Fischer Panda

Manual

Description of the generator and operation manual

Panda PVMV-N 12.000NE 10kW
Panda PVMV-N 14.000NE 12 kW
Panda PVMV-N 15.000NE 12,7kW
Super silent technology

230V/400V - 50 Hz

120V/240V - 60 Hz

Fischer Panda GmbH

Current revison status

	Dokument
Actual:	Panda_12000NE_PVMV-N_eng.R04_16.3.09
Replace:	Panda_12000NE_PVMV-N_eng.R03

Revision	**Page**
+ Panda 14.000 + Panda 15.000	

Table of contents

Table of 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 generators developed at that time set new technological standards worldwide.

The generators became more efficient and powerful than other generators 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 generators 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 generators 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 generators from the DC/AC Panda AGT series, which is a very interesting solution for the production of mobile power.

The 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 machine itself to warn of the possibility of personal injury. 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 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 = required size
	Hook wrench for oil filter
	Screw driver, for slotted head screws and for recessed head screws
	Multimeter, multimeter with capacitor measuring
	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 accordance with the machine guideline 98/37/EG

The generator has been developed in such a way, that all assembly groups correspond to the CE guidelines. If machine guideline 98/37/EG is applied, then it is forbidden to start the generator, until it has been ascertained that the system into which the generator is to be integrated, also corresponds to the machine guideline regulation 98/37/EG. This includes the exhaust system, cooling system and electrical installation.

The evaluation of "protection against contact" must be carried out when installed, in conjunction with the respective system. This includes correct electrical connections, a safe ground wire connection, foreign body and humidity protection, protection against humidity due to excessive condensation, as well as overheating through appropriate and inappropriate use in its installed state. The responsibility lies with those who undertake installation of the generator in the final 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 by trained and qualified personnel!

Safety Instructions concerning operating the generator

- The generator must not be taken into use with the cover removed.
- If the generator is being installed without a sound insulation capsule, then make sure, that all rotating parts (belt-pulley, belts etc) are covered and protected so that there is no danger to life and body!
- If a sound insulation covering will 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.
- There is full current in the AC control box when the generator is running. It must therefore be ensured that the control box is closed and cannot be touched when the generator is running.
- Do not work in an ambient, where there are explosives. Working on an electrical system in an ambient where there are flammable gases is dangerous.
- 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.

Ground Wire:

The generator, is "earthed" as series (centre and ground are connected together in the generator terminal box by a bridge). This is an initial ground fuse, which offers protection, as long as no other measures are installed. Above all, it is conceived for the delivery and possible test run.

This "neutralisation" (Protective Earthing Neutral - PEN) is only effective, if all parts of the electrical system are commonly "earthed" to a common potential. The bridges can be removed, if this is necessary for technical reasons and another protective system has been setup.

Safety Instructions concerning working on the generator

The battery must always be disconnected, if work on the generator or electrical system is to be carried out, so that the generator cannot be unintentionally started. **It is not allowed to disconnect the battery during operation!** After the generator has been stopped, the battery can be disconnected!

Switch off all load when working on the generator

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

Safety Instructions concerning the capacitors

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

A) The working capacitors

B) The (Booster) capacitors

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

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

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

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

Safety Instructions concerning the cables

Cable Type

It is recommended is that the cable used be UL 1426 (BC-5W2) compliant, with Type 3 stranding (ABYC Section E-11)

Cable Size

The cable size must be selected taking into account the amperage, voltage and conductor length (from the positive power source connection to the electrical device and back to the negative power source connection.

Cable Installation

It is recommended that a self draining wire loom classified as V-2 or better in accordance with UL 94 be installed in the section of the cable routed in the interior of the sound capsule. Care should be taken to avoid hot surfaces such as the exhaust manifold or engine oil drain bolt and routed clear of any possible sources of chafing.

Battery

Warning:

Do not use Gel-Cel batteries, because the regulation voltage is high for this type of batteries.

Do not use large batterybanks as a starting battery. The generator must have a dedicated starter battery (maximum size group 24).

Recommend starter battery size (if model not shown - please see engine manual)

Panda 6000 -8000	12V, 28AH equivalent		Panda 18	12V, 65AH equivalent
Panda 9000-14000	12V, 36AH equivalent		Panda 24-30	12V, 70AH equivalent
Panda 16	12V, 52AH equivalent		Panda 33-42	12V, 100 to 120AH equivalent



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

WHEN AN ADULT STOPS BREATHING

WARNING

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

1 Does the Person Respond?

Tap or gently shake victim.

Shout, "Are you OK?"

2 Shout, "Help!"

Call people who can phone for help.

3 Roll Person onto Back.

Roll victim toward you by pulling slowly.

4 Open Airway.

Tilt head back, and lift chin.

Shout, "Are you OK?"

5 Check for Breathing.

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

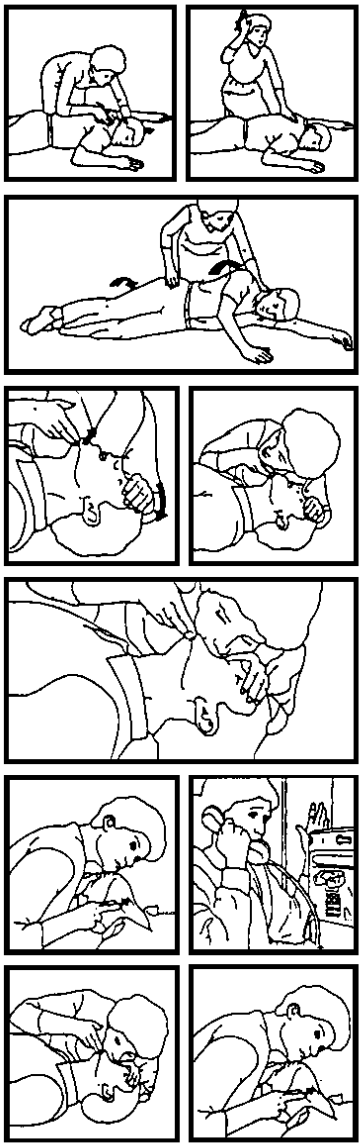
6 Give 2 Full Breaths.

Keep head tilted back.

Pinch nose shut.

Seal your lips tight around victim's mouth.

Give 2 full breaths for 1 to 1½ seconds each.



7 Check for Pulse at side of Neck.

Feel for pulse for 5 to 10 seconds.

8 Phone EMS for Help.

Send someone to call an ambulance.

9 Begin Rescue Breathing.

Keep head tilted back.

Lift chin.

Pinch nose shut.

Give 1 full breath every 5 seconds.

Look, listen, and feel for breathing between breaths.

10 Recheck Pulse Every Minute.

Keep head tilted back.

Feel for pulse for 5 to 10 seconds.

If victim has pulse, not breathing, continue rescue breathing. If no pulse, begin CPR.

A. The Panda Generator

A.1 Type plate at the Generator

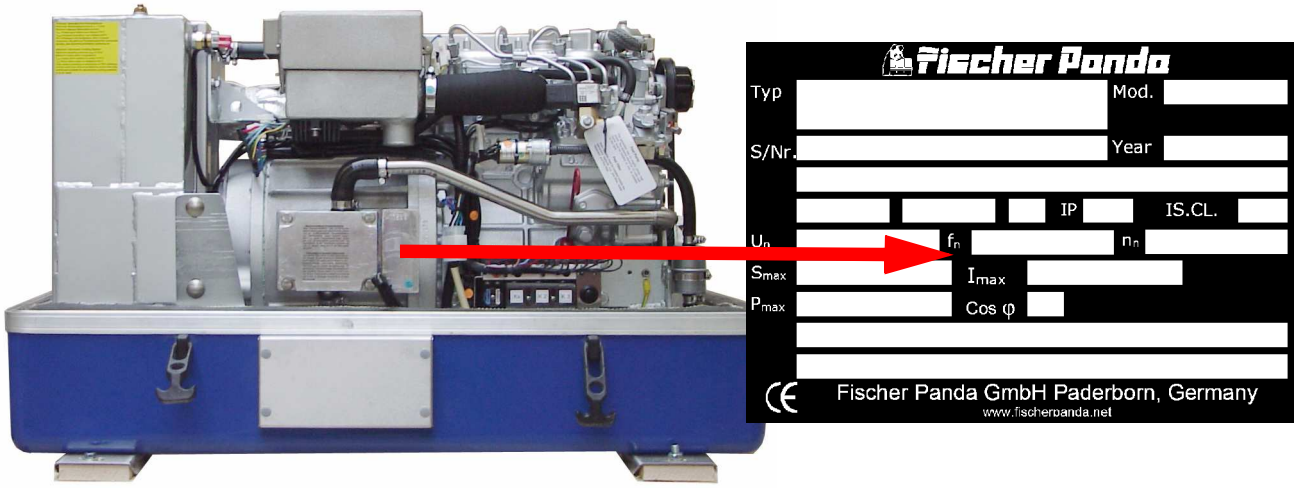


Fig. A.1-1: Type plate

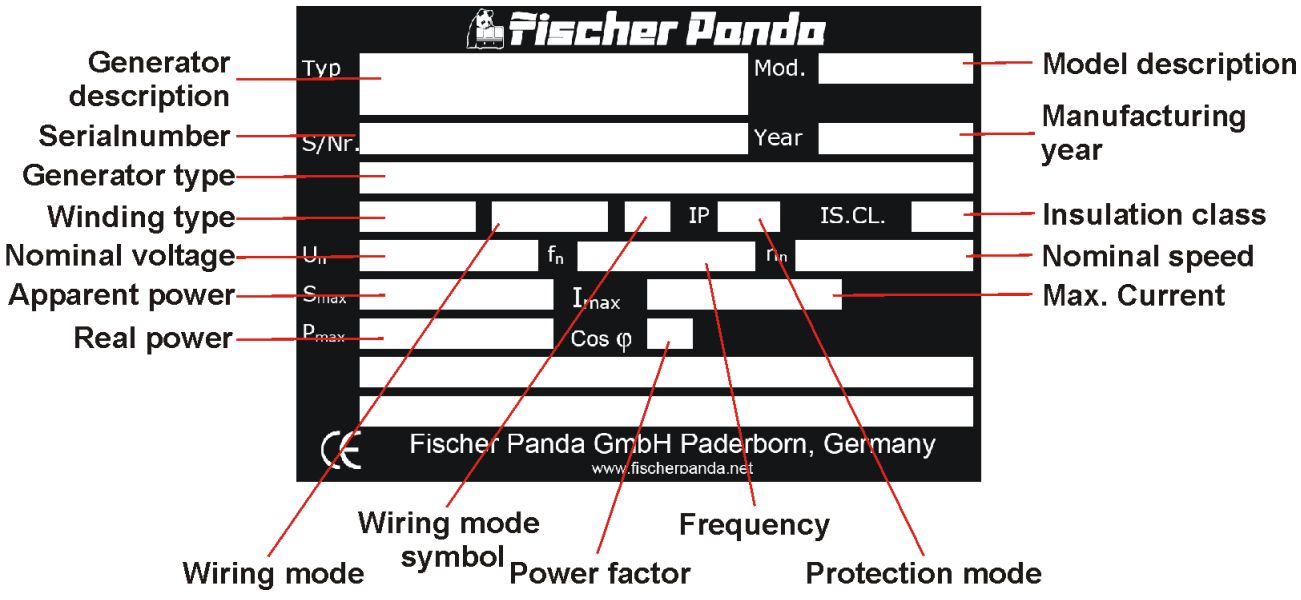
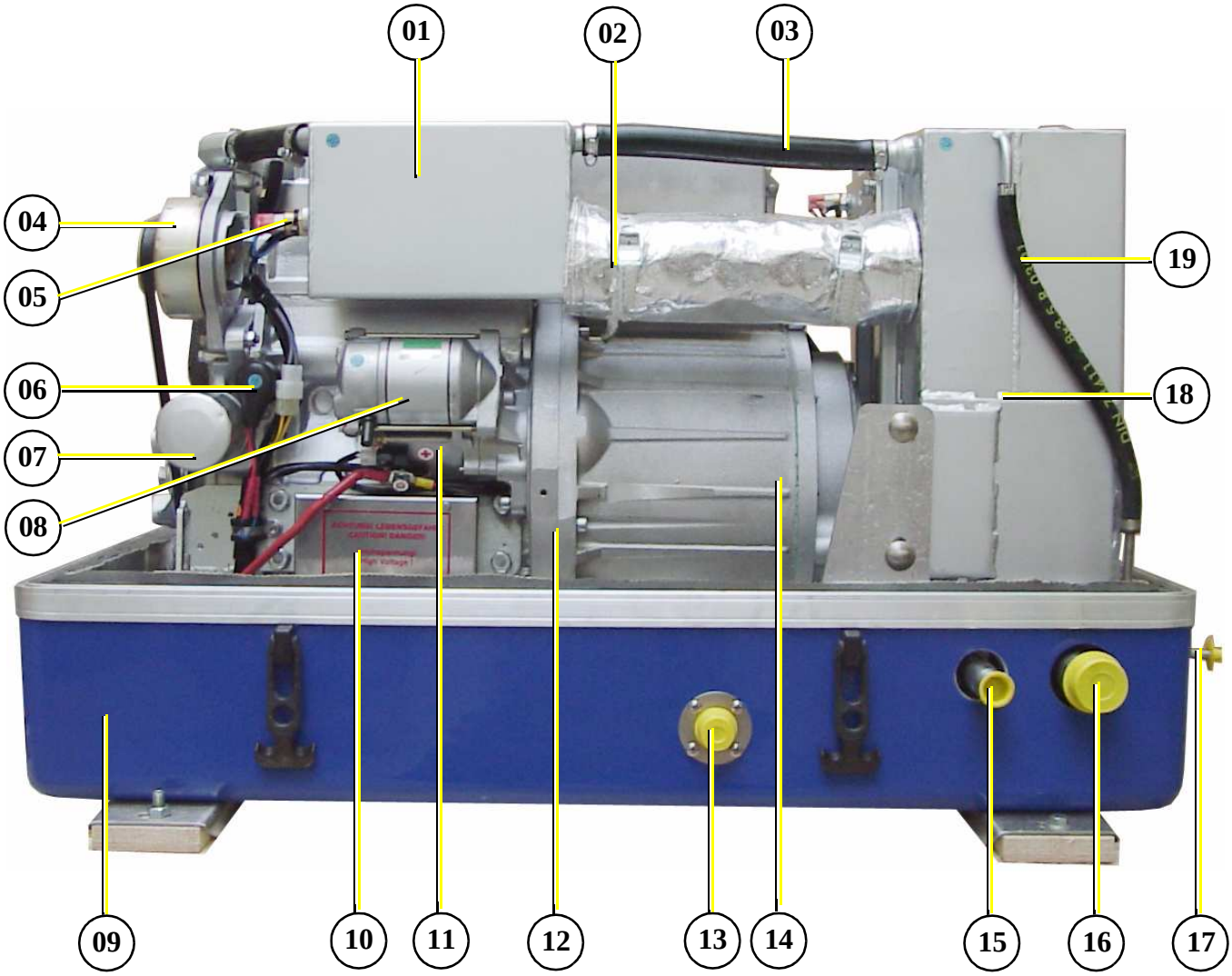


Fig. A.1-2: Discription type plate

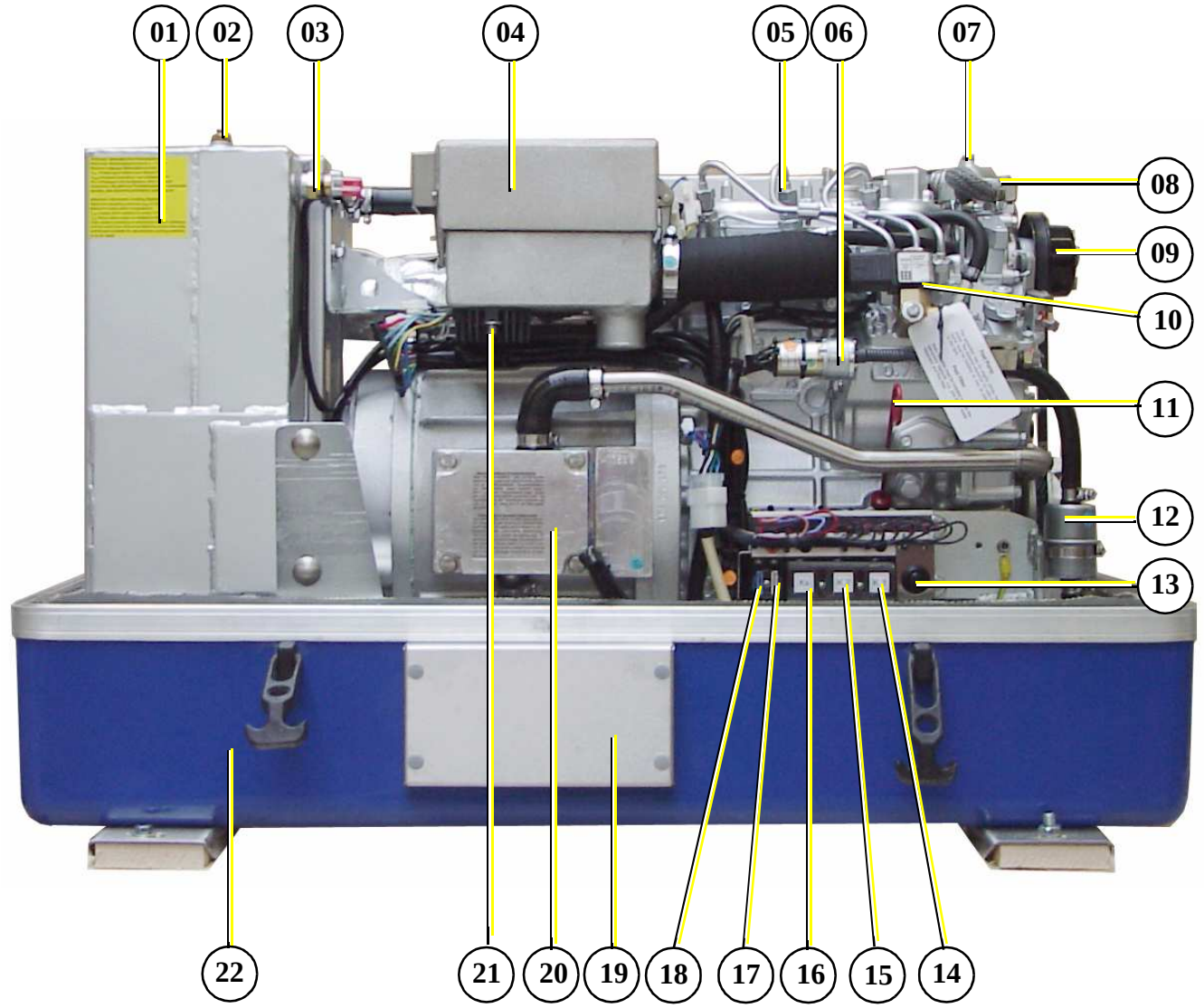
A.2 Description of the Generator

A.2.1 Right Side View



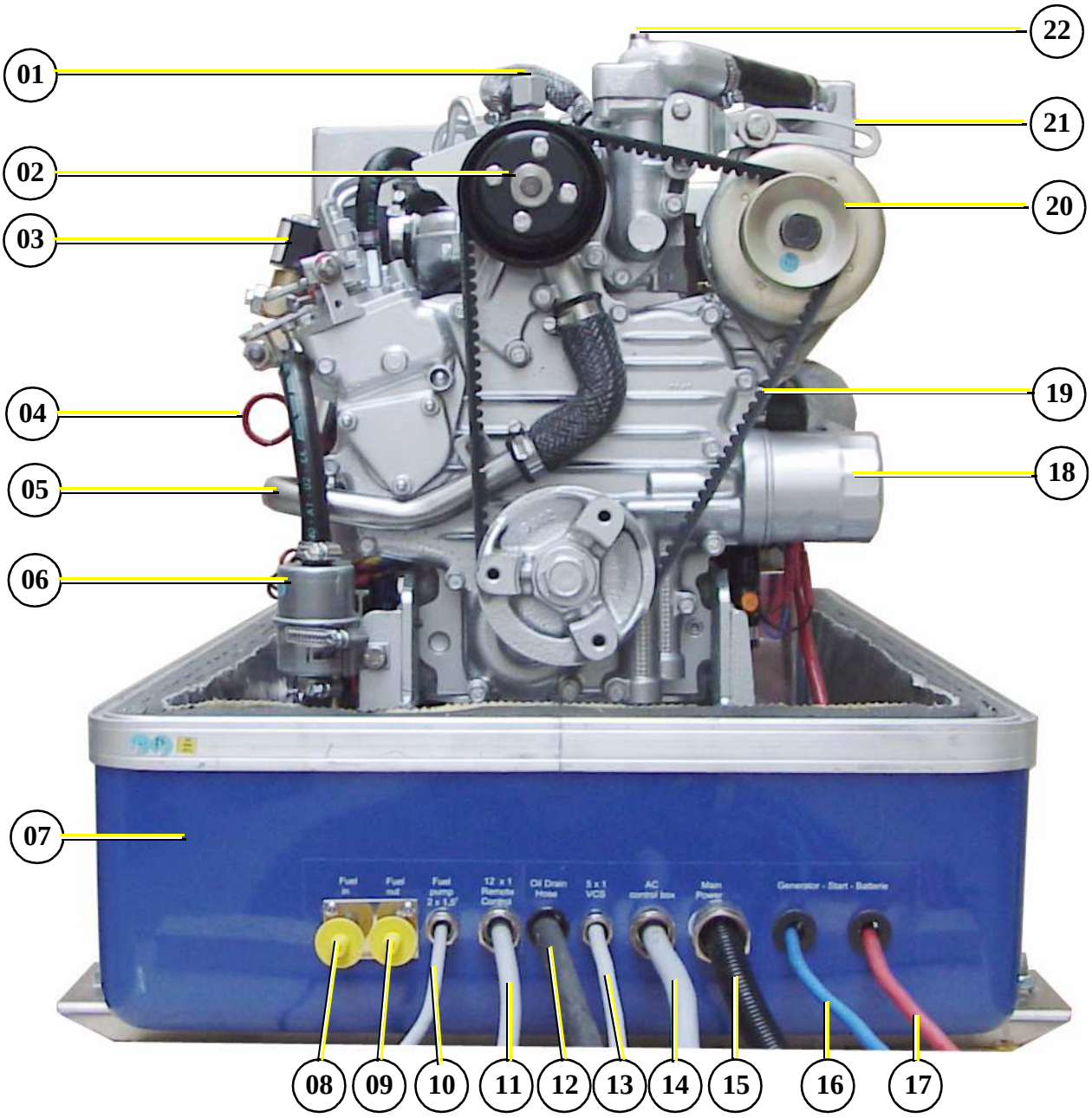
01. Water-cooled exhaust elbow
02. Compensator under heat isolation
03. Coolant pipe, exhaust elbow - silencer
04. DC-alternator 12V
05. Thermo-switch exhaust elbow
06. Oil pressure switch
07. Oil filter
08. Starter motor
09. Sound cover base part
10. Generator power terminal box
11. Solenoid for starter motor
12. Engine flange
13. Connection cooling water inlet
14. Generator housing with coil
15. Connection cooling water output
16. Connection exhaust hose
17. Connection external cooling water expansion tank
18. Water-cooled pre-silencer with dry-silencer
19. Ventilation hose to the external expansion tank

A.2.2 Left Side View



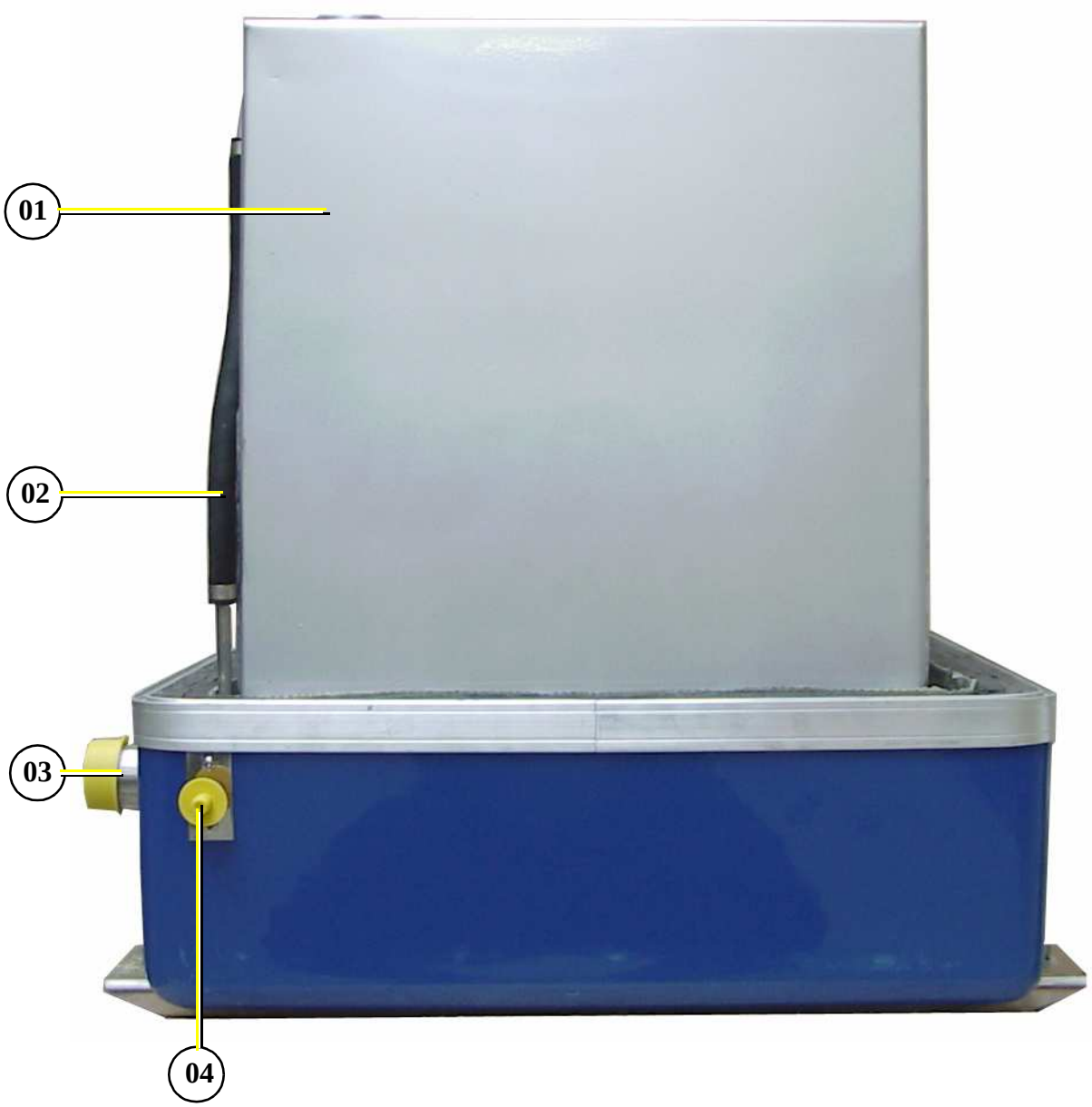
01. Water-cooled pre-silencer with dry-silencer
02. Ventilation screw silencer
03. Thermo-switch silencer
04. Air suction housing with air filter
05. Injection nozzle
06. Actuator for rpm-regulation
07. Ventilation screw thermostat housing
08. Ventilation screw internal cooling water pump
09. Pulley for internal coooing water pump
10. Fuel solenoid valve
11. Oil dipstick
12. Fuel filter
13. Failure bypass switch
14. Fuel pump start-relay K3
15. Pre-glow relay (glow plugs) K2
16. Starter-relay Ks
17. Elektrical fuse 25A (white)
18. Electrical fuse 15A (blue)
19. Air intake
20. Cooling water connection block
21. Charge control for DC-alternator
22. Sound cover base part

A.2.3 Front View



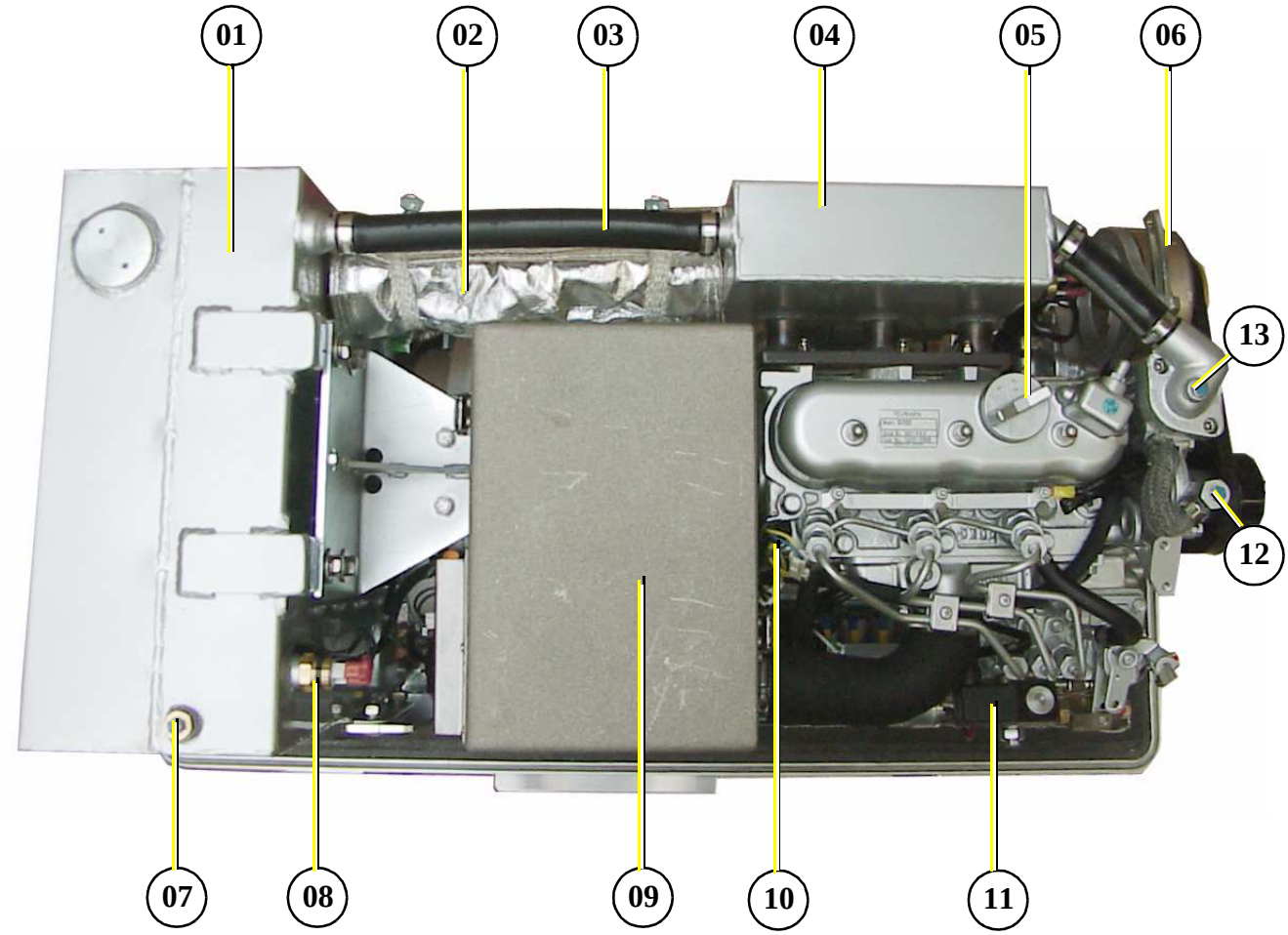
01. Ventilation screw internal cooling water pump
02. Pulley for internal cooling water pump
03. Fuel solenoid valve
04. Oil dipstick
05. Cooling water intake pipe
06. Fuel filter
07. Sound cover base part
08. Connection fuel in
09. Connection fuel out
10. Cable fuel pump (2x1,5mm²)
11. Cable remote control panel (12x1mm²)
12. Oil drain hose
13. Cable VCS
14. Cable AC-Control box
15. Load
16. Starter battery minus (-)
17. Starter battery plus (+)
18. Oil filter
19. V-belt for DC-alternator nnd internal cooling water pump
20. DC-alternator 12V
21. Clamp device for DC-alternator
22. Entlüftungsschraube thermostat housing

A.2.4 Back View



01. Water-cooled pre-silencer with dry-silencer
02. Return-flow external expansion tank
03. Connection exhaust hose
04. Connection external expansion tank

A.2.5 View from Above



01. Water-cooled pre-silencer with dry-silencer
02. Compensator under heat isolation
03. Cooling water pipe, exhaust elbow - silencer
04. Water-cooled exhaust elbow
05. Oil filler neck with cap
06. DC-alternator 12V
07. Ventilation screw silencer
08. Thermo-switch silencer
09. Air suction housing with air filter
10. Thermo-switch cylinder head
11. Fuel solenoid valve
12. Ventilation screw cooling water pump
13. Ventilation screw thermostat housing

A.3 Details of functional units

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

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

A.3.2 Components of cooling system

Cooling water intake

This port is to be connected with the external radiator. From here the cold coolant flows to the coolant connection block.

