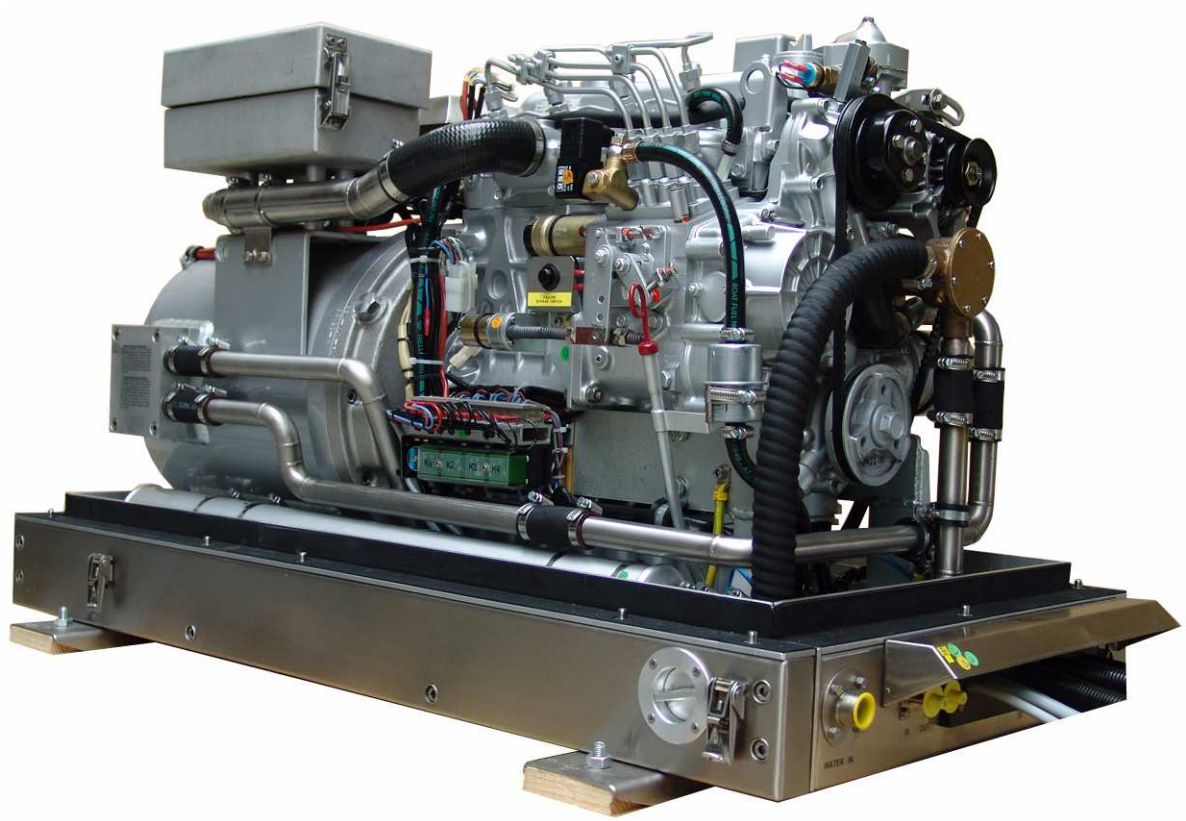
Fischer Panda®

Power wherever you are™



# Operation manual marine generator

Panda 16NE PMS 230V/400V - 50Hz /15,5kVA - Panda 16NE PMS 120V/240V - 60Hz / 15,5kVA

Panda 18NE PMS 230V/400V - 50Hz / 18 kVA - Panda 18NE PMS 120V/140V - 60Hz / 18 kVA

Panda 22NE PMS 230V/400V - 50Hz / 22kVA - Panda 22NE PMS 120V/240V - 60Hz / 22kVA

Panda 24NE PMS 230V/400V - 50Hz / 24kVA - Panda 24NE PMS 220V/240V - 60Hz / 24 kVA

Panda 30NE PMS 230V/400V - 50Hz / 30kVA - Panda 30NE PMS 120V/240V - 60Hz / 30kVA

Panda 30NE IC PMS 230V/400V - 50Hz / 25,5kW

## Super silent technology

## Fischer Panda GmbH

# Current revision status

| | Document |
|---|---|
| **Actual:** | Panda_18-30NE_PMS_eng.R01_3.5.11 |
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| Revision | Page |
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**Erstellt durch / created by**

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## Dear Customer,

Thank you for purchasing a Fischer Panda Generator and choosing Fischer Panda as your partner for mobile power onboard. With your generator, you now have the means to produce your own power – wherever you are - and experience even greater independence. Not only do you have a Fischer Panda generator onboard, you also have worldwide support from the Fischer Panda Team. Please take the time to read this and find how we can support you further.

