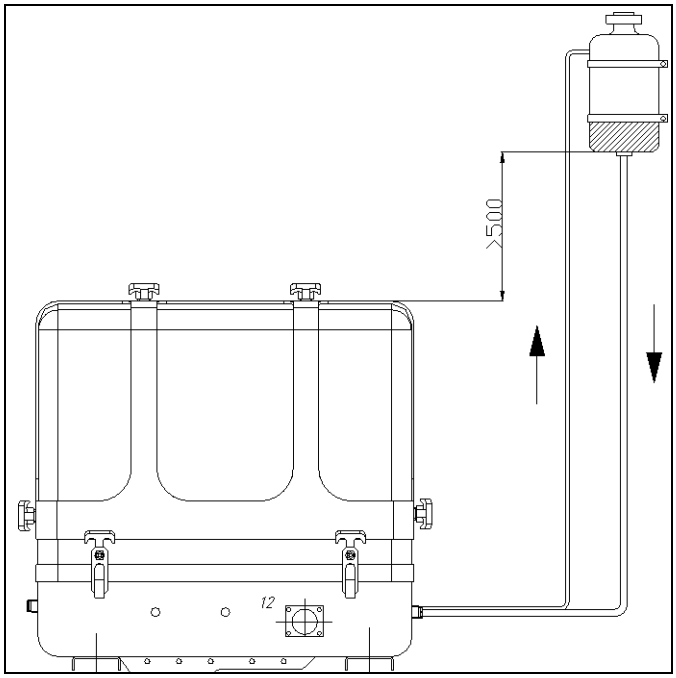
Fig. B.3.5-4: Installation Scheme

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.



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.

Fig. B.4.1-1: Position external Cooling Water Expansion Tank

B.4.2 Ventilating 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,

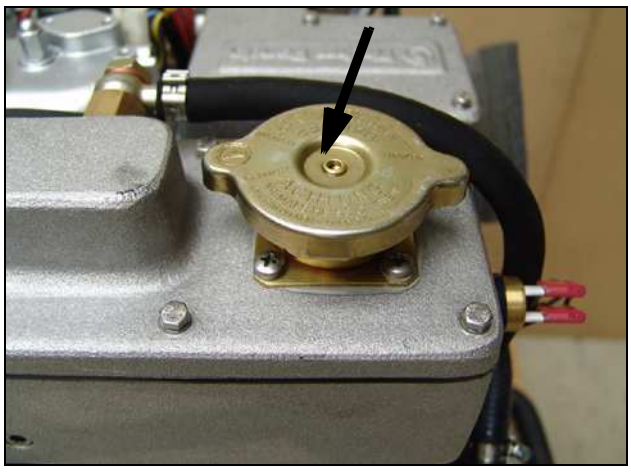


Fig. B.4.2-1: Cooling Water Cap

b. Vent screw on the thermostat housing,

Fig. B.4.2-2: Vent Screw at Themostate Housing

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

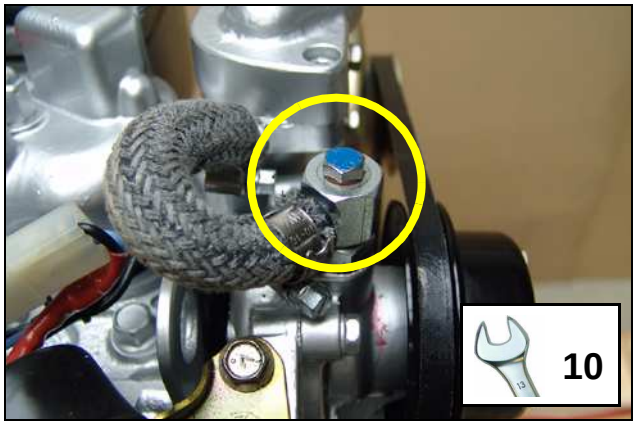


Fig. B.4.2-3: Vent Screw at Pipe Socket

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.

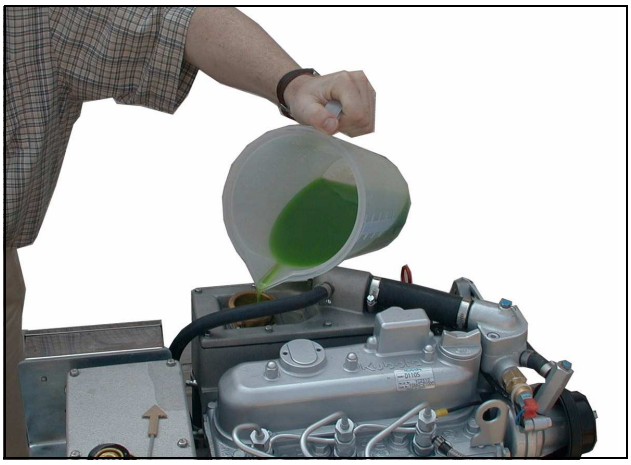


Fig. B.4.2-4: Filling the Cooling Water Circuit

Anti-freeze

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

c. 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!).

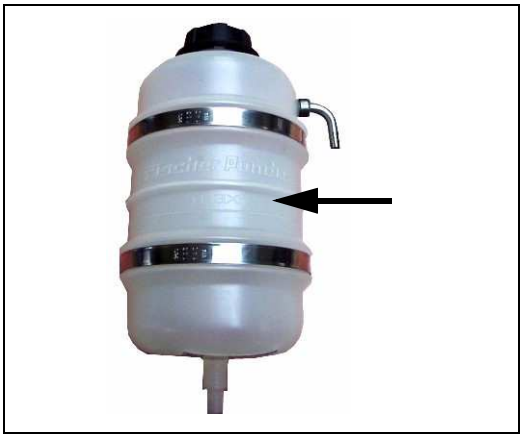


Fig. B.4.2-5: Cooling Water Expansion Tank

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:

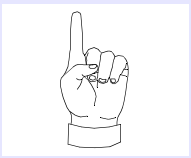
1. The generator runs approx. 1 minute.
2. Stop the generator.
3. Hold on one minute for drop of air.
4. The collected air is led out over the two de-aeration points.

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

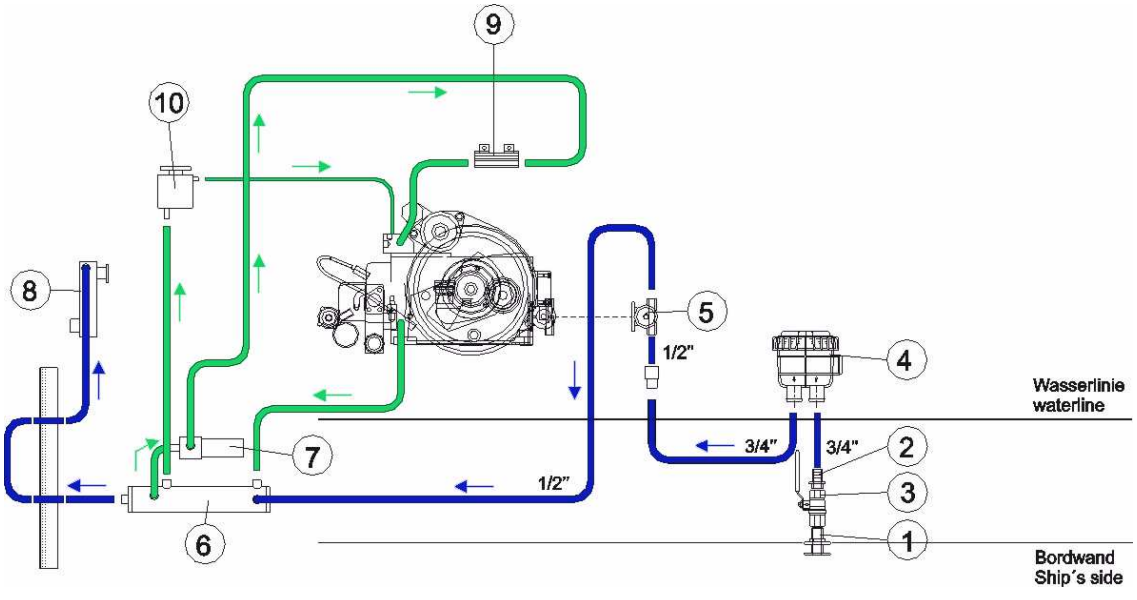
Check with the hand if a temperature difference exists whether between cooling water in-flow and cooling water return.

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) Thru-Hull Fitting
2) Hose Nozzles
3) Sea Valve
4) Raw Water Filter
5) Sea Water Pump
6) Heat Exchanger
7) Fresh Water Pump
8) Water Cooled Exhaust Elbow
9) Water Cooled Diode Block
10) Cooling Water Block

Fig. B.4.4-1: Scheme for freshwater circuit at two circuit cooling system

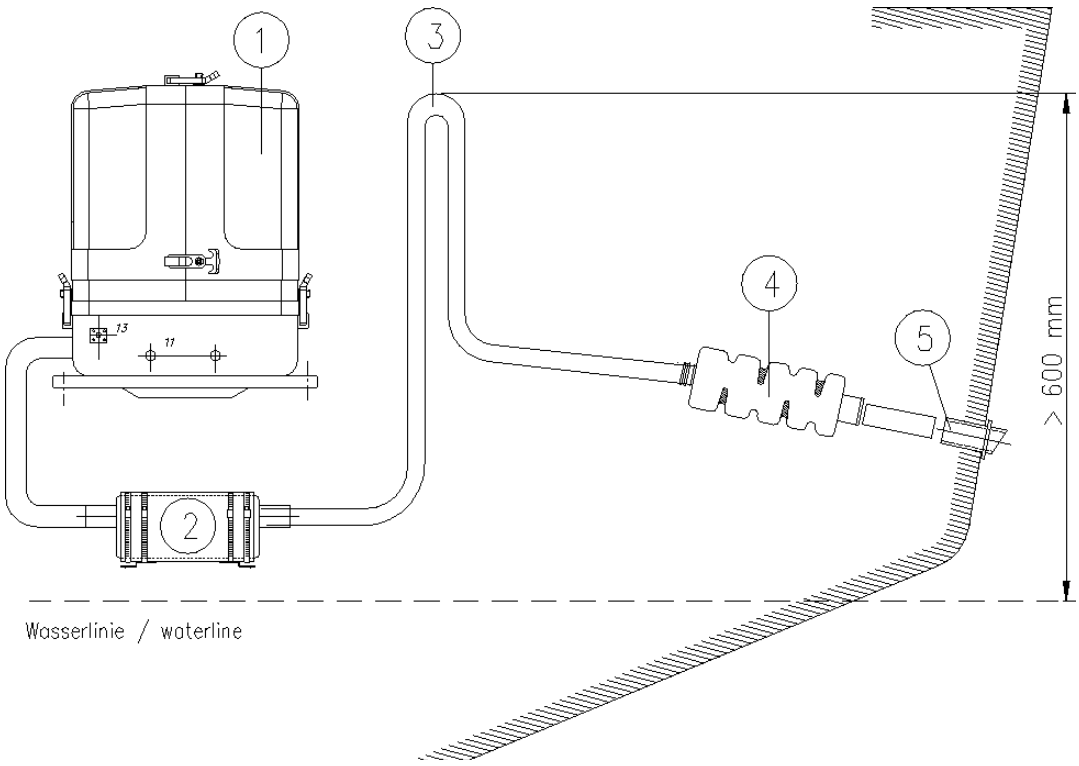
B.5 Watercooled Exhaust System

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 des Standard-Abgassystems

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 I.***



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

Fig. B.5.1-1: Installation of the Standard Exhaust System

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 Fischer Panda, 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.

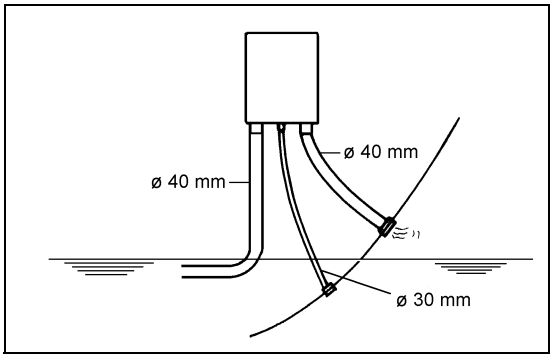


Fig. B.5.2-1: Exhaust / Water Separator

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
1. 8. Hose clips

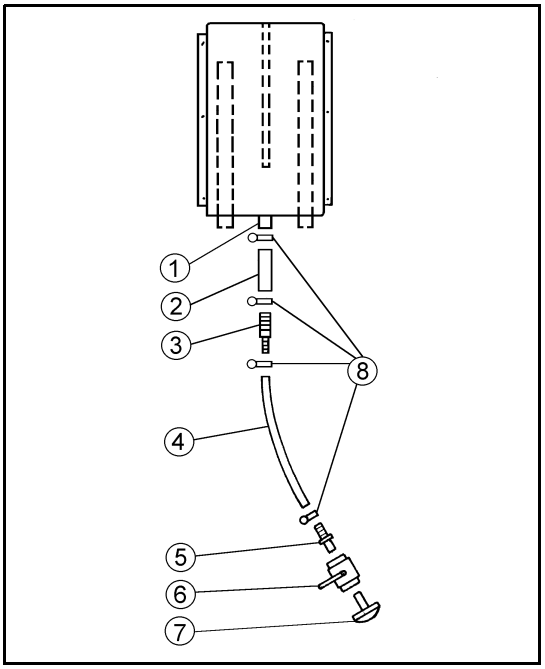
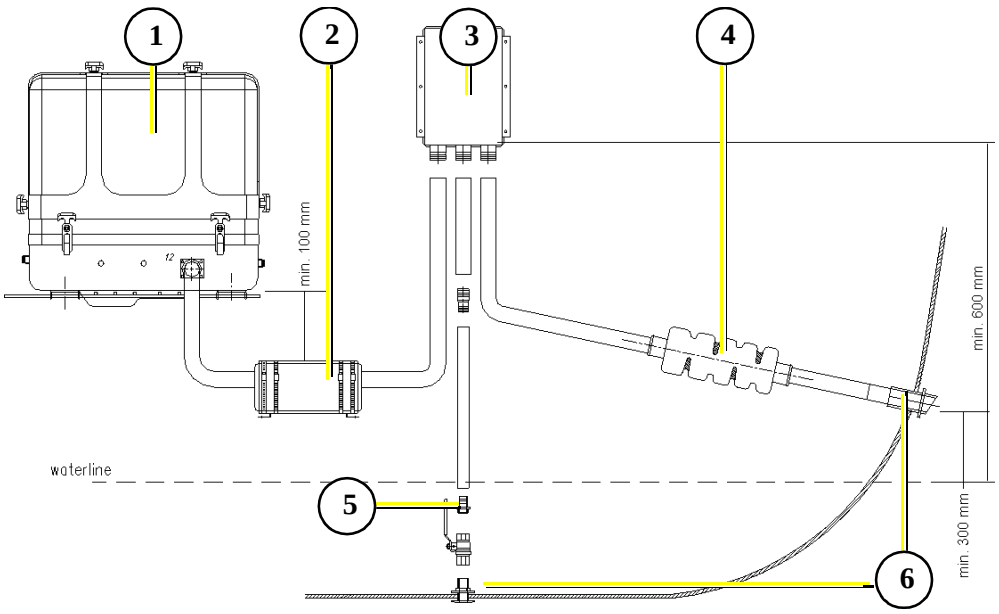


Fig. B.5.2-2: Exhaust / Water Separator

B.5.3 Installation exhaust/water separator

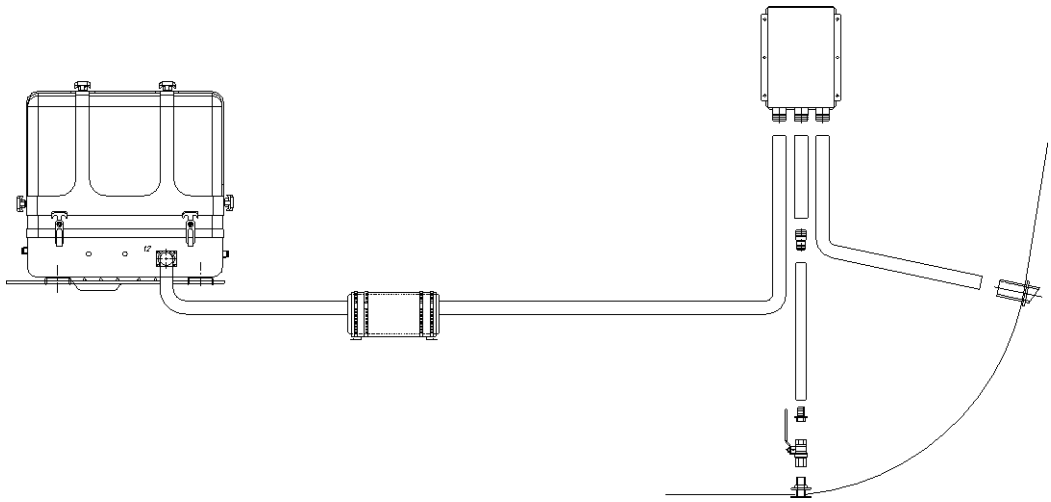
If the exhaust/water separator was sufficiently highly installed, a goose neck is no longer necessary. The exhaust/water separator fulfills the same function. If the "Supersilent" exhaust system were installed correctly, the generator will not disturb your boat neighbour. The exhaust noise should be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

Fig. B.5.3-1: Installation Exhaust / Water Separator

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: Example for an unfavorable installation

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:

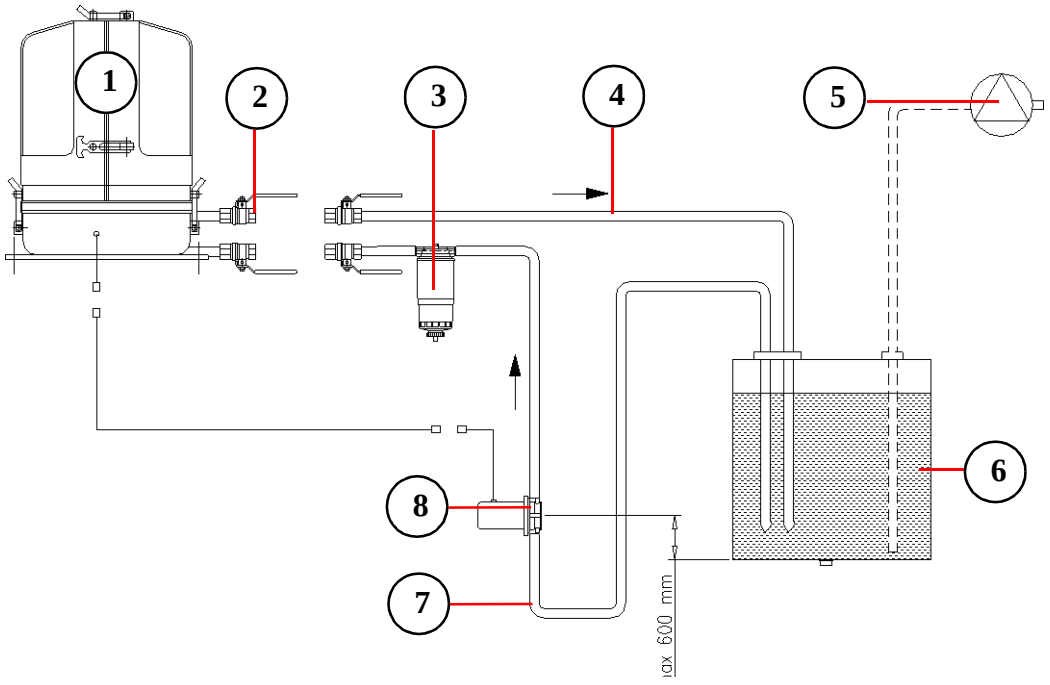
- Fuel supply pump (12V-DC)

- 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 (optional)
6. Fuel tank
7. Fuel supply
8. Electrical fuel pump (12V-DC)

Fig. B.6.1-1: Anschluss an das Kraftstoffsystem

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.