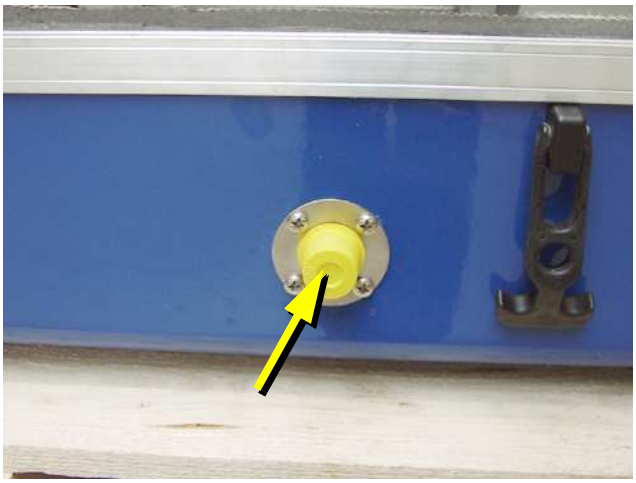


Fig. A.3.2-1: Cooling water intake

Coolant connection block

The cooling water connection block cooles the diode plate. The cooling water connection block consists of an aluminium alloy, which can behave like a sacrificial anode.

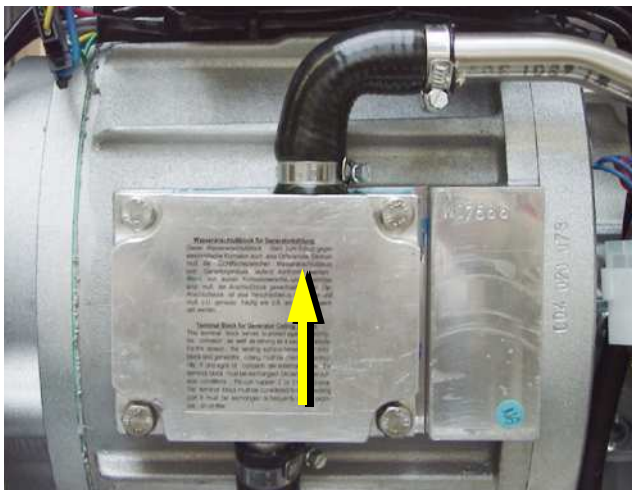


Fig. A.3.2-2: Coolant connection block

Cooling water pipe

From the cooling water connection block the water leads to the internal cooling water pump.

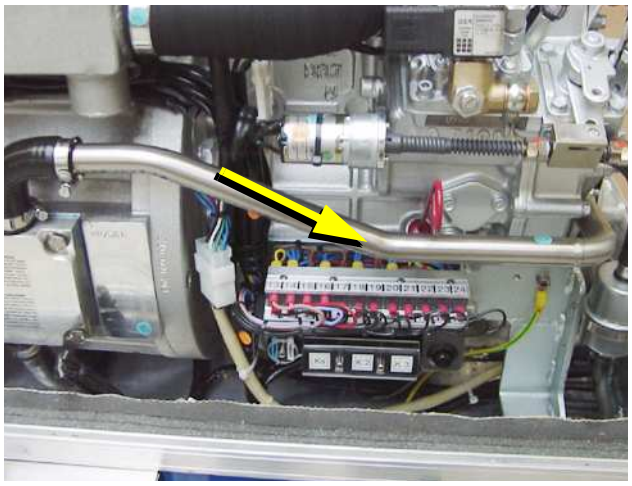


Fig. A.3.2-3: Cooling water pipe

Internal cooling water pump

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

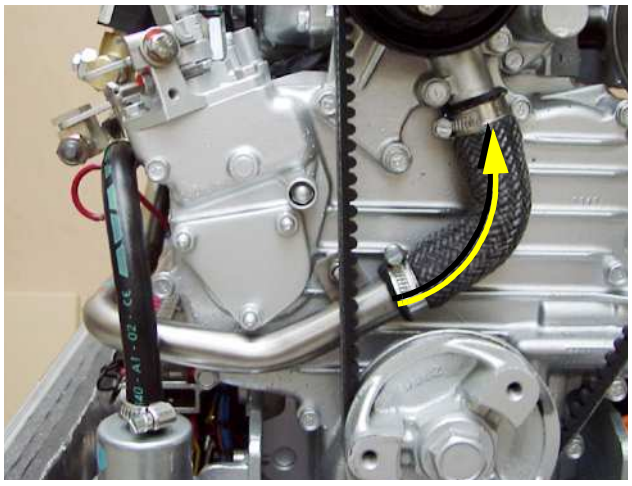


Fig. A.3.2-4: Internal cooling water pump

Ventilation screw cooling water pump

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

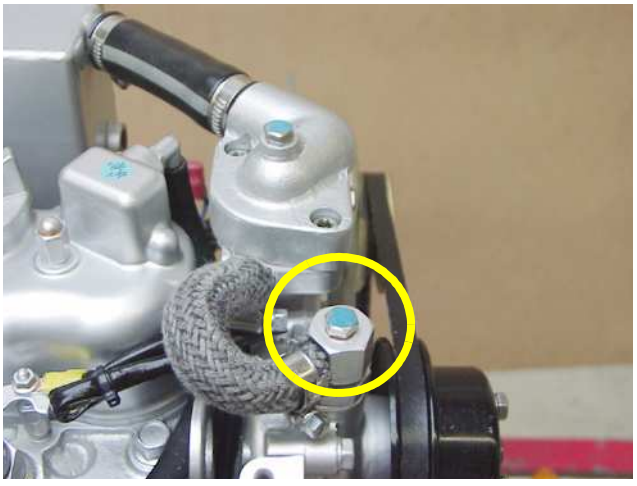


Fig. A.3.2-5: Ventilation screw cooling water pump

Ventilation screw thermostat housing

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

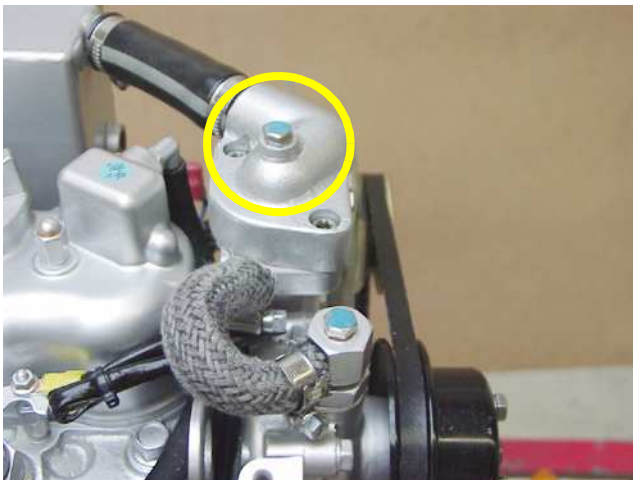


Fig. A.3.2-6: Ventilation screw thermostat housing

Water-cooled exhaust elbow

The exhaust elbow is cooled by means of the internal cooling system.

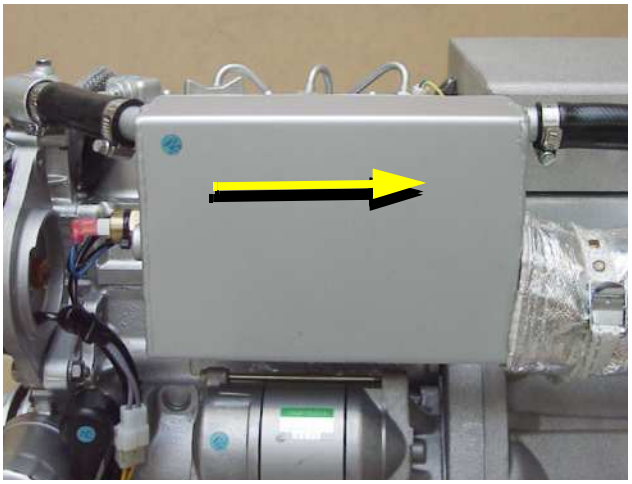


Fig. A.3.2-7: Water-cooled exhaust elbow

Coolant pipe

Coolant pipe from water-cooled exhaust elbow to the water-cooled pre-silencer.

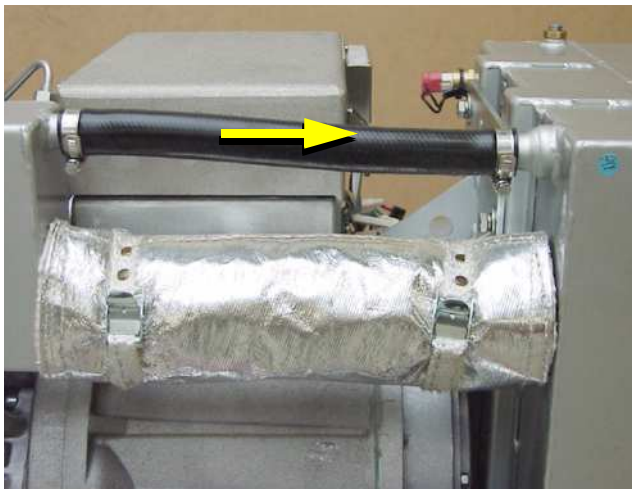


Fig. A.3.2-8: Coolant pipe

Water-cooled pre-silencer

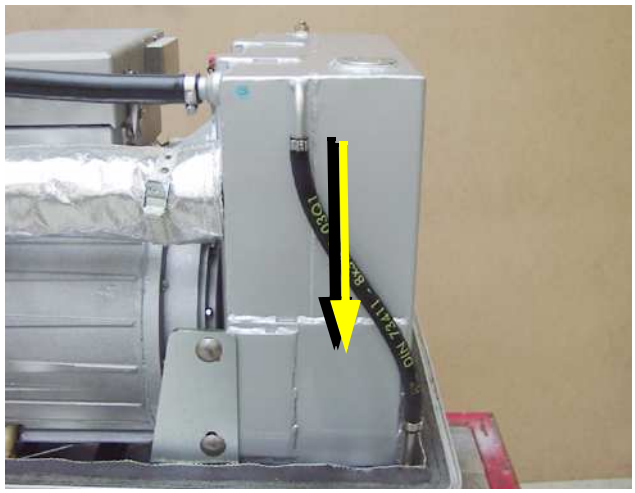


Fig. A.3.2-9: Water-cooled pre-silencer

Coolant output

From here the hot coolant flows to the radiator.

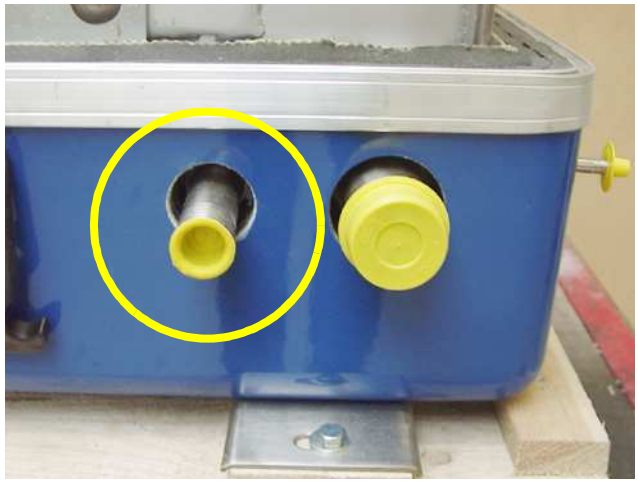


Fig. A.3.2-10: Coolant output

Ventilation screw silencer

The ventilation screw at the water-cooled pre-silencer is used at first filling or repair works.

Fig. A.3.2-11: Ventilation screw silencer

Return flow expansion tank

The ventilation pipe leads from the water-cooled silencer to the external expansion tank.

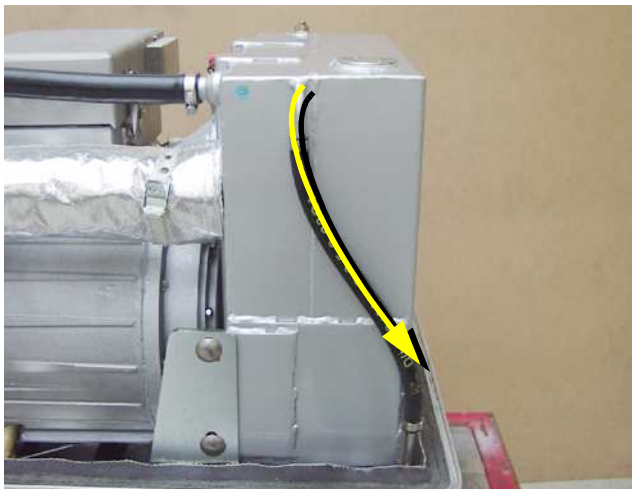


Fig. A.3.2-12: Return flow expansion tank

A.3.3 Components of fuel system

External fuel pump

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

Fig. A.3.3-1: External fuel pump

Connecting pieces for the fuel pipe

1. Fuel intake
2. Fuel output

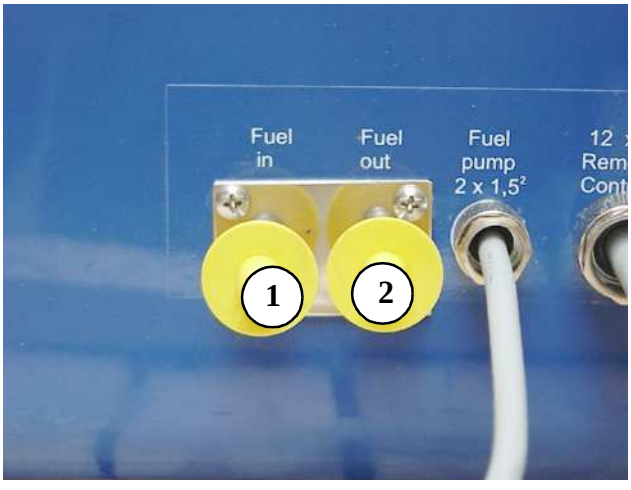


Fig. A.3.3-2: Fuel connections

Fuel Filter

A consequential filtering of fuel is especially important for all marine systems.

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

Sample Picture

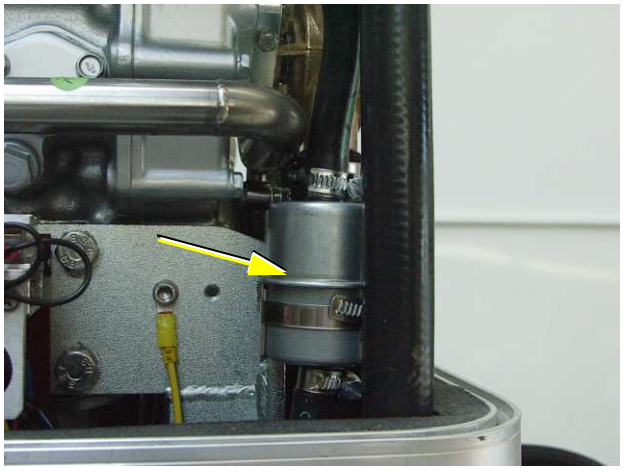


Fig. A.3.3-3: Fuel Filter

Fuel filter with water separator (optional)

A consequential filtering of fuel is especially important for all marine systems. See directions for fuel filter installation.

Sample Picture

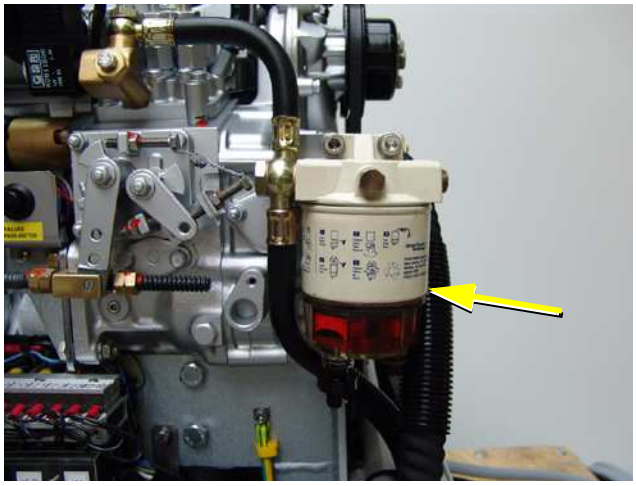


Fig. A.3.3-4: Fuel filter

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.

1) Fuel solenoid valve

2) Ventilation screw solenoid valve

3) Magnetic coil

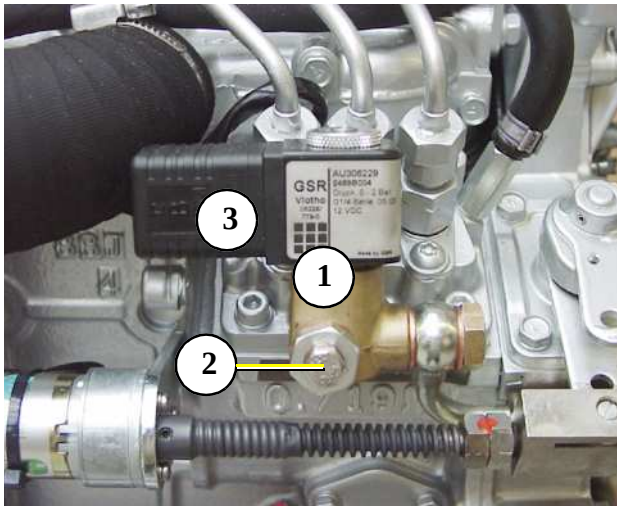


Fig. A.3.3-5: Fuel solenoid valve

Injection nozzles

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

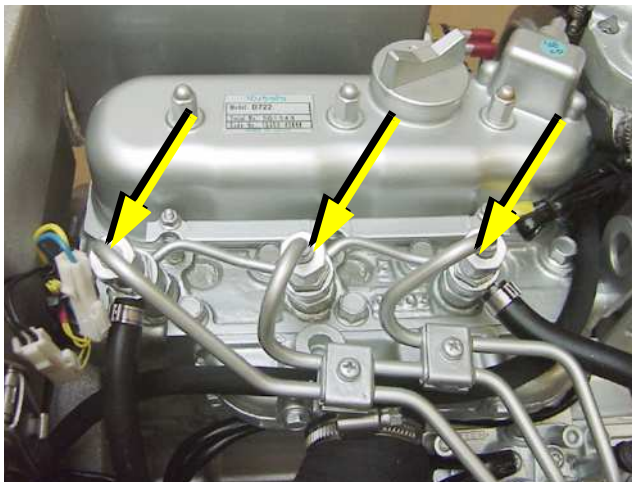


Fig. A.3.3-6: Injection nozzles

Glow plugs

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

Fig. A.3.3-7: Glow plugs

A.3.4 Components of combustion air

Combustion air intake

The sound cover is provided at the side 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 down no water can arrive into the proximity of these air openings. (minimum distance 150 mm)

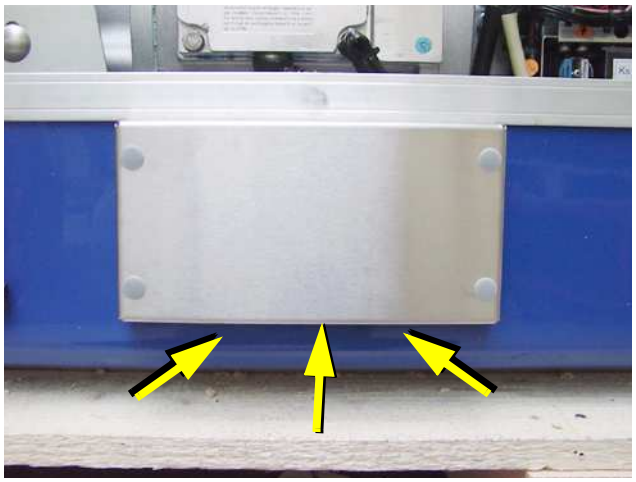


Fig. A.3.4-1: Verbrennungsluft Eintritt

Air suction housing

The air suction housing suck air from the capsule.

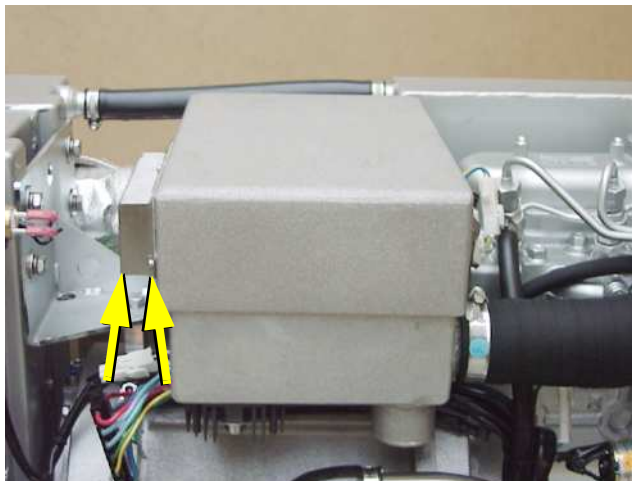


Fig. A.3.4-2: Air suction housing

Air suction housing with air filter

Type: MANN C2039

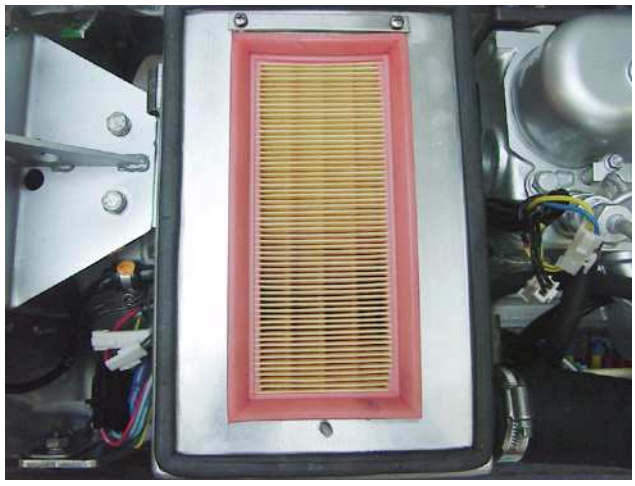


Fig. A.3.4-3: Air filter

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 pulls together at operation.

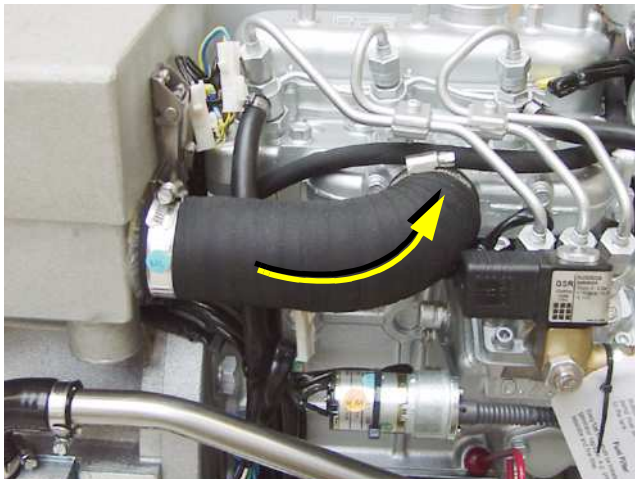


Fig. A.3.4-4: Combustion chamber intake elbow

Water-cooled exhaust elbow

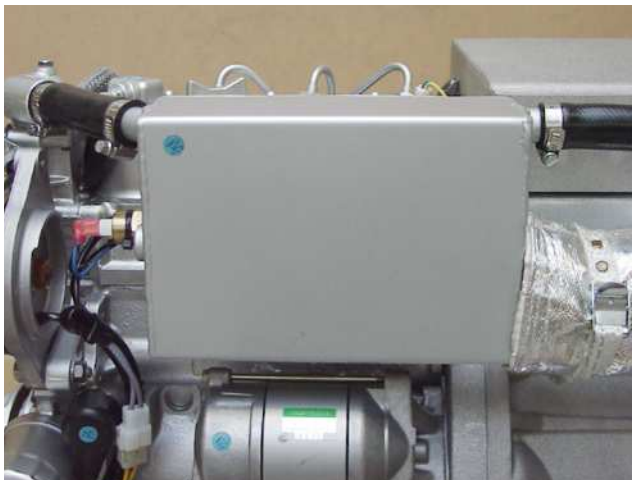


Fig. A.3.4-5: Water-cooled exhaust elbow

Compensator under heat isolation

This part is because of the internal construction elastic and comensates vibrations.

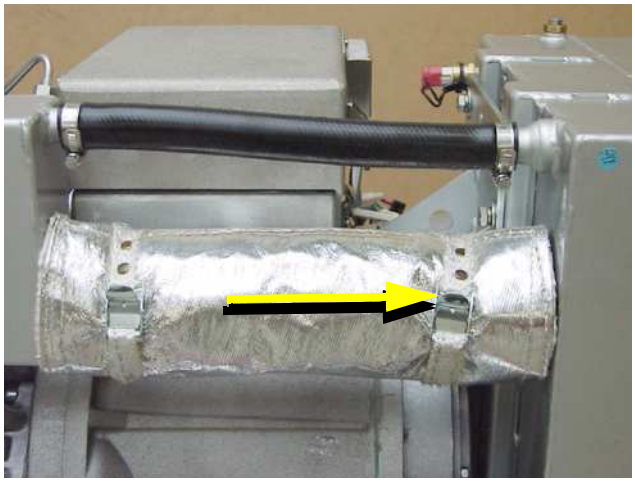


Fig. A.3.4-6: Compensator under heat isolation

Exhaust output

Connect here a muffler.

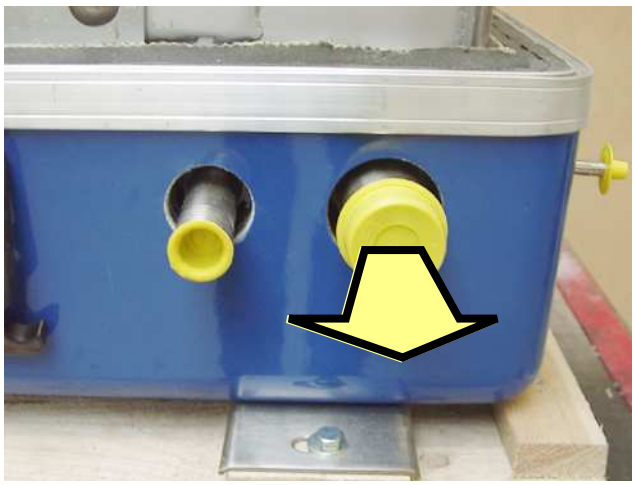


Fig. A.3.4-7: Exhaust output

A.3.5 Components of electrical system

Connection starter battery

1: Passage for starter battery (minus)

2: Passage for starter battery (plus)

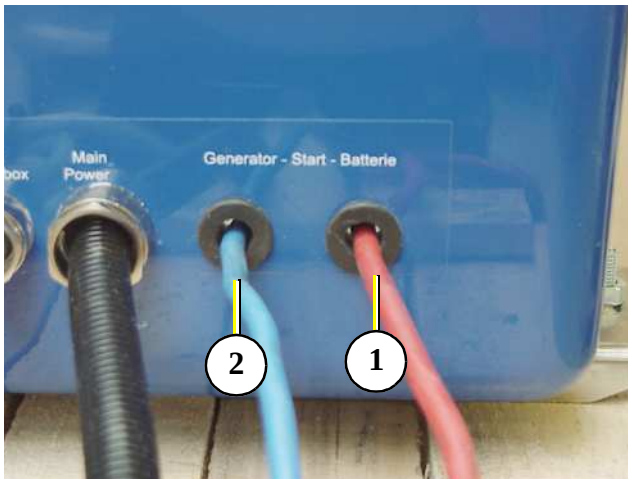


Fig. A.3.5-1: Connection starter battery

Connection for load

Connect the load here.