### Installation Approval and Warranty

Every generator has a worldwide warranty. You can apply for this warranty through your dealer when the installation is approved. If you have purchased an extended warranty, please ensure that it is kept in a safe place and that the dealer has your current address. Consult your dealer about warranty options especially if you have purchased a used generator. He will be able to advise about authorised Fischer Panda Services worldwide.

### Service and Support

To ensure that your generator operates reliably, regular maintenance checks and task as specified in this manual must be carried out. Fischer Panda can supply Service Kits which are ideal for regular servicing tasks. We only supply the highest quality components which are guaranteed to be the RIGHT parts for your generator. Service “Plus” Kits are also available and ideal for longer trips where more than one service interval may be required.

If you require assistance – please contact your Fischer Panda Dealer. Please do not attempt to undertake any repair work yourself, as this may affect your generator warranty. Your dealer will also be able to assist in finding your nearest Fischer Panda service station. Your nearest service station can also be found in our Global Service Network which can be downloaded from our homepage.

### Product Registration

Please take the time to register your Fischer Panda Generator on our website at

http://www.fischerpanda.de/mypanda

By registering, you will ensure that you will be kept up to date on any technical upgrades or specific information on the operation or servicing of your generator. We can even let you know about new Fischer Panda products – especially helpful if you are planning to upgrade or expand your installation at a later date.

### Fischer Panda Quality - Tried and Tested

DIN-certified according DIN ISO 9001

## Thank you for purchasing a Fischer Panda Generator.

## Your Fischer Panda Team

# 1. General Instructions and Regulations

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**Thank you for purchasing a Fischer Panda Generator.**

## 1.1 Safety first!

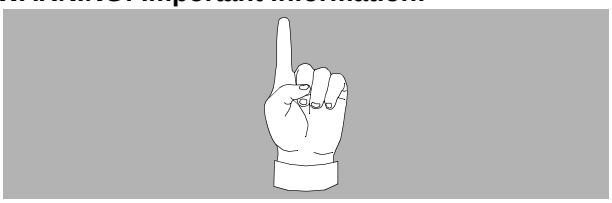
These symbols are used throughout this manual and on labels on the machine itself to warn of the possibility of personal injury of lethal danger during certain maintenance work or operations. Read these instructions carefully.

Can cause acute or chronic health impairments or death even in very small quantities if inhaled, swallowed, or absorbed through the skin.

**WARNING: Hazardous materials**

This warning symbol draws attention to special warnings, instructions or procedures which, if not strictly observed, may result in damage or destruction of equipment.

**WARNING: Important information!**



Warning of materials that may ignite in the presence of an ignition source (cigarettes, hot surfaces, sparks, etc.).

**WARNING: Fire hazard**

In the environment described / during the work specified, smoking is prohibited.

**PROHIBITED: No smoking**

Fire and naked light are ignition sources that must be avoided.

**PROHIBITED: No fire or naked light**

The equipment shall not be activated or started up while work is in progress.

**PROHIBITED: Do not activate/start up**

Touching of the corresponding parts and systems is prohibited.

**PROHIBITED: Do not touch**

An external signal may trigger an automatic start-up.

**DANGER: Automatic start-up**

This danger symbol refers to the danger of electric shock and draws attention to special warnings, instructions or procedures which, if not strictly observed, may result in severe personal injury or loss of life due to electric shock.

**WARNING: Hazardous electric voltage**

General warning of a hazard area

**WARNING: General warning**

Can cause acute or chronic health impairments or death even in very small quantities if inhaled or ingested.

**WARNING: Danger due to inhalation and/or ingestion**

Warning of live parts that may cause electric shock upon contact. Especially dangerous for persons with heart problems or pacemakers.

**WARNING: Risk of electric shock upon contact**

Danger of injury due to being pulled into equipment. Bruising and torn off body parts possible. Risk of being pulled in when touching with body part, loose-fitting clothing, scarf, tie, etc.

**WARNING: Danger due to rotating parts**

Warning of substances that may cause an explosion under certain conditions, e.g. presence of heat or ignition sources.

**WARNING: Explosion hazard**

Warning of hot surfaces and liquids. Burn/scalding hazard.

**WARNING: Hot surface**

Warning of substances that cause chemical burns upon contact. These substances can act as contaminants if introduced into the body.

**WARNING: Danger due to corrosive substances, potential contamination of person**

When the system is opened, the pressure can be relieved abruptly and expel hot gases and fluids. Risk of injury due to parts flying about, burn hazard due to liquids and gases.