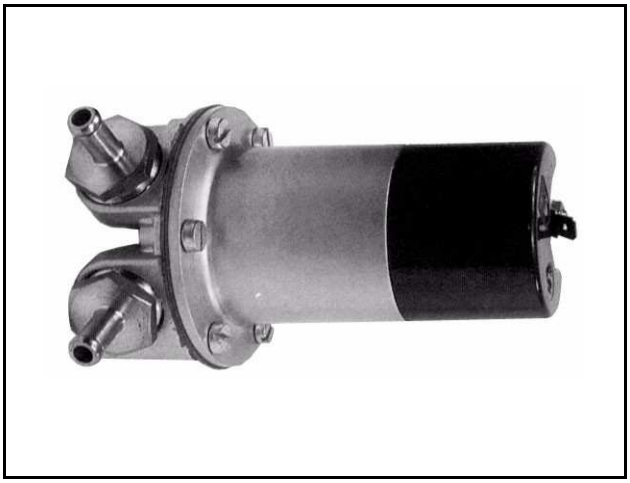


Fig. B.6.2-1: Electrical Fuel Pump

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

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 Pre-Filter with Water Separator

B.6.5 Ventilating air from the fuel system

Normally, the fuel system is designed to vent 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-vent after some time automatically. It is nevertheless essential to vent 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 vent 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 vent 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

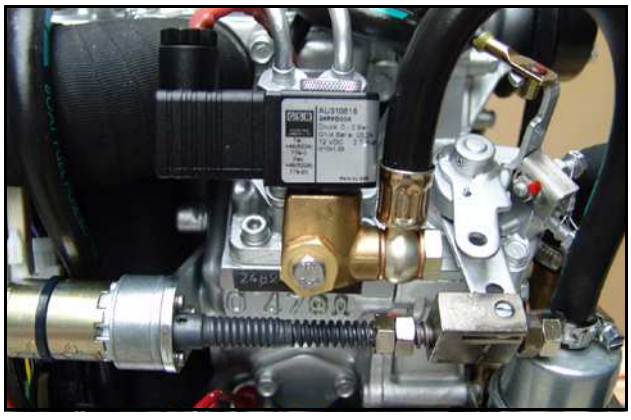


Fig. B.1: Vent Screw at the Fuel Solenoid Valve

B.7 Generator 12 V DC System-Installation

The Panda Generators from Panda 8000 upwards have its own dynamo to charge a 12 V 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 12 V starter battery

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

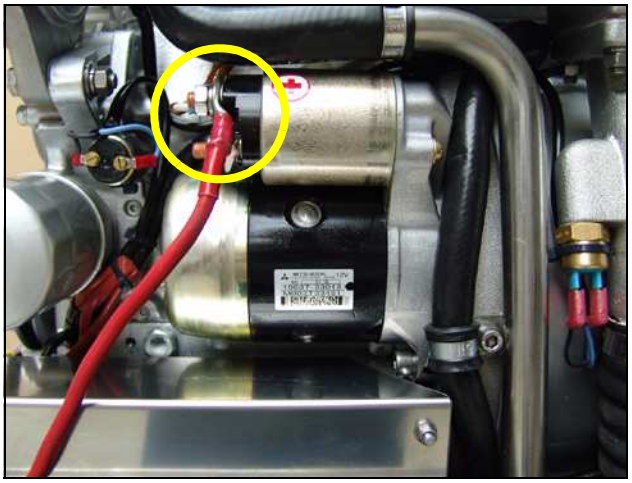


Fig. B.7.1-1: Connection Starter Battery

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

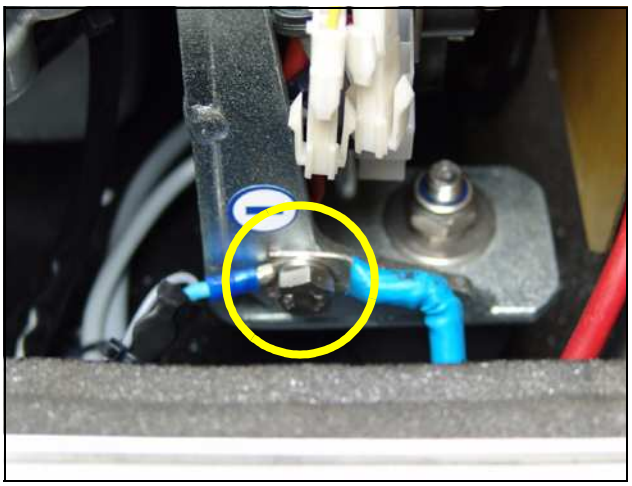


Fig. B.7.1-2: Connection Starter Battery

The Panda generators 8000 to 30 are equipped with various DC-relays, which can be found under the terminal strip. The various relays have the following tasks (also see the DC circuit diagram)

1. Start-Relaiy
2. Pre-heat Relay (glow plugs)
3. Fuel Pump Start Relay

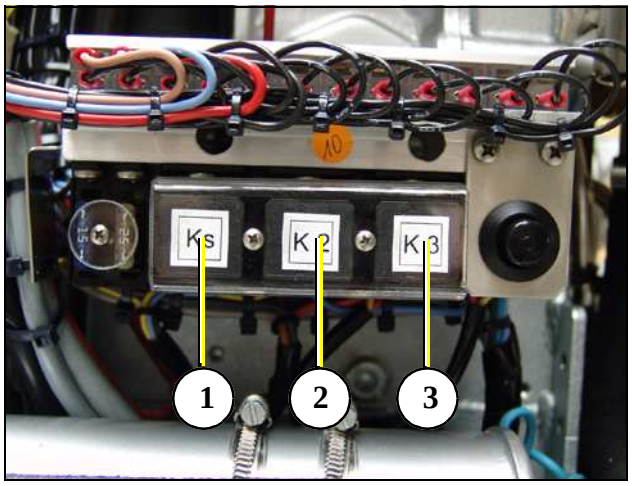


Fig. B.7.1-3: Terminal Strip

Alle Panda Generatoren sind mit einem eigenständigem 12 V-DC Anlasser ausgestattet. Die Verbindungsleitungen von der Batterie zum DC-System sollten einen Leitungsquerschnitt von 25 mm² besitzen

1. Magnetschalter für Anlasser
2. Anlasser

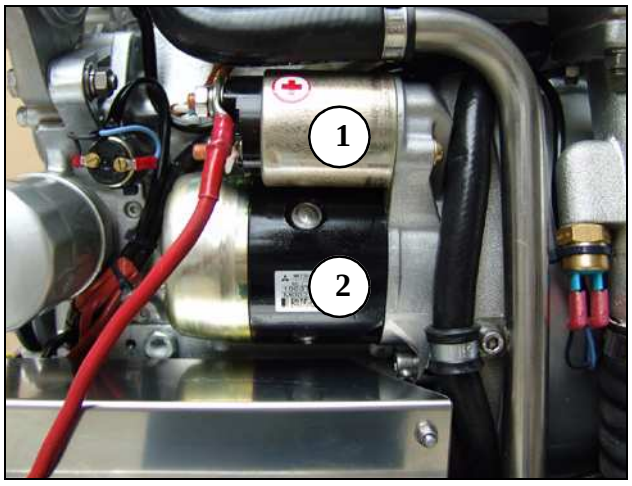


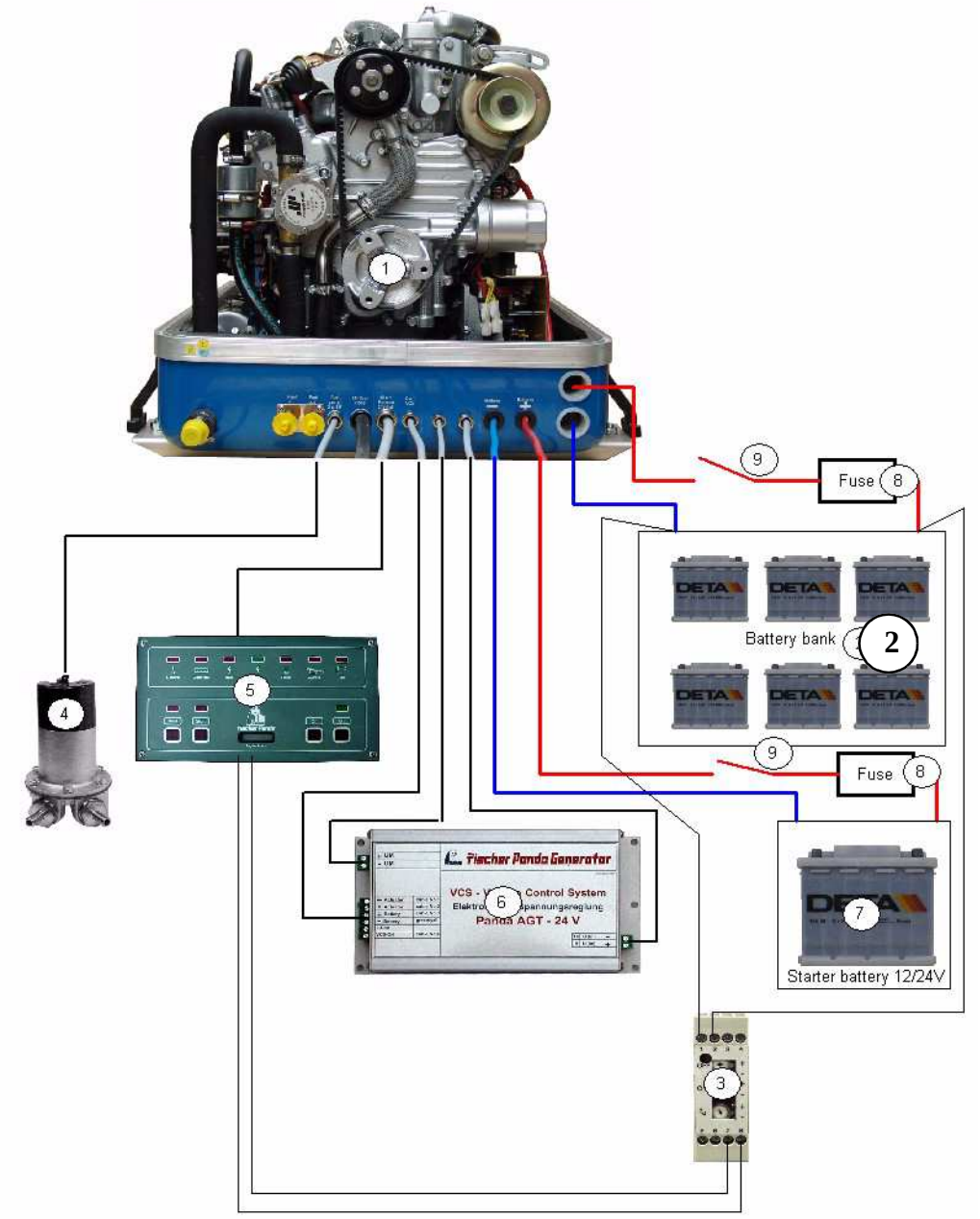
Fig. B.7.1-4: Starter Motor

B.7.2 Installation of the remote control panel - see remote control panel manual

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 12-72V-system



1. Generator
2. Battery block 12-72V depending on system
3. Battery monitor
4. Fuel pump
5. Remote control panel
6. Voltage control VCS
7. Starter battery 12/24V depending on system
8. Fuse
9. Battery switch

Fig. B.8.1-1: Installation Panda AGT 24 V Sysetm

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 I)*

B.9 Voltage Control System

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.

VCS

01. Measuring voltage (+) (24V)
02. Measuring voltage (-) (24V)
03. Actuator (+)
04. Actuator (-)
05. Battery voltage supply (+)
06. Battery voltage supply (-)
07. Stop-line (regulates the actuator back at shut-off device)
08. Terminal shunt-measurement 60mV DC (-)
09. Terminal shunt-measurement 60mV DC (+)

Fig. B.9-1: Electronic Voltage Control VCS

ATTENTION!

The cable for the measuring voltage must be attached directly at the battery, and may not attached to the output of the electric rectifier.

By the voltage drop between generator and battery the accurate voltage can only recieved direct at the battery. A false link can lead to damage the battery!

B.10 Insulation test

ATTENTION: Once the electrical system installation is complete, a ground insulation test must be performed as follows:

1.) Switch off all on-board electrical devices.

2.) Start the generator..

3.) Measure the AC-voltage with a voltmeter (adjust to Volt/AC) between:

a) generator housing and AC-Control box

b) generator housing and ground.

The measured voltage must not exeed 50mV (millivolts).

4.) Once the safety systems have been installed, they must be checked. If a leakage current relay has been installed, it also has to be tested. In order to ensure that the leakage voltage relay functions properly, the individual generated phases from the generator must be checked between each other, between phase and ground, (the single phase or 4th phase also needs to be checked in this fashion).

5.) If the generator is protected by a ground connection, then **ALL** electrical devices, must also be connected to this "common" ground (usu. ground contacts are attached to the devices' metallic housings).

The electrical system installation must also comply to the hook-up requirements of the shore current grid. Generally a leakage current relay is sufficient for safe electrical operation, however, this must be confirmed by the electrical safety standard in the region where the system is attached to a main land power grid. The relay has to be meet the required safety standard regulations.

In addition to a proper circuit diagrams, terminal points, connections, electrical devices, etc. should also be labelled with stickers or signs

There is always the possibility that circuits have been rerouted/changed or individual components have not been not been correctly laid out on the circuit diagrams.

The installation electrician should therefore check and label all electrical connections to ensure that they correspond to the main circuit diagram. The inspection and correct labelling is especially critical for terminals L1/ L2/L3/L1'/N (for the 230V-50Hz model) and for terminals L1/L2/L3/N &1/ 2/ 4 for the 60Hz (120V) models. The electrician is **therefore obliged, before** installation to check whether the generator is earth-free. As long as this test has not been carried out all other components for electrical installation must be removed. Once the system has been installed and inspected, this test should also be performed with all electrical devices (i.e. voltage check between common and metallic housings) while the generator is running.

B.11 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.11.1 Adjustment of the rated voltage

The voltage controller must be ordered for the appropriate rated voltage (12, 24, 32, 48, 42 V DC). Other voltage on request.

Changing between these voltages is not possible.

B.11.2 Functional decription of the voltage controller

The voltage controller has 3 different adjustment possibilities:

upper switching point, lower switching point and time lag of the generator.

B.11.3Time lag of the switching points

For the upper as well as for the lower switching point a time delay is adjusted. That is, the voltage must have overstep or fall short of the switching point on the time lag.

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. Maintenance Instructions

C.1 General maintenance instructions

C.1.1 Checks before starting

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

For Maintenance Intervalls see Table F.4, “Inspection checklist for services,” on Page VIII

C.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.

C.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 Table F.5, “Engine oil,” on Page IX and Table F.2, “Technical Data Engine,” on Page VI.

C.3 Execution of an oil change

Oil drain hose

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

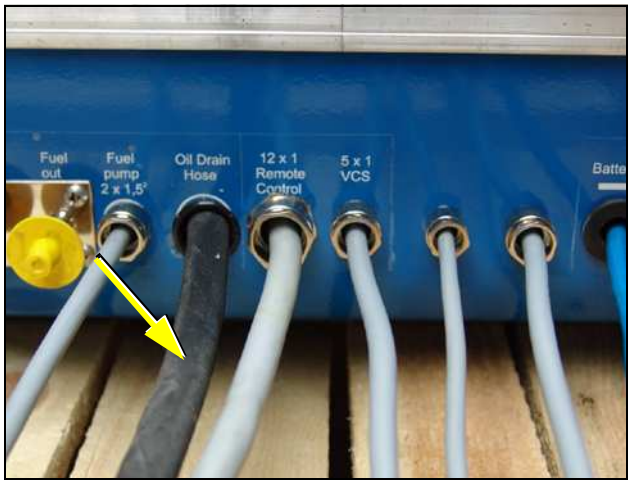


Fig. C.3-1: Oil Drain Hose

Oil drain screw

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

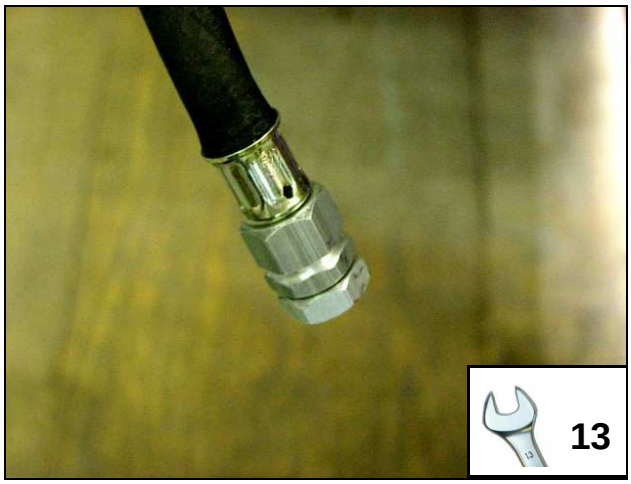


Fig. C.3-2: Oil Drain Screw

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. C.3-3: Oil Drain Pump

Oil filter change

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

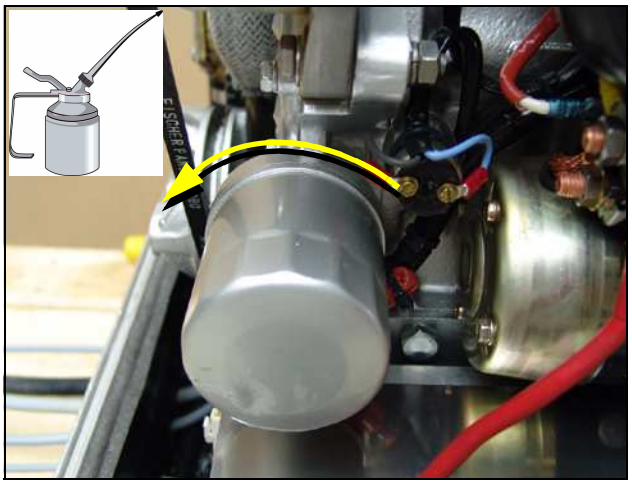


Fig. C.3-4: Oil Filter Change

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. C.3-5: Oil Filter Gasket

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.