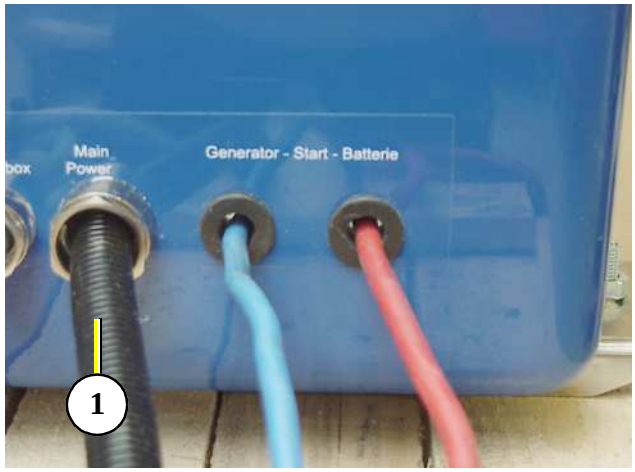


Fig. A.3.5-2: Connection load

Electrical connections for control

1: Cable for fuel pump

2: Cable for remote control panel

3: VCS

4: Cable for AC-control box

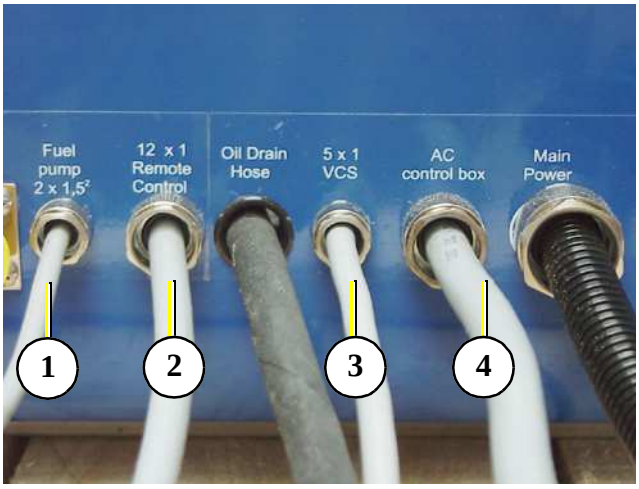


Fig. A.3.5-3: Electrical connections for control

Starter motor

1. Starter motor and

2. Solenoid switch

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

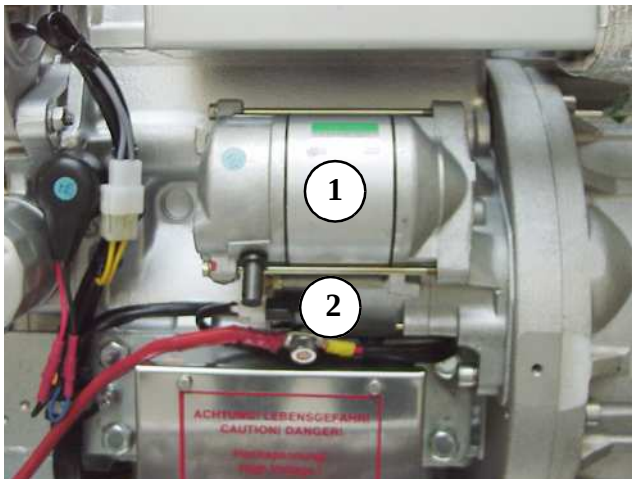


Fig. A.3.5-4: Starter motor

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.

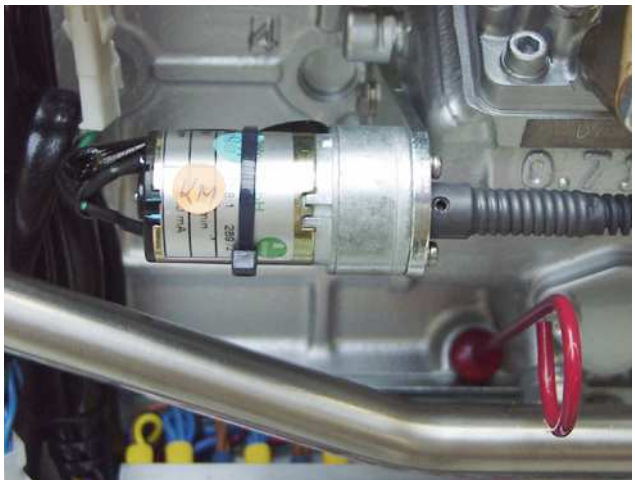


Fig. A.3.5-5: Actuator

Blind plug for speed sensor

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

Fig. A.3.5-6: Blind plug

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

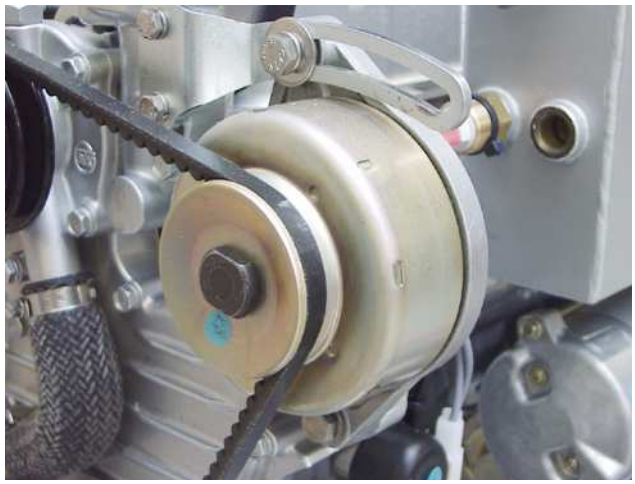


Fig. A.3.5-7: DC-alternator

Charge control for DC-alternator

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

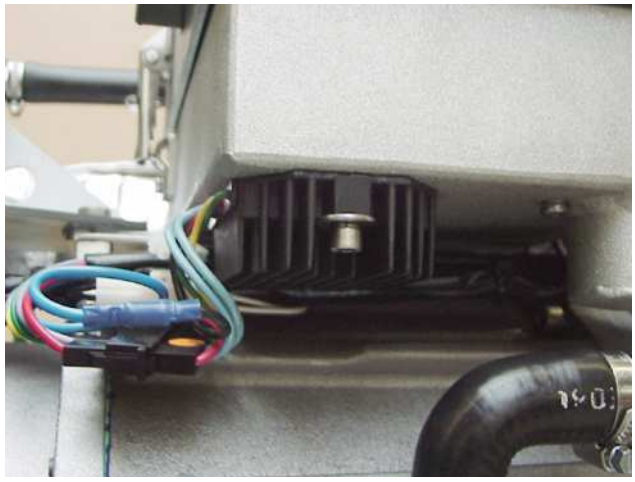


Fig. A.3.5-8: Charge control

Generator Power Terminal Box 230V/50Hz

To locate the Terminalbox see Chapter A2.

In these terminal boxe there are the electrical connection points for the AC generator. Here is also the bridge for the protective grounding of the generator. The cover may only be removed, if it is guaranteed that the generator cannot be inadvertently started.

Sample Picture

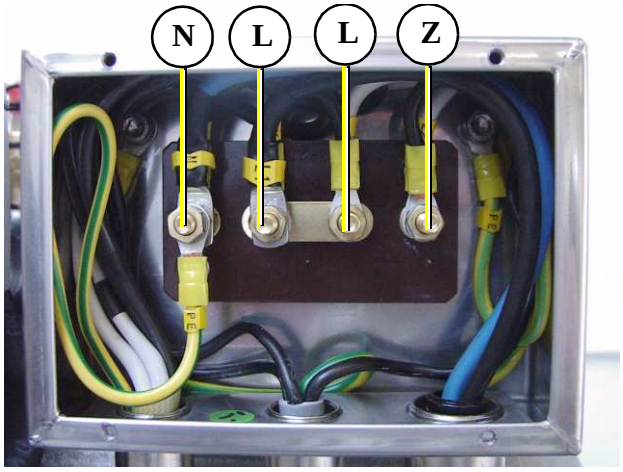


Fig. A.3.5-9: Generator Power Terminal Box 230V/50Hz

Generator Power Terminal Box 400V/50Hz

To locate the Terminalbox see Chapter A2.

In these terminal boxe there are the electrical connection points for the AC generator. Here is also the bridge for the protective grounding of the generator. The cover may only be removed, if it is guaranteed that the generator cannot be inadvertently started.

Sample Picture

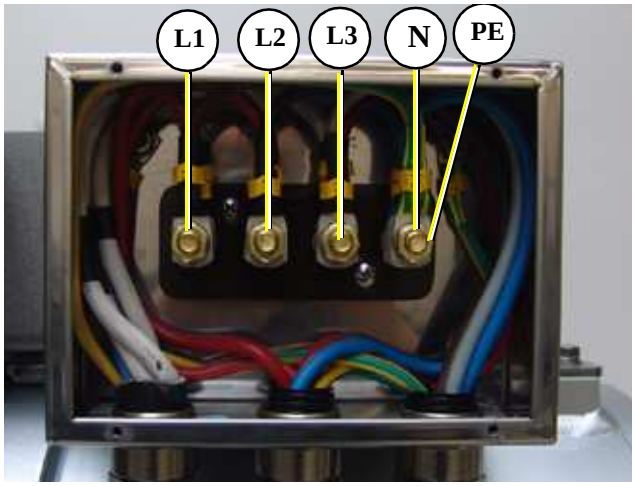


Fig. A.3.5-10: Generator Power Terminal Box 400V/50Hz

Generator power terminal box 120V/60Hz

To locate the Terminalbox see Chapter A2.

In these terminal boxe there are the electrical connection points for the AC generator. Here is also the bridge for the protective grounding of the generator. The cover may only be removed, if it is guaranteed that the generator cannot be inadvertently started.

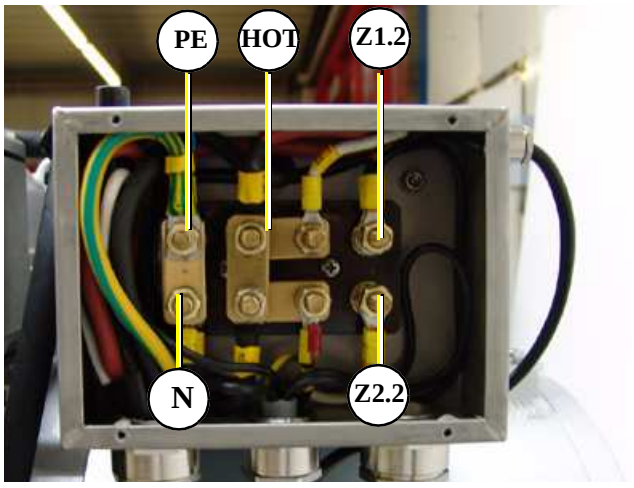


Fig. A.3.5-11: Generator power terminal box

Terminal block for remote control cable with fuses and power relais

F1 fuse 15A for DC wiring

F2 fuse 25A for starter relay

Ks power relais for Starter

K2 power relais for Glow plugs

K3 power relais for Fuel pump

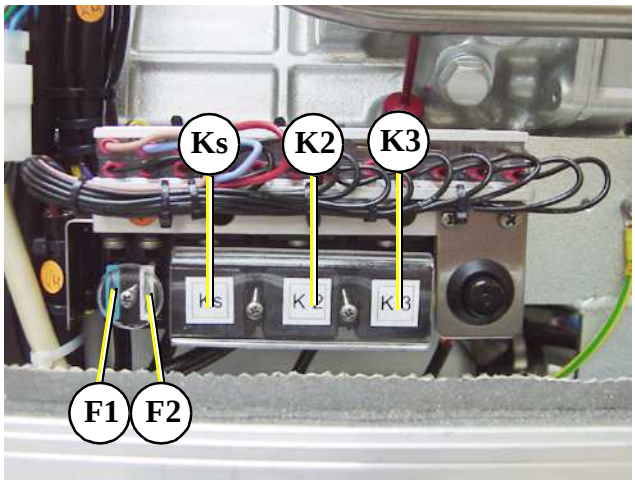


Fig. A.3.5-12: Terminal block

A.3.6 Sensors and switches for operating surveillance

Thermo-switch at cylinder head

The thermo-switch at the cylinder head serves 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.3.6-1: Thermo-switch cylinder head

Thermo-switch at water-cooled exhaust elbow

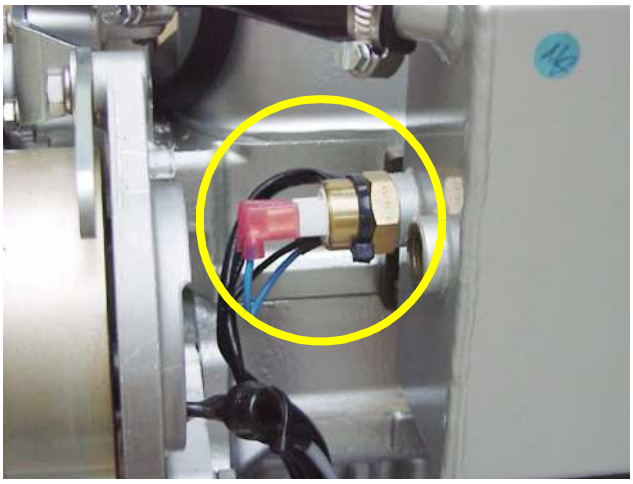


Fig. A.3.6-2: Thermo-switch at exhaust manifold

Thermo-switch at pre-silencer

At this point th coolant usually achieves its highest value. From here it flows back into the radiator.

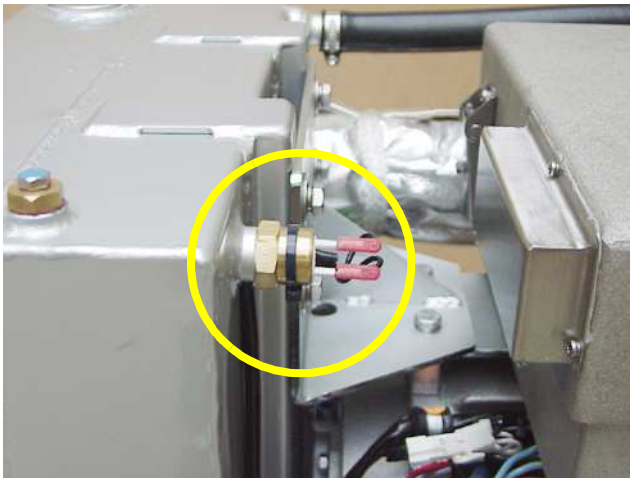


Fig. A.3.6-3: Thermoschalter am Abgasanschluss

Thermo-switch at the front plate

The generator bearing is equipped with a grease thermoswitch, which switches the engine off if the grease temperature becomes to high.

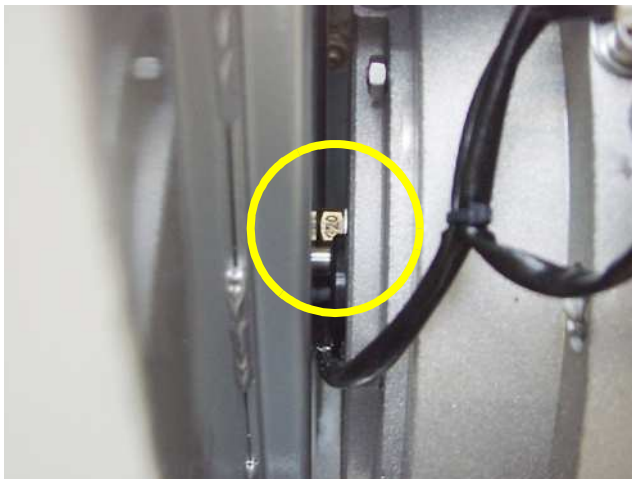


Fig. A.3.6-4: Thermo-switch at front plate

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.

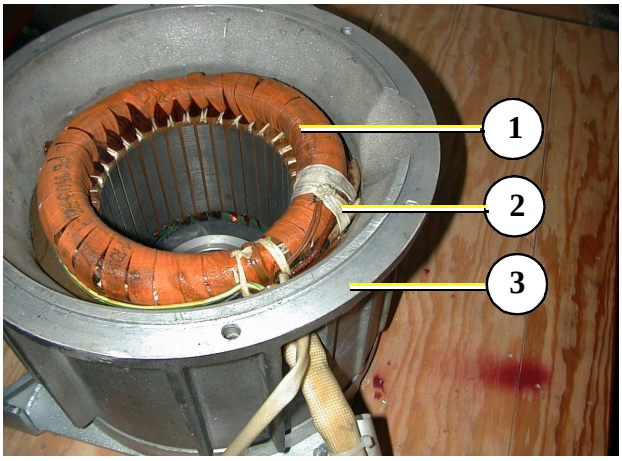


Fig. A.3.6-5: Coil thermo-swotch

Oil pressure switch

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

Fig. A.3.6-6: Oil pressure switch

Failure bypass switch

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

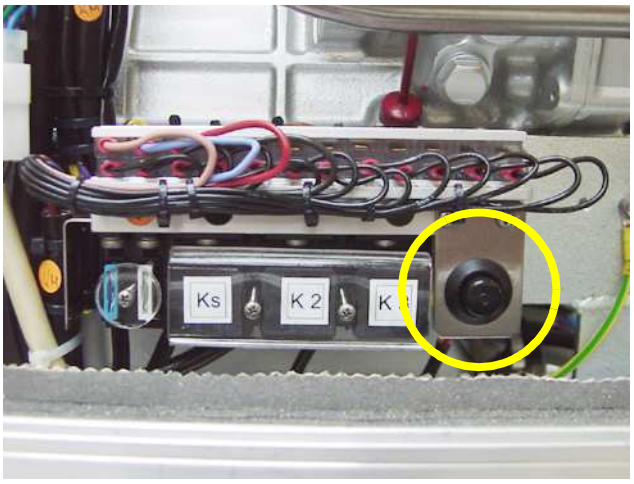


Fig. A.3.6-7: Failure bypass switch

A.3.7 Components of oil circuit

Oil filler neck with cap

Normally the filler neck for the engine oil is on the top side of the valve cover. At numerous generator types a second filler neck is attached additionally at the operating side. Please pay attention that the filler necks are always well locked after filling in engine oil. Consider also the references to the engine oil specification.

Fig. A.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 up beyond the maximum conditions.

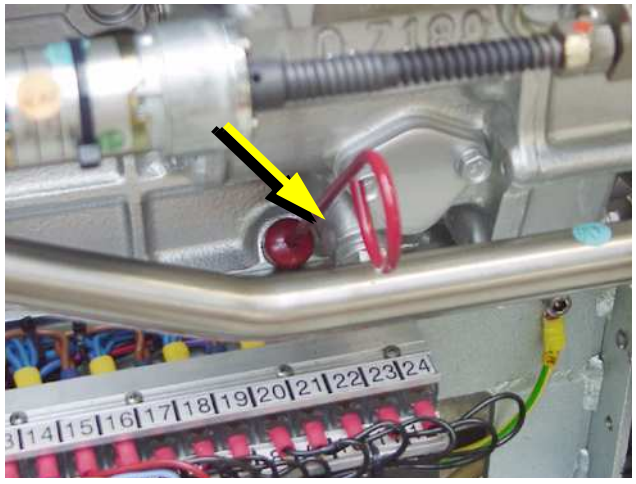


Fig. A.3.7-2: Oil dipstick

Oil filter

The oil filter should be exchanged with an oil change.

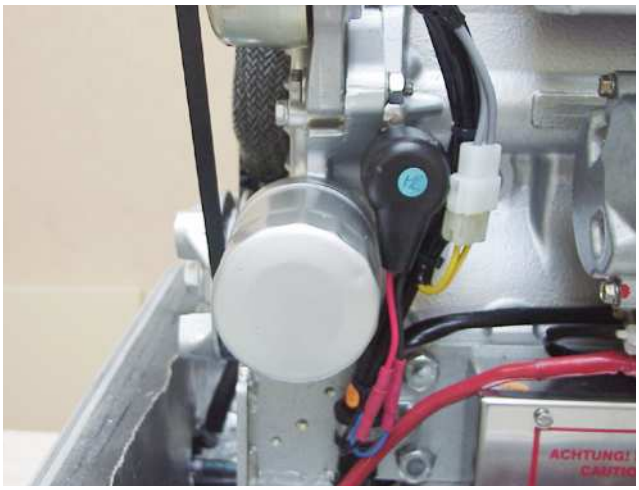


Fig. A.3.7-3: Oil filter

Oil drain hose

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

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

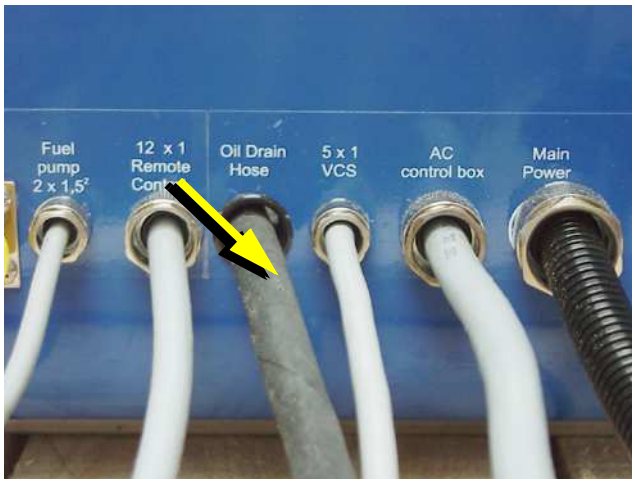


Fig. A.3.7-4: Oil drain hose

A.3.8 External components

AC-Control box

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

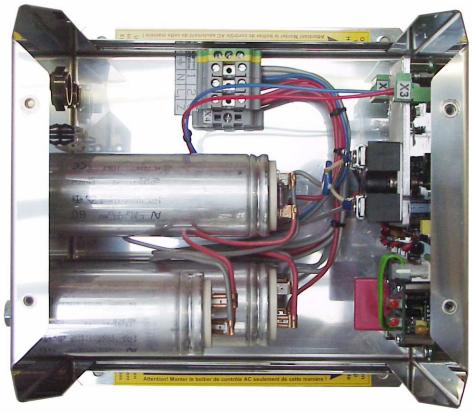


Fig. A.3.8-1: AC-control box

Voltage control VCS

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

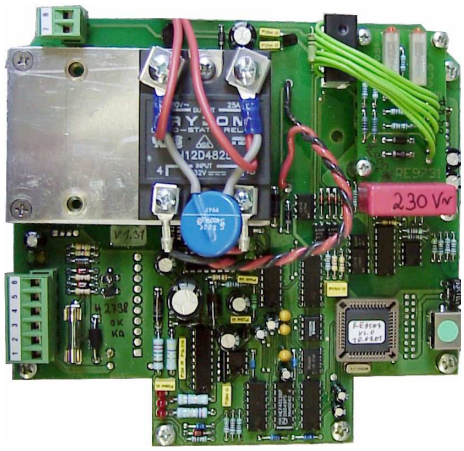


Fig. A.3.8-2: VCS

Electrical fuel pump

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

Fig. A.3.8-3: Electrical fuel pump

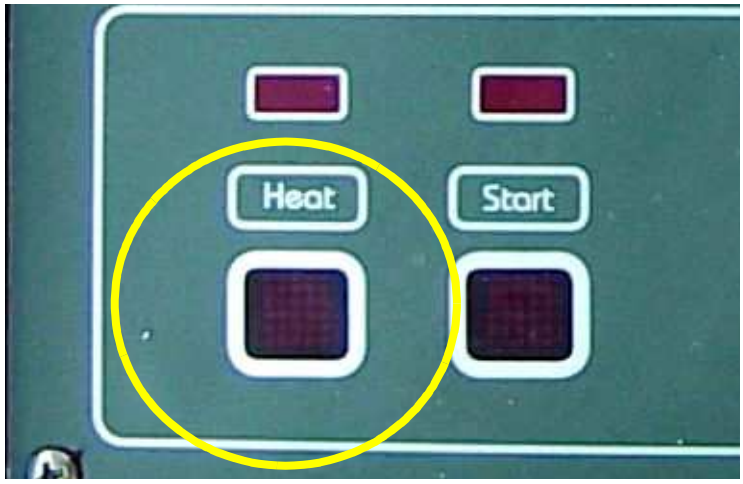
A.4 Operation instructions

A.4.1 Preliminary remark

Pre-heating the diesel motor

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

sample picture



Tips regarding Starter Battery

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

A.4.2 Daily routine checks before starting

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

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

You should change the oil, regardless off the ambient temperature. Table E.4, “Engine oil,” on Page XIII. Engine oil amounts Table 10, “Technical Data,” on Page X and Table 11, “Technical Data,” on Page XI.

2. State of Cooling Water.

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

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

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

4. Check all electrical Lead Terminal Contacts are Firm.

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

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

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

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

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

7. Check the Automatic Controls Functions and Oil Pressure.

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

A.4.3 Starting Generator - see remote control panel datasheet

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

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

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

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

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

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

This is also the case when the generator is started when consumers are switched on.

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

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

B. Installation Instructions

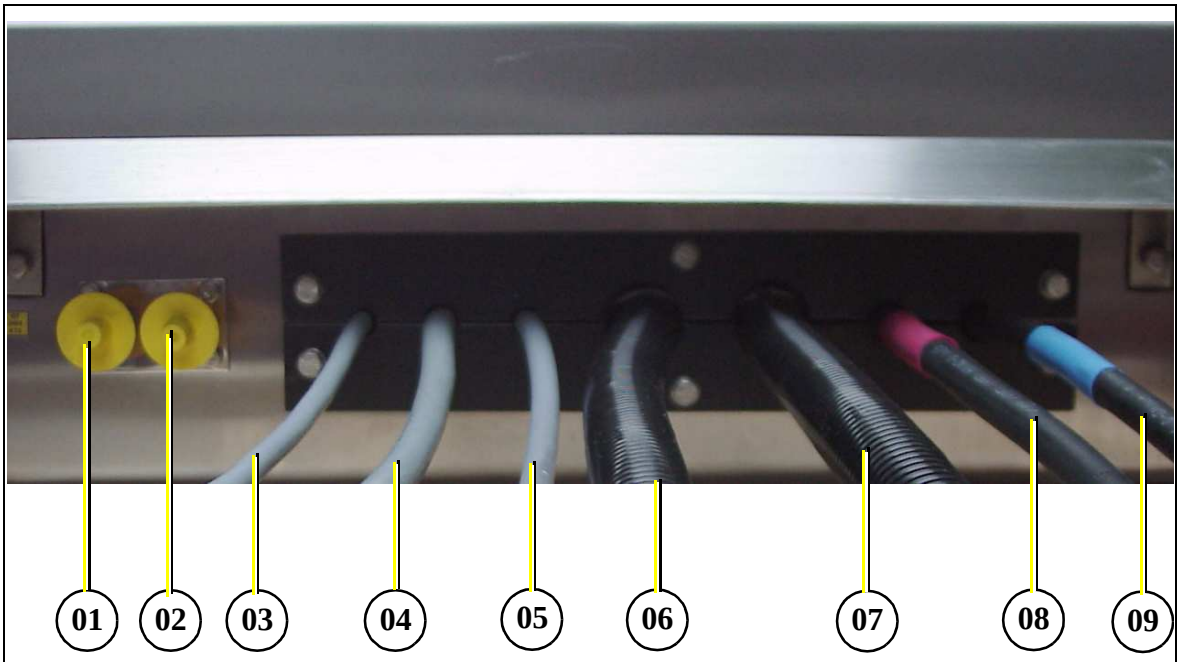
B.1 Generator Connections

ATTENTION! Before working on the System read the “Safety first” on Page 6.

B.1.1 General Instructions

- It is important to pay attention to the fresh air intake.
- Sufficient space must be available below the generator, in order to allow flow of cooling air. (Underside and side: Underneath is not sufficient!)
- The radiator may not be covered.
- Untrained personnel should never open the generator.

B.1.2 Connections



01. Connection fuel IN
02. Connection fuel OUT
03. Cable for fuel pump
04. Cable for remote control panel
05. Cable for VCS
06. Cable for AC-Control box (not all models)
07. Load
08. Cable starter battery plus (+
09. Cable starter battery minus (-)

Fig. B.1.2-1: Connections - sample

B.1.3 Fuel System Installation

A fuel filter with water separator is already installed at the generator. Generally fuel intake and fuel return must be attached with its own fuel intake at the Diesel tank.

If the generator is installed more highly than the tank, the return pipe should be led to the tank up to the same submergence into the tank as the sucking in line, in order to avoid that after the shut-off the generator the fuel can run back into the tank, which leads to substantial initial problems after longer shut-off the generator.

If the return pipe cannot put as immersion tube into the tank, it should be absolutely ensured by a non-return valve in the sucking in line that the fuel cannot flow back after shut-off the generator.

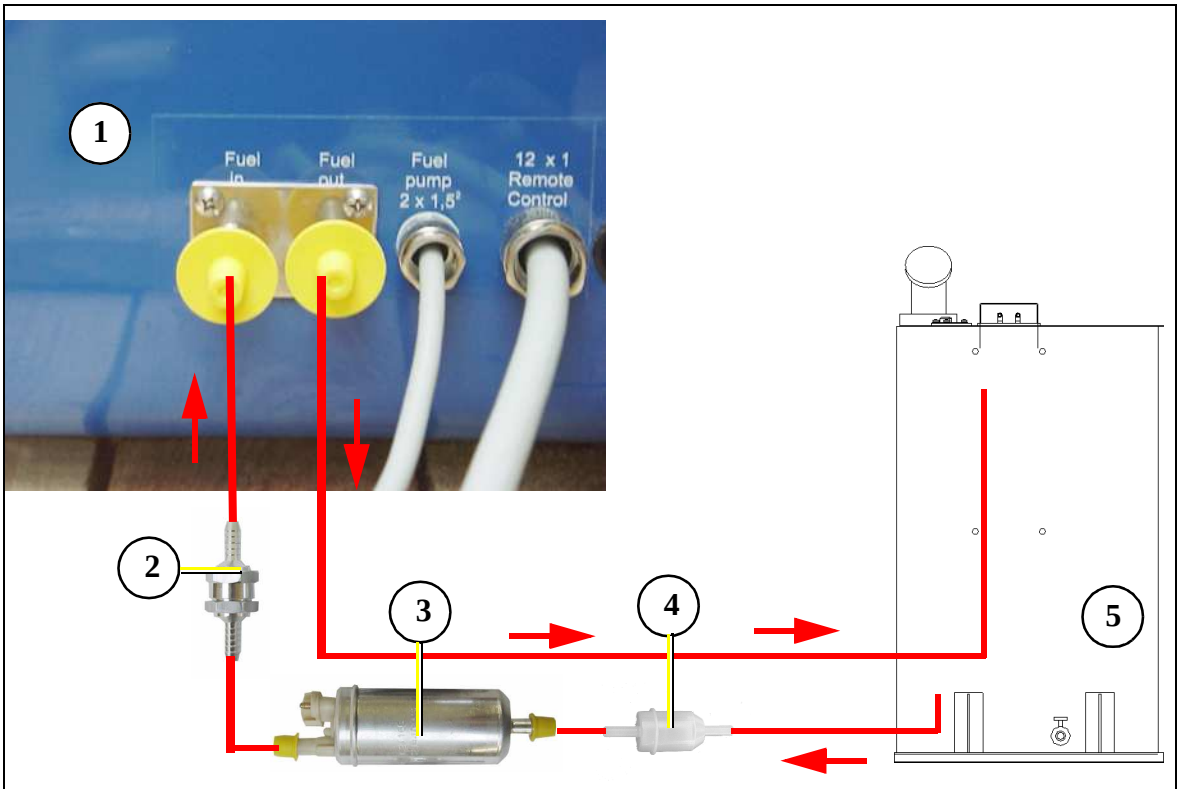
Basically the Panda is airing out. After the first line-up or after longer downtime the notes "Ventilation of the Fuel System" should be considered.

see “Air-bleeding of the Fuel System” on page 68.

The following components must be installed:

1. Fuel pre-filter
2. external fuel pump
3. non-return valve

The external electrical fuel pump is to be installed in the proximity of the tank.