**WARNING: System may be pressurised!**

**WARNING: Hearing damage**

**WARNING: Magnetic field**

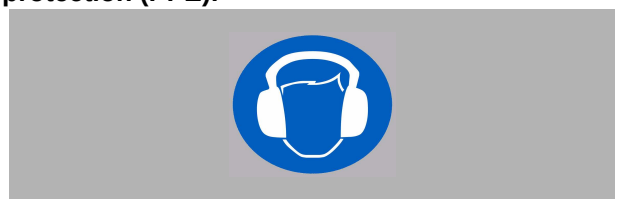
**WARNING: Overpressure**

Wearing the applicable snugly fitting protective clothing provides protection from hazards and can prevent damage to your health.

**MANDATORY INSTRUCTION: Wear snugly fitting protective clothing (PPE).**

Wearing hearing protection provides protection from acute and gradual hearing loss.

**MANDATORY INSTRUCTION: Wear hearing protection (PPE).**



Wearing safety goggles protects the eyes from damage. Optical spectacles are not a replacement for the corresponding safety goggles.

**MANDATORY INSTRUCTION: Wear safety goggles (PPE).**

Wearing protective gloves provides the hands from hazards like friction, graze, punctures or deep cuts and protects them from contact with hot surfaces.

**MANDATORY INSTRUCTION: Wear protective gloves (PPE).**

Compliance with the instructions in the manual can avert danger and prevent accidents. This will protect you and the generator.

**MANDATORY INSTRUCTION: Observe the instructions in the manual.**

Environmental protection saves our living environment. For you and for your children.

**MANDATORY INSTRUCTION: Comply with environmental protection requirements.**

## 1.2 Tools

These symbols are used throughout this manual to show which tool must be used for maintenance or installation.

| | |
|---|---|
|  | Spanners<br>W.A.F X = width across flats of X mm |
|  | Hook wrench for oil filter |
|  | Screw driver, for slotted head screws and for Phillips head screws |
|  | Multimeter, multimeter with capacitor measuring unit |
|  | Socket wrench set |
|  | Hexagon socket wrench set |

| | |
|---|---|
|  | Clamp-on ammeter (DC for synchronous generators; AC for asynchronous generators) |
|  | Torque wrench |

## 1.3 Manufacturer declaration in accordance with the Machinery Directive 98/37/EC

Manufacturer declaration in accordance with the Machinery Directive 98/37/EC

The generator was designed in such a way that all assemblies correspond with the **CE guidelines**. If Machinery Directive 98/37/EC 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 complies with the Machinery Directive 98/37/EC. This includes the exhaust system, cooling system and electrical installations.

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

## 1.4 Customer registration and guarantee

Use the advantages of registering your product:

- you will receive a Guarantee Certificate after approval of your installation data
- you will receive extended product information that may be relevant to safety.
- You will receive free upgrades as necessary.

Additional advantages:

Based on your complete data record, Fischer Panda technicians can provide you with fast assistance, since 90% of the disturbances result from defects in the periphery.

Problems due to installation errors can be recognized in advance.

### 1.4.1 Technical support

Technical Support via the Internet: info@fischerpanda.de

### 1.4.2 Caution, important information for start-up!

1. The commissioning log shall be filled in immediately after initial operation and shall be confirmed by signature.
2. The commissioning log must be received by Fischer Panda GmbH at Paderborn within 4 weeks of initial operation.
3. After receiving the commissioning log, Fischer Panda will make out the official guarantee certificate and send it to the customer.
4. If warranty claims are made, the document with the guarantee certification must be submitted.

If the above requirements are not or only partly fulfilled, the warranty claim shall become void.

# 1.5 Safety Instructions - Safety First!

## 1.5.1 Safe operation

Careful handling of the equipment is the best insurance against an accident. Read the manual diligently, and make sure you understand it before starting up the equipment. All operators, regardless of their experience level, shall read this manual and additional pertinent manuals before commissioning the equipment or installing an attachment. The owner shall be responsible for ensuring that all operators receive this information and are instructed on safe handling practices.

## 1.5.2 Observe safety instructions!

Read and understand this manual and the safety instructions on the generator before trying to start up and operate the generator. Learn the operating practices and ensure work safety. Familiarise yourself with the equipment and its limits. Keep the generator in good condition.

## 1.5.3 Personal protective clothing (PPE)

For maintenance and repair work on the equipment, ***do not*** wear loose, torn, or ill-fitting clothing that may catch on protruding parts or come into contact with pulleys, cooling disks, or other rotating parts, which can cause severe injury.

Wear appropriate safety and protective clothing during work.

Do not operate the generator while under the influence of alcohol, medications, or drugs..

Do not wear head phones or ear buds while operating, servicing, or repairing the equipment..

## 1.5.4 Cleanliness ensures safety

Keep the generator and its environment clean.

Before cleaning the generator, shut down the equipment and secure it against accidental start-up. Keep the generator free from dirt, grease, and waste. Store flammable liquids in suitable containers only and ensure adequate distance to the generator. Check the lines regularly for leakage and eliminate leaks immediately as applicable.