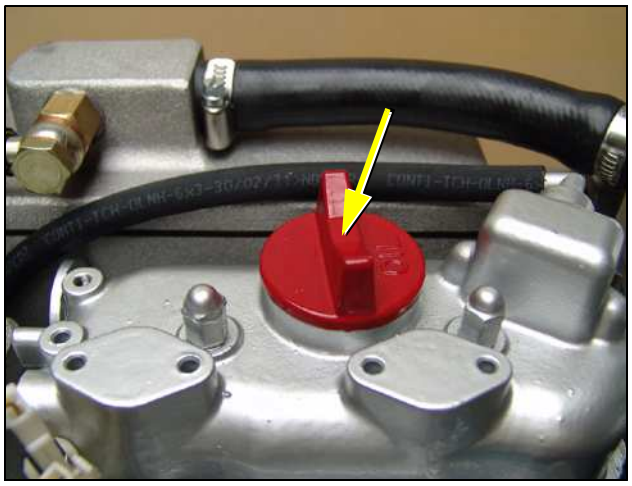


Fig. C.3-6: Open the Oil Filter Neck

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.

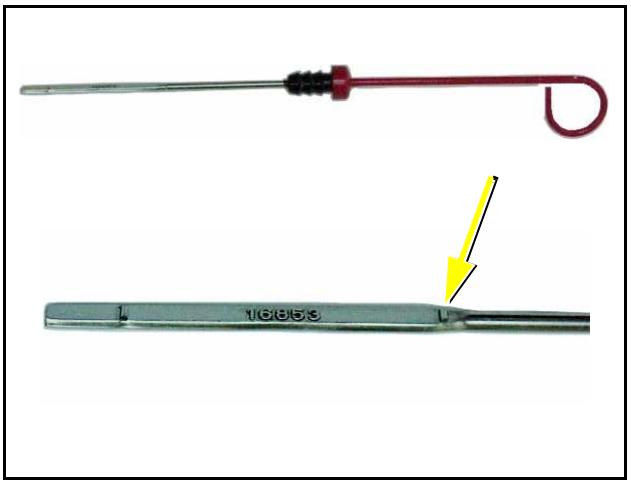


Fig. C.3-7: Oil Dipstick

C.4 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. C.4-1: Pre-Filter with Water Separator

C.4.1 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 de-aerated 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).

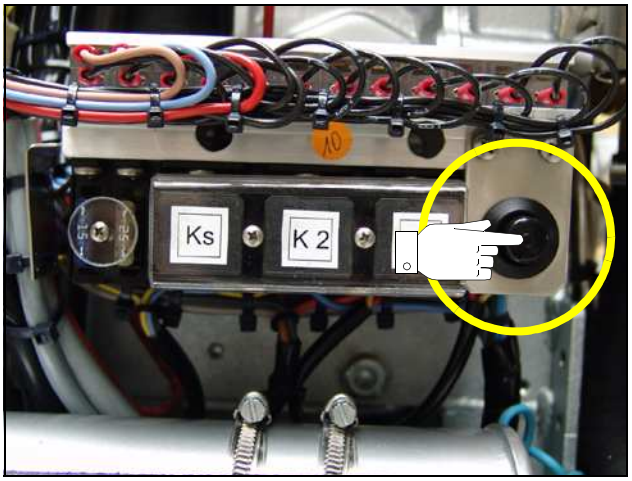


Fig. C.4.1-1: Failure Bypass Switch

3. After the fuel pump has been running 3 to 4 minutes because the failure bypass switch has been pushed down the 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. Now stop pushing the failure bypass switch.

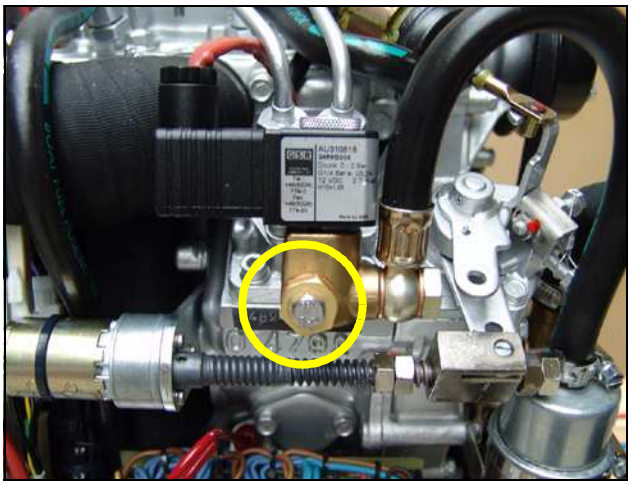


Fig. C.4.1-2: Fuel Solenoid Valve

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".

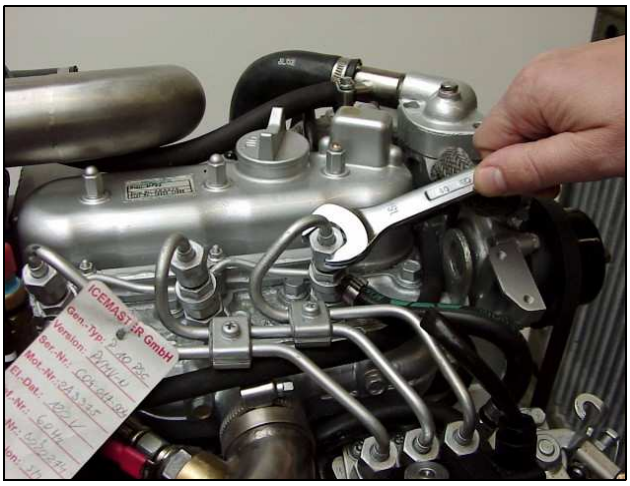


Fig. C.4.1-3: Injection Nozzles

C.4.2 Exchange of the fuel filter

The exchange of the filter depends on the contamination of the fuel, should take place at least all 300 operation hours. Before the exchange 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. C.4-1: Fuel Filter

C.4.3 Exchange the air filter

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

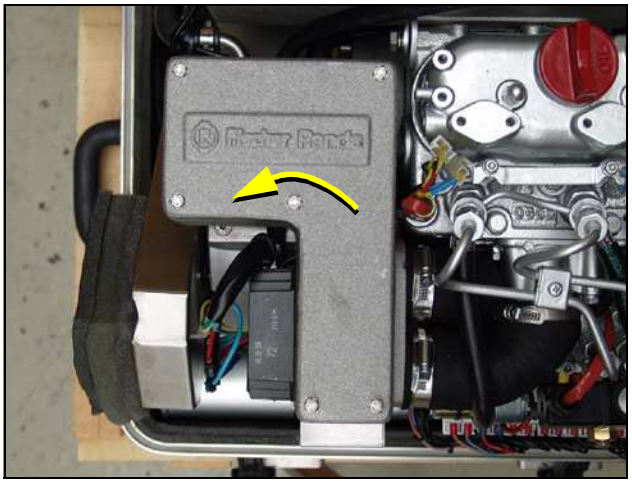


Fig. C.4.3-1: Air Suction Housing

Change the air filter mat.

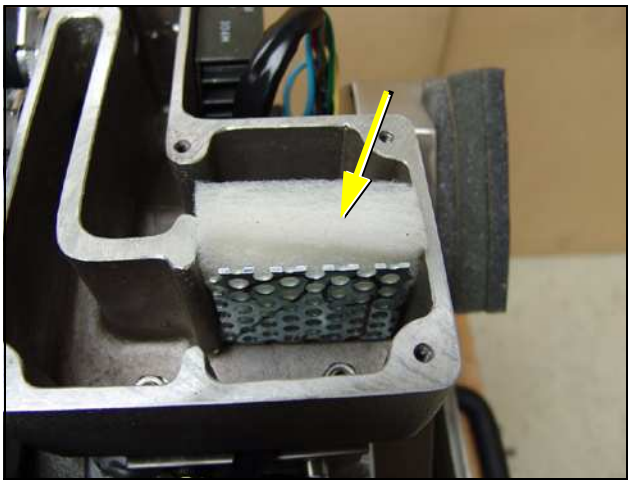


Fig. C.4.3-2: Opened Air Suction Housing

C.5 Ventilation 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 de-aerate the cooling system. This de-aerate procedure must be repeated several times:

ATTENTION! Before opening the ventilating 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 (600mm9 over the level of the generator exhaust elbow union.

Fig. C.5-1: Expansion Tank

Open vent screw at the cooling water pump.

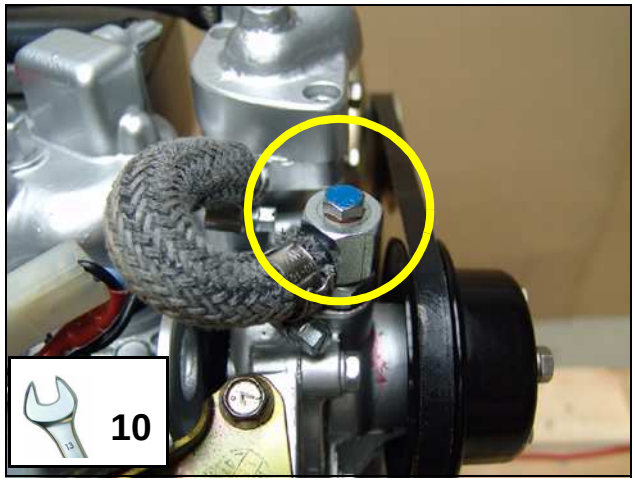


Fig. C.5-2: Vent Screw at the Cooling Water Pump

Open vent screw at the thermostat housing.

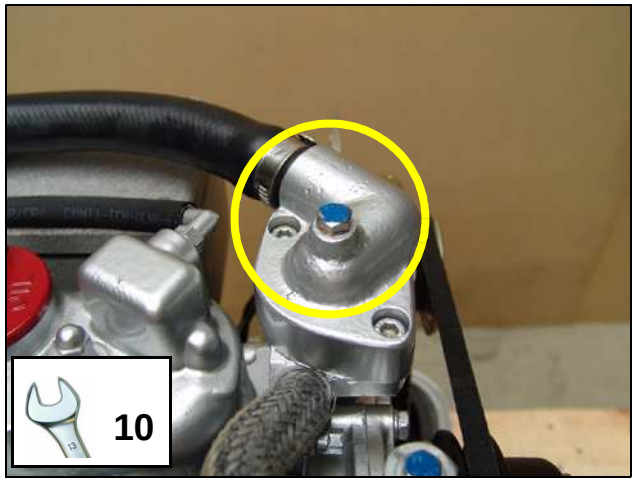


Fig. C.5-3: Vent Screw at the Thermostat Housing

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 cooling water screws and start the generator.

Run the generator for max. 60 seconds.

Stop the generator.

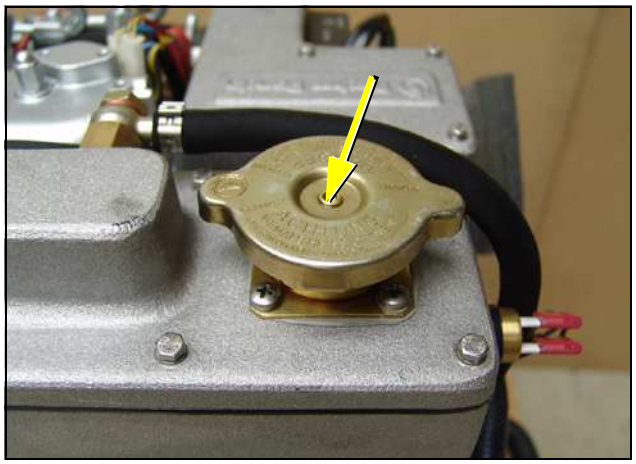


Fig. C.5-4: Cooling Water Filler Neck

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 de-aeration two - three times.

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

The vent 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. C.5-5: Vent Screw over the Housing of the Cooling Water Pump

C.5.1 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..

C.6 Exchange 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.

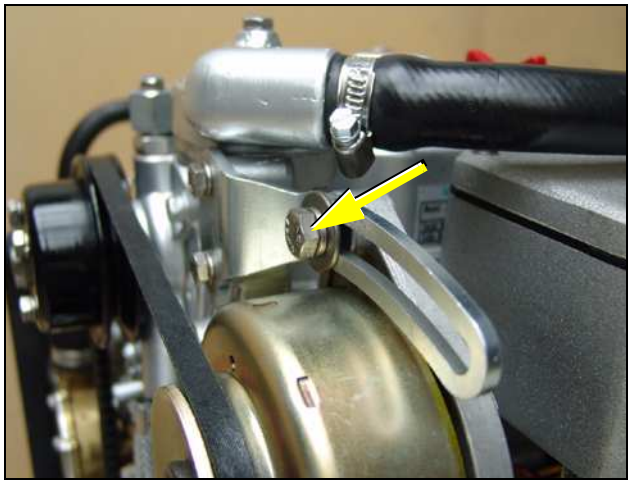


Fig. C.6-1: Fixing Screw above the Alternator

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

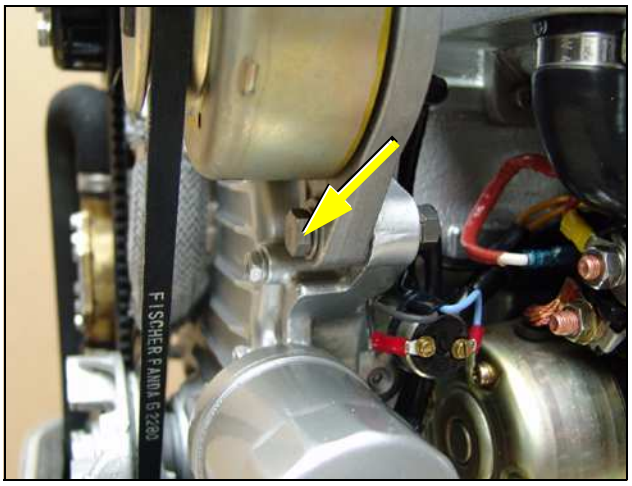


Fig. C.6-2: Fixing Screw below the Alternator

Press the alternator to the direction of the thermostat housing.

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

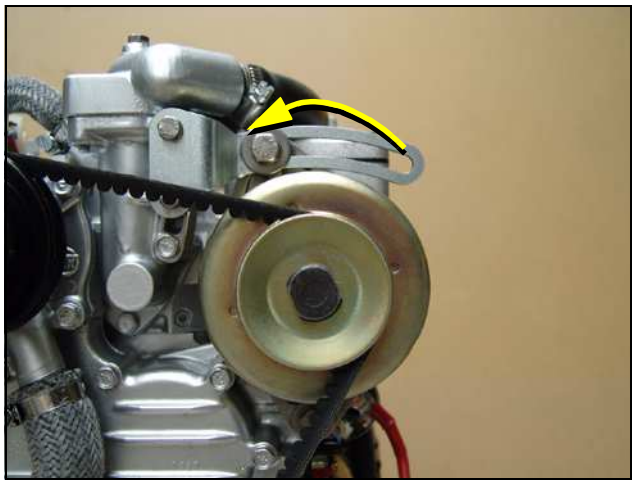


Fig. C.6-3: V-Belt

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.

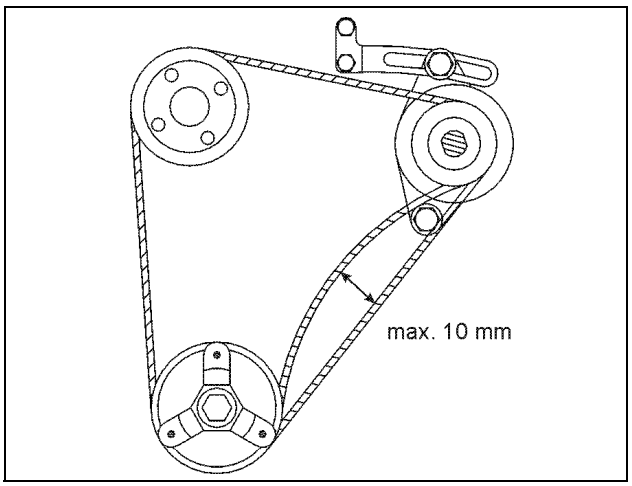


Fig. C.6-4: Drawing V-Belt

C.7 The Raw Water Circuit

C.7.1 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. C.7.1-1: Raw Water Filter

C.8 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")

C.8.1 Exchange of the impeller

Close the raw water stop cock.

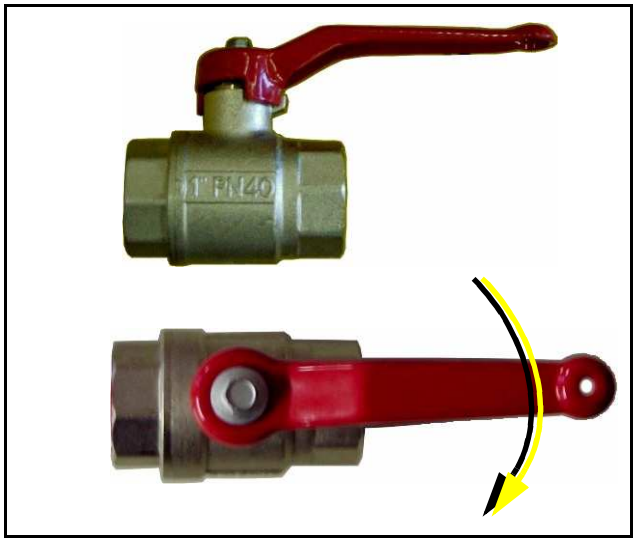


Fig. C.8.1-1: Raw Water Stop Cock

Raw water pump on the front side of the generator.