1. Generator
2. Non-return valve
3. External fuel pump
4. External fuel filter
5. Fuel tank

Fig. B.1.3-1: Fuel System installation - Scheme

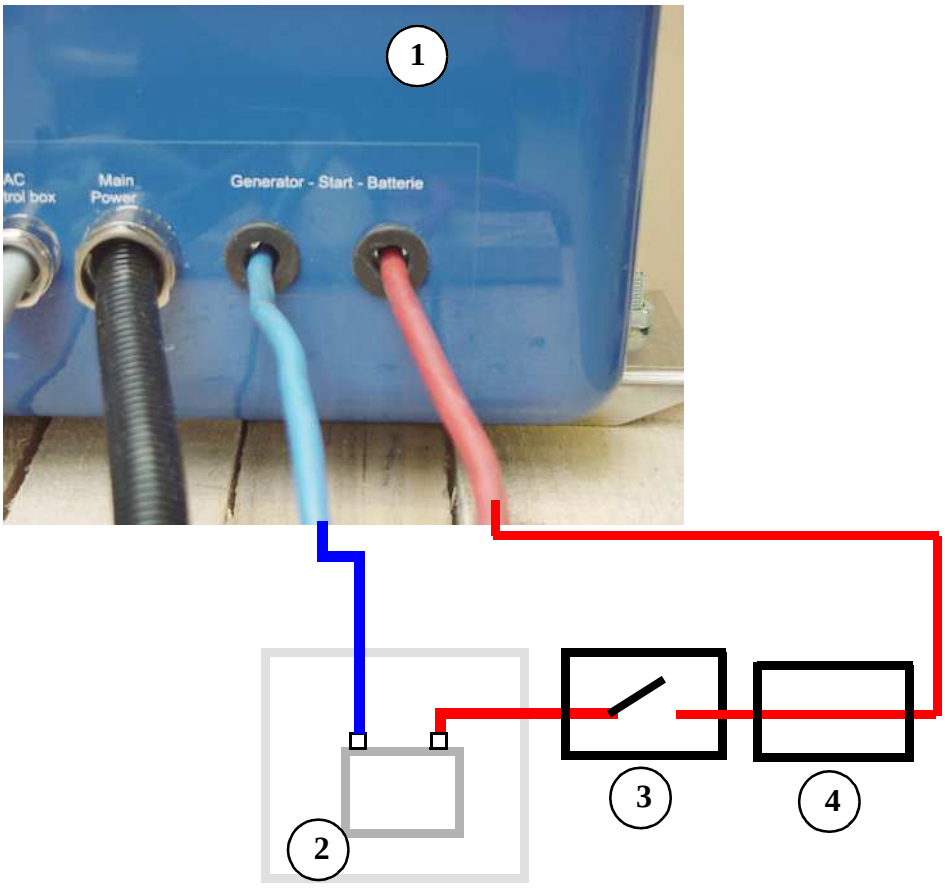
B.1.4 Connection to 12V Starter Battery-Block

An own separate 12V starter battery must be installed for the generator.

The positive cable (+) of the battery is attached directly at the solenoid switch of the starter motor (position 1). The negative cable (-) of the battery is attached underneath the starter motor at the engine mount (position 2).

ATTENTION!

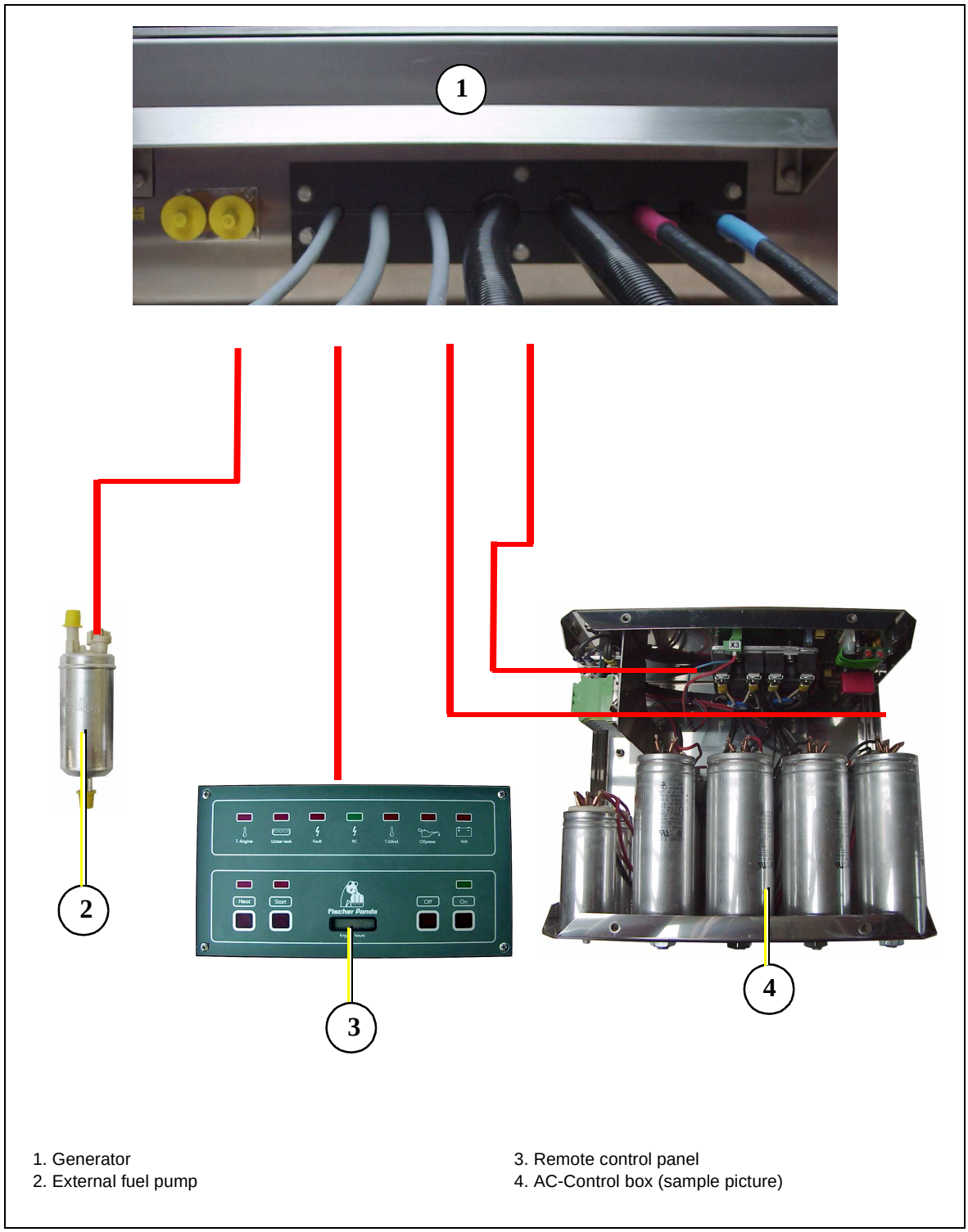
It must be guaranteed that first the cables are attached at the generator and then at the battery. To avoid large voltage drops the battery should be installed as near as possible to the generator. The positive terminal of the battery is attached at the red cable, the negative pole at the blue cable.



1. Generator
2. Battery block 12V
3. Battery main switch
4., Fuse

Fig. B.1.4-1: Battery installation - Scheme

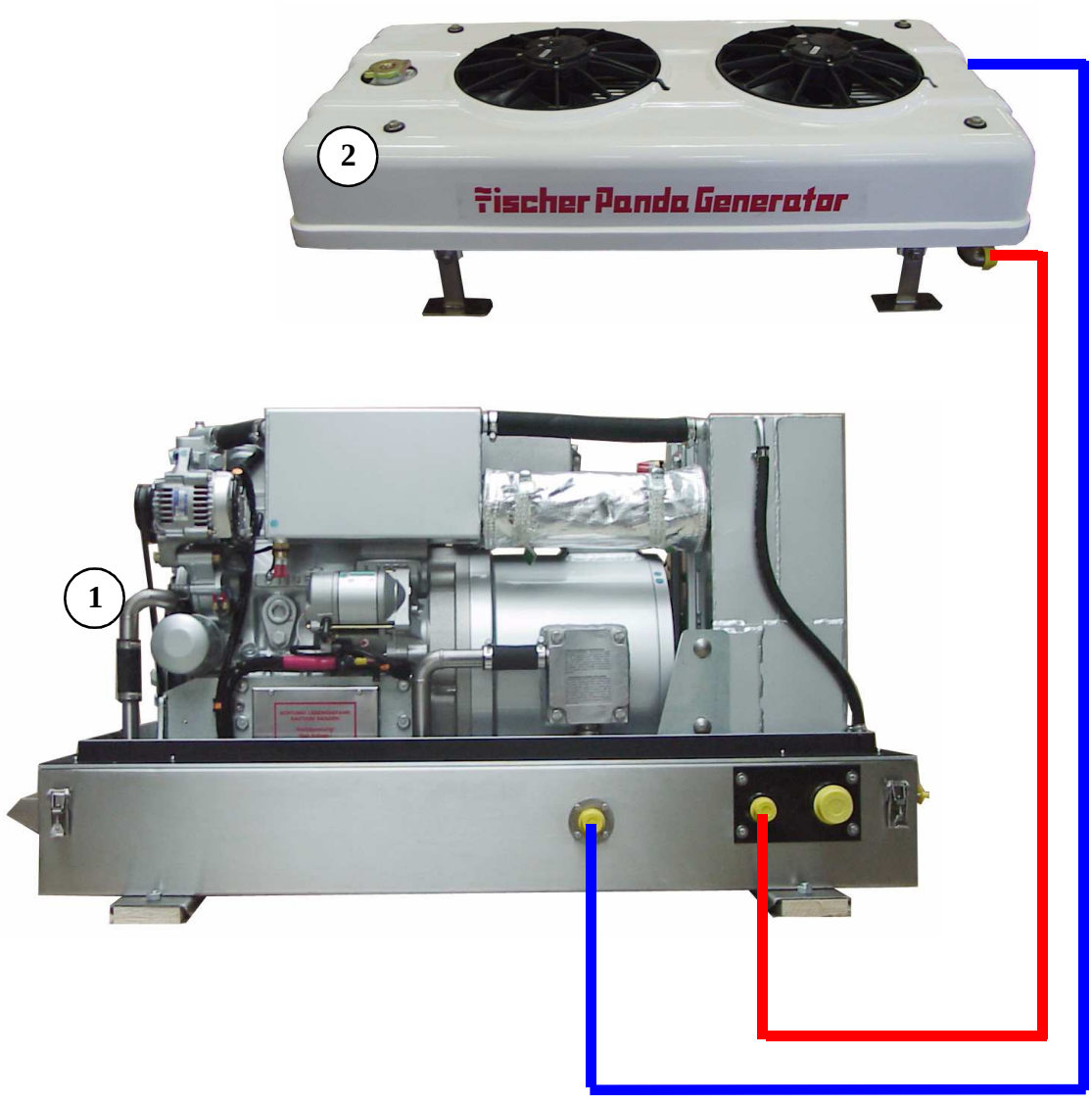
B.1.5 Connection of electrical components



1. Generator
2. External fuel pump
3. Remote control panel
4. AC-Control box (sample picture)

Fig. B.1.5-1: Connection of electrical components - Scheme

B.1.6 Connection of the external radiator



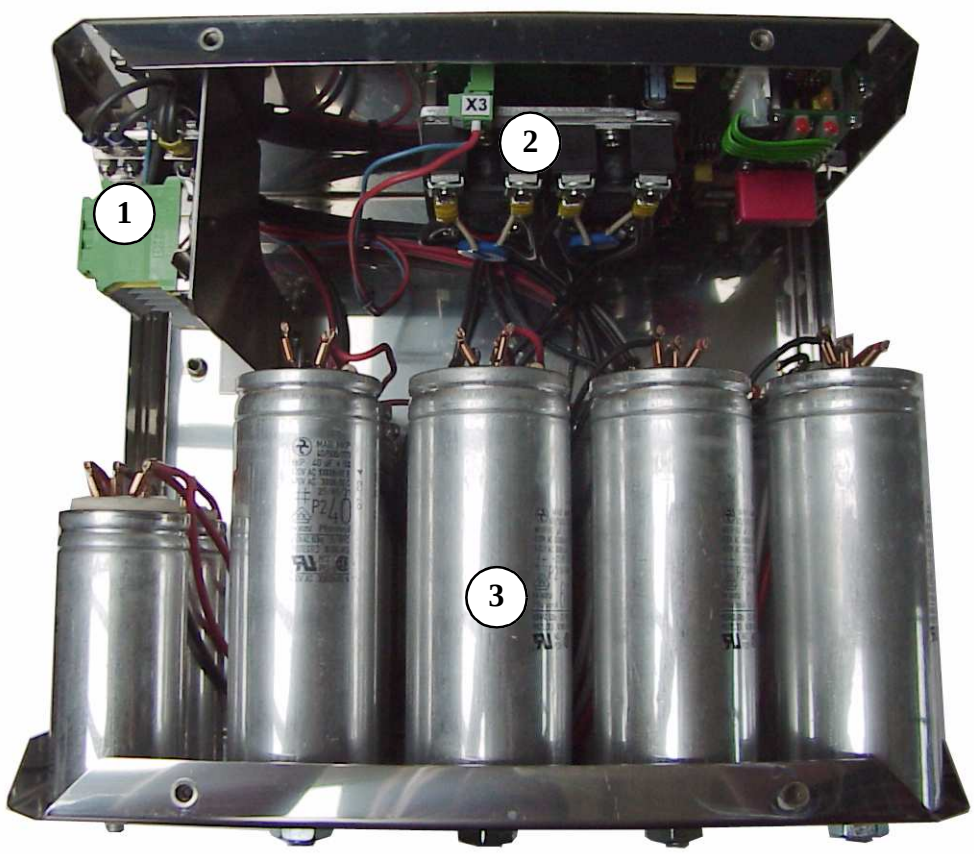
1. Generator
2. External radiator

Fig. B.1.6-1: Connection of the external radiator

B.2 AC-Control box (not all models)

In the AC-Control box the needed capacitors for the excitation of the generator are placed as well as the electronic control for voltage/speed regulation VCS and the starting current reinforcement ASB. The AC-Control box must be connected with the conductions (high voltage and low-voltage) to the generator.

The front panel must always be closed, since the AC-Control box produces 400V during operation.



1. Terminal block for excitation cable
2. VCS
3. Capacitors

Abbildung 03: AC-Controlbox - Sample

B.3 The fan control

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

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

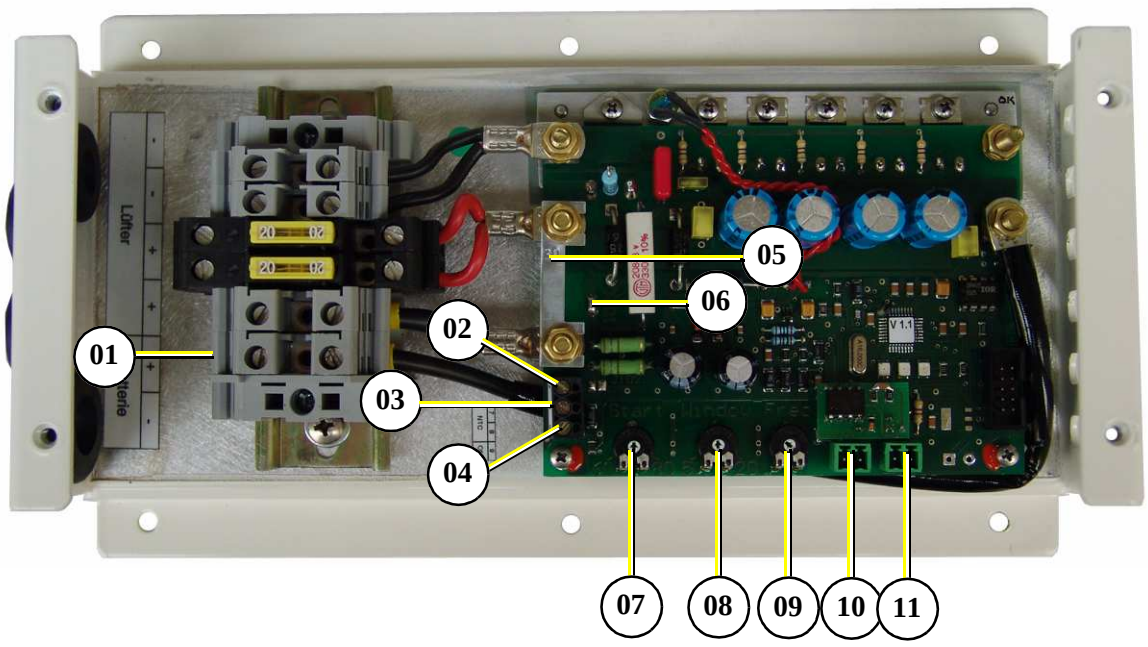
The speed adjustment of the fan is determined by the Running Voltage Pulse/Pause modulation. The Pulse/pause-ratio is goverened by the cooling water temperature via an external NTC-gauge (terminal 7 and 8). A NTC-resistor reduce his resistor value if the temperature is rising. This NTC-gauge has the value 100kOhm at 25℃ (57℉) and 7kOh m at 70℃ (102℉). The full running voltage is sent to the fan when the upper temperature has been reached.

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

J1 closed : Fan control continually running

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

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



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

Fig. B.3-1: Fan Control - Sample

B.4 Cooling system

General instructions

The PANDA vehicle generator is supplied as standard without a radiator. Various radiators are available according to the customer's requirements; these can be chosen according to the appropriate operating and installation situation. The cooling system can also be assembled together with a normal commercial vehicle radiator.

Some series has an integrated Radiator (f.e. PVK-UK, PSC ect.), for these generators an external radiator is not necessary.

Determing the size of the radiator

Consideration must be paid to the total heat load when determining the size of the unit. This equates to the generator nominal performance without the water-cooled pre-silencer. The heat resistance is 1.8 times the generator nominal capacity, when the water-cooled pre-silencer is used (i.e. Panda 12000 PVMV-N has a total heat capacity of approx. 18kW). The radiator can be serviced by any usual radiator servicing agency. It should, however, be pointed out that the radiator possesses high safety levels. Tthe radiator is often manufactured too small. ICEMASTER also has various radiators available (for horizontal and vertical installation) as standard generator components.

Radiator position

The place and fitting position of the radiator must be carefully considered. It is especially important that the warm air can escape. For this reason, the best place for the radiator is in a vertical position on the vehicle roof (if one take into account that an obstruction could arise in narrow entrances).

The manufacturer is only too happy to give suggestions on how to install the radiator. It must, however, be expressively pointed out that all recommendations of this type are **not binding**. It continually occurs that special influencing factors are not recognised from the start. The customer or the technician making the installation must always take changes to the position or radiator's place of installation into consideration. The manufacturer cannot accept liability for the recommendations given to the best of his knowledge. As a precaution, attention should always be paid that the air outlet for escaping warm **is as large as possible**. The vehicle paint sprayer is often not in agreement with this, but the person making the installation must make the aim clear. **The fitter** must make his position clear.

Radiators which are installed vertically, and the warm air is blown **downwards**, must be twice the size of such radiators, by which the warm air rises through its own thermal energy. It must also be considered that a build up of heat results through the emission of warm air in the direction of the ground, whereby the warm air is once again forced to rise to the area of the radiator. Freely escaping warm air cannot be guaranteed in this case. Additional ventilators may be necessary should the warm air need to be channelled through pipes.

It must be ensured that warm air is extracted out of the radiator.

Permitted coolant temperatures

The performance of the radiator must be so measured that the coolant temperature of the Panda generator does not exceed more than 70℃. The coola nt intake must be fitted direct to the coolant pump.

There must be a large amount of water circulating to ensure that the difference in temperature when compared to the temperature of the water leaving the generator (full load) does not exceed 12℃. The difference may also amount to 17K if a pr e-silencer is installed.

The hoses must be so laid out that knots and other obstructions are avoided. If necessary, the amount of coolant must be measured. As a minimum the following values are necessary:

Essential coolant amounts:

Panda 4500 ..... min. ca. 10 l/min

Panda 8000 - 9000 .....approx. 16 to 22 l/min

Panda 12000 - 14000 .....approx. 24 to 28 l/min

Panda 18 - 24 ..... approx. 32 to 38 l/min

Panda 30 - 32 ..... approx. 40 to 45 l/min

Panda 42 - 65 ..... approx. 50 to 60 l/min

The greater the amount of coolant circulating, the lower the difference in temperature. If the necessary cooling performance cannot be achieved, the amount circulating can be increased by adjusting the pulley on the pump and thereby raising the performance.

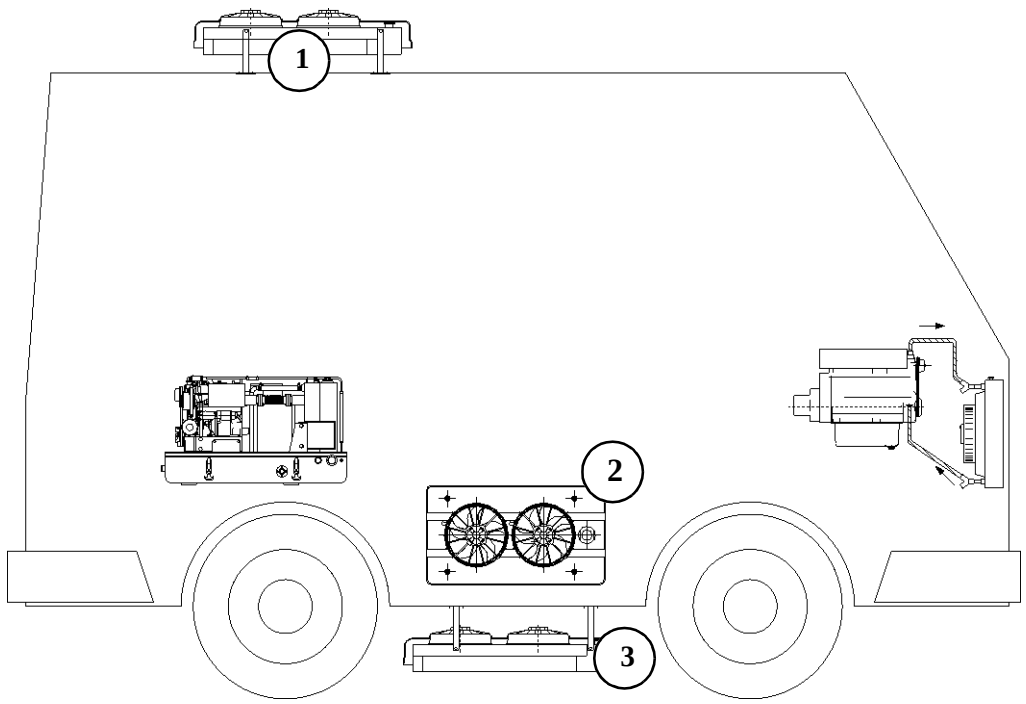
ATTENTION! The coolant pressure may, however, not exceed 0.7 bar!

Construction and position of the radiator

The radiator can be assembled away from the generator in a well ventilated position. Attention must be paid that the radiator emission direction is completely free of obstruction. Turbulence is to be avoided. There is often a clash between the streamline appearance of the chassis and the technical requirements.

The radiator can be installed (vertically) or (horizontally). Consideration must be given to the fact that air is drawn in via a fan motor.

The best result is achieved if the radiator is fitted vertically on the vehicle roof.

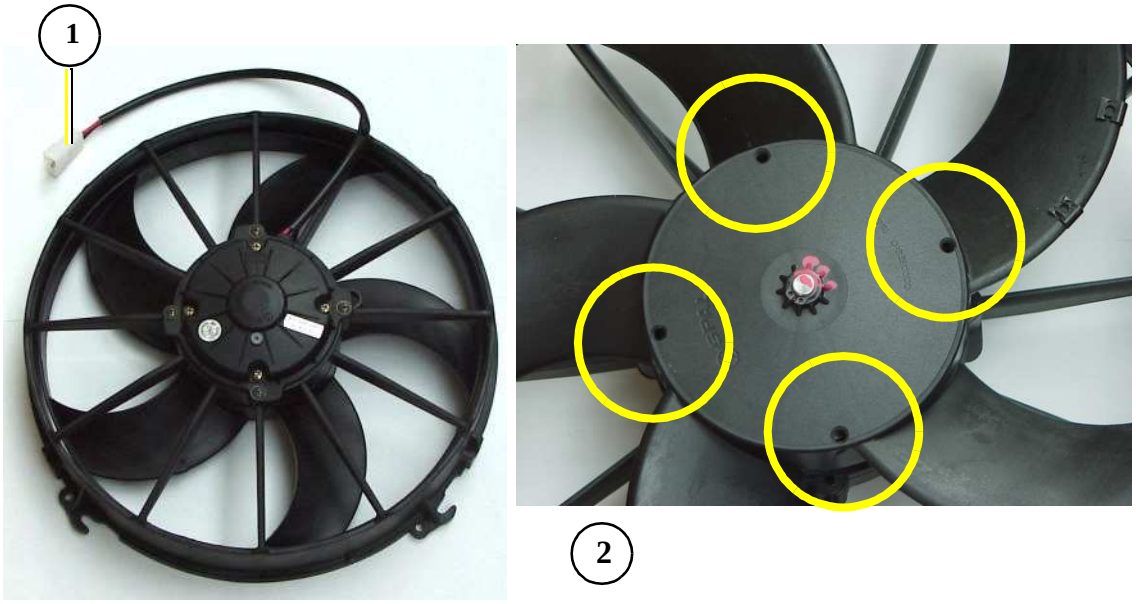


1. Radiator on the roof
2. Radiator vertical
3. Radiator under the vehicle

Fig. B.4-1: Possible positioning of the external radiator

Pay attention to the following item at the horizontal assembly of the radiator:

To avoid damages of the fan motor please bore some holes on the backside of the fan (diameter approx 4mm). Because water can enter the fan (rainwater, condenswater, sweatwater etc.). The water can run out through these holes. (see below 02) Generally a fan is a wearing part and should be changed one time a year.



1. Plug for fan control

2. Bores (diameter 4mm)

Fig. B.4-2: Preperation of the fan

Distance from the radiator to the unit

The coolant water pump mounted on the generator is so laid out that a **maximum** distance of up to 5 mtrs length from the radiator is possible. The hose cross-section must be laid out accordingly. The minimal internal diameter amounts to 18mm (Panda 4500). A hose must be used for both sides (forward and back flow) which is resilient to pressure and high temperatures (at least 120℃).

Minimum hose diameter for cooling lines:

Panda 04 kW ..... Ø18mm (¾")

Panda 06 - 20 kW ..... Ø25mm (1")

Panda 25 - 30 kW ..... Ø32mm (1¼")

Panda 40 - 50 kW ..... Ø38mm (1½")

Panda 50 - 60 kW ..... Ø44mm (1¾")

Coolant expansion tank

It is absolutely essential, that a exoansion tank, that can be aerated, is fitted adjacent to the radiator. The ventilation pipe should, if possible, be fitted to the radiator's highest position. For this, a pipe with a maximum diameter of 10mm suffices, which must be fed to the expansion tank. A further pipe, which must be fitted to the floor of the expansion tank, can be fitted to the cooling system in any desired place (i.e. T-piece). Frequently a connection is provied on the radiator itself. The coolant expansion tank is not normally supplied by ICEMASTER. For this a standard vehicle expansion tank is the most suitable. Vehicle accessory range is the most suitable.

Coolant Pump

This Is normally equipped with a independent impeller suction pump. This pump suffices if the cooling water pipes etc equate to the normal standard. ICEMASTER can give no guaranty. It must be determined whether the amount of cooling water circulating is sufficient. Consideration must always be given to the fact that the water flow is supported by an external pump.

Antifreeze

The **antifreeze** concentration must be regularly checked in the interests of safety. The antifreeze solution supplied from the factory provides protection to -15℃. If lower temperatures are occasioned during transportation or storage, then the coolant must be drained. The cooling system is, however, so arranged that the draining of the coolant is only possible in the assembled state, when air under pressure is blown into the system. Air pressure of approx. 0.5b suffices, in order to blow out the water.

Suction filter as a source of noise

The external suction filter (not included on delivery) must always be used if the generator is to be used in a dust-free environment. This filter is connected by means of a hose with a connecting piece to the generator housing. The filter can be the source of considerable noise. If this is the case, an air intake muffler with the appropriate nominal width should be ordered from ICEMASTER. This is a cylinder, which takes up relatively large amou nt of room (Total length approx 700mm, Diameter 100mm).

Vehicle Generator with Centrifugal Coolant Pump

An impeller pump can also be provided if the radiator, for technical reasons, is to be installed relatively distant from the radiator and addtionally requires a number of changes to the direction of the pipe. This coolant impeller pump is mounted on the generator as an additional pump, and is driven by pulleys. The pump action is carried out by a "rubber impeller".

ATTENTION! Temperature restriction!

This pump may only be used if it is ensured that the temperature of the coolant entering the pump does not exceed 70℃ during continual duty. 75℃ is permissible for short periods. These may, however, in no case be for longer periods. If the coolant temperature exceeds the permissible rate, this can lead to the impeller blades being torn off.The advantage of this impeller pump is that this pump, as a "positive displacement pump", is self-suctioning and is therefore very sensitive to air bubbles etc.

Ventilating the cooling system with the aid of a self suction impeller pump is very simple. In some cases the pump is additionally installed for this reason alone. Unfortunately the operating noise of these pumps is very loud.

In spite of this attention must be paid that a zone is available at a high point, where the air bubbles in the coolant are able to escape to. As a rule, this is the expansion tank, as long as this is connected direct to the tank. If the coolant expansion tank is, however, so integrated in the system that it cannot be reached by circulating water, then an air release valve must be fitted in the circulation pipe at a place of your own choice, which can then also be connected to the expansion tank (see next page).

In case of doubt, you should send a diagram of the required coolant system to ICEMASTER and let this be checked there.

Installation with special air separator

An "air separator" must be fitted at all critical places in the circulation system, in case a perfect automatic ventilation on account of obstacles in the pipe passage cannot be achieved. A self-actuating ventilation valve must be fitted to each air separator.

Monitoring the Temperature

You are expressively advised to measure the temperature of the circulating coolant after installation. Two remote thermometers must be used for this. A connection must be fitted to the motor coolant inlet; the second on the coolant outlet. After a short warming-up period, the generator must have a load of at least 75% of the nominal capacity placed on it. The coolant circulating is to be checked. The values must lie within the following limits:

1. Coolant inlet, max 70℃ during constant duty at m aximum load
2. Coolant outlet, max 85℃ during constant duty
3. Difference of both values: This point is especially important and gives an indication of the coolant circulating. The difference should amount to a maximum of 17℃ for a water-cooled system with an integrated water-cooled pre-silencer, as a rule it should, however, lie between 10 - 12℃.

The circulating coolant is not sufficient, if the difference amounts to more than 15℃, and the amount of water circulating must be increased. This can be solved, for example, if the pipe passage is improved or the pulley diameter is reduced. It is absolutely essential to measure the performance of the cooling system after installation of the generator. The above named values should be considered as the maximum permissible values. They are also valid for operation at high temperatures. During constant duty at normal temperatures (20℃), the values should be well below the above named data.