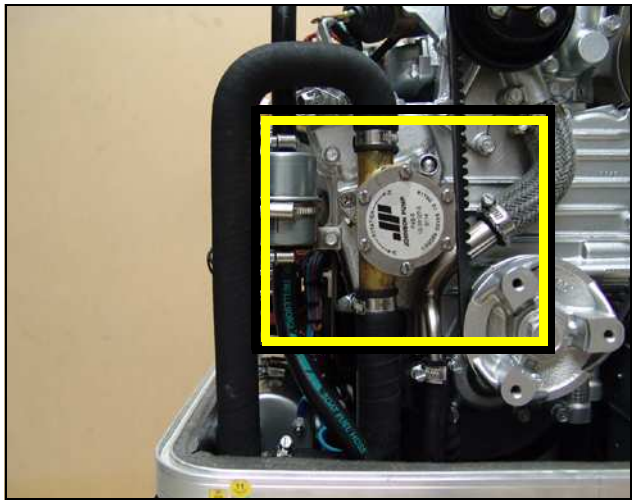


Fig. C.8.1-2: Raw Water Pump

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

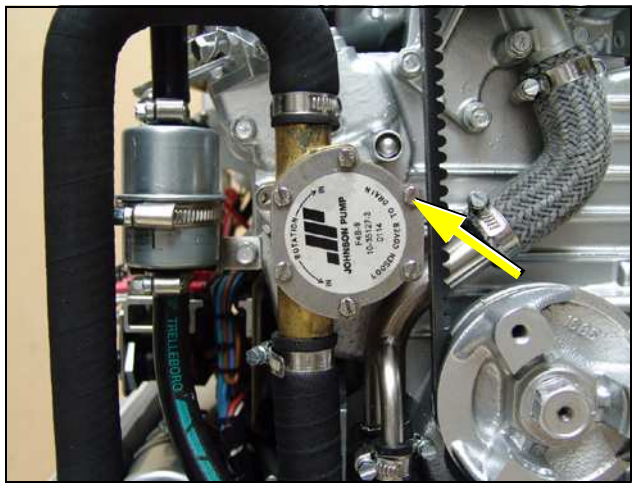
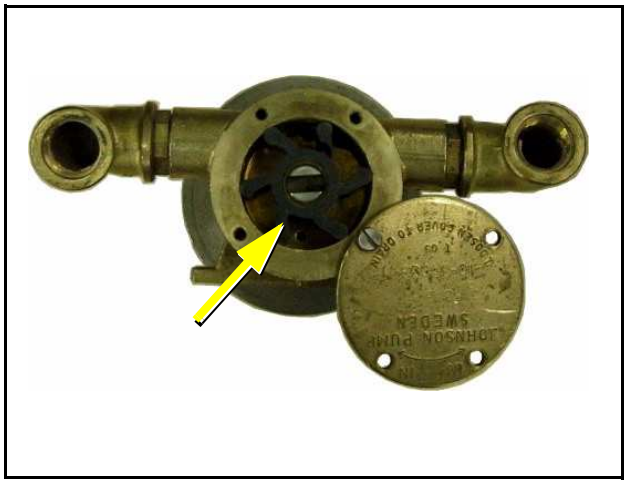


Fig. C.8.1-3: Raw Water Pump

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.



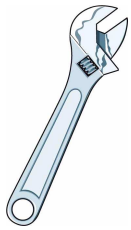


Fig. C.8.1-4: Seewasserpumpe geöffnet

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. C.8.1-5: Impeller

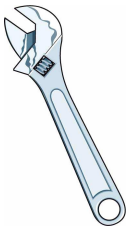
The impeller is attached to the pump wave (if the old impeller is used, pay attention to the before attached marking).

Fastening the cover and use a new seal.

Fig. C.8.1-6: Impeller

C.9 Conservation at longer operation interruption

C.9.1 Measures 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.

C.9.1 Measures on preparation of the winter storage (Forts.) (Forts.)

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.
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.

C.9.2 Initiation at spring

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

Fischer Panda does not take over adhesion for possible damages!

D. Generator Failure

D.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

D.2 Überlastung des Generators

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.

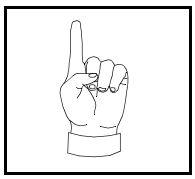
Keep PEAK LOADING demand in mind when switching on electrical devices (esp. fridge compressors, electric motors, battery chargers, kettles, etc.) which are fed by the generator. Careful "powering up" (gradual loading) of the electrical demand on the generator will help prolong the life of your genset! 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.

D.3 Adjusting the Nominal Charge Current

ATTENTION! Before working on the System read the section “Safety Precautions” on Page 11.



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

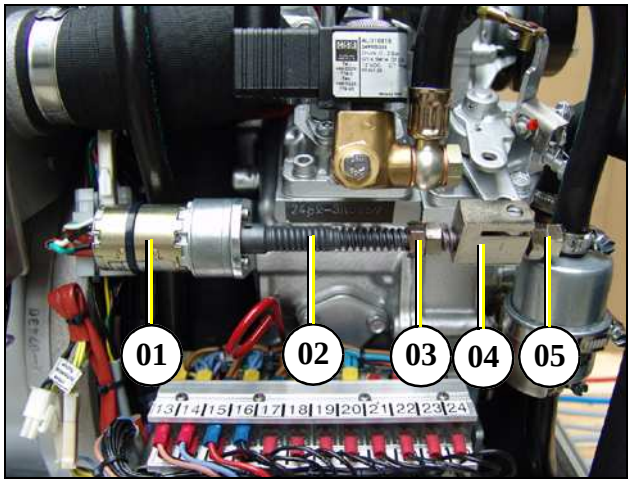


Fig. D.3-1: Actuator with spiral thread spindle

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

D.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°C) 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.

01. Speed actuator

02. Spiral thread spindle

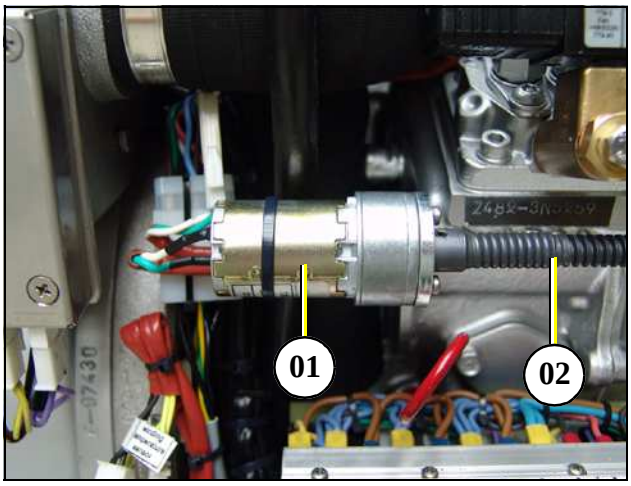


Fig. D.3.1-1: Drehzahl-Stellmotor

D.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)

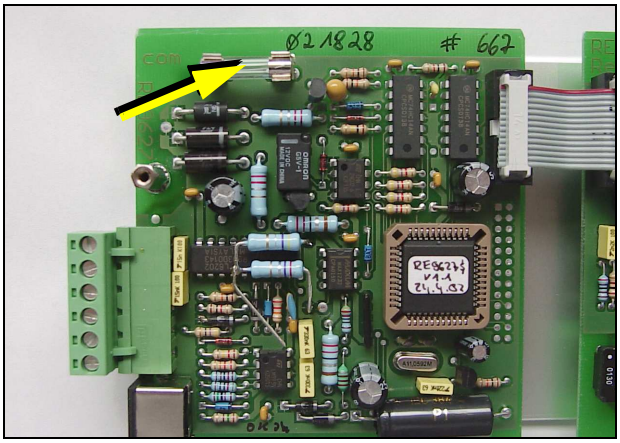


Fig. D.1: Fuse on the control plate

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. • surface is mechanical damaged. • actuator is defect. • defect of the VCS control (short of winding). • signal DC missing. • 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.

Actuator does not move	The actuator is defect and must be changed.
Actuator does move and works mechanically correct	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.

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:

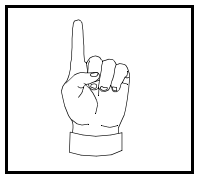
2. Switch off all load.
3. Connect an electrical ammeter.
4. Start the generator.
5. Turn the actuator manually to the lower suspension point.
6. Charge current must be <10 A, at U=U_{Nenn}.

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.

D.4 Low Generator-Output Voltage

.ATTENTION! Before working on the system read the see “Safety Instructions” on page iv.



The Panda Generators are constructed so that they cannot be damaged under normal circumstances. The fault could therefore be found elsewhere in the system, if the generator does not produce current or the voltage is too low, for example:

- Consumer have not been switched off before starting

- Short circuit in the electrical system

- Generator is overloaded.

D.5 Prüfen der Generator Stator Wicklungen

ATTENTION! Before working on the system read the see “Safety Instructions” on page iv.

D.5.1 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.

Doide plate at the Panda generator

Fig. D.5.1-1: Diode Plate

Wiring Diagram

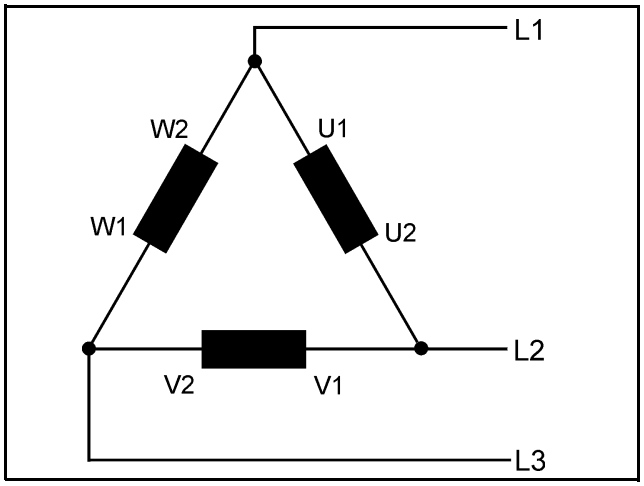


Fig. D.5.1-2: Wiring Diagram

D.5.2 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.

D.5.3 Messung des induktiven Widerstandes

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

D.6 Starting Problems

D.6.1 VCS does not work

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

IIs the voltage sense connecttion ok? Check polatrity!

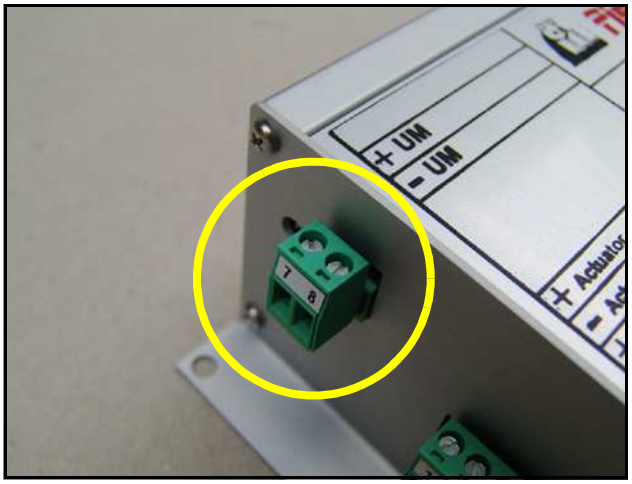


Fig. D.6.1-1: Checking VCS

Is the shunt connection ok? Check polatrity!

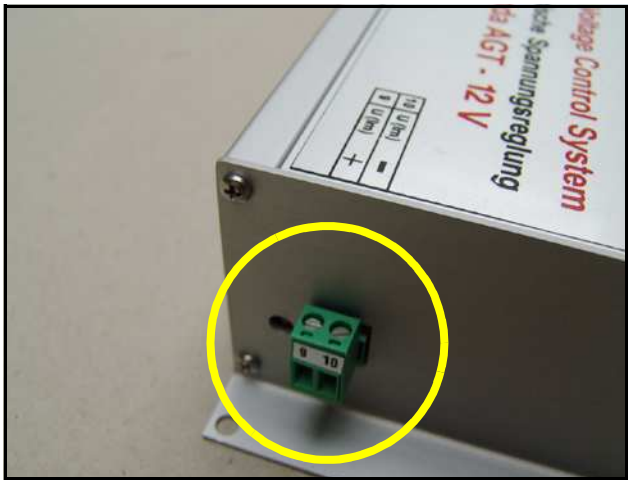


Fig. D.6.1-2: Checking VCS

Is the main supply connection ok? Check polatrity!

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

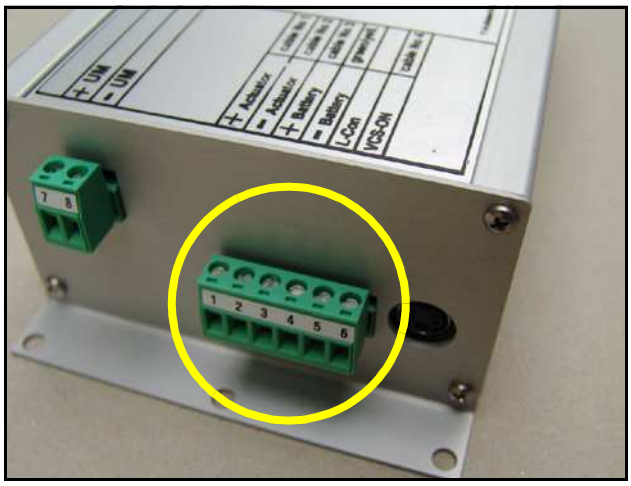


Fig. D.6.1-3: Checking VCS

Checking the fuse on the VCS printed circuit board.

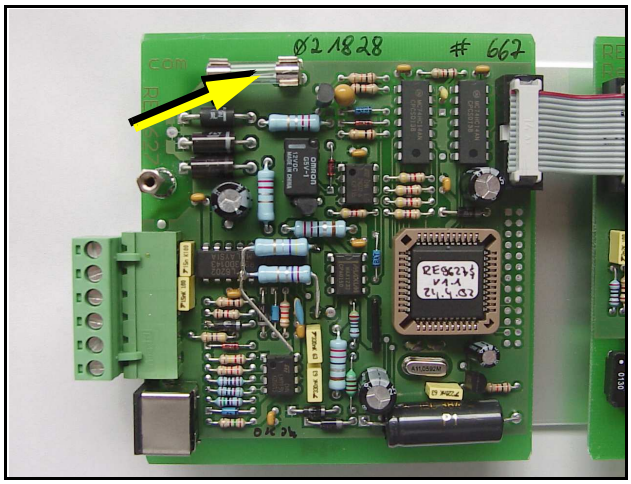


Fig. D.6.1-4: Checking VCS

D.6.2 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

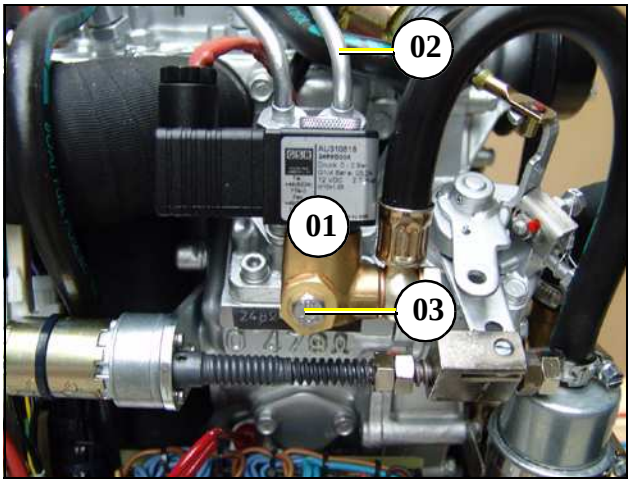


Fig. D.6.2-1: Kraftstoffmagnetventil

Stop solenoid for engine stop

D.6.3 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

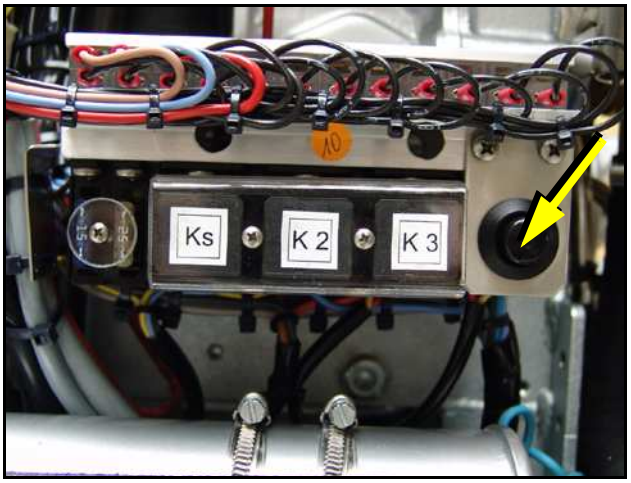


Fig. D.6.3-1: Failure Bypass Switch

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.

D.7 Troubleshooting Table

For Troubleshooting see Table F.1, “Trouble shooting,” on Page II

F. Tables

Table 1: Diameter of conduits

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 6000	20	20	40	8	8

Table 2: Technical Data

Type	Nominal power [kW]	Continuous power [kW]	Nominal voltage [VDC]	Dauer-charging current[A]	Nominal charging current [A]
AGT 2500-12	2,5	2,5	12	180	180
AGT 2500-24	2,5	2,5	24	90	90
AGT 4000-12	4	3,2	12	220	280
AGT 4000-24	4	3,2	24	110	140
AGT 6000-12	5,5	4,8	12	290	360
AGT 6000-24	5,5	4,8	24	170	210
AGT10.000-24	10	8	24	290	360
AGT15.000-48	15	12	48	208	260
AGT20.000-48	20	16	48	290	360
AGT25.000-72	25	20	72	240	300
AGT30.000-96	30	24	96	208	260
AGT40.000-96	40	30	96	290	360

Table 3: Cable cross section

Length	1 - 3 m	4 - 6 m	7 - 10 m	11 - 15 m	16 - 20 m
16 mm²	70 A	63 A	55 A	48 A	42 A
25mm²	112 A	100 A	88 A	75 A	63 A
35mm²	155 A	140 A	125 A	110 A	95 A
50mm²	225 A	200 A	175 A	150 A	125 A
70mm²	315 A	285 A	250 A	220 A	190 A
95mm²	425 A	380 A	340 A	300 A	260 A
120mm²	540 A	490 A	440 A	400 A	360 A

F.1 Trouble shooting

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

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

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

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

MOTOR TURNS OVER BUT DOES NOT START	
Cause	**Solution**
Stop solenoid valve not opening.	Check wire connections and circuitry to solenoid valve. (ref. DC wiring diagram: Relay K2, Fuse)
Fuel pump does not operate.	Check fuel-filter and pump: clean if necessary.
Lack of fuel.	Check fuel supply.
Glow-plugs not working correctly.	Check glow plugs and heating time.
Too much air in fuel lines.	Test fuel system for leakage. 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. 2. Remove the glow plug (see Kubota-manual). 3. Rotate the motor by hand carefully. 4. Check if there is water in the oil and change both oil and filter if necessary. 5. Determine cause for excess water in the combustion chamber. The excess water can be caused by a defective air vent in the cooling water system, which should be checked and cleaned, or replaced if faulty.

MOTOR RUNS IRREGULARLY	
Cause	**Solution**
Faulty centrifugal injector governor.	Have the centrifugal governor inspected by a Kubota-Service technician.
Too much air in fuel lines.	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: - fuel filter, renew if necessary - check fuel pump - check fuel lines (bleed if necessary)
Lack of intake air.	Check air intake paths. Check and clean air filter (and intake muffler if installed).
Generator overloaded by too many load.	Reduce the electrical load (switch off load).
Generator overloaded by over-energizing.	Check that the proper capacitor type is installed and that they are connected correctly.
Defective generator (windings, bearings, or other).	Generator must be sent to manufacturer for repair of damaged bearings or winding.
Damaged engine.	Repair of bearing damage, etc., by Kubota-Service.

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

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

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

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

TROUBLESHOOTING VCS SYSTEM	
Cause	**Solution**
Actuator does not move.	Check voltage supply and wire connections to actuator. Motor connected? Check connection to VCS.
Actuator sets throttle too high or too low.	Check that the wires to the actuator are connected properly (±). Check connection to VCS.
If the VCS electronics are faulty, the generator can still run by over-riding the system. To override the VCS, disconnect the plug and jumper the contacts. Loosen the connecting rods motor from the injection pump regulator and turn screw to a max. voltage of 33V.	

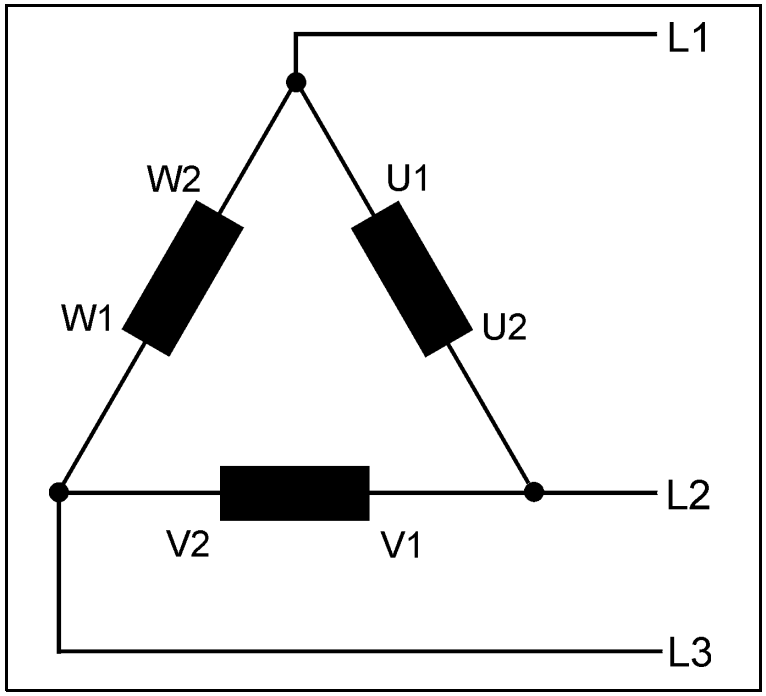
F.2 Technical Data Engine

	Panda AGT 6000 PMS
Type	Z482
Govenour	VCS
Cylinder	2
Bore	67mm
Stroke	68mm
Stroke volume	479cm^3
max- power (DIN 6271-NB) at 3000 rpm	9,32kW
Rated speed 50Hz	3000rpm
Idle running speed [a]	2900rpm
Valve clearance (engine cold)	0,2mm
Cylinder head torque	42Nm
Compression ratio	23:1
Lubrication oil capacity	2,5l
Fuel consumption [b]	ca. 0,58 - 1,54 l
Oil consumption	max. 1% of fuel consumption
Cooling water requirement for raw water circuit	16-28l/min
Permissible max. permanent tilt of engine	a) 25° acr oss the longitudinal axis b) 20° in the longitudinal direction

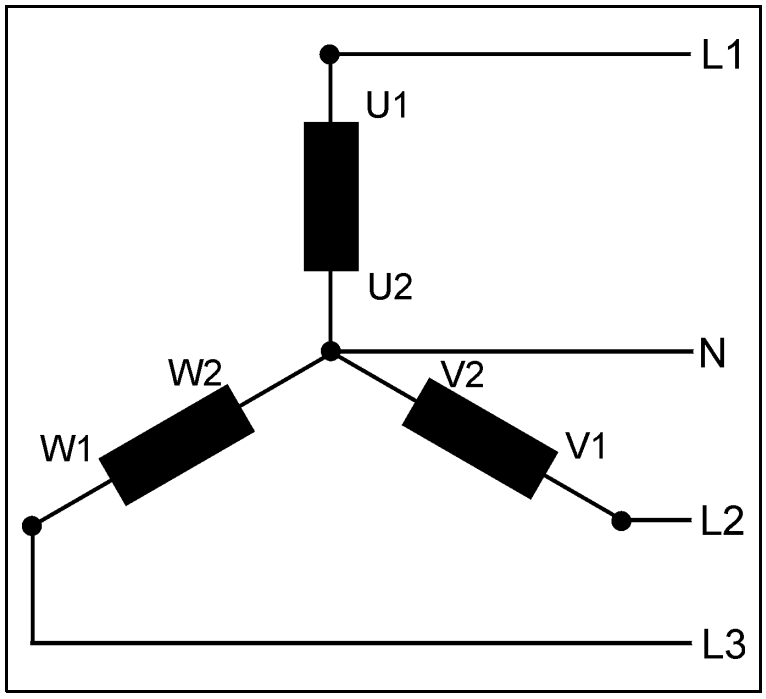
a. progressive speed by VCS
b. 0,35l/kW electrical power, the randomized values between 30% and 80% of the nominal power

F.3 Types of Winding

HP3 delta-connection



HP3 star-connection



F.4 Engine oil

Engine oil classification

Operating range:

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

Quality of oil:

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

API C for diesel engines

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

Examples for diesel engine oil:

API CG Engine oil for highest demands, turbo-tested

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

F.5 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℃

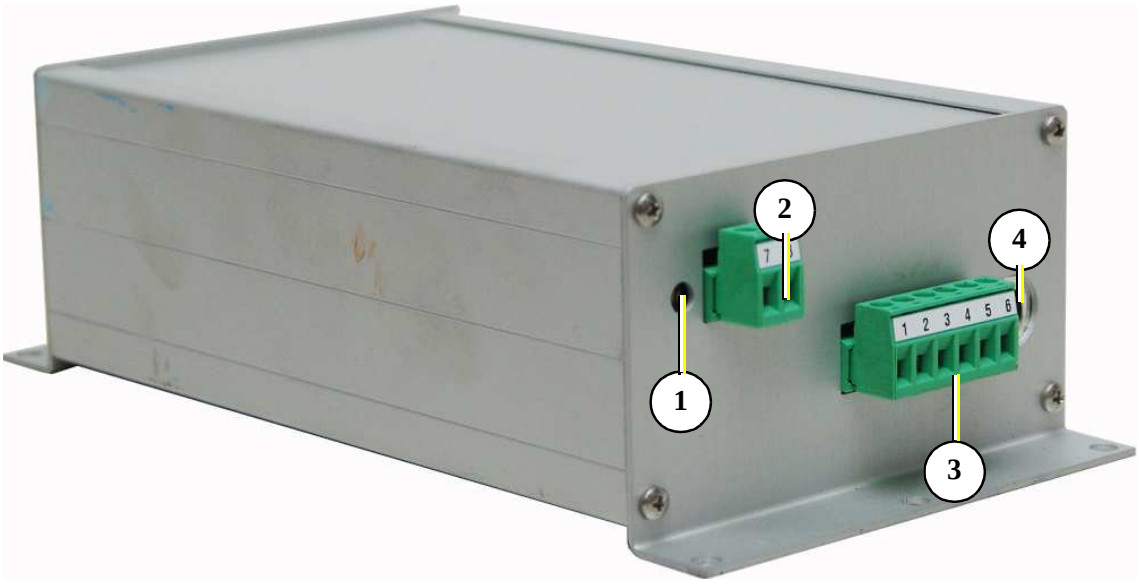
Fischer Panda Datasheet

A. VCS-AGT-U/I

A.1 VCS-AGT-U/I Versions

Art. Nr.: Fischer Panda	Set point	Art. Name
F1RORE9627-012-212	12V	VCS-AGT-U/I 12V= @60mV
F1RORE9627-024-212	24V	VCS-AGT-U/I 24V= @60mV
F1RORE9627-036	36V	VCS-AGT-U/I 36V= @60mV
F1RORE9627-048	48V	VCS-AGT-U/I 48V= @60mV
F1RORE9627-072-212	72V	VCS-AGT-U/I 72V= @60mV
F1RORE9627-080-212	80V	VCS-AGT-U/I 80V= @60mV
auf Anfrage / on request	96V	VCS-AGT-U/I 96V= @60mV
auf Anfrage / on request	115V	VCS-AGT-U/I 115V= @60mV
F1RORE9627-120	120V	VCS-AGT-U/I 120V= @60mV
F1RORE9627-144	144V	VCS-AGT-U/I 144V= @60mV
F1RORE9627-180	180V	VCS-AGT-U/I 180V= @60mV
auf Anfrage / on request	300V	VCS-AGT-U/I 300V= @60mV
auf Anfrage / on request	320V	VCS-AGT-U/I 320V= @60mV
auf Anfrage / on request	336V	VCS-AGT-U/I 336V= @60mV

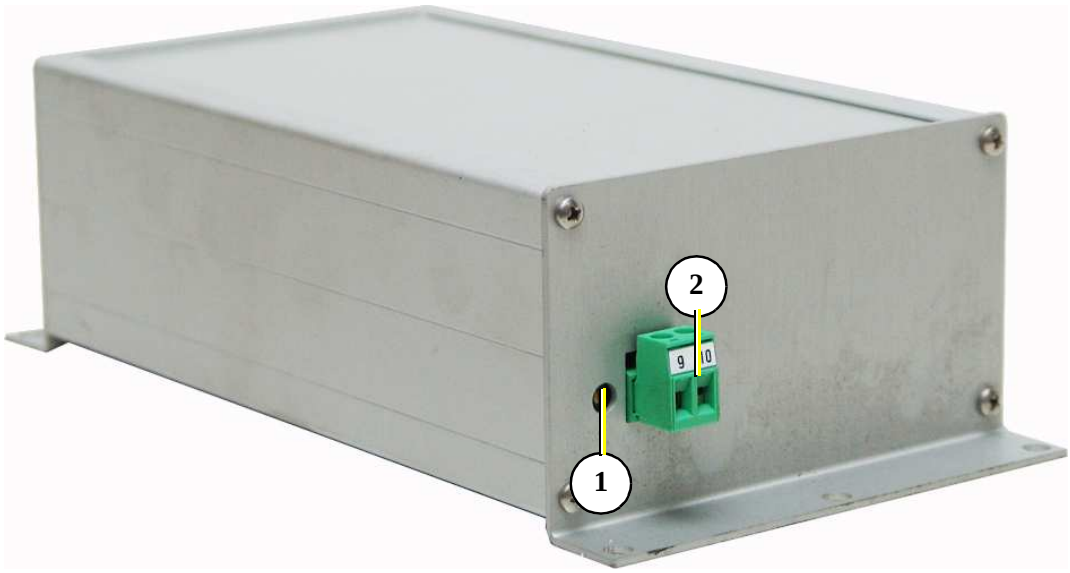
A.2 Voltage control system



1. Terminals 7+8
2. Potentiometer for the charging voltage
3. Terminals 1-6
4. Programming

Fig. A.2-1: VCS view

Fischer Panda Datasheet



1. Terminals 9+10
2. Potentiometer for the charging current

Fig. A.2-2: VCS view

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.

No.	Short mane	IN/OUT	Function
1	+ Actuaror	O	Out (+) for actuator
2	- Actuator	O	Out (-) for actuator
3	+12V	I	Operation voltage(+); 12V-Automotive
4	0V	I	Operation voltage(-); 12V-Automotive
5	AC Controllamp	O	to 0V - Optional
6	VCS on	I	12V: VCS is on / open : VCS is off
7	Mesurement voltage +	I	Mesurement voltage (+) from the generator
8	Mesurement voltage -	I	Mesurement voltage (-) from the generator
9	Mesurement current +	I	Mesurement current (+) from the generator
10	Mesurement current -	I	Mesurement voltage (-) from the generator

Fig. A.2-3: Terminals of the VCS

The potentiometer next to clamp 7/8 is needed for adustment of the measurement voltage and should be done by an service technican only.

The potentiometer next to clamp 9/10 is needed for adustment of the measurement current and should be done by an service technican only.

Fischer Panda Datasheet

A.2.1 Gerneral working of the VCS

When the VCS is active (+12V on clamp 6) the VCS controls the actuator to reach the exact voltage.

The mesurement voltage is taken from the generator by an shunt which has 60mV nominal.

A.2.2 Safety instructions for the voltage control

- A broken cable in the mesurement line will be notice by the VCS and the generator will slow down and stop.
- A short circiut in the mesurement line or a wrong pol connection is not noticed by the VCS (its like that there is no voltage). The voltage control in this vase ist out of funktion. It is necessary at the installation to check the right working of the VCS and a second overvoltage protection must be installed.
- For the mesurement voltage a shieldet cable is needet, it must be less than 3 mtr long. The shield should be connected to ground at one side.

Note the safety instruction in the generator manual!

Please Note!

- Run the generator with closed sound cover only
- Recommend: install a smoke connection.
- Ask for regular service

Fischer Panda Datasheet

Intentionally Blank

Generator Control Panel P6+ Manual

12V version - 21.02.02.009H
24V special version - 21.02.02.012H
Option automatic adapter - 21.02.02.016H
Option master-slave adapter - 21.02.02.015H

Fischer Panda GmbH

Panel Generator Control P6+ RE0703_Kunde_eng.R04 16.1.09

Current revision status

	Document
Actual:	Panel Generator Control P6+ RE0703_Kunde_eng.R04_16.1.09
Replace:	Panel Generator Control P6+ RE0703_Kunde_eng.R03

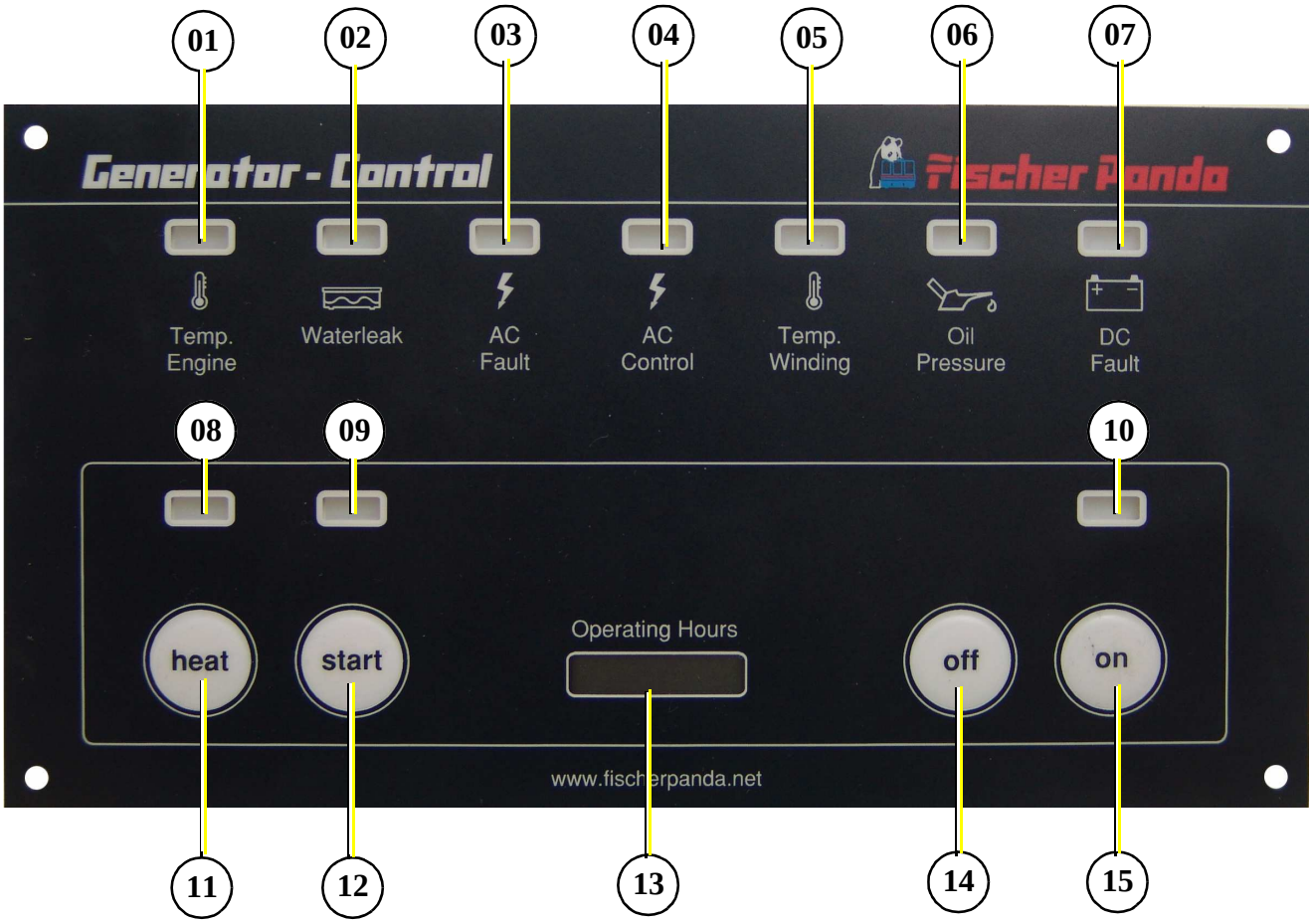
Revision	**Page**
Upgrade the whole manual	
Safety instruktion See valve added	
Hole pattern changed	

ATTENTION!: Please read the safety instructions in your generator manual!