Installing a Coolant Temperature Display

A remote display unit for coolant temperatures should be installed, when fitting sensitive systems (i.e. Television broadcasting vehicles, ambulances or other vehicles) with sensitive measuring instruments. In this case a standard coolant **display device** with remote thermometer can be used. It is absolutely essential that two display instruments are installed:

1. Cooling water **inlet**

2. Cooling water **outlet**

It does not matter at which place the measurement is made. T-pieces for hose elements can be obtained from ICEMASTER into which the usual trade sensors can be installed.

Monitoring of temperature:

1. Temperature at the cylinder head
2. Temperature at the manifold
3. Temperature in the generator winding area (only Panda 8000 upwards)

The winding temperature monitor is not fitted with a special display unit. The fuel solenoid valve is switched on as a circuit breaker for the motor stop solenoid or the fuel pump. If the generator switches off because the winding overheats, nothing is displayed. In this case a long period of waiting can, in circumstances, be necessary. This can be bridged by using the switch. This must be carried out by an electrician who should use the circuit diagram for this. It suffices in this case when the plug which leads to the guage wire is opened and both conducters in the plug are bridged. This shut down should, however, be a last resort! It is only applicable, if the generator temperature exceeds the permissible value on account of inaccessible working conditions. It must then be explained which measures are necessary to restore normal operating conditions.

Recording the temperature values

Installation records are delivered with every handbook, which must be completed after installation and returned to the manufacturer (Copy). The generator should be tested at 70% of its maximum performance. The temperature values must be checked at the maximum possible performance. The external temperature must be taken into consideration when doing this check. The values for T1 (see additional installation record for the vehicle version) may not exceed 85℃, even at high external temperatures and maximum load. If necessary the maximum permissible performance must be reduced (i.e. by the use of fuses).

Connection of the Generator to the Vehicle Cooling System

The Panda can in many cases be connected to the original vehicle system (vehicle-drive motor), without a problem. The amount of time required to do this is minimal, if the vehicle radiator is fitted with an electric fan. Should that not be the case, an electric fan is to be additionally placed in front of the radiator, which is monitored by a thermostat. The coolant pipes are connected directly with the pipes leading from the motor to the radiator. This installation is comparable with the installation of an additional hot water heating system, as long as this includes the motor cooling system. The manufacturer should be consulted in cases of doubt. The generator can be fitted to the vehicle cooling system via a heat exchanger, should there be any objections.

External radiator should be installed when initially being put into operation or after repairs

A ventilating valve is fitted, as a rule, to all units manufactured since the Spring 1995. A hose must be placed on the connecting nozzle ventilation valve to aerate the unit (nominal width 6-8mm). A transparent hose is recommended, since the ventilation process is easy to observe. The hose is to be fixed with light hose clips to the connecting nozzle. The hose must be sufficiently long to be able to feed the other end into the open coolant expansion tank during operation.

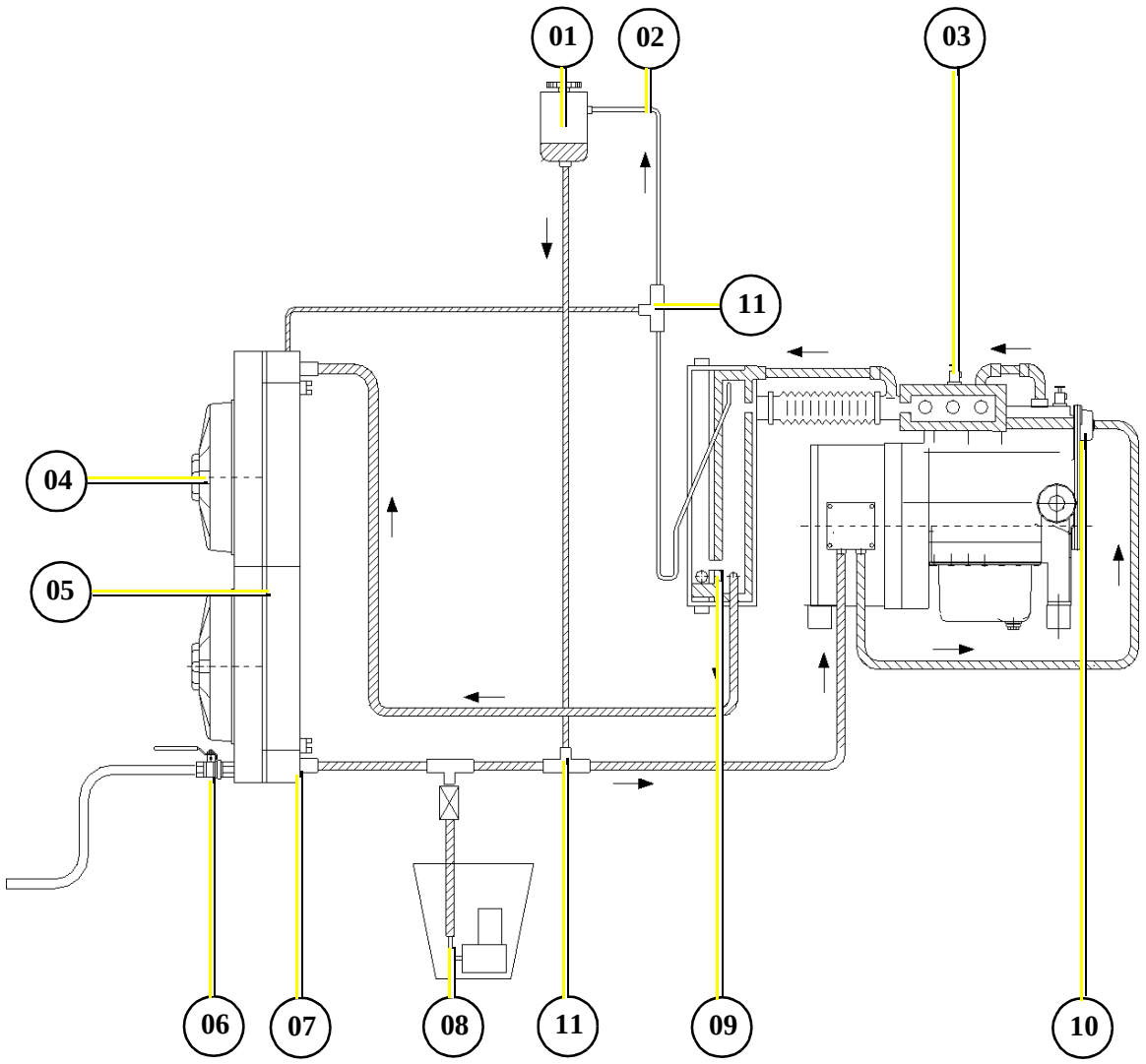
The coolant expansion tank is initially filled with coolant. The air valve must be completely opened before the following procedure is carried out. You should assure yourself whether the connecting pipe has been connected correctly to the coolant backflow pipe by means of a T-piece. This pipe should have an internal diameter of 12mm. Since the coolant pipes, for technical reasons, can only be gradually laid out with difficulty, resistance builds up during refilling, which can only be displaced with difficulty by the air in the generator or motor. This process can be made easier by producing excess pressure by means of the above mentioned ventilation pipe. The process is eased considerably, in that a transparent ventilation hose draws in air (this can also be carried out by mouth, if done cautiously). Meanwhile the coolant expansion tank should, at the same time, be refilled with water. The generator can be started as soon as the drawn in water is seen in the ventilation pipe (all other measures must, of course, be considered, for example, checking whether the motor oil has been topped up etc., as stipulated in the generator operating

instructions).

During the starting process, the coolant expansion tank must be continually refilled with coolant so that no further air can force its way into the system from above. The other end of the ventilation pipe should be laid in the open coolant expansion tank filling opening, so that outflowing coolant runs back into the tank.

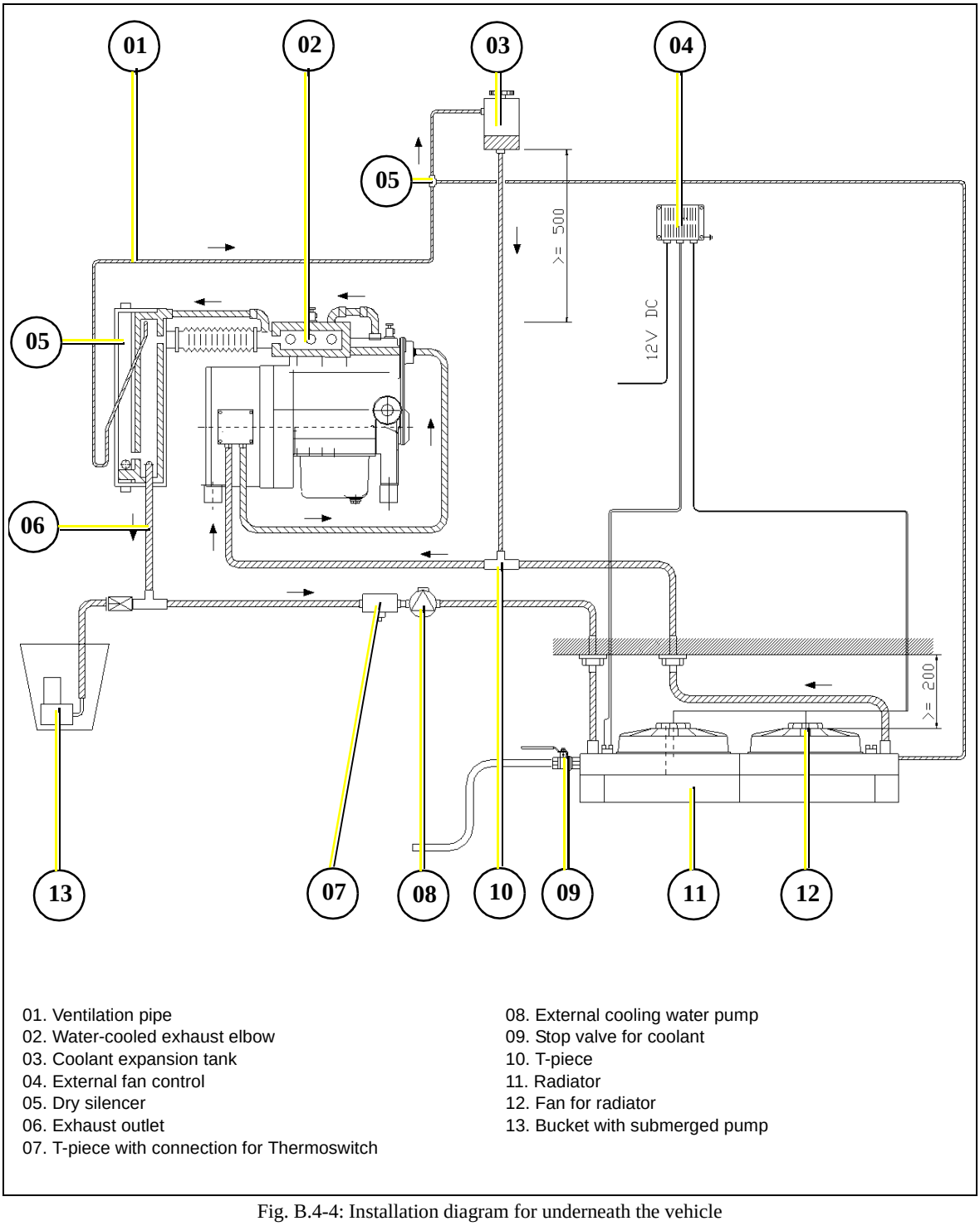
During the starting process the open coolant expansion tank must continually be filled with coolant so that no further air can force its way into the system. The ventilation pipe should be laid in the open filler cap of the coolant expansion tank during the starting procedure, so that escaping coolant runs back into the tank.

Decisive for the success of this procedure is that sufficient water enters to internal coolant pump, so that the coolant pump can function. The coolant pump cannot draw water as long as there is air in the casing.



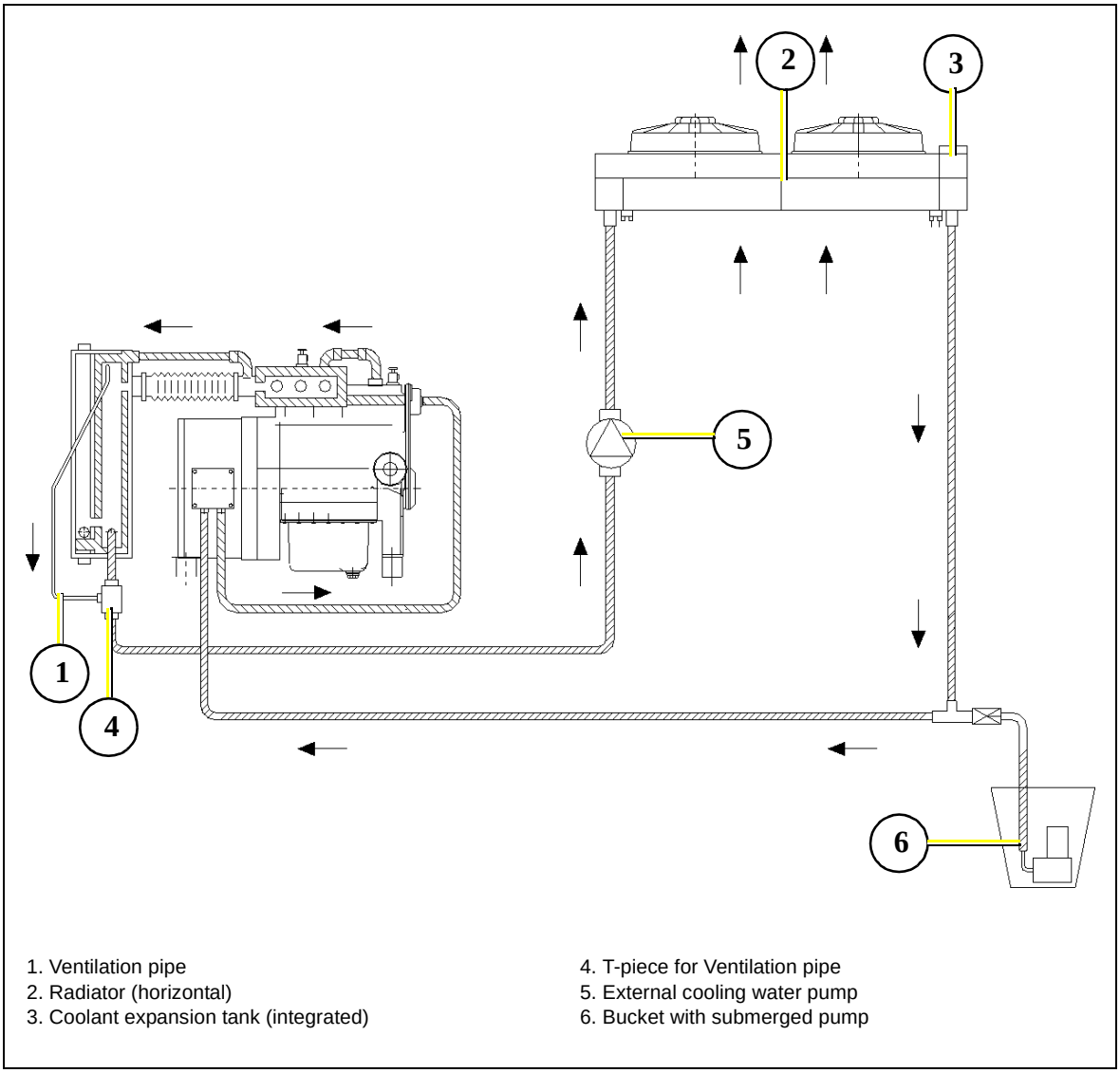
01. Coolant expansion tank
02. Ventilation pipe
03. Ventilation screw
04. Fan for radiator
05. Radiator
06. Stop valve for coolant
07. Thermoswitch
08. Bucket with submerged pump
09. Water-cooled pre-silencer
10. Internal cooling water pump
11. T-piece

Fig. B.4-3: Installation diagram for vertical radiator



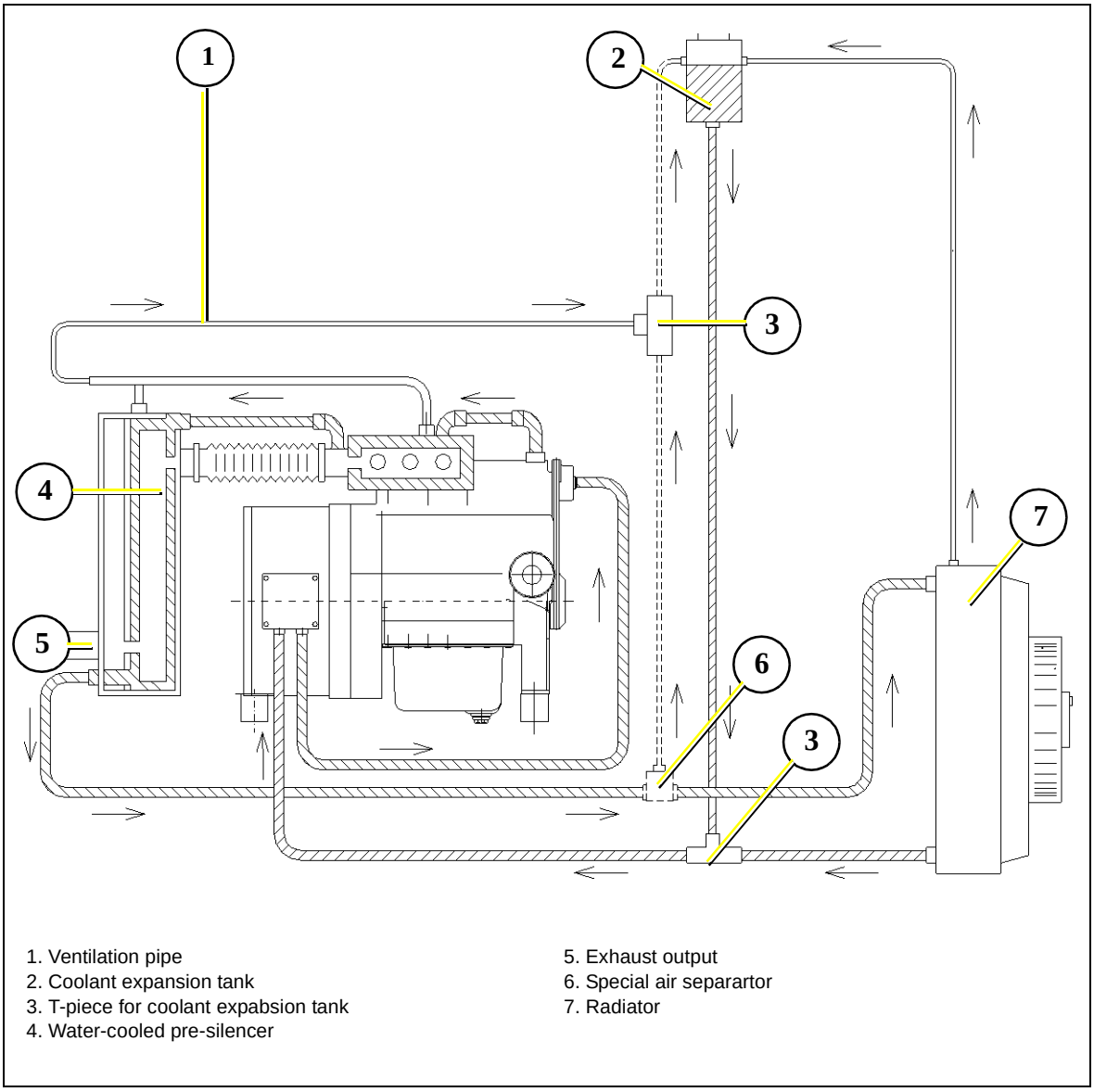
01. Ventilation pipe
02. Water-cooled exhaust elbow
03. Coolant expansion tank
04. External fan control
05. Dry silencer
06. Exhaust outlet
07. T-piece with connection for Thermoswitch
08. External cooling water pump
09. Stop valve for coolant
10. T-piece
11. Radiator
12. Fan for radiator
13. Bucket with submerged pump

Fig. B.4-4: Installation diagram for underneath the vehicle



1. Ventilation pipe
2. Radiator (horizontal)
3. Coolant expansion tank (integrated)
4. T-piece for Ventilation pipe
5. External cooling water pump
6. Bucket with submerged pump

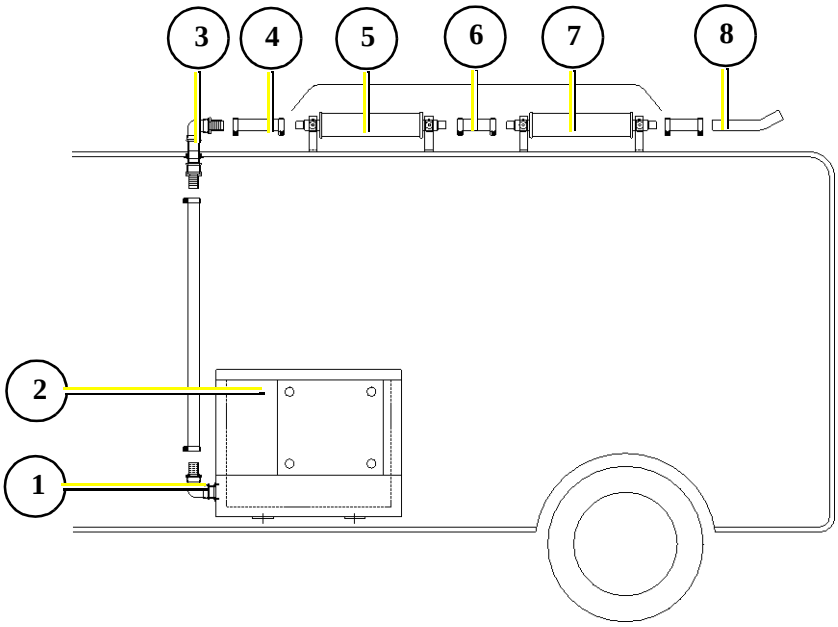
Fig. B.4-5: Installation diagram for radiator on the roof



1. Ventilation pipe
2. Coolant expansion tank
3. T-piece for coolant expabsion tank
4. Water-cooled pre-silencer
5. Exhaust output
6. Special air separartor
7. Radiator

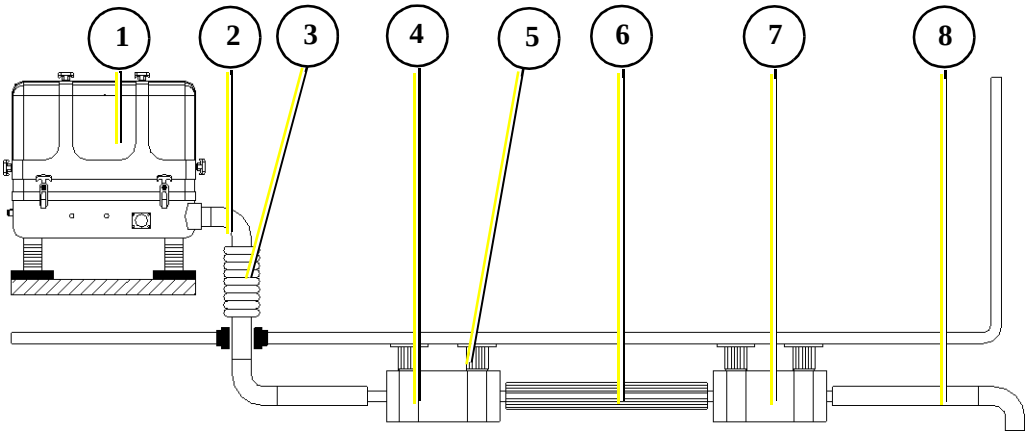
Fig. B.4-6: Installation diagram with special air separator

B.5 Exhaust installation



1. Exhaust oulet
2. Generator
3. Dachdurchführung mit Winkel
4. Vibration damper
5. External pre-silencer
6. Exhaust pipe
7. External series silencer
8. End pipe

Fig. B.5-1: Exhaust connection for roof outlet



1. Generator
2. Exhaust outlet
3. Compensator
4. External pre-silencer
5. Vibration damper
6. Exhaust pipe
7. External series silencer
8. End pipe

Fig. B.5-2: Exhaust connection for mounting below the vehicle

C. Generator Operating Instructions

C.1 Safety Instructions

Do not run the generator with an open capsule!

There are dangerous rotating machine components which could cause injury.

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

High Voltage DANGER !

The genset output Voltages can all be lethal.

Ensure that all electrical installations comply with all required regulations of the regional authorities. The electrical installation should be performed by a qualified technician.

C.1.1 Protection Conductor:

The standard Panda generator is grounded. The 3-phase connection (delta) centre point is bridged to earth in the AC output terminal box (mounted on the generator). This is the initial earth safety point and is sufficent to ensure safe operation however only as long as no other system is installed. This system is adapted to enable test running of the generator before delivery.

The bridge to ground (PEN) is only effective when all components in the electrical system share a common ground. The bridge to ground can be removed and reconnected to another ground system if required for other safety standards.

Full voltage connections are mounted in the electrical cabinet. It must be ensured that the electrical cabinet is secured and closed while the generator is running.

The starter battery cable should be disconnected when work is being done on either the generator or the electrical system in order to prevent accidental starting of the generator.

C.1.2 Instructions for Capacitors

The generator's electrical system requires two different groups of capacitors:

A) The booster capacitors

B) The operating capacitors

Both types are mounted in the electrical cabinet.

Capacitors store an electrical charge. It is possible that even after they have been disconnected stored energy is still held. Therefore it is essential that the connectors are not touched.

Should it be necessary to check or test the capacitors, they should be shorted out by using an insulated screw driver.

The operating capacitors are automatically discharged when the generator is stopped in the normal way. The booster capacitors will be discharged through internal resistor´s.

For safety however, the capacitors have to be discharged (short circuited) prior to carrying out any work on the AC-Control box.

CAUTION! Do not touch the capacitor contact terminals!

C.1.3 Overloading of Engine during longer Operation

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

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

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C.1.4 Operating Control System on the Panda Generator

Panda generators are equipped with various sensors. One of these sensors is to stop excitation should a short circuit occur. The combustion engine is further equipped with a oil pressure control switch, which switches the motor off, if the oil pressure sinks to a particular level. Apart from this, all generators are equipped with four temperature switches.

The thermo-switches are placed at the following locations:

1. Thermo-switch fitted to the cylinder head
2. Thermo-switch fitted to the thermostat housing
3. Thermo-switch fitted to the exhaust manifold
4. Thermo-switch fitted to the silencer
5. Thermo-switch fitted to the endshield
6. Thermo-switch in the genset coil
7. Oil pressure switch

Thermo-switch at cylinder head

sample picture

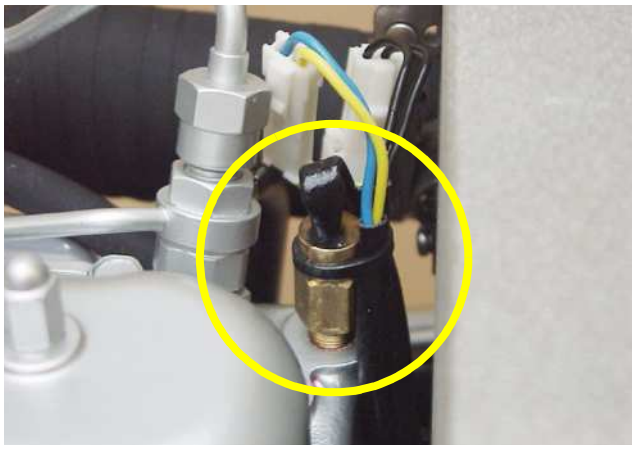


Fig. C.1.4-1: Thermo-switch cylinder head

Thermo-switch at thermostat housing

sample picture

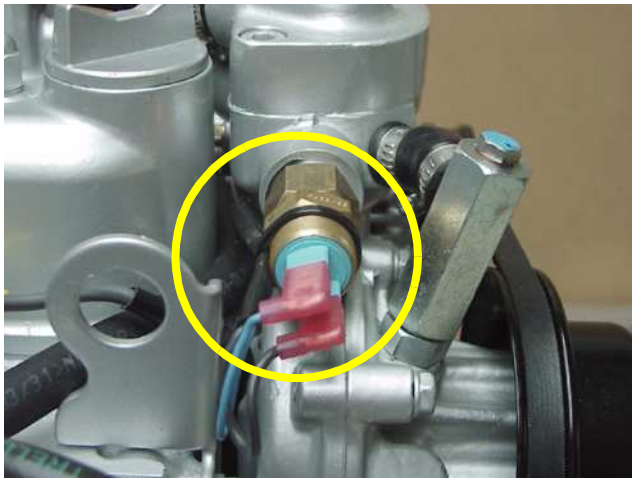


Fig. C.1.4-2: Thermo-switch at thermostat housing

Thermo-switch at water-cooled exhaust elbow

sample picture

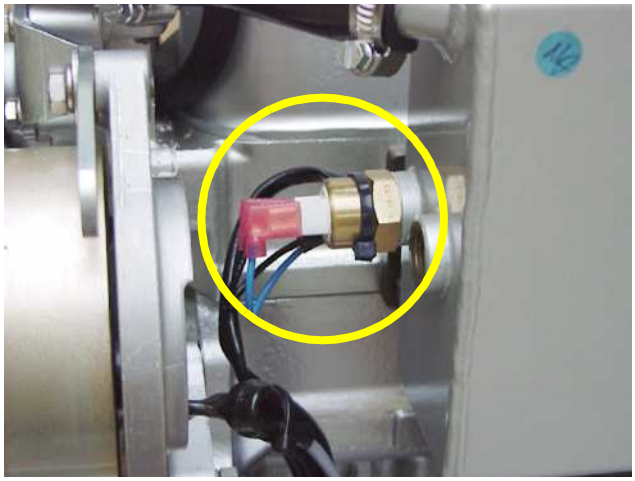


Fig. C.1.4-3: Thermo-switch at exhaust manifold

Thermo-switch at pre-silencer

sample picture

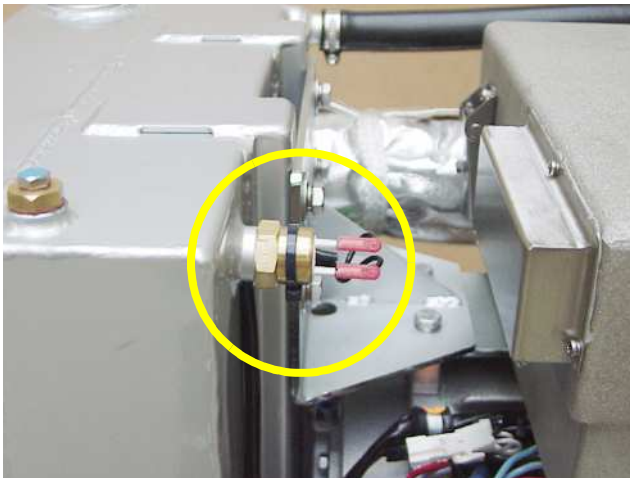


Fig. C.1.4-4: Thermoschalter am Abgasanschluss

Thermo-switch at the endshield

(only at oil colled bearing)

sample picture

Fig. C.1.4-5: Thermo-switch at front plate

Thermo-switch at coil

01. Thermo-switch coil

02. Generator housing

sample picture

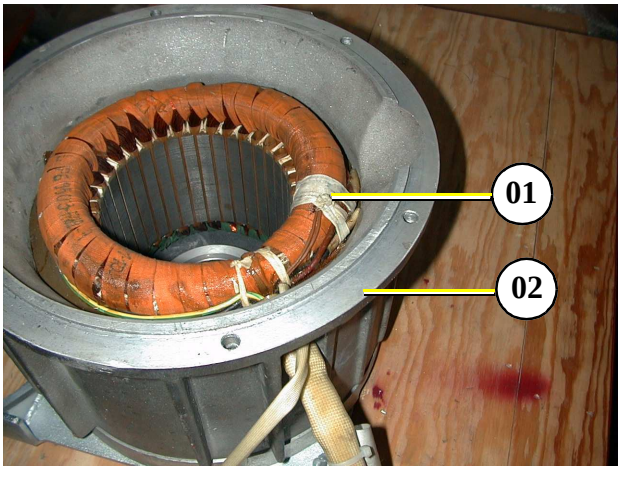


Fig. C.1.4-6: Thermo-switch coil

Oil pressure switch

sample picture

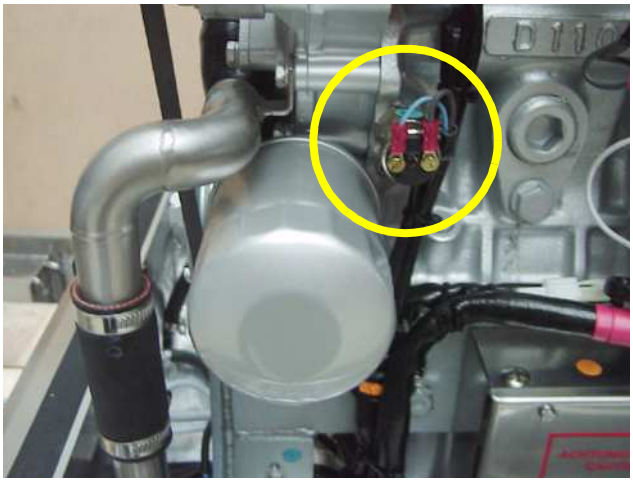


Fig. C.1.4-7: Oil pressure switch

D. Maintenance Instructions

D.1 Maintenance Requirements

Control 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 week • Lubrication of actuator-trapezoid thread spindle

D.2 Oil Circuit Maintenance

The laid down intervals must be heeded in order to avoid serious damage to the motor!