A. General operation

A.1 Panel Generator Control

Fischer Panda Art. No. 21.02.02.009H



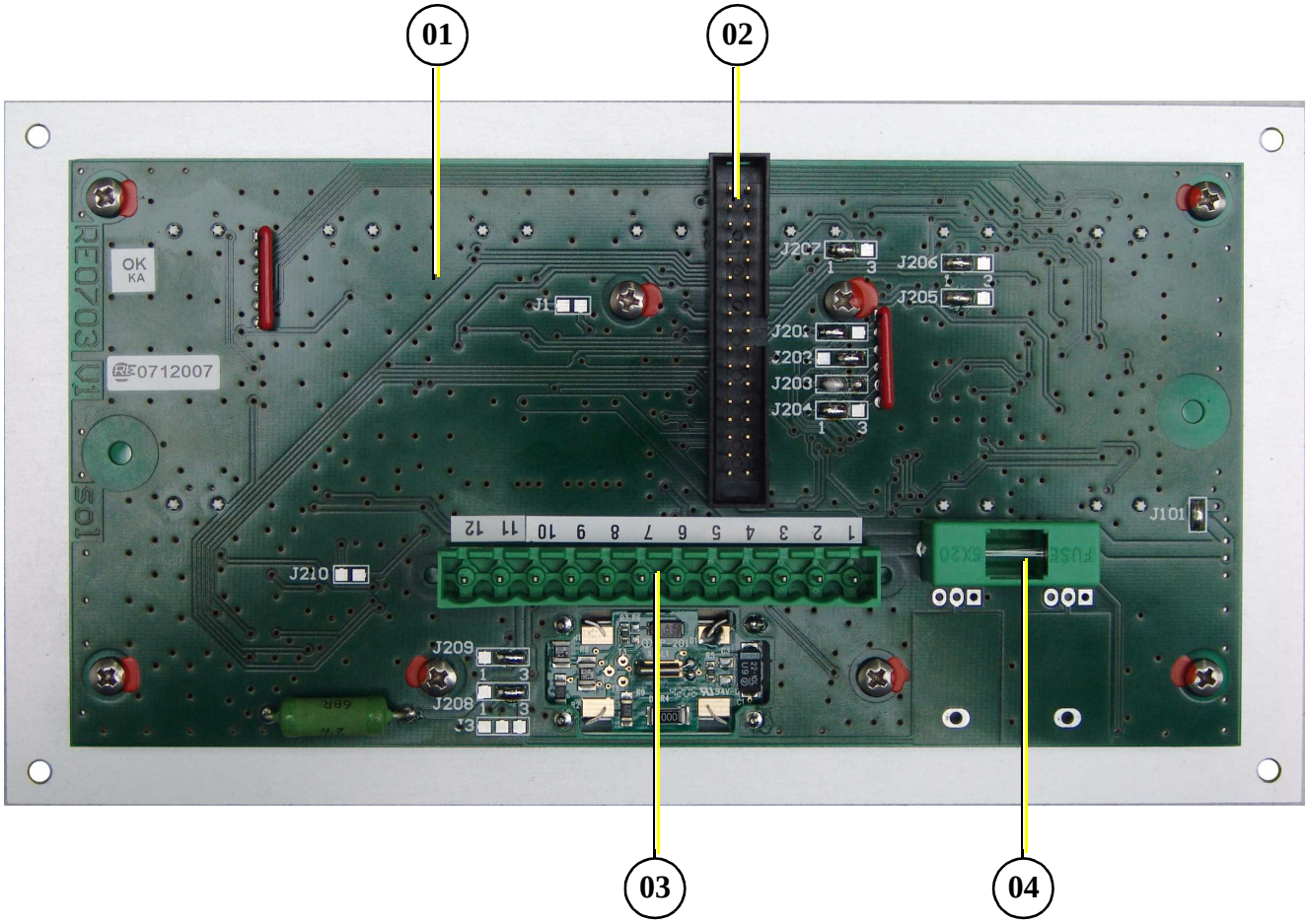
01. LED for coolant temperature red[1]
02. LED for waterleak red/yellow[1] (sensor optional)
03. LED for AC-voltage fault red/yellow[1]
04. LED for AC-voltage ok green[1]
05. LED for winding temperature red[1]
06. LED for oil pressure red[1]
07. LED for battery charge voltage fault green/red[1]
08. LED for pre-glow „heat“ orange[1]
09. LED for Generator „start“ green[1]
10. LED for Generator „stand-by“ green[1]
11. Push button for pre-glow „heat“
12. Push botton for Generator „start“
13. Operating hours counter
14. Push button panel „off“
15. Push button panel „on“

[1] LED green: normal operation mode, LED red: fault, LED yellow: warning, LED orange: active

Fig. A.1-1: Panel front

A.2 Rear view 12V-version

Fischer Panda Art. No. 21.02.02.009H

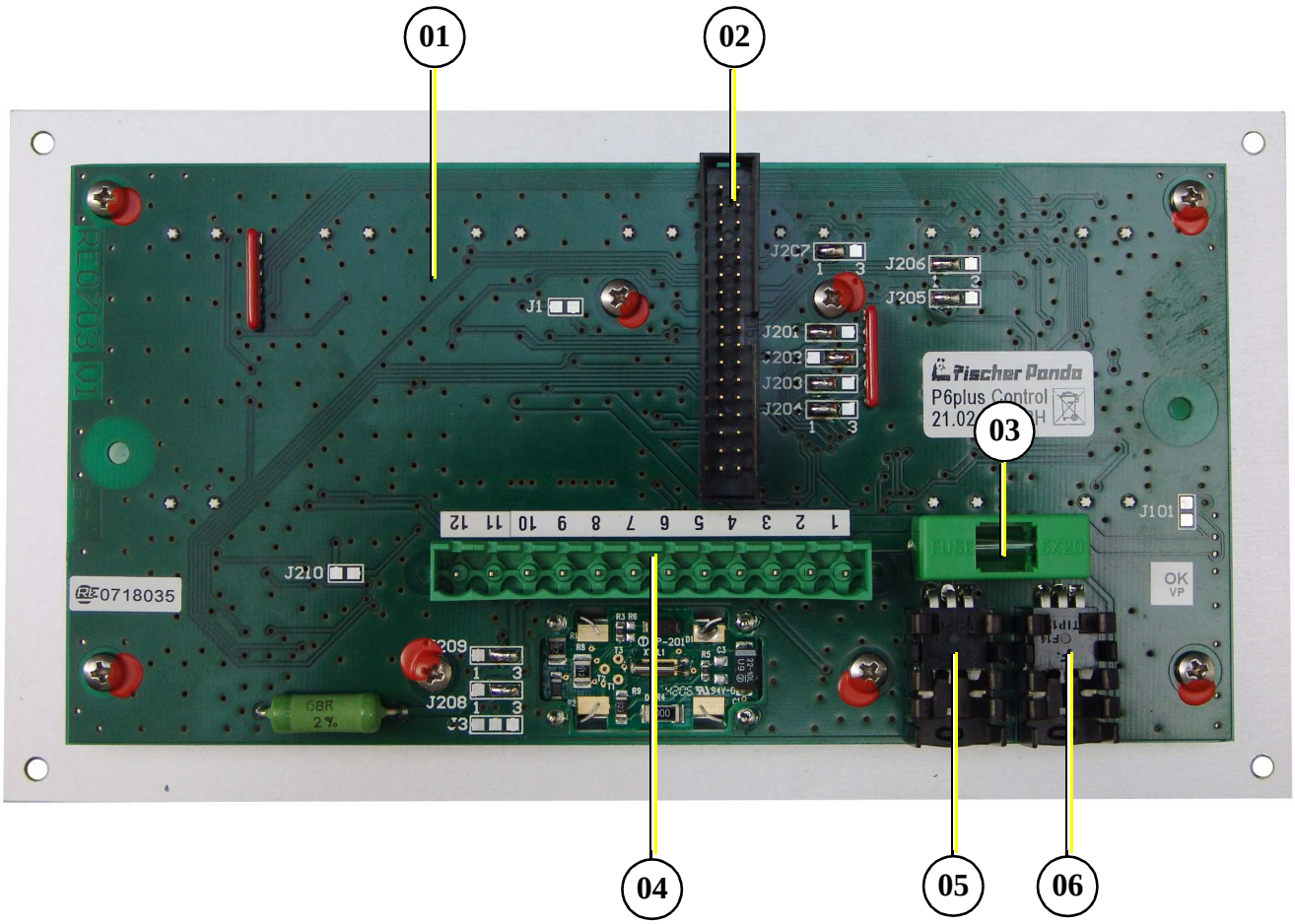


01. Control board
02. Terminal block (master-slave adapter: left row; automatic adapter: right row)
03. Terminals 1-12 (see section A.3.1, “Terminal connections,” on page 130)
04. Fuse 630mA slow-blow

Fig. A.2-1: Panel rear view 12V-version

A.3 Rear view 24V-version

Fischer Panda Art. No. 21.02.02.012H



01. Control board
02. Terminal block (master-slave adapter: left row; automatic adapter: right row)
03. Fuse 630mA slow-blow
04. Terminals 1-12 (see section A.3.1, “Terminal connections,” on page 130)
05. Linear controller 24V
06. Linear controller 24V

Fig. A.3-1: Panel rear view 24V-version

A.3.1 Terminal connections

Standard for NC temperature switch configured i.e. in case of failure „open“.

Clamp no.	Clamp name	IN / OUT	Description
1	Vbat	IN	Current supply + 12V (or optional 24V, must be adjusted by jumper)
2	GND	IN	Current supply -
3	T-Engine	IN	Error “coolant temperature”. Input for thermo-switch to GND. The input is adjustable for NC/NO (N = no error) (must be adjusted by solder Jumper). The input loads the switch with ≥22mA to +12V (with 24V-operated internally generated). The occurrence of an error is delayed, for analysis and displayed, around 100ms. Omission not. The in/out status is indicated with red LED.
4	Water leak (Replace air filter)	IN	Error “water leak”. Input for sensor switch to GND. The input is adjustable for NC/NO (N = no error) (must be adjusted by solder Jumper). The input loads the switch with ≥10mA to +12V (with 24V-operated internally generated). The occurrence of an error is delayed, for analysis and displayed, around 100ms. Omission not. The input status is indicated with red LED. The input can be used alternatively for the signal “Replace air filter” (must be adjusted by solder Jumper). Then the signal does not lead to switching off and is indicated with yellow LED.
5	Oil-Press	IN	Error “oil pressure“. Input for oil pressure switches to GND. The input is adjustable for NC/NO (N = no error) (must be adjusted by solder Jumper). The input loads the switch with ≥22mA to +12V (with 24V-operated internally generated). The occurrence of an error is delayed, for analysis and displayed, around 1s. Omission not. The input status is indicated with red LED.
6	DC-Control	IN / OUT	Load control display. Input for signal of the dynamo. The input is adjustable for GND = OK or 12V/24V = OK (must be adjusted by solder Jumper). The input loads the signal with 5mA at 12V and 10mA at 24V. The input status is indicated with red and green LED. The connection can supply an energizing current for the dynamo over a fixed resistor with 68R. Either with the control panel switched on or with “Fuel pump” switched on (must be adjusted by solder Jumper). This function is available only in 12V-operation.
7	AC-Control	IN	AC control display. Input for NC-open-collector-sensor-switch to GND (N = OK). The input loads the switch with ≥2,5mA to +12V (with 24V-operated internally generated). The input status is indicated with red and green LED´s.
8	Heat	OUT	Output for pre-glow relays. The output is so long active, as the button “Heat” is pressed. The output supplies, if active, the voltage of clamp 1. Additionally the output can be operated via the button “start” (must be adjusted by solder Jumper). Consider (notes 1-4).
9	Fuel-Pump	OUT	Output for fuel pump relay. The output is active, if no error is present (inputs 3, 4, 5, 11 and 12, if configured accordingly). The button “start” suppresses the error analysis and the output is then also active in the case of error, if the button “start” is pressed. The output supplies, if active, the voltage of clamp 1. Consider (notes 1-4).
10	Start	OUT	Output for starting relay. The output is active, as long as the button “start” is pressed. The output supplies, if active, the voltage of clamp 1. Consider (notes 1-4).
11	AC-Fault (Fuel Level) [former T-Oil]	IN	Error generator AC input for NC-open-collector-sensor-switch to GND (N = no error). The input loads the switch with ≥2,5mA to +12V. (with 24V-operated internally generated). The occurrence of an error is delayed, for analysis and displayed, around 100ms. Omission not. The input status is indicated with red LED. The input can be used alternatively for the signal “Fuel level” (must be adjusted by solder Jumper). The signal does not lead to switching off and is indicated with yellow LED. The input can be used alternatively for the signal “error oil-temperature”. The input is adjustable for NC/NO (N = no error) (must be adjusted by solder Jumper). The load of the sensor switch is adjustable to ≥10mA by +12V (must be adjusted by solder Jumper).
12	T-Winding	IN	Error “winding temperature”. Input for thermo-switch to GND. The input is adjustable for NC/NO (N = no error) (must be adjusted by solder Jumper). The input loads the switch with ≥22mA to +12V (with 24V-operated internally generated). The occurrence of an error is delayed, for analysis and displayed, around 100ms. Omission not. The input status is indicated with red LED.

Fig. A.3.1-1: Terminal connections

Notes:

1. Power rating of the output: max. 0,5A in continuous operation and briefly 1,0A.
2. The supply of all output currents may not exceed (less 0,2A power consumption) the rated current of the safety device of the control panel.
3. The output has a free wheeling diode, which short circuits negative voltages (related to GND).
4. The output has a Z-diode, which prevents a supply of positive voltage (related to GND) into the output.

A.3.2 Function of the jumpers

Jumper	Status	Description
J1	closed	during operation of the start button heat is along-operated
	open	Function deactivated
J3	1-2	Dynamo excitation resistor 68R is switched on with Fuel-Pump (1)
	2-3	Dynamo excitation resistor 68R is switched on with Panel-ON (1)
	open	Dynamo excitation resistor is deactivated
J101	closed	12V - operation
	open	24V - operation (optional)
J201	1-2	T-Engine-input, for contact, which opens in case of error (2)
	2-3	T-Engine-input, for contact, which closes in case of error (2)
J202	1-2	Water leak-input / Replace air filter, for contact, which opens in case of error (2)
	2-3	Water leak-input / Replace air filter, for contact, which closes in case of error (2)
J203	1-2	Oil-Press-input, for contact, which opens in case of error (2)
	2-3	Oil-Press-input, for contact, which closes in case of error (2)
J204	1-2	AC-Fault-input / Fuel level, for contact, which opens in case of error (2)
	2-3	AC-Fault-input / Fuel level, for contact, which closes in case of error (2)
J205	1-2	T-Winding-input, for contact, which opens in case of error (2)
	2-3	T-Winding-input, for contact, which closes in case of error (2)
J206	1-2	Input Water leak has red LED and switches off
	2-3	Input Water leak has yellow LED and does not switch off
J207	1-2	Input AC-Fault has red LED and switches off
	2-3	Input AC-Fault has yellow LED and does not switch off
J208	1-2	DC-Control-Signal (-) = OK dynamo 12V at Kubota Z 482 / D 722 engines
	2-3	DC-Control-Signal (+) = OK three-phase DC-alternator
J209	1-2	DC-Control-Signal (-) = OK dynamo 12V at Kubota Z 482 / D 722 engines
	2-3	DC-Control-Signal (+) = OK three-phase DC-alternator
J210	closed	Input AC-Fault has Pull-Up-current ≥10mA
	open	Input AC-Fault has Pull-Up-current ≥2,5mA

Fig. A.3.2-1: Function of the solder jumper

The solder jumpers are marked on the printed circuit board (with jumper no. and at three-part solder jumper with soldering surface no.)

(1): Equivalent resistance for load control lamp e.g. for use with three-phase alternator also integrated automatic controller of Bosch. The resistance value is 68Ω 3W, i.e. only for 12V.

(2): A closed contact switches the appropriate input to GND.

A.3.3 Configuration and adjustment

Configuration and setting sheet KE01

Standard jumpering for generators with three-phase DC-alternator (Kubota Super 5 series).

Panel only for 12V-operation.

The safety device is installed with the value 0,63AT.

The circuit parts for 24V-operation are not equipped.

Jumper	Status	Conf.	Description
J1	closed		during operation of the start button heat is along-operated
	open	X	Function deactivated
J3	1-2		Dynamo excitation resistor 68R is switched on with Fuel-Pump (1)
	2-3		Dynamo excitation resistor 68R is switched on with Panel-ON (1)
	open	X	Dynamo excitation resistor is deactivated
J101	closed	X	12V - operation
	open		~~24V - operation~~ (not possible)
J201	1-2	X	T-Engine-input, for contact, which opens in case of error (2)
	2-3		T-Engine-input, for contact, which closes in case of error (2)
J202	1-2		Water leak-input / Replace air filter, for contact, which opens in case of error (2)
	2-3	X	Water leak-input / Replace air filter, for contact, which closes in case of error (2)
J203	1-2	X	Oil-Press-input, for contact, which opens in case of error (2)
	2-3		Oil-Press-input, for contact, which closes in case of error (2)
J204	1-2	X	AC-Fault-input / Fuel level, for contact, which opens in case of error (2)
	2-3		AC-Fault-input / Fuel level, for contact, which closes in case of error (2)
J205	1-2	X	T-Winding-input, for contact, which opens in case of error (2)
	2-3		T-Winding-input, for contact, which closes in case of error (2)
J206	1-2	X	Input Water leak has red LED and switches off
	2-3		Input Water leak has yellow LED and does not switch off
J207	1-2	X	Input AC-Fault has red LED and switches off
	2-3		Input AC-Fault has yellow LED and does not switch off

Fig. A.3.3-1: Settings of soldered jumper for this configuration (column Conf.)

J208	1-2		DC-Control-Signal (-) = OK dynamo 12V at Kubota Z 482 / D 722 engines
	2-3	X	DC-Control-Signal (+) = OK three-phase DC-alternator
J209	1-2		DC-Control-Signal (-) = OK dynamo 12V at Kubota Z 482 / D 722 engines
	2-3	X	DC-Control-Signal (+) = OK three-phase DC-alternator
J210	closed		Input AC-Fault has Pull-Up-current ≥10mA
	open	X	Input AC-Fault has Pull-Up-current ≥2,5mA

Fig. A.3.3-1: Settings of soldered jumper for this configuration (column Conf.)

The solder jumpers are marked on the printed circuit board (with jumper no. and at three-part solder jumper with soldering surface no.)

(1): Equivalent resistance for load control lamp e.g. for use with three-phase alternator also integrated automatic controller of Bosch. The resistance value is 68Ω 3W, i.e. only for 12V.

(2): A closed contact switches the appropriate input to GND.

Configuration and setting sheet KE02

Standard jumpering for generators with three-phase DC-alternator.

Panel for 24V-operation (over attitude of solder jumper J101 alternatively 12V-operation is possible).

The safety device is installed with the value 0,63AT.

The circuit parts for 24V-operation are not equipped.