The first oil change should be carried out 35 hours after running time. Thereafter every 150 hours.

SAE 30 is to be used for temperatures over 20℃ and SEA 20 for temperatures between 5℃ and 20℃. Viscosity SAE 10W or 10W-30 is laid down for temperatures below 5℃.

Type and amount of required oil see:

Table F.3, “Engine oil,” on Page 102 and Table 10, “Technical Data,” on Page 100 and Table 11, “Technical Data,” on Page 101

An oil drainage hose is fitted in the sound cover for changing the oil. This is fed through the capsule to the outside.

Open the pass-through cover at the sound cover for the oil drain hose.

sample picture

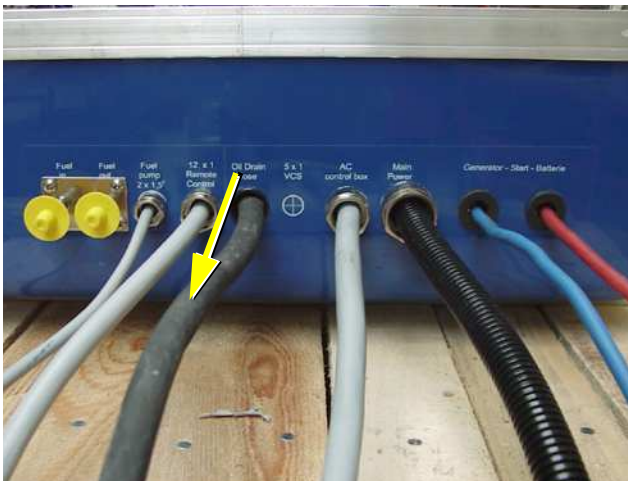


Fig. D.2-1: Oildrainhose

The oil can then be drained by opening the oil drainage screw.

sample picture

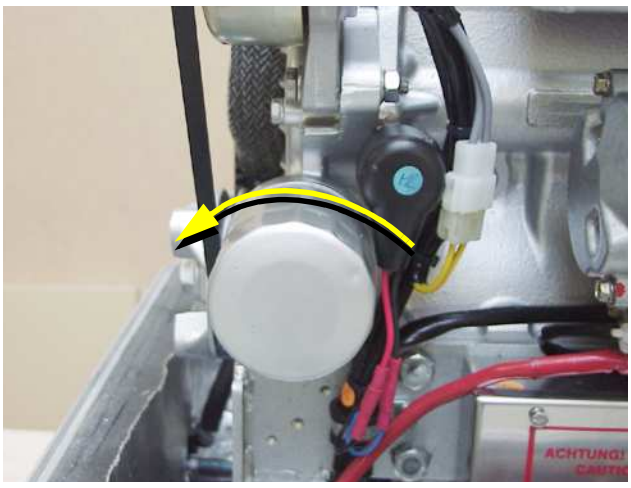
Fig. D.2-2: Oildrainhose

If the oil cannot be drained we recommend the use of a hand pump, which can be connected to the oil drainage hose.

The oil drainage screw is then closed again and the hose again stored in the sound-insulated capsule.

sample picture

Fig. D.2-3: Oilpump



The oil filter could be loosen by a tool (oil-filter strap)

sample picture

Fig. D.2-4: Oilfilter

Oil filter seal ring

Before reinsert the gasket of the new oil filter should be coated with something oil.

sample picture

Fig. D.2-5: Oilfilter seal ring

Oil filler neck

The new oil is filled here.

sample picture

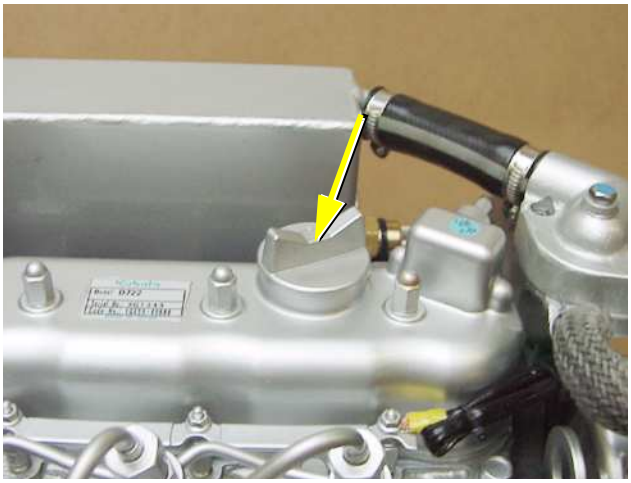


Fig. D.2-6: Oil filler neck

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

sample picture

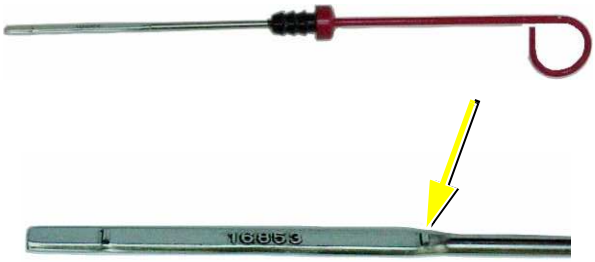
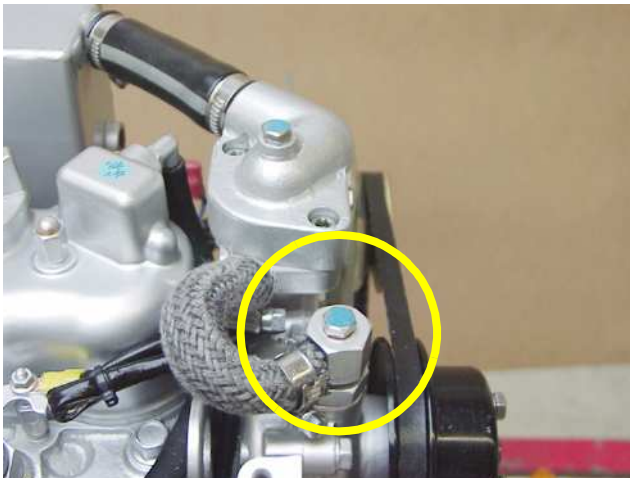


Fig. D.2-7: Oil dipstick

D.3 De-aerating of the coolant circuit

Particular hints for the de-aerating of the cooling system

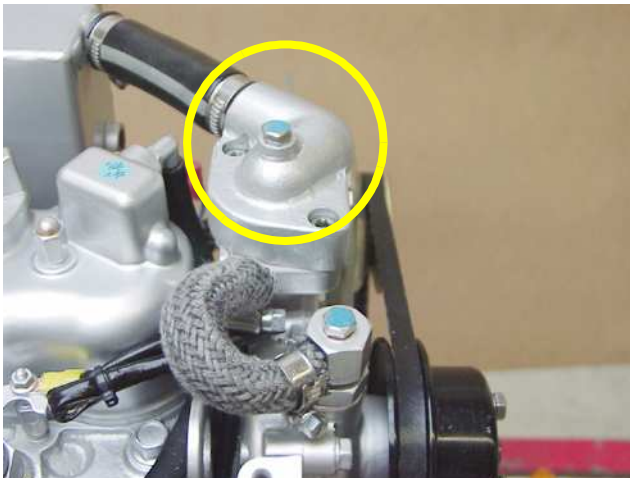
If the coolant has been drained or if air has permeated into the cooling system by other reasons, a careful ventilation of the cooling system is necessary. The de-aerating process has to be rerunned several times.



Open de-aerating screw at the cooling water pump.

sample picture

Fig. D.3-1: De-aerating screw



Open de-aerating screw at the thermostat-houing

sample picture

Fig. D.3-2: De-aerating screw

Open de-aerating screw at the watercooled silencer.

sample picture

Fig. D.3-3: De-aerating screw

Pour in coolant through the cooling water filler cap. The coolant flows in very slow.

sample picture

Fig. D.3-4: Cooling water filler cap

If it is to be recognized that the cooling water level does not sag any longer (with cold cooling water the cooling water level must cover the sheet metal in the exhaust elbow union), close the de-aerating screws and start the generator. Run the generator to maximally 60. Switch off generator.

Open the cooling water filler neck again and also the de-aerating screws at the same time.

Fill in again cooling water.

sample picture

Fig. D.3-5: Cooling water filler cap

Repeat this procedure several times.

The generator can be started for 5 minutes, if there is no change. De-aerating must be then repeated two or three times.

To be sure that the coolant circulates it is very important that the hose pipe away from the genset also gets warm. After a short time the radiator and the reverse-flow pipe from the radiator to the genset also get warm.

Please wait until the temperatures raise more and check if the fan will activate.

It makes sense to, once again, repeat the de-aerating procedure after a few days, in order to ensure that remaining air bubbles have been finally removed.

D.4 Air-bleeding of the Fuel System

Normally, the fuel system is designed to bleed out air itself i.e. as soon as the electric starter motor starts operation the fuel pump starts working and the fuel system will be air-bleed 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".

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).

sample picture

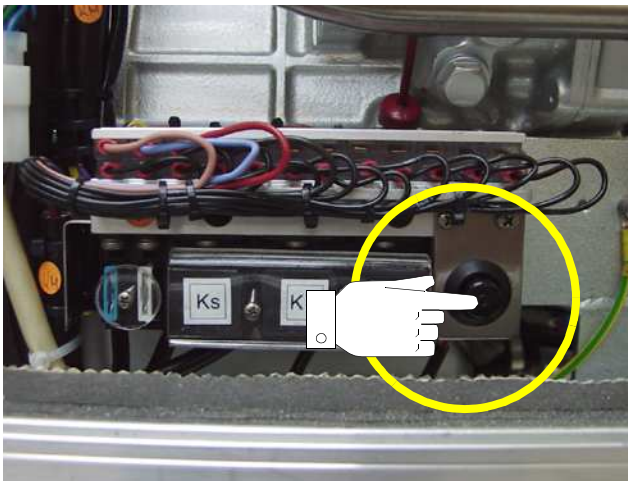


Fig. D.4-1: Failure bypass switch

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

sample picture

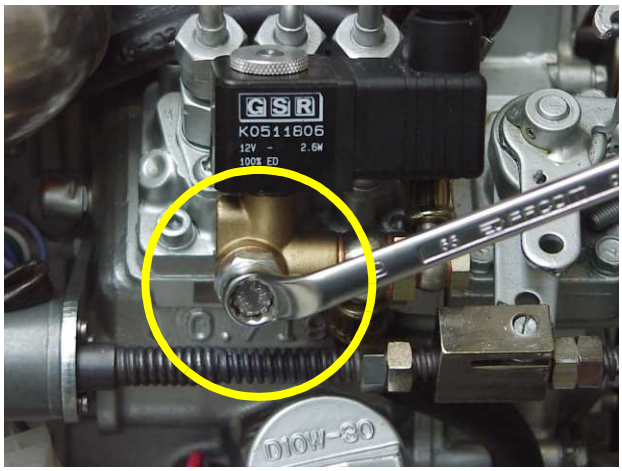


Fig. D.4-2: Fuel stop solonoid

4.) Now the unit can be started by pushing the "START"-button. The unit should start after a short while. Should the unit not start the pipe union nuts of the injection nozzles has to be loosen and lift the injection pipe a few millimeter. Try again to start the unit. After the unit has started the pipe union nut has to be tightened again.

sample picture

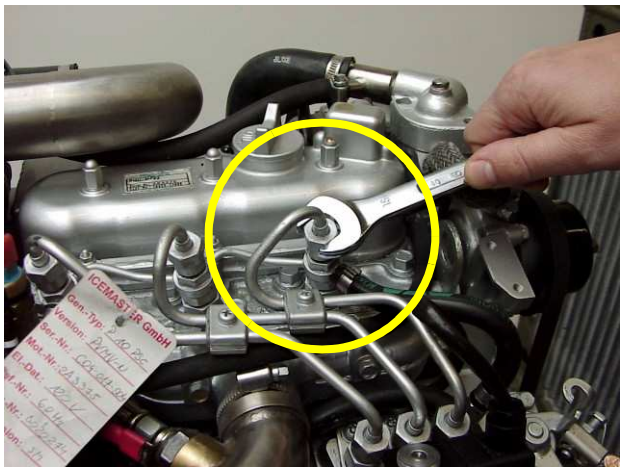
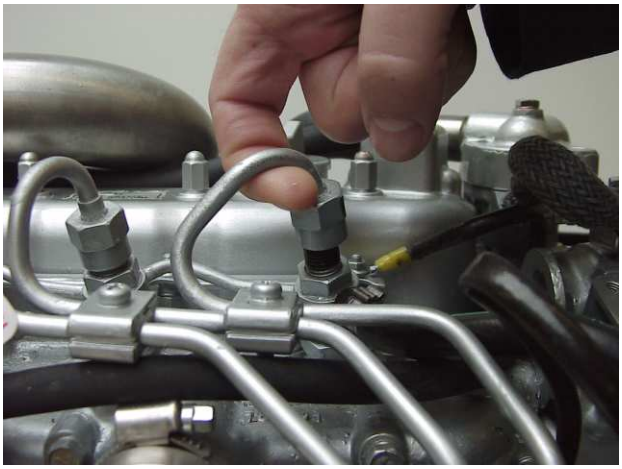


Fig. D.4-3: Injection nozzle



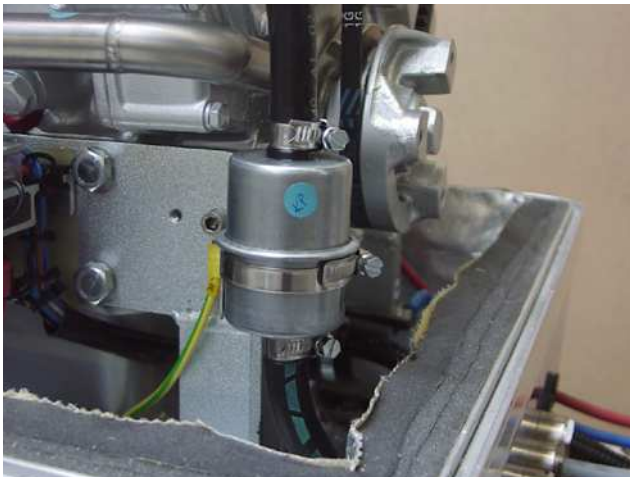
5.) The injection line must be raised some millimeters.

6.) Main power switch "OFF".

sample picture

Fig. D.4-4: Injection nozzle

D.4.1 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

sample picture

Fig. D.4.1-1: Fuel filter

D.5 Exchange the air filter

Open the combustion air housing by loosen the clamp at the cover.

sample picture

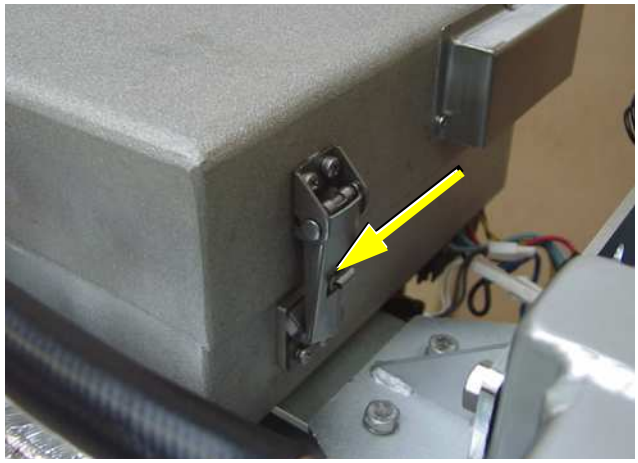


Fig. D.5-1: Air filter

Open the combustion air housing by loosen the clamp at the cover.

sample picture

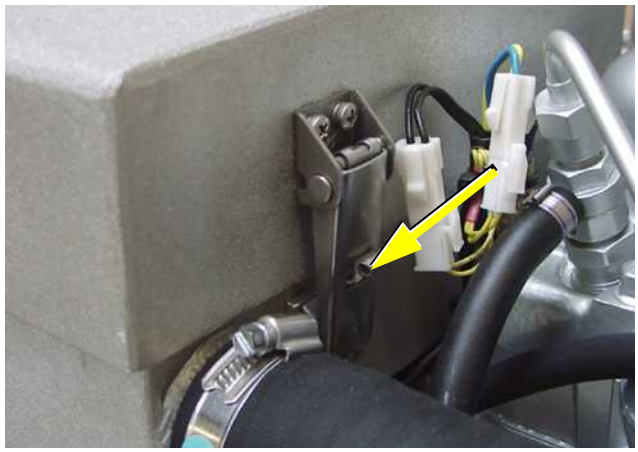


Fig. D.5-2: Airfilter

Loose the wing bolt and lift the frame that holds the air filter.

Change the air filter (MANN C2039).

sample picture

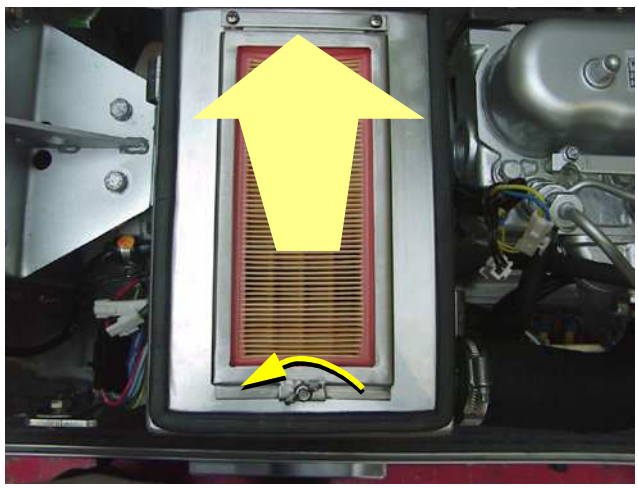
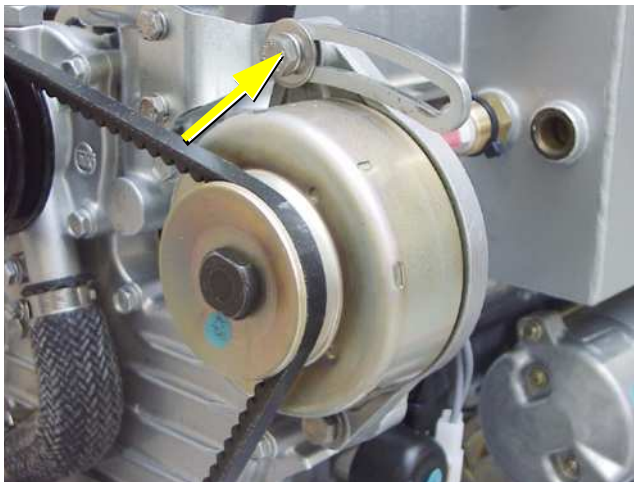


Fig. D.5-3: Air filter

D.6 Exchange of the V-belt

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.

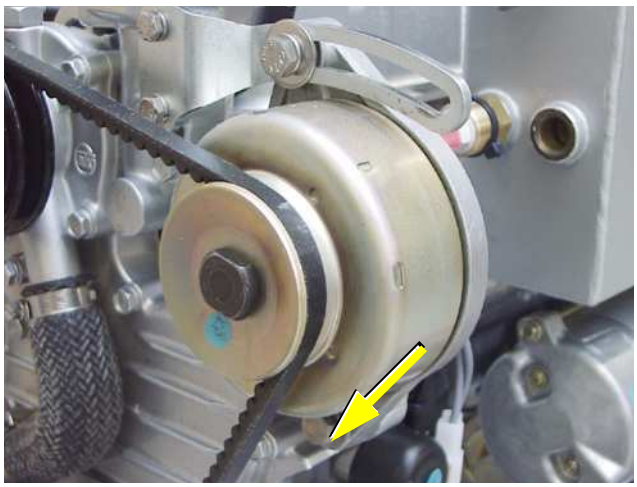
The v-belt must be controlled in a very short time interval. It can be happen to change the v-belt after some weeks because of unfavorably conditions. Therefore the control is needed in an interval of 150 operating hours. The v-belt ia a wearing part. It should be enough spare v-belts on board. We suggest to stand by the according service-packet.



Loosen the fixing screw above the alternator.

sample picture

Fig. D.6-1: Alternator fixing screw



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

sample picture

Fig. D.6-2: Alternator fixing screw

Press the alternator to the direction of the thermostat housing.

Now the v-belt can be changed:

Panda 8000-14000NE type: XPZ 850.

Panda 18NE-42NE type: XPZ 925.

sample picture

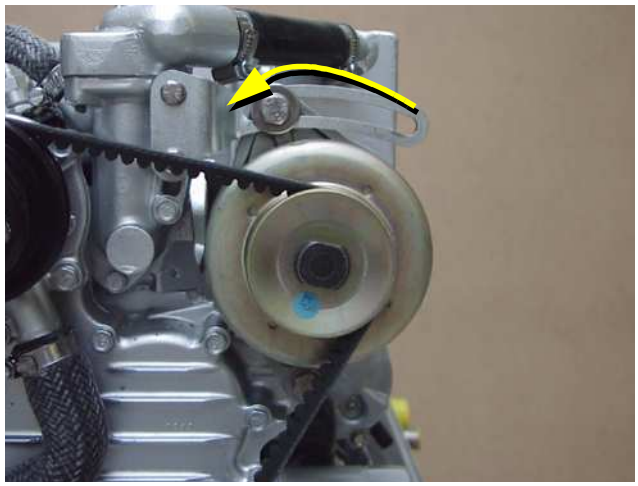


Fig. D.6-3: V-belt

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.

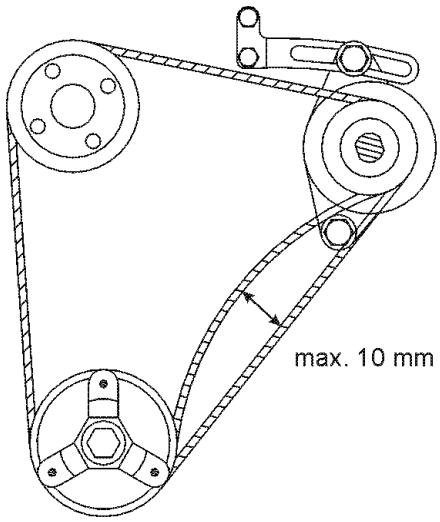


Fig. D.6-4: V-Belt

Blank

E. Generator Failure

E.1 Tools and measuring instruments

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

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

E.2 Overloading the Generator

Please ensure that the genset is not overloaded. This is especially the case with multi-power aggregates. Overloading occurs when the electrical load (demand) induces a load torque in the generator which is higher than what the diesel drive motor can provide. Overloading causes the engine to run rough, burn oil, create excessive exhaust (environmentally unfriendly) and even to stall.

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 power.

Bear this in mind when switching on electrical devices. This ensures a longer life expectancy.

Continuous performance is the uninterrupted running of the generator for many hours. 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.

Overloading the Generator with Electric Motors

Please note that electric motors require six to ten times more power than their rated capacity to start.

If the supplied generator power is lower than what the electric motor requires, the generator voltage will collapse. For applications where a high current draw is required to start an electrical device (such as an electric motor), the motor manufacturer should be consulted for possible solutions (for example: stronger capacitors, gradual power-up switches, or a specially designed starting unit for electric motors).

System efficiency can be improved by up to 50% and motor current draw (to start) reduced by as much as 100% if it is properly designed. If the inductive load (i.e. E-Motor) is more than 20% of the generator nominal power, a compensation is necessary. See also the information brochure "Special information for operation of Panda generators with inductive load".

E.2.1 Generator Voltage Fluctuations and Monitoring

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

During periods of high electric loading, the voltage may drop to 190V/50Hz (or 95V/60Hz) or even lower. Such voltage drops can potentially cause damage to certain electrical devices such as electric motors, compressors and electronic equipment. In order to ensure that sufficient voltage is available and to avoid the risk of damage to sensitive electrical devices, the supply voltage should be monitored with the voltmeter, which is mounted at the operation unit.

The voltmeter must be respectively checked if additional load is switched on. As long as the voltage remains below the critical level the sensitive devices must be switched off during this period.

Overvoltage can be caused by the generator under certain circumstances. This occurs, especially if the speed of the motor changes (increases in speed). Adjustment to the normal motor speed (rpm) should only be done with the use of a rev counter and/or a voltmeter.

A voltage regulated circuit breaker is installed in the electrical system in order to avoid damage, if sensitive or valuable equipment is used. (voltage control with circuit breaker).

E.2.2 Automatic Voltage Monitoring and Auto-Shut Down

If air conditioning units (compressors) or other such valuable equipment are installed on-board, an automatic voltage monitoring unit should be installed to protect this equipment from possible sharp voltage drops. The voltage monitoring system shuts down the entire system (and therefore all users) through a circuit breaker relay as soon as the voltage falls below a set value (the monitor will also shut down the on board grid automatically when the generator is stopped). The monitoring system also switches the grid back on once the required voltage level is again reached. This ensures no damage is caused to the load and fittings through undervoltage. Such a voltage relay can be obtained from wholesale dealers or as a complete unit from PANDA dealers.

The circuit is always automatically cut off if the generator is stopped.

E.3 Adjusting Instructions for the Spindle of the actuator (not ND models)

There are two independent regulation devices for the speed range of the generator. Limited upward and downward:

With the regulation nuts at the spindle of the actuator left and right of the spindle nut.

With an adjusting screw directly at the base of the speed regulator lever. (only up)

After all work at the components of the speed regulation is done the adjustment of the limitation must be checked.

1. Actuator
2. Spiral thread spindle
3. Regulating nuts for max. speed
4. Spindle nut with speed regulator level
5. Regulating nuts for min. speed

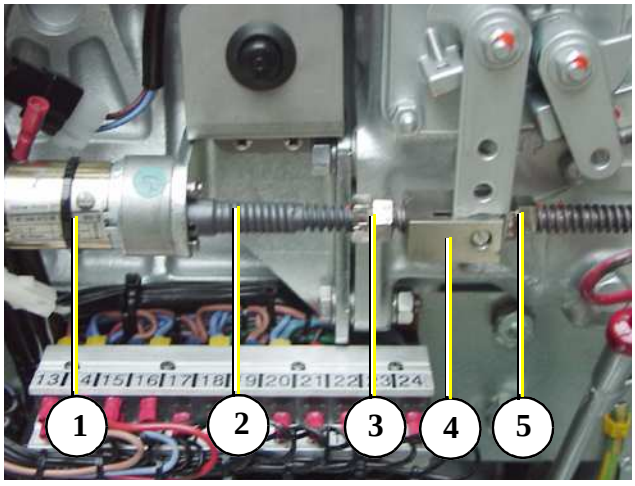


Fig. E.1: Actuator

During any operation at the generator all consumers have to be switched off to avoid damages at the equipments. Also the solid state relay, which is installed in the AC-control box must be disconnected to avoid an accidentally activation of the booster capacitors.

E.3.1 Adjustment of the maximum upper speed

1. Disconnect the plug at the electrical supply line of the actuator.
2. Unclamp the countering nut at the limitation screw with a wrench SW 10.
3. Connect an electrical voltage instrument (voltmeter) with a display range until 300V AC to AC outlet in the electrical cabinet.
4. Be sure that no electrical load is adjusted.
5. Start the generator.
6. Increase the speed of the generator by turning the spindle of the actuator manually until the voltmeter reach a value of 270V.
7. Turn the limit stop screw tight against the limit stop point at the speed regulator lever.
8. Protect the limit stop screw with the countering nut.
9. Check again if the voltage of the generator is limited to max. 270V without load.

The adjustment of the upper limitation of the rev serves an additional safety. The value of the max. voltage lies above the normal operating border.

1. Countering nut
2. Adjusting screw for upper limitation
3. Speed regulator lever

This adjustment should not be changed, otherwise the warranty expires.

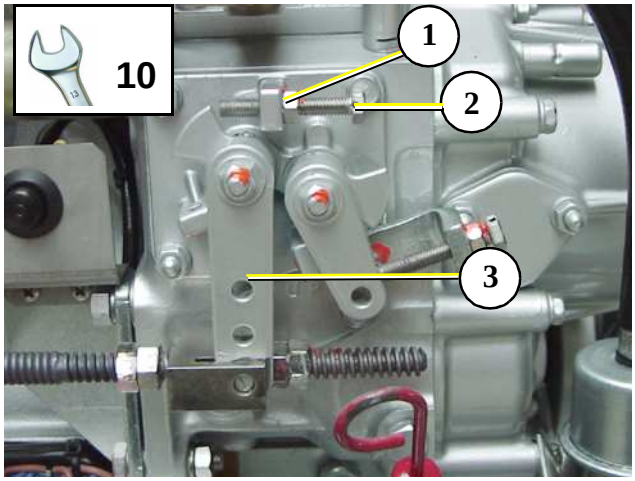


Fig. E.2: Max speed set

E.3.2 Adjustment of the normal speed limitation

Adjusting the lower limitation:

1. Disconnect the plug at the electrical supply line of the actuator.
2. Unclamp the countering nuts with two wrench SW 14.
3. Connect an electrical voltage instrument (voltmeter) with a display range until 300V AC to AC outlet in the elektrical cabinet.
4. Be sure that no electrical load is adjusted.
5. Start the generator.
6. Decrease the rev of the generator by turning the spindle of the actuator manually until the voltmeter reach a value of 220V.
7. Both nuts must be screwed tight.
8. Check again if the lower voltage of the generator is limited to min. 220V without load.