Jumper	Status	Conf.	Description
J1	closed		during operation of the start button heat is along-operated
	open	X	Function deactivated
J3	1-2		Dynamo excitation resistor 68R is switched on with Fuel-Pump (1)
	2-3		Dynamo excitation resistor 68R is switched on with Panel-ON (1)
	open	X	Dynamo excitation resistor is deactivated
J101	closed		12V - operation
	open	X	24V - operation
J201	1-2	X	T-Engine-input, for contact, which opens in case of error (2)
	2-3		T-Engine-input, for contact, which closes in case of error (2)
J202	1-2		Water leak-input / Replace air filter, for contact, which opens in case of error (2)
	2-3	X	Water leak-input / Replace air filter, for contact, which closes in case of error (2)
J203	1-2	X	Oil-Press-input, for contact, which opens in case of error (2)
	2-3		Oil-Press-input, for contact, which closes in case of error (2)
J204	1-2	X	AC-Fault-input / Fuel level, for contact, which opens in case of error (2)
	2-3		AC-Fault-input / Fuel level, for contact, which closes in case of error (2)
J205	1-2	X	T-Winding-input, for contact, which opens in case of error (2)
	2-3		T-Winding-input, for contact, which closes in case of error (2)

Fig. A.3.3-2: Einstellung der Lötjumper für diese Konfiguration (Spalte Konf.)

J206	1-2	X	Input Water leak has red LED and switches off
	2-3		Input Water leak has yellow LED and does not switch off
J207	1-2	X	Input AC-Fault has red LED and switches off
	2-3		Input AC-Fault has yellow LED and does not switch off
J208	1-2		DC-Control-Signal (-) = OK dynamo 12V at Kubota Z 482 / D 722 engines
	2-3	X	DC-Control-Signal (+) = OK three-phase DC-alternator
J209	1-2		DC-Control-Signal (-) = OK dynamo 12V at Kubota Z 482 / D 722 engines
	2-3	X	DC-Control-Signal (+) = OK three-phase DC-alternator
J210	closed		Input AC-Fault has Pull-Up-current ≥10mA
	open	X	Input AC-Fault has Pull-Up-current ≥2,5mA

Fig. A.3.3-2: Einstellung der Lötjumper für diese Konfiguration (Spalte Konf.)

The solder jumpers are marked on the printed circuit board (with jumper no. and at three-part solder jumper with soldering surface no.)

(1): Equivalent resistance for load control lamp e.g. for use with three-phase alternator also integrated automatic controller of Bosch. The resistance value is 68Ω 3W, i.e. only for 12V.

(2): A closed contact switches the appropriate input to GND.

Configuration and setting sheet KE03

Standard jumpering for generators with DC-alternator.

Panel only for 12V-operation.

The safety device is installed with the value 0,63AT.

The circuit parts for 24V-operation are not equipped.

Jumper	Status	Konf.	Description
J1	closed		during operation of the start button heat is along-operated
	open	X	Function deactivated
J3	1-2		Dynamo excitation resistor 68R is switched on with Fuel-Pump (1)
	2-3		Dynamo excitation resistor 68R is switched on with Panel-ON (1)
	open	X	Dynamo excitation resistor is deactivated
J101	closed	X	12V - operation
	open		~~24V - operation~~ (not possible)
J201	1-2	X	T-Engine-input, for contact, which opens in case of error (2)
	2-3		T-Engine-input, for contact, which closes in case of error (2)
J202	1-2		Water leak-input / Replace air filter, for contact, which opens in case of error (2)
	2-3	X	Water leak-input / Replace air filter, for contact, which closes in case of error (2)
J203	1-2	X	Oil-Press-input, for contact, which opens in case of error (2)
	2-3		Oil-Press-input, for contact, which closes in case of error (2)

Fig. A.3.3-3: Einstellung der Lötjumper für diese Konfiguration (Spalte Konf.)

J204	1-2	X	AC-Fault-input / Fuel level, for contact, which opens in case of error (2)
	2-3		AC-Fault-input / Fuel level, for contact, which closes in case of error (2)
J205	1-2	X	T-Winding-input, for contact, which opens in case of error (2)
	2-3		T-Winding-input, for contact, which closes in case of error (2)
J206	1-2	X	Input Water leak has red LED and switches off
	2-3		Input Water leak has yellow LED and does not switch off
J207	1-2	X	Input AC-Fault has red LED and switches off
	2-3		Input AC-Fault has yellow LED and does not switch off
J208	1-2	X	DC-Control-Signal (-) = OK dynamo 12V at Kubota Z 482 / D 722 engines
	2-3		DC-Control-Signal (+) = OK three-phase DC-alternator
J209	1-2	X	DC-Control-Signal (-) = OK dynamo 12V at Kubota Z 482 / D 722 engines
	2-3		DC-Control-Signal (+) = OK three-phase DC-alternator
J210	closed		Input AC-Fault has Pull-Up-current ≥10mA
	open	X	Input AC-Fault has Pull-Up-current ≥2,5mA

Fig. A.3.3-3: Einstellung der Lötjumper für diese Konfiguration (Spalte Konf.)

The solder jumpers are marked on the printed circuit board (with jumper no. and at three-part solder jumper with soldering surface no.)

(1): Equivalent resistance for load control lamp e.g. for use with three-phase alternator also integrated automatic controller of Bosch. The resistance value is 68Ω 3W, i.e. only for 12V.

(2): A closed contact switches the appropriate input to GND.

Configuration and setting sheet KE04

Standard jumpering for generators with DC-alternator.

Panel for 24V-operation (over attitude of solder jumper J101 alternatively 12V-operation is possible).

The safety device is installed with the value 0,63AT.

The circuit parts for 24V-operation are not equipped.

Jumper	Status	Konf.	Description
J1	closed		during operation of the start button heat is along-operated
	closed	X	Function deactivated
J3	1-2		Dynamo excitation resistor 68R is switched on with Fuel-Pump (1)
	2-3		Dynamo excitation resistor 68R is switched on with Panel-ON (1)
	closed	X	Dynamo excitation resistor is deactivated
J101	closed		12V - operation
	closed	X	24V - operation
J201	1-2	X	T-Engine-input, for contact, which opens in case of error (2)
	2-3		T-Engine-input, for contact, which closes in case of error (2)

Fig. A.3.3-4: Einstellung der Lötjumper für diese Konfiguration (Spalte Konf.)

J202	1-2		Water leak-input / Replace air filter, for contact, which opens in case of error (2)
	2-3	X	Water leak-input / Replace air filter, for contact, which closes in case of error (2)
J203	1-2	X	Oil-Press-input, for contact, which opens in case of error (2)
	2-3		Oil-Press-input, for contact, which closes in case of error (2)
J204	1-2	X	AC-Fault-input / Fuel level, for contact, which opens in case of error (2)
	2-3		AC-Fault-input / Fuel level, for contact, which closes in case of error (2)
J205	1-2	X	T-Winding-input, for contact, which opens in case of error (2)
	2-3		T-Winding-input, for contact, which closes in case of error (2)
J206	1-2	X	Input Water leak has red LED and switches off
	2-3		Input Water leak has yellow LED and does not switch off
J207	1-2	X	Input AC-Fault has red LED and switches off
	2-3		Input AC-Fault has yellow LED and does not switch off
J208	1-2	X	DC-Control-Signal (-) = OK dynamo 12V at Kubota Z 482 / D 722 engines
	2-3		DC-Control-Signal (+) = OK three-phase DC-alternator
J209	1-2	X	DC-Control-Signal (-) = OK dynamo 12V at Kubota Z 482 / D 722 engines
	2-3		DC-Control-Signal (+) = OK three-phase DC-alternator
J210	closed		Input AC-Fault has Pull-Up-current ≥10mA
	open	X	Input AC-Fault has Pull-Up-current ≥2,5mA

Fig. A.3.3-4: Einstellung der Lötjumper für diese Konfiguration (Spalte Konf.)

The solder jumpers are marked on the printed circuit board (with jumper no. and at three-part solder jumper with soldering surface no.)

(1): Equivalent resistance for load control lamp e.g. for use with three-phase alternator also integrated automatic controller of Bosch. The resistance value is 68Ω 3W, i.e. only for 12V.

(2): A closed contact switches the appropriate input to GND.

A.4 Starting preparation / Checks (daily)

A.4.1 Marine version

1. Oil level control (ideal level: 2/3 MAX).

   The level should be about 2/3 of the maximum level of a cold engine.
   Further, if installed, the oil level of the oil-cooled bearing must be controlled before each start - see sediment bowl at generator front cover!.

2. State of cooling water.

   The external expansion tank should be filled up to 1/3 of the maximum in a cold state. It is very important that a large expansion area remains above the cooling water level.

3. Check if sea cock for cooling water intake is open.

   For safety reasons, the sea cock 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. Visual inspection.

   Control fixing bolts, check hose connectors for leakages, control electrical connections.

6. Switch off the load.

   The generator should only be started without load.

7. Open fuel valve, if installed.

8. Close battery main switch (switch on).

A.4.2 Vehicle version

1. Oil level control (ideal level: 2/3 MAX).

   The level should be about 2/3 of the maximum level of a cold engine.
   Further, if installed, the oil level of the oil-cooled bearing must be controlled before each start - see sediment bowl at generator front cover!.

2. State of cooling water.

   The external expansion tank should be filled up to 1/3 of the maximum in a cold state. It is very important that a large expansion area remains above the cooling water level.

3. Visual inspection.

   Control fixing bolts, check hose connectors for leakages, control electrical connections.

4. Switch off the load.

   The generator should only be started without load.

5. Open fuel valve, if installed.

6. Close battery main switch (switch on).

A.5 Starting and stopping the generators

A.5.1 Starting the generator

1. Press button „on“ (switch on).

   LED for "on“ = green.

2. Press button „heat“ (preglow engine).

   LED for "heat“ = orange.
   Depending upon engine type and execution pre-heating can be necessary. Pre-heat is necessary at an operating temperature <20°C.

A.5.1 Starting the generator

3. Press button „start“ (start engine).

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

4. Switch on load.

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

Note!: In the event of starting problems, close the sea water inlet cock. Panda marine generators only.

Should there be any reason to turn the engine (over) or start the engine i.e. to bleed the fuel system, the sea water inlet cock must be closed! During the starting process, the cooling water pump is driven with the motor. The cooling water is discharged to the exhaust outlet and, since the motor has not run, the exhaust pressure is not high enough to expel the sea water which has been brought to the exhaust outlet. To avoid filling the exhaust outlet with water and causing further problems, close the inlet sea water valve.

Once the engine is running, be sure to open the inlet valve!

A.5.2 Stopping the generator

1. Switch off load.

2. Recommendation: With turbo engines and during load more than highly 70% of the rated output, stabilize generator temperature at least 5 minutes with load switched off.

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

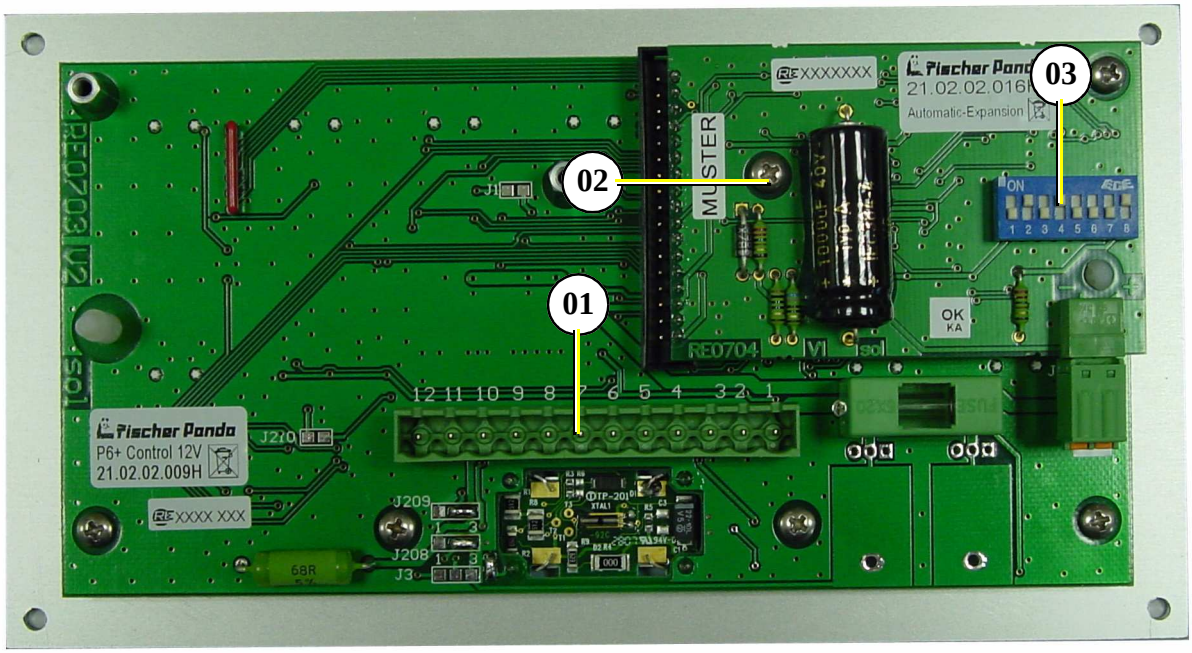
3. Press button „off“ (switch off).

   LED for "on“ = off.

NOTE: Never switch off the battery until the generator has stopped, if necessary close fuel valve!

A.6 Automatic adapter - option

Fischer Panda Art. No. 21.02.02.016H



01. Main terminals
02. Automatic adapter 21.02.02.016H
03. 8-pole DIP-switch

Fig. A.6-1: Panel 21.02.02.009H with Automatic adapter 21.02.02.016H

Function:

The automatic adapter RE0704 extends the generator control panel P6+ with an automatic input. A potential-free contact can be attached to this input. If this contact is closed, then the generator, which is attached to the generator control panel P6+, is started automatically. If the contact is opened, then the generator is stopped automatically.

The automatic starting procedure consists of pre-heating (heat) and operating the starter (start). It can be again aborted at any time by opening the contact at the automatic input.

For automatic stopping (stop) the output “Fuel pump” (clamp 9 generator control panel) is switched off. The time for the automatic stop procedure can be terminated only by switching off generator control panel prematurely.

The times for “heat”, “start” and “stop” are separately adjustable (see below).

The additional automatic adapter switched on and off using the generator control panel with its push buttons “on” and “off”.

If the contact at the automatic input is connected, while the generator control panel is switched on, then the automatic starting procedure is carried out.

If the current supply is attached or switched on using the generator control panel, while the contact of the automatic input is closed, then the automatic starting procedure won´t be carried out, because the generator control panel is always switched off after attaching the current supply (generator the control panel must have been separate from the current supply for at least 60s).

The mechanism entrance:

With (-) characterized connection is connected to GND.

With (+) characterized connection is the input.

The input is connected through a resistance to 12V (with 24V-operated internally generated). If the two connections are short circuited over a potential-free contact, then the input current flows.

To be considered for an electronic contact the low input current and the polarity is to be selected.

The high input current is to be selected for an electromechanical contact.

The input is debounced (delay time approx.1s).

On the input an external voltages must not be set.

Data:	
Parameter	**Information**
Operation voltage	The automatic adapter power is supplied via the generator control panel P6+. The same absolute maximum ratings obtain as with the generator control panel P6+.
Operation temperature	The same absolute maximum ratings obtain as with the generator control panel P6+.
Proper power consumption	10mA - 20mA
Tolerance of times	± 10%

8-pole DIP-switch S1 settings (S1.1 to S1.8):

		standard	S1.1	S1.2	S1.3	S1.4	S1.5	S1.6	S1.7	S1.8
Heat-time	2,5s		OFF	OFF						
	5s		ON	OFF						
	10s	X	OFF	ON						
	20s		ON	ON						
Start-time	8s	X			OFF					
	16s				ON					
Stop-time	16s					OFF	OFF			
	32s	X				ON	OFF			
	64s					OFF	ON			
	128s					ON	ON			
Operation-mode	Normal	X						OFF		
	Test (all times over 16)							ON		
Input current	1,25mA									OFF
	7mA	X								ON

Fig. A.6-2: Settings

Attention:

The automatic adapter must only be used together with a device. The starter should only be switched on when the generator stationary (shut-down)!