Adjusting the upper limitation:

1. Proceed like before and tighten the countering nuts at a voltage of max. 270V without load.
2. Check again if the upper voltage of the generator is limited to this value.

1. Adjusting nut for upper speed limitation
2. Adjusting nut for lower speed limitation

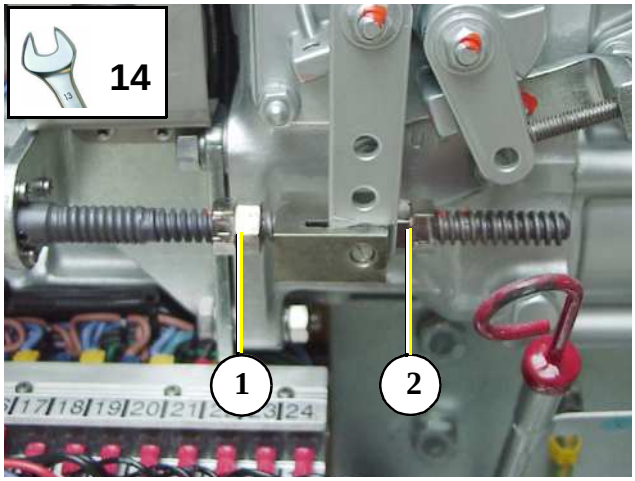


Fig. E.3: upper speed limitation

If the adjustment is finished the plug of the actuator must be re-connect for operation.

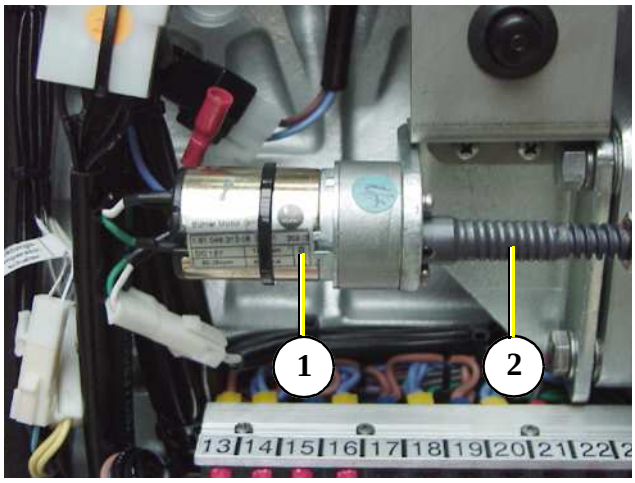
Re-connect the connections if the electrical supply lines in the AC-control box were also be disconnected.

E.3.3 Lubrication of the spiral thread spindle (not ND models)

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

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

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



1. Speed actuator
2. Spiral thread spindle

Fig. E.4: Actuator

E.3.4 Effects of a overload to the actuator(not ND models)

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 aggregate was overloaded for a short time and if thereby the winding of the actuator was damaged. Then the actuator has to be changed.

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

Change this fuse (1,6A slow to blow)

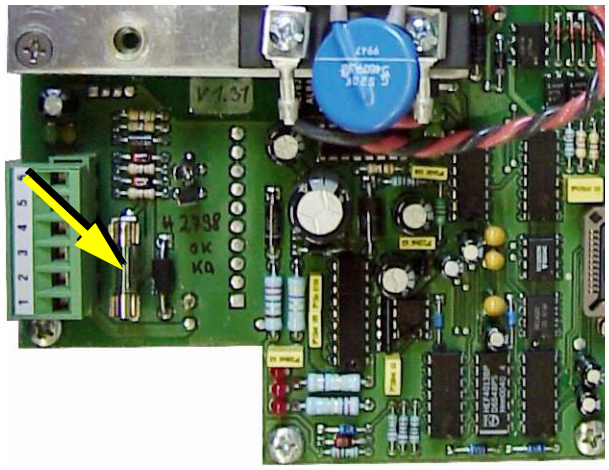


Fig. E.5: VCS

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 consumers 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 230V AC 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 consumers.
2. Disconnect the plug of the actuator.
3. Turn the actuator manually to check if the adjusting nut is jamed to the limit stop points.
4. Turn the actuator manually to check if the adjusting nut on the spindel runs faultless.

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

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

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

1. The motor turns not strongly rather weak:

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

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

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

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

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

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

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

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

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

1. Disconnect the plug of the actuator.

2. Switch off all consumers.

3. Connect an electrical voltmeter.

4. Start the generator.

5. Turn the actuator manually to the lower limit stop point.

6. The voltage must be 220V.

7. Turn the actuator manually to the upper limit stop point. The max. voltage is 270V.

8. A new adjustment is necessary in case of deviants.

Over-/undervoltage switch off

It ensures that the generator is switched off during a pre-defined over and/or undervoltage. This represents a kind safety attitude, which prevent large voltage outbreaks opposite consumers.

In cases, in which it is wished that the generator supplies briefly importantly more power; e.g. to start large engines, the voltage monitor can be deactivated by short circuit a cable. Cable for the over / undervoltage monitoring (blue); Plug red.

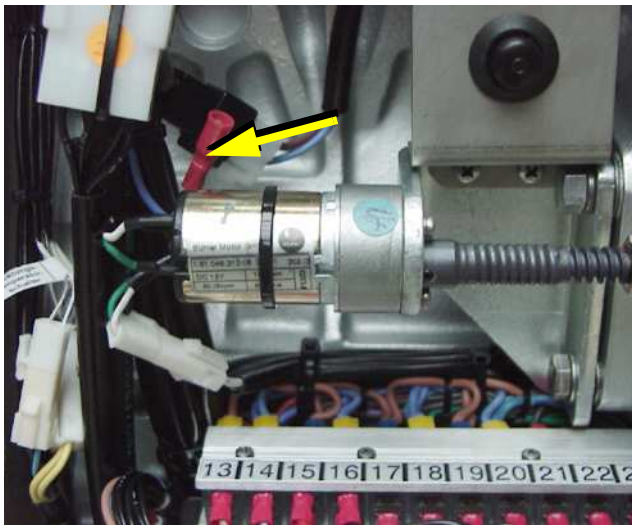


Fig. E.6:

E.4 Low Generator-Output Voltage

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

E.4.1 Discharge the capacitors

ATTENTION! Never work at the electrical cabinet, when the generator is running! Do not contact the capacitor. Before working on the system read the section “Safety first” on Page 6.

1) Switch off generator

2) Disconnect starter battery

3) Open AC-Control box

The capacitors are discharged, by short circuit the two contacts. In addition use the cone end of an isolated screwdriver.

Fig. E.4.1-1: Capacitor

E.4.2 Checking the Capacitors

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

Do not check the capacitors whilst the generator motor is running! Charged capacitors can be lethal. Do not contact the capacitors with bare fingers or non-insulated metallic objects! In order to test the capacitors, the terminal lead wires have to be disconnected using pliers or a screwdriver with insulated handle(s). Once the wires have been removed, the capacitors must discharged by bridging the capacitor terminals together with a slot screwdriver with an isulated handle.

Discharge the capacitor

1. Screw driver blade
2. Capacitor connections
3. Capacitor

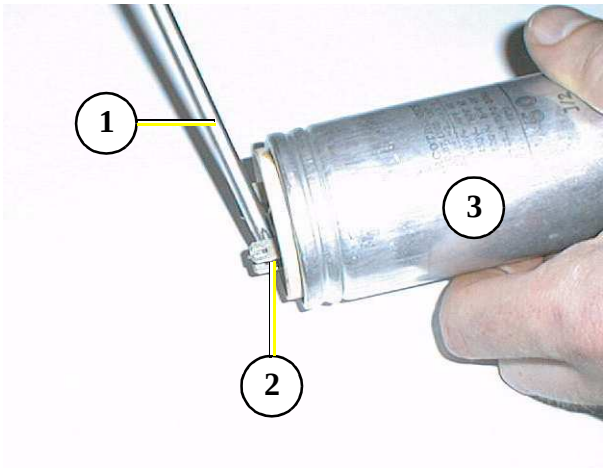


Fig. E.4.2-1: Capacitor

The capacitors can be checked using a normal multimeter with a continuity beeper. Check that the multimeter "beeps" when the selector is set to continuity and the end probes are contacted together.

Checking

Switch the multimeter to „Continuity: acoustic signal“ and touch both capacitor terminals with the meter end probes.

Fig. E.4.2-2: Capacitor

Test each capacitor by touching the multimeter (set on "continuity") end probes on the capacitor terminals: only a brief "beep" should be audible from the multimeter.

Once this has been done, reverse the end probe positions and repeat the check. (The multimeter battery charges the capacitor and then the capacitor discharges quickly. The discharge to the multimeter "closes" the circuit briefly and continuity is achieved for a brief instant causing the short "beep".)

If there is no beep at all or there is a continuous beep, then the capacitor(s) is faulty and needs to be replaced.

E.4.3 Checking the generator voltage

In order to test, whether the fixed winding produces enough voltage, proceed in such a way:

1. Guarantee that the connection to the electrical system is interrupted.
2. Remove all conductions in the power terminal box of the generator.
3. Starter battery must be connected with the generator.
4. Start the generator start.
5. Measure with a voltmeter the votage between the phase(s) and N. If the measured values are under the substantially values in Table 5, “Voltage values stator coil,” on Page 97, a coil damage is to be accepted.

During the measurement in the 60Hz version both partial coils must be interconnected, i.e. a connection must be provided between line 1 and line 3. (see wiring diagram)

(notes: the voltage results from the remainder magnetism of the rotor, which induced a voltage in the coil.)

E.4.4 Measuring the coil resistance

For this a measuring instrument must be used that is suitable for low impedance values.

- Adjust the measuring instrument to resistance test. If hold the poles of the measuring instrument hold together, 0.00 ohms should be indicated. If the poles are isolated, the display should indicate an overflow. Please implement this test, in order to examine the equipment.
- Measure of the resistance within the individual windings.

If strong deviations in the individual coils are measured, must assumed that there is a coil short-circuit in a coil. This leads to the fact that the generator does not excite itself any longer.

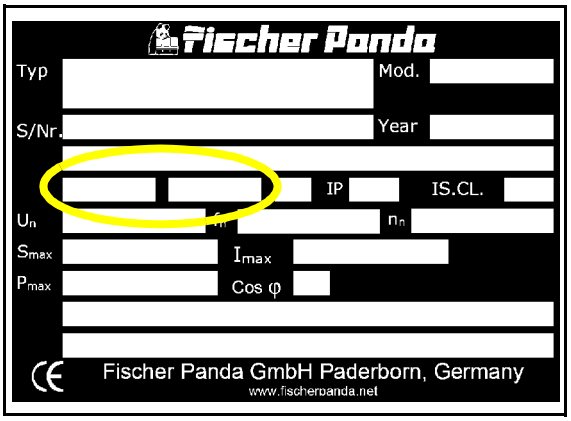
The actual values between the coils and ground are not to be determined exactly. It depends primarily on the fact that the values of all three measurements are close to the same. Deviations among themselves refer to a coil short-circuit. In this case the generator must be wound again by a specialist.

E.4.5 Checking the coil(s) to short-circuit

In order to check the coils for short-circuit, first all lines, which lead to the electrical system, must be interrupted. This happens on the power terminal box of the generator or, if available, in the electrical system junction box. Guarantee that no voltage lies at the lines, before they are interrupted (see “Discharge the capacitors” on Page 83.).

Now remove the bridge between "N" and "PE", so that coils and housing are electrically separate from each other.

Check with a circuit indicator (multimeter) in the power terminal box if between the individual connection points of the coil and the housing (PE) a pass exists.



The contacts which can be measured depend on the type of the generator (see identification plate):

HP1 - 50Hz: L, Z

HP1 - 60Hz: L, Z

HP3 - 50Hz:: L1, L2, L3

HP3 - 60Hz:: L1, L2, L3, 1, 2, 3 , 4

DVS - 50Hz : L1, L2, L3, L1’

DVS - 60Hz : L1, L2, L3, L1’, 1, 2, 3, 4

If a pass (beep) should be determined, the generator must be returned for examination in the plant, or it can also be wound again locally. For this coil datas can be requested.

E.4.6 Measuring the inductive resistance

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

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

The arranging value for the inductive resistance can take from the Table 2, “Inductance generator coil HP1,” on Page 96.

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

E.5 Generator provides no Voltage

E.5.1 Rotor Magnetism Loss and "Re-magnetizing"

After having stood idle for a longer period of time, or after having been shut down abruptly from operating under a heavy electrical load, most asynchronous generators have difficulties achieving full excitation independently. The remaining rotor magnetism is lost.

ATTENTION! Before working on the System read the section "Safety Instructions" in this Manual.

The magnetism required for excitation can be easily restored using a simple DC Battery. The generator must be stopped to do this, that means the starter may not be actuated. DC is fed to a desired part of the winding from the exterior for a short period. This can, for example, be carried out for by feeding DC to the windings from both terminals of a 230V (115V) socket of the vehicles system. (This, of course, can only happen if there is no connection to any power source). There must be a connection between socket and the generator (see diagram below). It suffices if DC is applied for a short period (1-2 seconds). The remaining magnetism can be restored and the generator can be started in the normal manner again.

ATTENTION!

Before this procedure is performed to restore the magnetic field, it is crucial to ensure that the generator is not running! (otherwise, it is very DANGEROUS TO LIFE!)

Initializing the magnetic field in the windings through external current from a 4,5 - 9 volt battery. (No car-battery !)

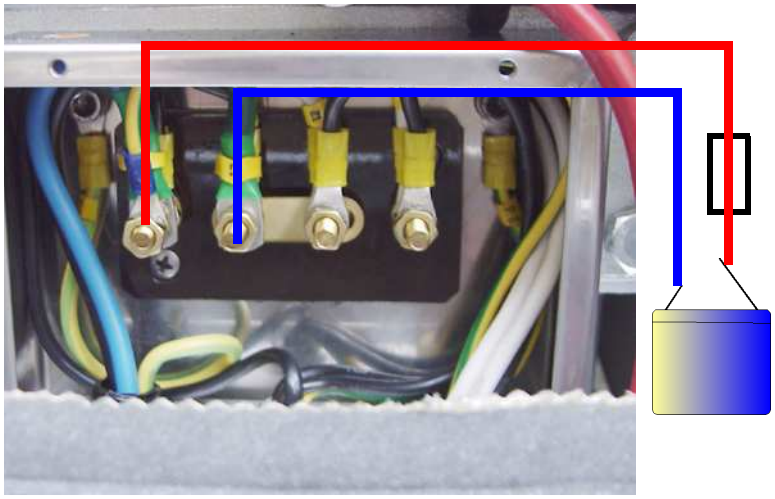


Fig. E.5.1-1: Generator termination box

E.6 Starting Problems

E.6.1 Fuel Solenoid Valve

All engines are equipped with an electric inlet fuel solenoid valve (12V) which switches off the motor.

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.

01. Fuel solenoid valve

02. Fuel injector line

03. Ventilation screw

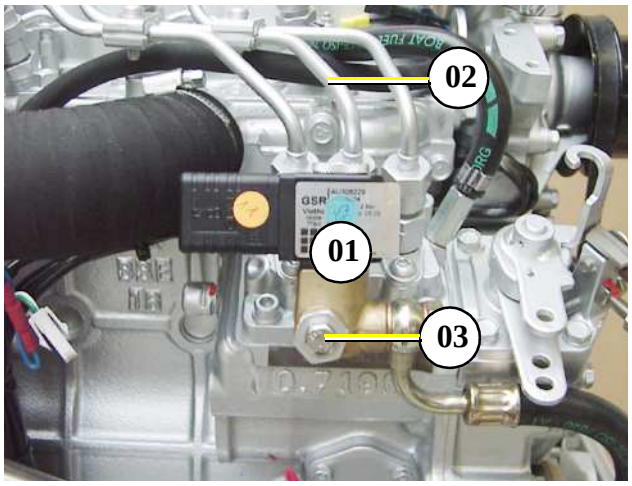


Fig. E.6.1-1: Fuel solonoid

E.6.2 Failure Bypass Switch

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

Failure bypass switch

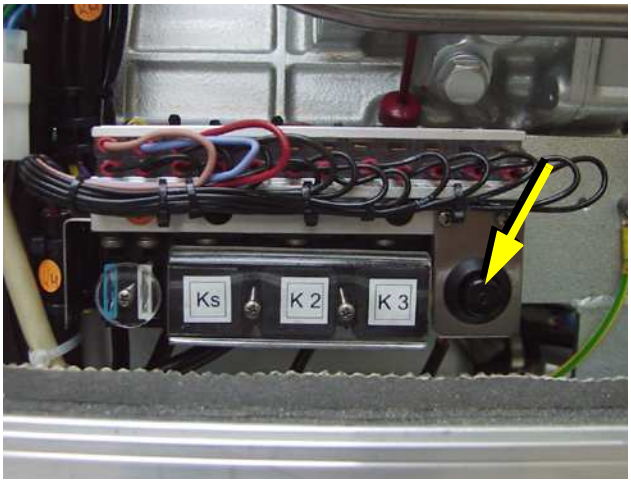


Fig. E.6.2-1: Failure bypass switch

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

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

BEWARE:

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

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

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

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

E.6.3 Stop solenoid

There are two different variations:

A. Energized to stop

By pressing the „OFF“-button on the remote control panel the stop solenoid is supplied with voltage and operate, through this the injection nozzles resets to zero position and the generator stops.

B. 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 off once the final position has been reached, which is maintained by the stop solenoid for as long as the generator is running

.ATTENTIONT

When starting the "START"-button may not be pressed longer than 5 sec., because the stop solenoid pulls too much current over the starter. Otherwise the stop solenoid must be disconnected.

Stop solenoid (optional)

Fig. E.6.3-1: Stop solonoid

Damage to starter motor

The starter is fitted with a free wheel or axial rotating spring cog, which prevents the starter being driven externally by means of the motor. The free wheel will be heavily worn, if the starter still operates, thereby causing damage to the springs, roller bearings or cog teeth. This could lead to complete destruction of the starter.

It is important that every person who operates the generator is informed of this situation. This is practically the only handling error that can be made on board that can lead to fatal consequences for both generator and operator.

E.7 Troubleshooting Table

For Troubleshooting see Table F.1, “Troubleshooting,” on Page 91

F. Tables

F.1 Troubleshooting

GENERATOR OUTPUT VOLTAGE TOO LOW For 50Hz versions: less than 200V For 60Hz versions: less than 100V	
Cause	**Solution**
Generator is overloaded.	Reduce the electrical load. (Switch off load)
Motor is not reaching the rated rpm.	Refer to "motor faults" section.
Defective capacitor(s).	Check capacitors and replace if necessary.

GENERATOR VOLTAGE TOO HIGH (MORE THAN 240V-50Hz / 135V-60Hz) If the generator is providing excessively high voltage, the following potential causes should be investigated:	
Cause	**Solution**
Over-energizing due to wrong capacitors.	Check capacitors type and replace if necessary.
Measurering voltage on the VCS circuit board is missing.	Check VCS System, check cable connections.
Motor is running too fast (rpm too high).	Check motor speed with rpm-meter or frequency meter and adjust to proper speed under "zero" electrical load: (3120 rpm-50Hz / 3720 rpm-60Hz). Inspect ESC or VCS Systems if installed.

GENERATOR VOLTAGE FLUCTUATES	
Cause	**Solution**
1. Disturbances on the electrical system/user side. 2. Motor disturbances.	1. Check if electrical load is fluctuating. 2. Refer to section: "Motor runs irregular".

GENERATOR NOT ABLE TO START ELECTRIC MOTOR	
Cause	**Solution**
If the generator is unable supply enough power to start an electric motor (120V-60Hz or 231V-50Hz), it is usually because the motor draws too much current during starting process.	Check the motor's current draw required for starting (switch to 380V if possible). This could be remedied by providing stronger capacitors or installing an optional "Easy Start Booster Set". (See App. G) Enquire at your nearest Panda dealer or directly at the manufacturer.

DIESEL MOTOR FAILS TO START	
Cause	Solution
Starter battery switched "OFF".	Check position of battery switch and switch "ON" (if installed).
Starter battery voltage insufficient (battery too weak).	Inspect battery terminals and cables for a good electrical connection (Inspect against corrosion, tattered wires, etc.).
Starting current disrupted.	During the normal starting process, the battery voltage drops to 11V with a fully charged battery. If the voltage does not drop during starting, the electrical connection is faulty. If the battery voltage drops lower than 11V, then the battery has been discharged.

STARTER IS TURNING MOTOR, BUT FAILS TO START	
Cause	Solution
Fuel inlet solenoid valve not opening.	Check wire connections and circuitry to solenoid valve. (ref. DC wiring diagram: Relay K2, Fuse)
Fuel pump not working.	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 "Bleeding Air from Fuel System").
Fuel-filter blocked.	Replace fuel filter.
Low compression pressure.	See Kubota motor-manual.

MOTOR DOES ACHIEVE ENOUGH SPEED DURING 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.

MOTOR SPEED DROPS	
Cause	Solution
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 RUNS IN OFF POSITION	
Cause	Solution
Fuel inlet 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). Is indicated on the remote control panel.	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 faulty.	Replace injector.
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 manaul.

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 - leakage in the cooling water system.	Refer to respective section of manual and if necessary, have repaired by Kubota-Service, or Panda representative.

Troubleshooting VCS System:	
Cause	Solution
Throttle control servo motor does not move.	Check voltage supply and wire connections to servo motor. Motor connected? Check 230V connection to VCS.

Servo motor sets trottle too high or too low.	Check that the wires to the servo motor are connected properly (±). Check 230V 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. 1. Loosen the connecting rods motor from the injection pump regulator and turn screw to a max. voltage of 240V. or 2. Loosen the connecting plugs of the Motor VCS electronic and turn the motor direct by hand.	

Table 1: Resistor generator coil HP1

	L-N[Ohm]	L-Z[Ohm]
Mains	120V / 60Hz	
Panda 8000 Panda 9000 Panda 12000 Panda 18 Panda 24	ca. 0,7 ca. 0,65 ca. 0,45 ca. 0,2 ca. 0,06	ca. 0,7 ca. 0,65 ca. 0,45 ca. 0,2 ca. 0,06
Mains:	230V / 50Hz	
Panda 8000 Panda 9000 Panda 12000 Panda 14000 Panda 18 Panda 24 Panda 30	ca. 0,9 ca. 0,8 ca. 0,3 ca. 0,25 ca. 0,25 ca. 0,17 ca. 0,1	ca. 0,9 ca. 0,8 ca. 0,3 ca. 0,25 ca. 0,25 ca. 0,17 ca. 0,1

Table 2: Inductance generator coil HP1

	L-N[Ohm]	L-Z[Ohm]
Maint	120V / 60Hz	
Panda 8000 Panda 9000 Panda 12000 Panda 18 Panda 24	ca. 2,8 ca. 2,8 ca. 3,5 ca. 3,2 ca. 0,3	ca. 2,8 ca. 2,8 ca. 3,5 ca. 3,2 ca. 0,3
Mains	230V / 50Hz	
Panda 8000 Panda 9000 Panda 12000 Panda 14000 Panda 18 Panda 24 Panda 30	ca. 3,7 ca. 3,7 ca. 3,5 ca. 2,3 ca. 1,8 ca. 1,3 ca. 0,9	ca. 3,7 ca. 3,7 ca. 3,5 ca. 2,3 ca. 1,8 ca. 1,3 ca. 0,9

Table 3: Resistore generator coil DVS

	L1-N[Ohm]	L2-N[Ohm]	L3-N[Ohm]	L1'-N[Ohm]	1-2[Ohm]	3-4[Ohm]
Mains	120V / 60Hz					
Panda 8000 Panda 9000 Panda 12000 Panda 18 Panda 24	ca. 0,7 ca. 0,65 ca. 0,45 ca. 0,2 ca. 0,06	ca. 0,7 ca. 0,65 ca. 0,45 ca. 0,2 ca. 0,06	ca. 0,7 ca. 0,65 ca. 0,45 ca. 0,2 ca. 0,06	ca. 0,15 ca. 0,17 ca. 0,15 ca. 0,05	ca. 0,15 ca. 0,17 ca. 0,15 ca. 0,05	
Mains:	230V / 50Hz					
Panda 8000 Panda 9000 Panda 12000 Panda 14000 Panda 18 Panda 24 Panda 30	ca. 0,9 ca. 0,8 ca. 0,3 ca. 0,25 ca. 0,25 ca. 0,17 ca. 0,1	 ca. 0,25 ca. 0,25 ca. 0,17 ca. 0,1	ca. 0,9 ca. 0,8 ca. 0,3 ca. 0,25 ca. 0,25 ca. 0,17 ca. 0,1	 ca. 0,12 ca. 0,1 ca. 0,1 ca. 0,08	ca. 0,9 ca. 0,8 ca. 0,3	ca. 0,4 ca. 0,4 ca. 0,2

Table 4: Inductance generator coil DVS

	L1-N[mH]	L2-N[mH]	L3-N[mH]	L1'-N[mH]	1-2[mH]	3-4[mH]
Mains	120V / 60Hz					
Panda 8000 Panda 9000 Panda 12000 Panda 18 Panda 24	ca. 2,8 ca. 2,8 ca. 3,5 ca. 3,2 ca. 0,3	ca. 2,8 ca. 2,8 ca. 3,5 ca. 3,2 ca. 0,3	ca. 2,8 ca. 2,8 ca. 3,5 ca. 3,2 ca. 0,3	ca. 0,8 ca 1,0	ca. 0,8 ca. 0,9 ca. 1,0 ca. 0,4	 ca. 0,9 ca. 0,4
Mains:	230V / 50Hz					
Panda 8000 Panda 9000 Panda 12000 Panda 14000 Panda 18 Panda 24 Panda 30	ca. 3,7 ca. 3,7 ca. 3,5 ca. 2,3 ca. 1,8 ca. 1,3 ca. 0,9	ca. 3,7 ca. 3,7 ca. 3,5 ca. 2,3 ca. 1,8 ca. 1,3 ca. 0,9	ca. 3,7 ca. 3,7 ca. 3,5 ca. 2,3 ca. 1,8 ca. 1,3 ca. 0,9	ca. 2,3 ca. 2,3 ca. 2,3 ca. 1,5 ca. 1,1 ca. 0,8 ca. 0,6		

Table 5: Voltage values stator coil

Terminal	Panda 8000	Panda 9000	Panda 12000	Panda 14000	Panda 18	Panda 24	Panda 30
L1 - L2	3-5 Volt	4-6 Volt	5-7 Volt	6-9 Volt	6-10 Volt	6-11 Volt	7-12 Volt
L2 - L3	3-5 Volt	4-6 Volt	5-7 Volt	6-9 Volt	6-10 Volt	6-11 Volt	7-12 Volt
L3 - L1	3-5 Volt	4-6 Volt	5-7 Volt	6-9 Volt	6-10 Volt	6-11 Volt	7-12 Volt
L1' - N (50Hz)	~ 2-3 Volt	~ 2-3 Volt	~ 3-4 Volt	~ 3-5 Volt	~ 3-5 Volt	~ 3-5 Volt	~ 3-6 Volt
4 - 2 (60Hz)	~ 2-3 Volt	~ 2-3 Volt	~ 3-4 Volt		~ 3-5 Volt	~ 3-5 Volt	

Table 6: Voltage values stator coil

Terminal	Panda 8000	Panda 9000	Panda 12000	Panda 14000	Panda 18	Panda 24	Panda 30
L - N	~ 2-3 Volt	~ 2-3 Volt	~ 3-4 Volt	~ 3-5 Volt	~ 3-5 Volt	~ 3-5 Volt	~ 3-6 Volt
4 - 2 (60Hz)	~ 2-3 Volt	~ 2-3 Volt	~ 3-4 Volt		~ 3-5 Volt	~ 3-5 Volt	

Table 7: Diameter of conduits

Generator type	Cooling water	Exhaust	Fuel	
			Feed	Return
Panda PVMV-N 8000 NE	25mm	40mm	8mm	8mm
Panda PVMV-N 9000 ND	25mm	40mm	8mm	8mm
Panda PVMV-N 12000 NE	25mm	40mm	8mm	8mm
Panda PVMV-N 14000 NE	25mm	40mm	8mm	8mm
Panda PVMV-N 18 NE	25mm	40mm	8mm	8mm
Panda PVMV-N 24 NE	25mm	40mm	8mm	8mm
Panda PVMV-N 30 NE	30mm	40mm	8mm	8mm
Panda PVMV-N 32 KU NE	30mm	50mm	8mm	8mm
Panda PVMV-N 42 KU NE	-	-	8mm	8mm

Table 8: Rated current

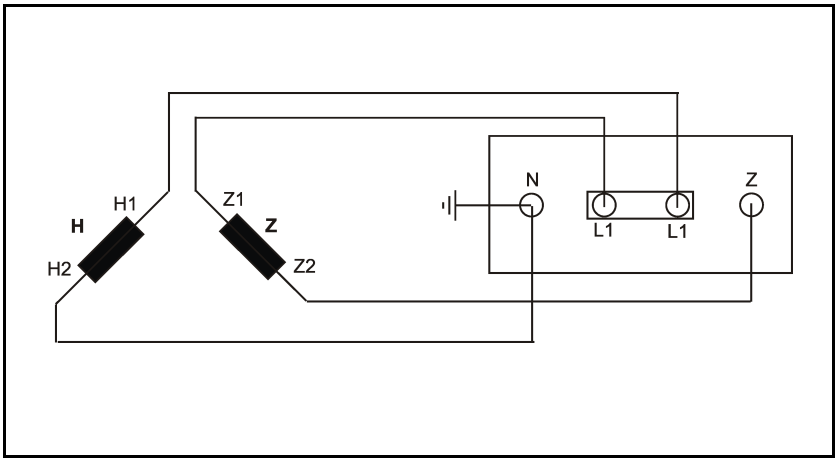
Panda 8000 - 230 V / 50 Hz Panda 8000 - 400 V / 50 Hz Panda 8000 - 120 V / 60 Hz	27,0 A 8,3 A 61,8 A		Panda 18 - 230 V / 50 Hz Panda 18 - 400 V / 50 Hz Panda 18 - 120 V / 60 Hz	60,3 A 20,0 A 128,0 A
Panda 9000 - 230 V / 50 Hz Panda 9000 - 400 V / 50 Hz Panda 9000 - 120 V / 60 Hz	34,9 A 11,1 A 74,5 A		Panda 24 - 230 V / 50 Hz Panda 24 - 400 V / 50 Hz Panda 24 - 120 V / 60 Hz	89,1 A 30,1 A 161,1 A
Panda 12000 - 230 V / 50 Hz Panda 12000 - 400 V / 50 Hz Panda 12000 - 120 V / 60 Hz	41,7 A 13,7 A 89,0 A		Panda 30 - 230 V / 50 Hz Panda 30 - 400 V / 50 Hz Panda 30 - 120 V / 60 Hz	Anfrage 35 A 219 A
Panda 14000 - 230 V / 50 Hz Panda 14000 - 400 V / 50 Hz Panda 14000 - 120 V / 60 Hz	48,0 A 15,2 A 112,7 A			

Table 9: Cable cross-section

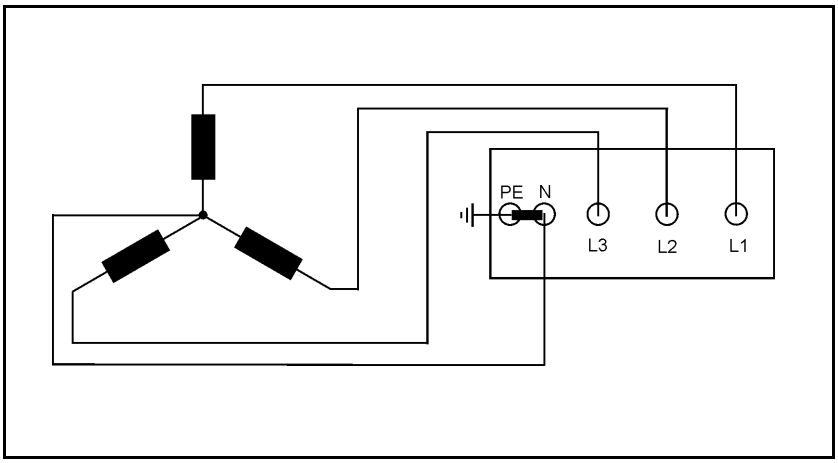
Voltage	Required cable cross-section						
	< 6 kW	6-10 kW	10-15 kW	15-20 kW	20-35 kW	35-45 kW	45-65 kW
120V 1-ph.	4x6mm²	4x10mm²	4x16mm²	4x25mm²	4x35mm²	4x50mm²	4x70mm²
230V 1-ph.	2x4mm²	2x6mm²	2x10mm²	2x16mm²	2x25mm²	2x35mm²	2x35mm²
400V 3-ph.	4x2,5mm²	4x4mm²	4x6mm²	4x10mm²	4x16mm²	4x16mm²	4x25mm²

F.2 Types of coil

HP1 - 230V / 50 Hz



HP3 - 400V / 50



DVS - 400V / 50 Hz

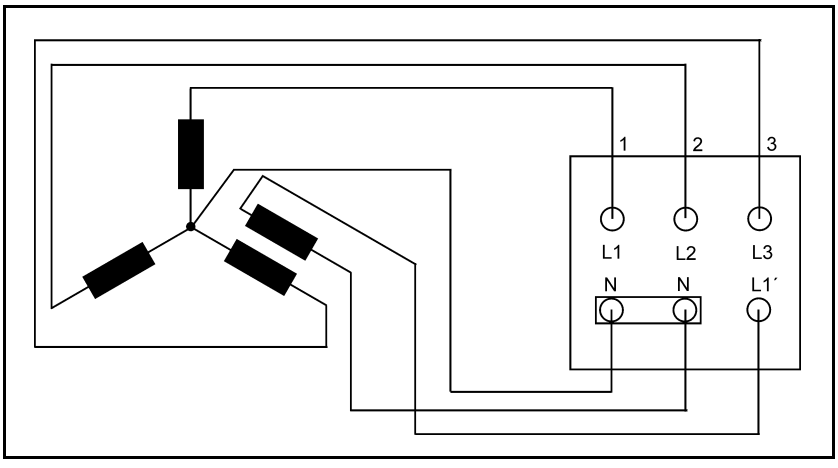


Table 10: Technical Data

	Panda 6000 ND	**Panda 8000 NE**	**Panda 9000 ND**	**Panda 12000 NE**	**Panda 14000 NE**	**Panda 15000NE**		
Type	Z482	Z482	D722	D722	D782	D902		
Govenor	mechanical	VCS	mechanical	VCS	VCS	VCS		
Automatic startbooster	yes	yes	yes	yes	yes	yes		
Cylinder	2	2	3	3	3	3		
Bore	67mm	67mm	67mm	67mm	67mm	72mm		
Stroke	68mm	68mm	68mm	68mm	73,6mm	73,6mm		
Stroke volume	479cm^3	479cm^3	719cm^3	719cm^3	782cm^3	898cm^3		
Max. power (DIN 6271-NB) at 3000rpm	9,32kW	9,32kW	14,0kW	14,0kW	13,5kW	17,5kW		
Rated speed 50 Hz	3000rpm	3000rpm	3000rpm	3000rpm	3000rpm	3000rpm		
Idle running speed [a]	3120rpm	2900rpm	3120rpm	2900rpm	2900rpm	2900rpm		
Valve clearance (engine cold)	0,2mm	0,2mm	0,2mm	0,2mm	0,2mm	0,2mm		
Cylinder head nut torque	42Nm	42Nm	42Nm	42Nm	68Nm	42Nm		
Compression ratio	23:1	23:1	23:1	23:1	23:1	24:1		
Lubrication oil capacity	2,5l	2,5l	3,8l	3,8l	3,8l	3,7l		
Fuel consumption [b]	ca. 0,53-1,4l	ca. 0,68-1,8l	ca. 0,79-2,1l	ca. 1,05-2,8l	ca. 1,25-3,3l	1,33-3,55l		
Oil consumption	max. 1% of fuel consumption							
Permissible max. permanent tilt of engine	a) 25° across 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 rated speed

Table 11: Technical Data

	Panda 18 NE	**Panda 24 NE**	**Panda 30 NE**	**Panda 33 KU NE**	**Panda 42 KU NE**
Type	D1105	V1505	V1505 TD	V2203	F2803
Govenor	VCS	VCS	VCS	VCS	VCS
Automatic startbooster	yes	yes	yes	yes	yes
Cylinder	3	4	4TD	4	5
Bore	78mm	78mm	78mm	87mm	87mm
Stroke	78,4mm	78,4mm	78,4mm	92,4mm	92,4mm
Stroke volume	1123cm^3	1498cm^3	1498cm^3	2197cm^3	2746cm^3
Max. power (DIN 6271-NB) at 3000rpm	18,7kW	23,3kW	31,3kW	32,7kW	40,8kW
Rated speed 50 Hz	3000rpm	3000rpm	3000rpm	3000UpM	3000UpM
Idle running speed [a]	2900rpm	2900rpm	2900rpm	2900UpM	2900UpM
Valve clearance (engine cold)	0,2mm	0,2mm	0,2mm	0,2mm	0,2mm
Cylinder head nut torque	68Nm	68Nm	68Nm	98Nm	98Nm
Compression ratio	22:1	22:1	23:1	23:1	23:1
Lubrication oil capacity	5,1l	6,0l	6,7l	9,5l	12,0l
Fuel consumption [b]	ca. 1,68-4,5l	ca. 2,20-5,85	ca. 2,7-7,2l	ca. 2,94-7,5l	ca. 3,8-10,1l
Oil consumption	max. 1% of fuel consumption				
Permissible max. permanent tilt of engine	a) 25°across 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 rated speed

F.3 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.4 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℃

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 16.3.09

Current revision status

	Document
Actual:	Panel Generator Control P6+ RE0703_Kunde_eng.R04_16.3.09
Replace:	Panel Generator Control P6+ RE0703_Kunde_eng.R03

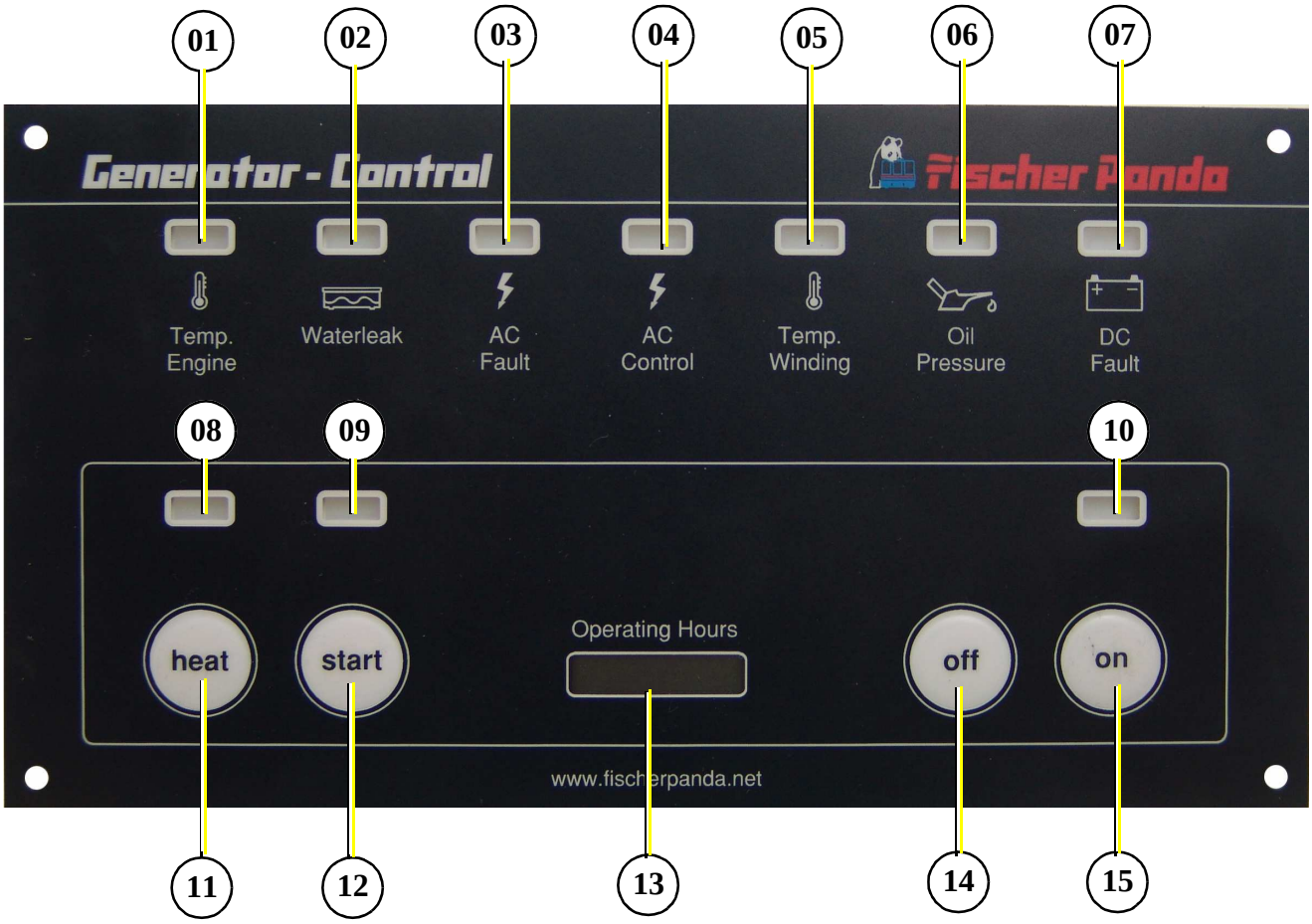
Revision	**Page**
Upgrade the whole manual	
Safety instruktion See valve added	
Hole pattern changed	

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



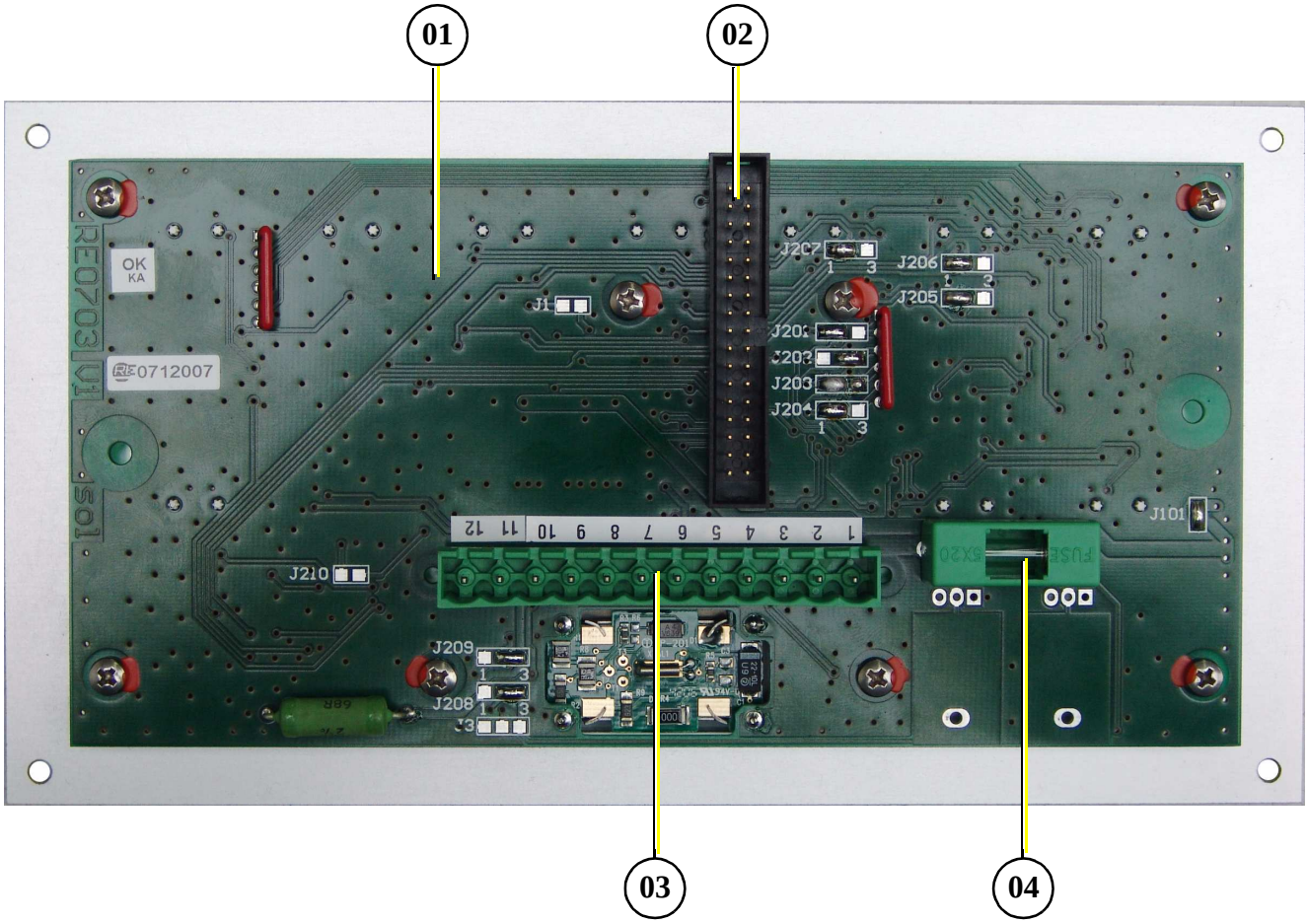
01. LED for coolant temperature red[1]
02. LED for waterleak red/yellow[1] (sensor optional)
03. LED for AC-voltage fault red/yellow[1]
04. LED for AC-voltage ok green[1]
05. LED for winding temperature red[1]
06. LED for oil pressure red[1]
07. LED for battery charge voltage fault green/red[1]
08. LED 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

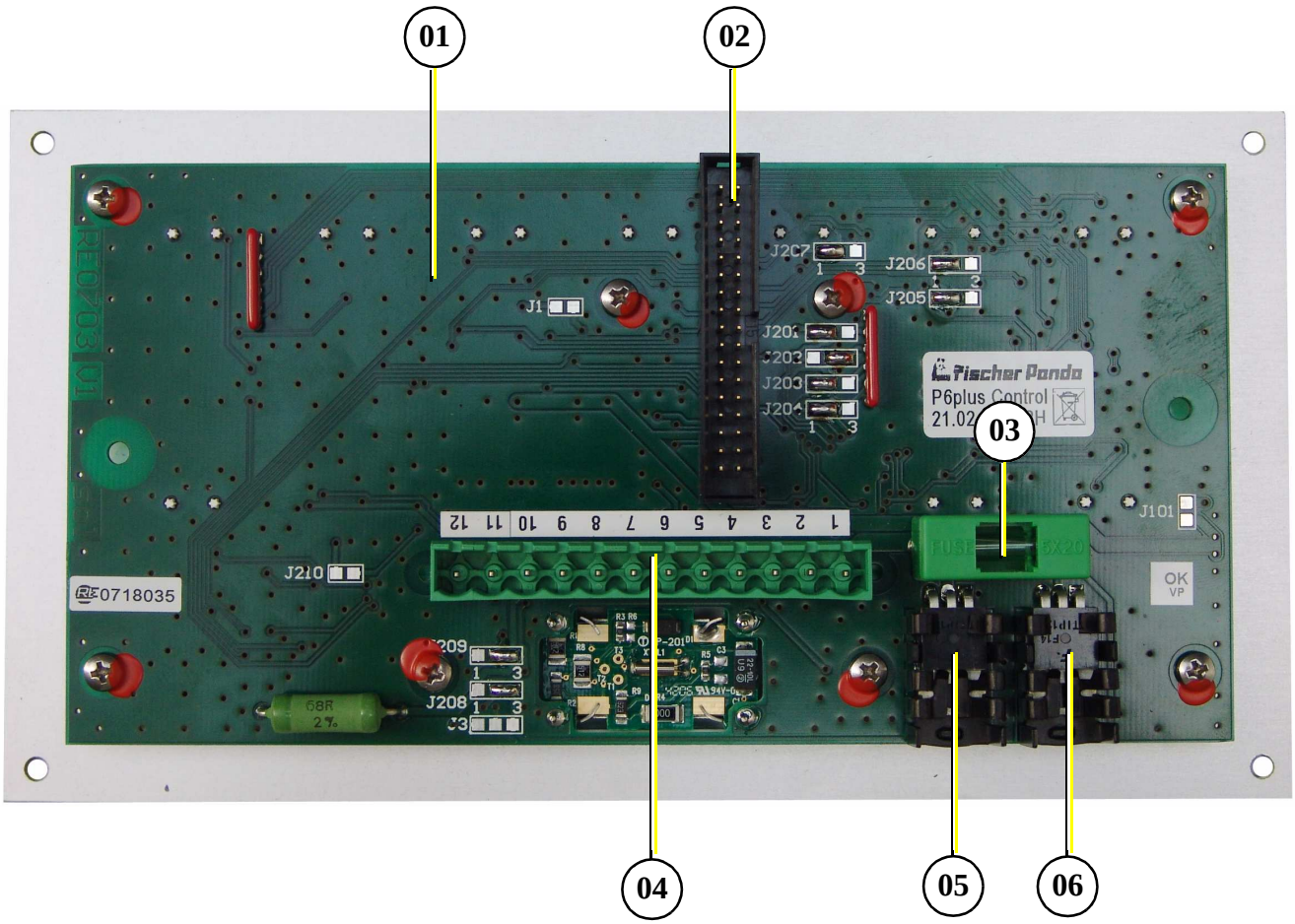


01. Control board
02. Terminal block (master-slave adapter: left row; automatic adapter: right row)
03. Terminals 1-12 (see section A.3.1, “Terminal connections,” on page 110)
04. Fuse 630mA slow-blow

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 110)
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.

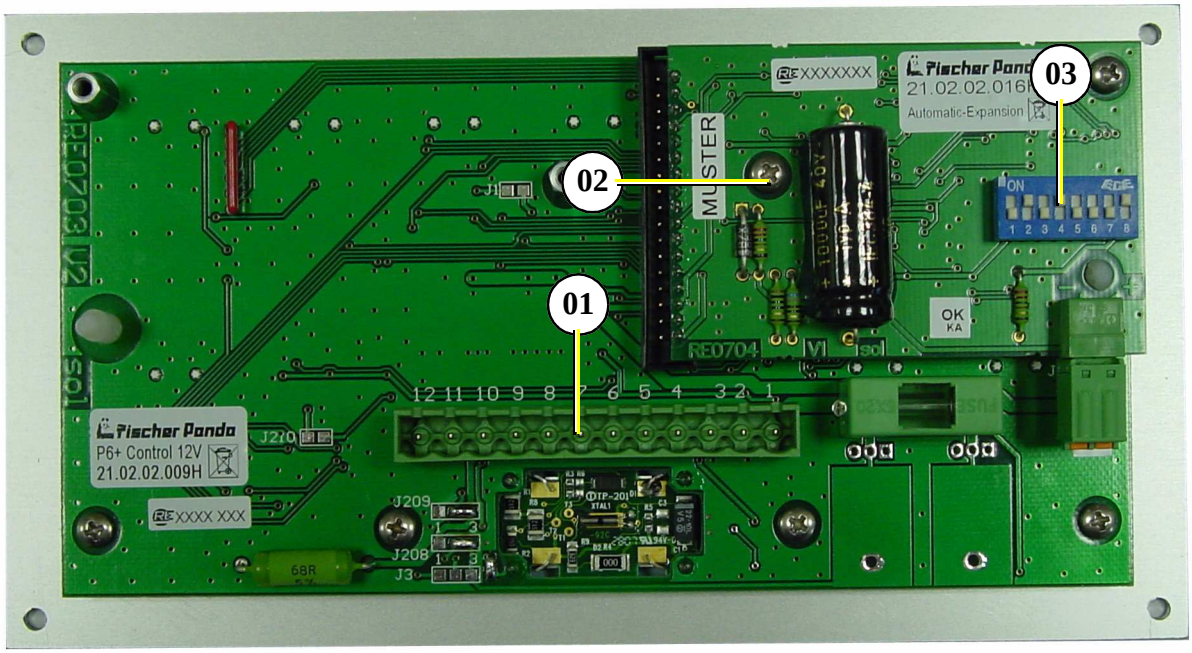
3. Press button „off“ (switch off).

   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

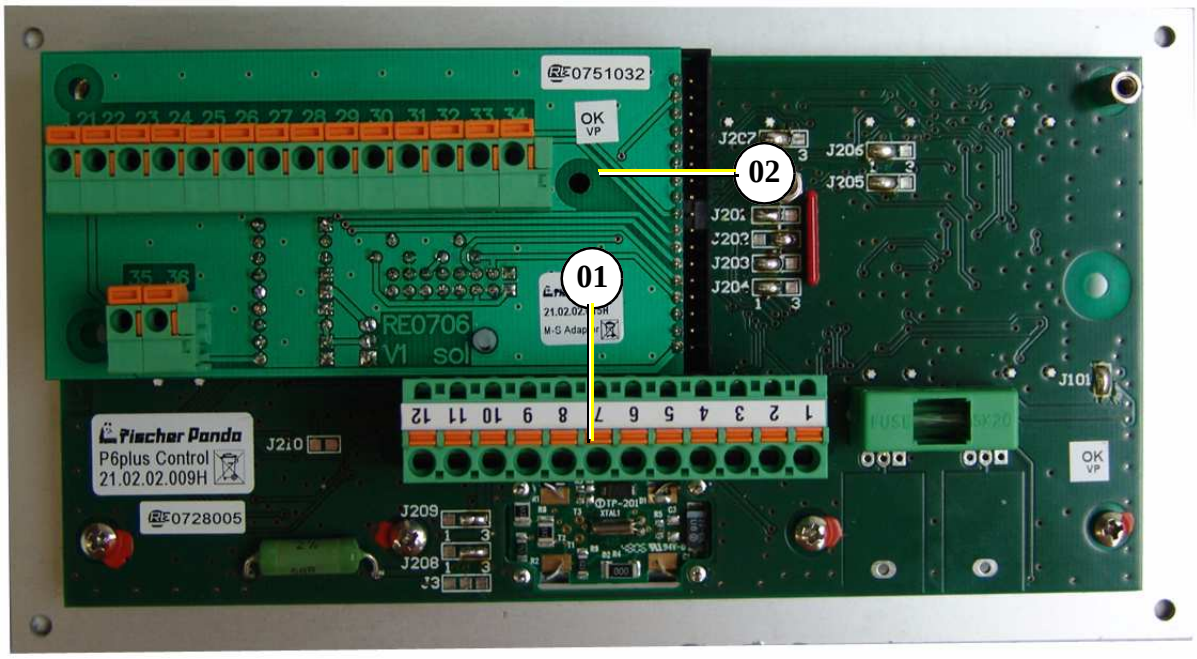
Connection for the automatic adapter X2 (row with odd pin numbers // I/O viwe from operating panel)

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

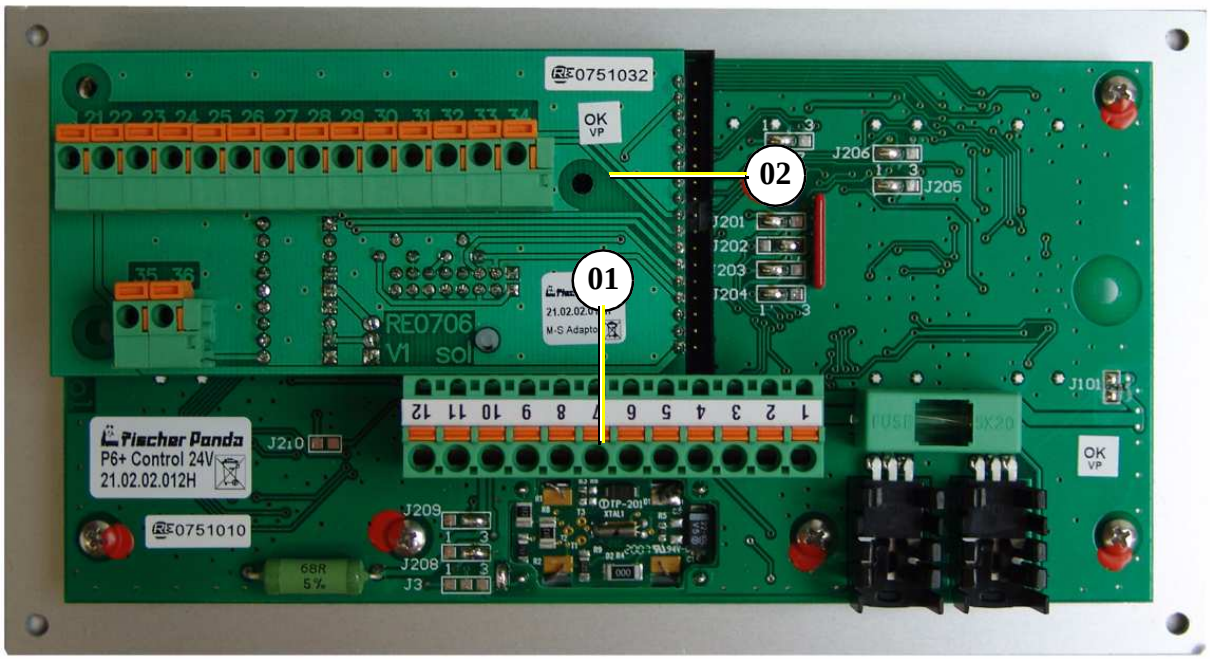
Fischer Panda Art. No. 21.02.02.015H 12V-version



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

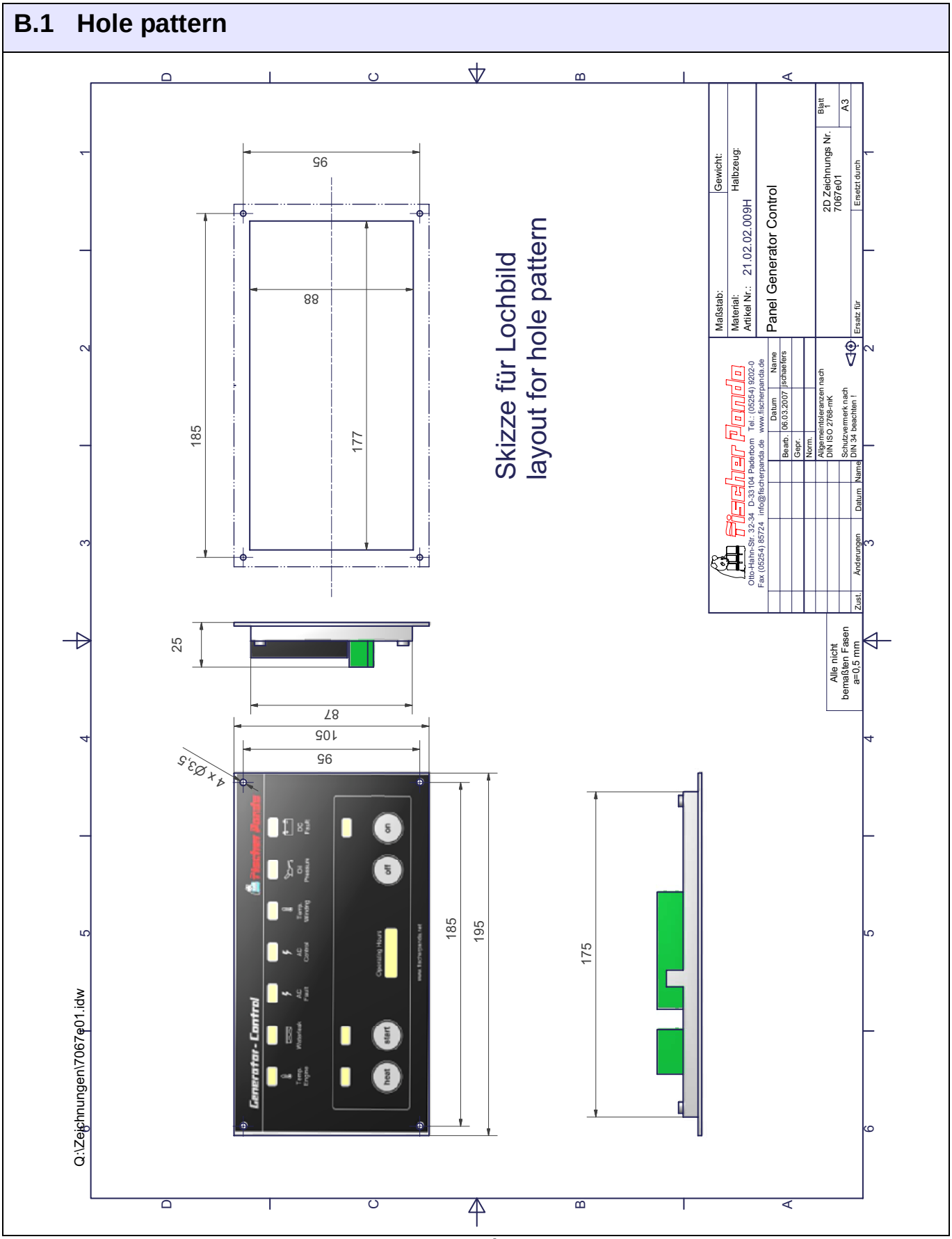


Fig. B.1-1: Hole pattern

Intentionally Blank