A.6.1 Terminal connections

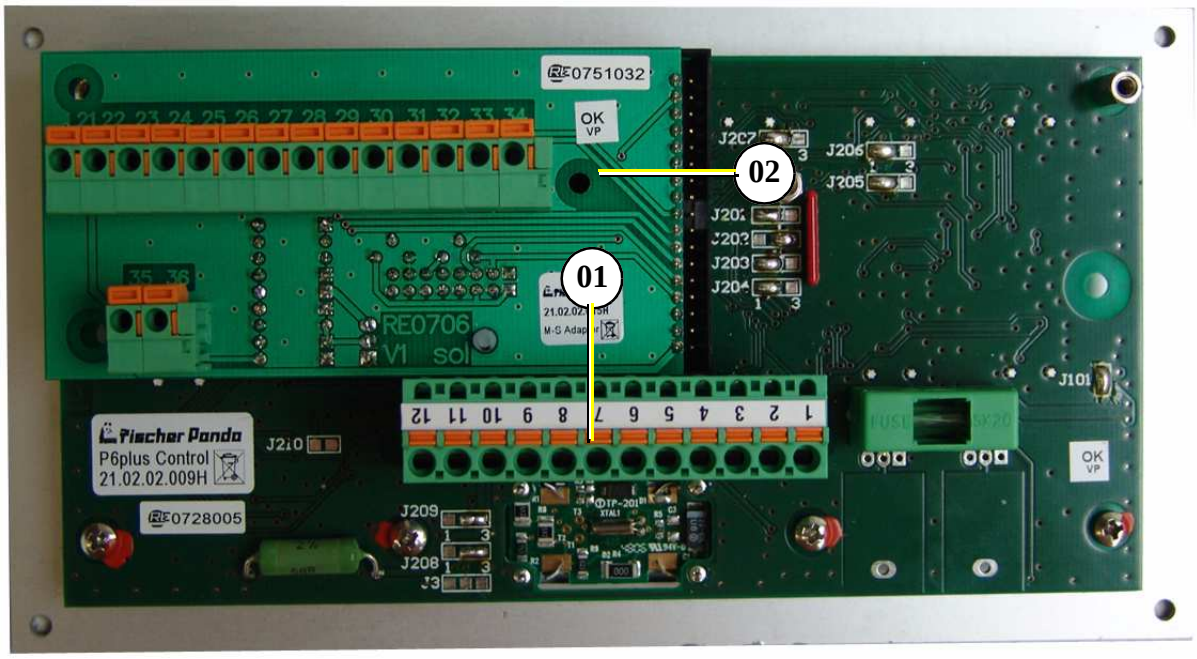
Connection for the automatic adapter X2 (row with odd pin numbers // I/O viwe from operating panel)

Pin-no.	Pin-name	I / O	Description
1	VBF	O	Current supply + (operation voltage behind fuse)
3	GND	O	Current supply - (ground)
5	VBFS	O	Current supply + switched (voltage Pin 1, with panel switched on)
7	12V	O	Current supply + switched, at 12V-operation over closed soldered jumper J101 connected with VBFS (at optional 24V-operation: VBFS over internal voltage regulator at 12,9V regulated)
9	GND	O	Current supply - (ground)
11	GND	O	Current supply - (ground)
13	/Heat-signal	I	Heat is active, if the input is switched to GND
15	/Start-signal	I	Start is active, if the input is switched to GND
17	GND	O	Current supply - (ground)
19	GND	O	Current supply - (ground)
21	GND	O	Current supply - (ground)
23	GND	O	Current supply - (ground)
25	GND	O	Current supply - (ground)
27	/Stop-signal	I	The Fuel pump signal is switched off, as long as the input is switched to GND, (also when starting)
29	FP-Int	O	Fuel pump signal internally, decoupled over diode from external signal
31	/Fault-signal	O	Output is switched to GND, if an error is present (inputs 3, 4, 5, 11 and 12, if configured and generally for 2s, after switching on the panel)
33	GND	O	Current supply - (ground)

Fig. A.6.1-1: Terminal connections automatic adapter

A.7 Master-Slave adapter - option

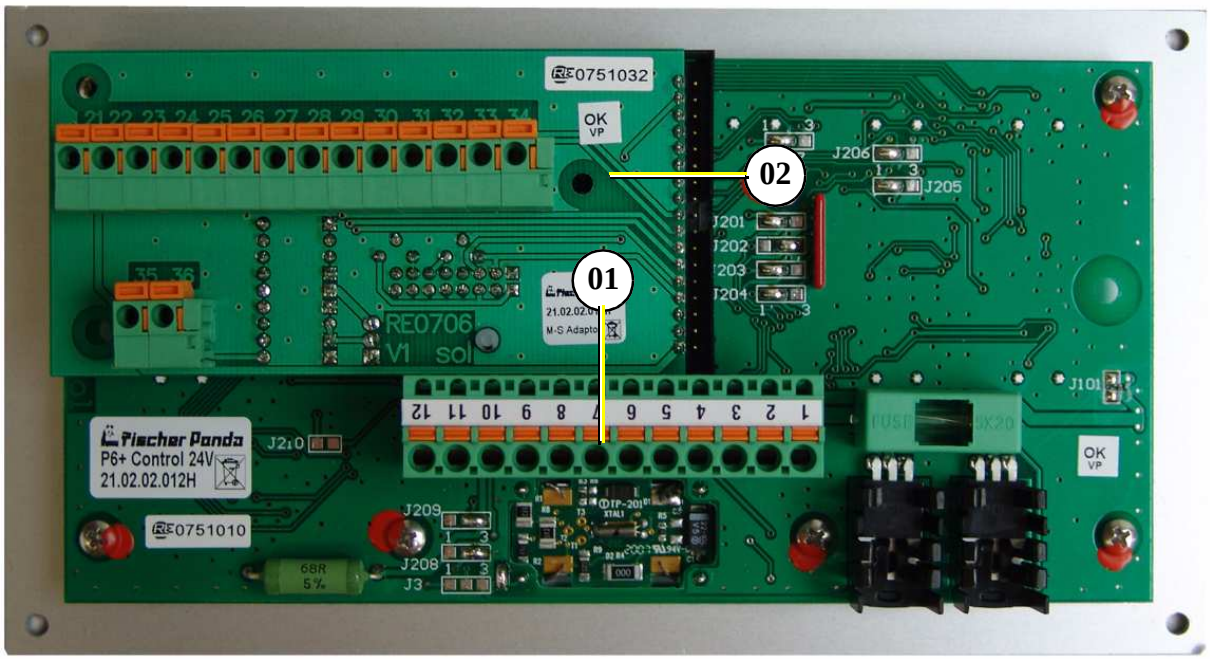
Fischer Panda Art. No. 21.02.02.015H 12V-version



01. Main terminals
02. Master-slave adapter 21.02.02.015H

Fig. A.7-1: Panel 21.02.02.009H with master-slave adapter 21.02.02.015H

Fischer Panda Art. No. 21.02.02.01H 24V-version



01. Main terminals
02. Master-slave adapter 21.02.02.015H

Fig. A.7-2: Panel 21.02.02.012H with master-slave adapter 21.02.02.015H

With the Master-Slave-Adapter RE0706 two Generator Control Panels P6+ RE0703 can be connected to a Master-Slave-Combination. In addition on each Generator Control Panel P6+ an Master-Slave-Adapter RE0706 is installed. The Generator Control Panel P6+ is interconnected by the 14pole connecting terminals on the Master-Slave-Adapters 1:1. The Master-Panel is hereby defined when the generator is connected to the main connector. Thus, the main connector of the Slave-Panel should not be occupied (unconnected).

The solder jumpers on the Master-Panel have to be coded in the same manner as for a Master-Panel without a Slave-Panel as in normal operation. The solder jumpers on the Slave-Panel are coded as for slave operation (please see the appropriate adjustment pages for the Generator Control Panel P6+ RE0703).

The Master-Panel and Slave-Panel are identical, and only differs as a result of the coding. Both Master-Slave-Panels are also identical.

Terminal Connections:

X2: (14polig, 21 - 34) master Slave connection (1:1 wire)

X3: (2polig, 35 - 36) 35: Panel on signal of the Generator Control Panel P6+ RE0703

36: Error signal of the Generator Control Panel P6+ RE0703

The Panel-ON-Signal is active when the panel is switched on.

The error signal is so long active, as the panel recognizes an error, which must lead to switching the generator off.

The output voltage corresponds to the operating voltage of the Generator Control Panel P6+ less 0,7V - 1,4V. Each output has a free wheeling diode which short circuits externals voltage supplies under 0V and a decoupling diode which decouples the circuitry from external power feeding.

Fuse:

A 0,8AT fuse must be installed on the Master-Panel.

A.7.1 Terminal connections

Terminal X2 (IN/OUT from view Master-Opearating-Panel)

Pin-No.	Pin-name	IN / OUT	Description
21	VBF	O	Current supply + (operation voltage behind fuse 12Vdc or 24Vdc depending on system)
22	GND	O	Current supply - (ground)
23	ON-Signal	I / O	Panels are switched on, if the connection is switched using a push button (on master or slave) to VBF
24	OFF-Signal	I / O	Panels are switched off, if the connection is switched using a push button (on master or slave) to VBF
25	/Heat-Signal	I / O	Heat is active, if the connection is switched over a push button (on master or Slave) to GND
26	/Start-Signal	I / O	Start is active, if the connection is switched over a push button (on master or Slave) to GND
27	LED-T-Engine	O	Output for LED T-Engine on the Slave panel, is switched to GND, if the LED is illuminated
28	LED-Water-leak (Replace Airfilter)	O	Output for LED Waterleak on the Slave panel, is switched to GND, if the LED is illuminated
29	LED-Oil-Press	O	Output for LED Oil-Press on the Slave panel, is switched to GND, if the LED is illuminated
30	LED-AC-Fault (Fuel Level)	O	Output for LED AC-Fault on the Slave panel, is switched to GND, if the LED is illuminated

Fig. A.7.1-1: Terminal connections terminal X2 (IN/OUT from the view of the master-control-panel)

31	LED-T-Win-ding	O	Output for LED T-Winding on the Slave panel, is switched to GND, if the LED is illuminated
32	DC-Control	O	Output for LED DC-Control-display on the Slave panel. The DC control signal is ground through 1:1.
33	AC-Control		Output for LED AC-Control-display on the Slave panel. The AC control signal is ground through 1:1.
34	VBFS	O	Current supply + switched (otherwise like 21, VBF)

Fig. A.7.1-1: Terminal connections terminal X2 (IN/OUT from the view of the master-control-panel)

The use of these connections for other purposes, other than the master-slave connection of two generator control panels, is generally forbidden. In individual cases, after consultation and clarifying the technical details, a release for another use can, if technically possible, be allowed.

Terminal X3

Pin-No.	Pin-name	IN / OUT	Description
35	Panel ON	O	With panel (ON/OFF) switched voltage of clamp X2.1 (VBF). (Consider notes 1-4)
36	Error	O	Output is switched on, if a ceitical error is present. (Consider notes 1-4)

Fig. A.7.1-2: Terminal connections terminal X3

Notes:

1. Power rating of the output: max. 0,5A in continuous operation and briefly 1,0A.
2. The supply of all output currents may not exceed (less 0,2A power consumption) the rated current of the safety device of the control panel.
3. The output has a free wheeling diode, which short circuit negative voltages (related to GND).
4. The output has a Z-diode, which prevents an overvoltage (related to GND) into the output.

A.7.2 Configuration and adjustment

Configuration and setting sheet KE05

Standard Jumperung for use as Slave-Panel in connection with **two** Master-Slave-Adapters RE0706 and a Generator Control Panel P6+ RE0703 as Master-Panel. Panel only for 12V-Betrieb.

The safety device is installed with the value 0,63AT.

The circuit parts for 24V-operation are not equipped.

Jumper	Status	Conf.	Description
J1	closed		during operation of the start button heat is along-operated
	open	XM	Function deactivated
J3	1-2		Dynamo excitation resistor 68R is switched on with Fuel-Pump (1)
	2-3		Dynamo excitation resistor 68R is switched on with Panel-ON (1)
	open	XM	Dynamo excitation resistor is deactivated
J101	closed	M	12V - operation
	open	M	~~24V - operation~~ (not possible)
J201	1-2		T-Engine-input, for contact, which opens in case of error (2)
	2-3	XM	T-Engine-input, for contact, which closes in case of error (2)
J202	1-2		Water leak-input / Replace air filter, for contact, which opens in case of error (2)
	2-3	XM	Water leak-input / Replace air filter, for contact, which closes in case of error (2)
J203	1-2		Oil-Press-input, for contact, which opens in case of error (2)
	2-3	XM	Oil-Press-input, for contact, which closes in case of error (2)
J204	1-2		AC-Fault-input / Fuel level, for contact, which opens in case of error (2)
	2-3	XM	AC-Fault-input / Fuel level, for contact, which closes in case of error (2)
J205	1-2		T-Winding-input, for contact, which opens in case of error (2)
	2-3	XM	T-Winding-input, for contact, which closes in case of error (2)
J206	1-2	M	Input Water leak has red LED and switches off
	2-3	M	Input Water leak has yellow LED and does not switch off
J207	1-2	M	Input AC-Fault has red LED and switches off
	2-3	M	Input AC-Fault has yellow LED and does not switch off
J208	1-2	M	DC-Control-Signal (-) = OK dynamo 12V at Kubota Z 482 / D 722 engines
	2-3	M	DC-Control-Signal (+) = OK three-phase DC-alternator
J209	1-2	M	DC-Control-Signal (-) = OK dynamo 12V at Kubota Z 482 / D 722 engines
	2-3	M	DC-Control-Signal (+) = OK three-phase DC-alternator
J210	closed		Input AC-Fault has Pull-Up-current ≥10mA
	open	XM	Input AC-Fault has Pull-Up-current ≥2,5mA

Fig. A.7-1: Settings of soldered jumper for this configuration (column Conf.)

The solder jumpers are marked on the printed circuit board (with jumper no. and at three-part solder jumper with soldering surface no.)

X = Jumper must be so set

XM = Jumper, function must be so set on the master panel is selected

M = Jumper must be set exactly the same, as on the master panel,

(1): Equivalent resistance for load control lamp e.g. for use with three-phase alternator also integrated automatic controller of Bosch. The resistance value is 68Ω 3W, i.e. only for 12V.

(2): A closed contact switches the appropriate input to GND.

Configuration and setting sheet KE06

Standard jumpering for use as Slave-Panel in connection with **two** Maste-Slave-Adapters RE0706 and a Generator Control Panel P6+ RE0703 as Master-Panel. Panel for 24V-operation. (over attitude of solder jumper J101 alternatively 12V-operation is possible)

The safety device is installed with the value 0,63AT.

The circuit parts for 24V-operation are not equipped.

Jumper	Status	Conf.	Description
J1	closed		during operation of the start button heat is along-operated
	open	XM	Function deactivated
J3	1-2		Dynamo excitation resistor 68R is switched on with Fuel-Pump (1)
	2-3		Dynamo excitation resistor 68R is switched on with Panel-ON (1)
	open	XM	Dynamo excitation resistor is deactivated
J101	closed	M	12V - operation
	open	M	24V - operation
J201	1-2		T-Engine-input, for contact, which opens in case of error (2)
	2-3	XM	T-Engine-input, for contact, which closes in case of error (2)
J202	1-2		Water leak-input / Replace air filter, for contact, which opens in case of error (2)
	2-3	XM	Water leak-input / Replace air filter, for contact, which closes in case of error (2)
J203	1-2		Oil-Press-input, for contact, which opens in case of error (2)
	2-3	XM	Oil-Press-input, for contact, which closes in case of error (2)
J204	1-2		AC-Fault-input / Fuel level, for contact, which opens in case of error (2)
	2-3	XM	AC-Fault-input / Fuel level, for contact, which closes in case of error (2)
J205	1-2		T-Winding-input, for contact, which opens in case of error (2)
	2-3	XM	T-Winding-input, for contact, which closes in case of error (2)
J206	1-2	M	Input Water leak has red LED and switches off
	2-3	M	Input Water leak has yellow LED and does not switch off
J207	1-2	M	Input AC-Fault has red LED and switches off
	2-3	M	Input AC-Fault has yellow LED and does not switch off
J208	1-2	M	DC-Control-Signal (-) = OK dynamo 12V at Kubota Z 482 / D 722 engines
	2-3	M	DC-Control-Signal (+) = OK three-phase DC-alternator
J209	1-2	M	DC-Control-Signal (-) = OK dynamo 12V at Kubota Z 482 / D 722 engines
	2-3	M	DC-Control-Signal (+) = OK three-phase DC-alternator
J210	closed		Input AC-Fault has Pull-Up-current ≥10mA
	open	XM	Input AC-Fault has Pull-Up-current ≥2,5mA

Fig. A.7-2: Settings of soldered jumper for this configuration (column Conf.)

The solder jumpers are marked on the printed circuit board (with jumper no. and at three-part solder jumper with soldering surface no.)

X = Jumper must be so set

XM = Jumper, function must be so set on the master panel is selected

M = Jumper must be set exactly the same, as on the master panel,

(1): Equivalent resistance for load control lamp e.g. for use with three-phase alternator also integrated automatic controller of Bosch. The resistance value is 68Ω 3W, i.e. only for 12V.

(2): A closed contact switches the appropriate input to GND.

B. Measurements

B.1 Hole pattern

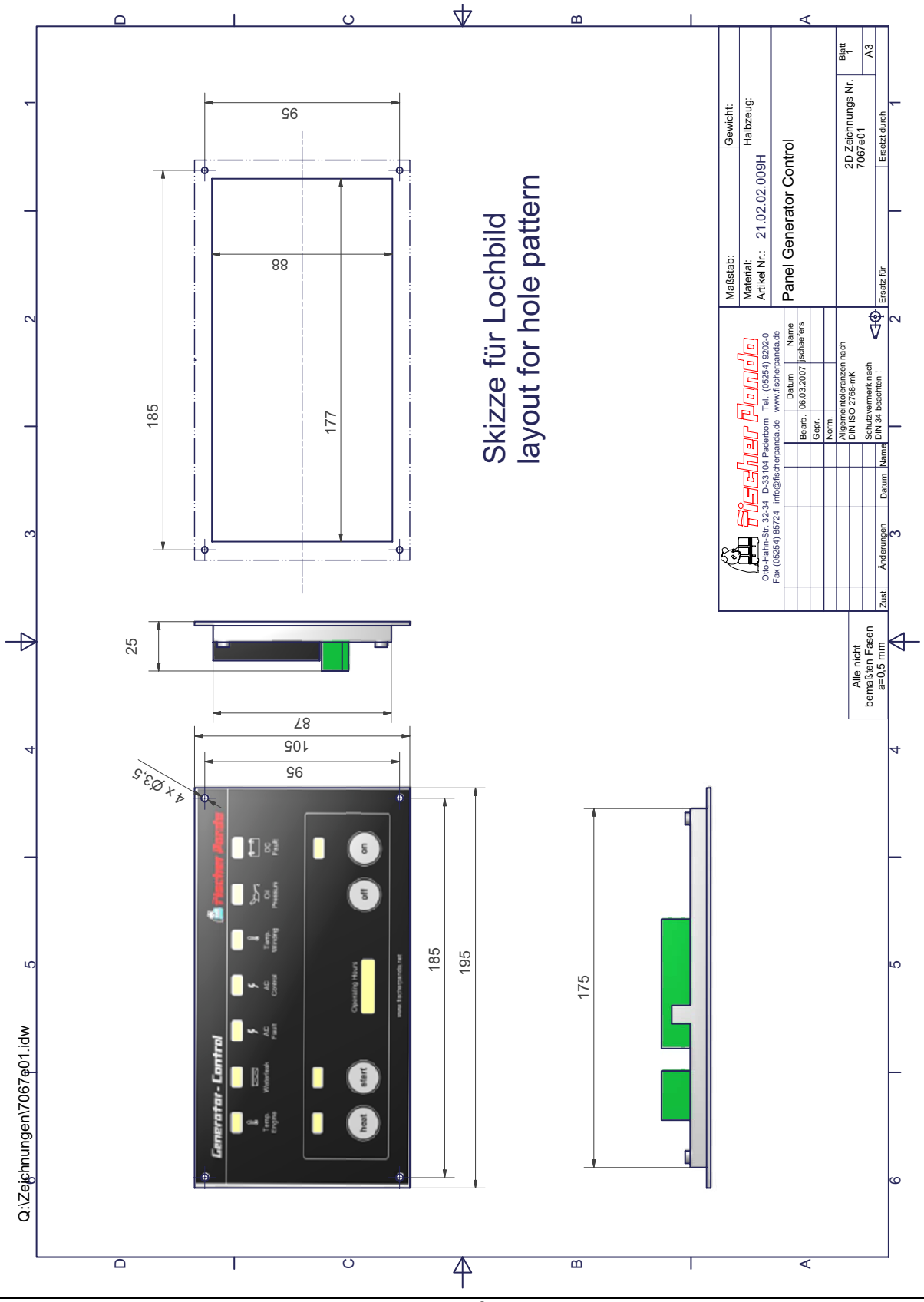


Fig. B.1-1: Hole pattern

Intentionally Blank