## 1.5.5 Safe handling of fuels and lubricants

Keep fuels and lubricants away from naked fire.

Before filling up the tank and/or applying lubricant, always shut down the generator and secure it against accidental start-up.

Do not smoke and avoid naked flame and sparking near fuels and the generator. Fuel is highly flammable and may explode under certain conditions.

Refuel in well-ventilated open spaces only. If fuel/lubricant was spilled, eliminate fluids immediately.

Do not mix diesel fuel with petrol or alcohol. Such a mixture can cause fire and will damage the generator.

Use only approved fuel containers and tank systems. Old bottles and canisters are not adequate.

## 1.5.6 Exhaust fumes and fire protection

Engine fumes can be hazardous to your health if they accumulate. Ensure that the generator exhaust fumes are vented appropriately (leak-proof system), and that an adequate fresh air supply is available for the generator and the operator (forced ventilation).

Check the system regularly for leakage and eliminate leaks as applicable.

Exhaust gases and parts containing such fumes are very hot; they may cause burns under certain circumstances. Always keep flammable parts away from the generator and the exhaust system.

To prevent fire, ensure that electrical connections are not short-circuited. Check regularly that all lines and cables are in good condition and that there is no chafing. Bare wires, open chafing spots, frayed insulation, and loose cable connections can cause dangerous electric shocks, short-circuit, and fire.

The generator shall be integrated in the existing fire safety system by the operating company.

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.

Exhaust gases from diesel motors and some components are carcinogenic and can cause deformities and other genetic defects.

## 1.5.7 Safety precautions against burns and battery explosions

The generator and its cooling agents and lubricants as well as the fuel can get hot while the generator is operated. Use caution around hot components such as parts containing exhaust fumes, radiator, hoses, and engine block during operation and after the generator was shut down.

The cooling system may be pressurised. Open the cooling system only after letting the engine and the coolant cool down. Wear appropriate protective clothing (e.g. safety goggles, gloves).

Prior to operation, ensure that the cooling system is sealed and that all hose clamps are tightened.

The battery represents an explosion hazard, this applies both to the starter battery and the batterybank of the AGT generators. While batteries are being charged, a hydrogen-oxygen mixture is generated, which is highly explosive (electrolytic gas).

Do not use or charge batteries if the fluid level is below the MINIMUM marking. The lifespan of the battery is significantly reduced, and the risk of explosion increases. Refill to a fluid level between maximum and minimum level without delay.

Especially during charging, keep sparks and naked fire away from the batteries. Ensure that the battery terminals are tightly connected and not corroded to avoid sparking. Use an appropriate terminal grease.

Check the charge level with an adequate voltmeter or acid siphon. Contact of a metal object across the terminals will result in short-circuiting, battery damage, and high explosion risk.

Do not charge frozen batteries. Heat the batteries to +16 ℃ (61 ℉) prior to charging.

## 1.5.8 Protect your hands and body from rotating parts!

Always keep the capsule closed while operating the generator.

To check the V-belt tension, always shut down the generator.

Keep your hands and body away from rotating parts such as V-belt, fans, pulleys, and flywheel. Contact can cause severe injury.

Do not run the engine without the safety devices in place. Prior to start-up, mount all safety devices securely and check for proper attachment and function.

## 1.5.9 Anti-freeze and disposal of fluids

Anti-freeze contains toxic substances. To prevent injury, wear rubber gloves and wash off any anti-freeze immediately in case of skin contact. Do not mix different anti-freeze agents. The mixture may cause a chemical reaction generating harmful substances. Use only anti-freeze that was approved by Fischer Panda.

Protect the environment. Collect drained fluids (lubricants, anti-freeze, fuel), and dispose of them properly. Observe the local regulations for the respective country. Ensure that no fluids (not even very small quantities) can drain into the soil, sewers, or bodies of water.

### 1.5.10 Implementation of safety inspections and maintenance

Disconnect the battery from the engine before performing service work. Affix a sign to the control panel - both the main and the corresponding slave panel - with the instruction " DO NOT START UP - MAINTENANCE IN PROGRESS" to prevent unintentional start-up.

To prevent sparking due to accidental short-circuiting, always remove the earthing cable (-) first and reconnect it last. Do not start work until the generator and all fluids and exhaust system parts have cooled down.

Use only suitable tooling and appliances and familiarise yourself with their functions to prevent secondary damage and/or injury.

Always keep a fire extinguisher and a first aid box handy while performing maintenance work.

## 1.6 Warning and instruction signs

Keep warning and instruction signs clean and legible.

Clean the signs with water and soap and dry them with a soft cloth.

Immediately replace damaged or missing warning and instruction signs. This also applies to the installation of spare parts.

### 1.6.1 Special instructions and hazards of generators

The electrical installations may only be carried out by trained and qualified personnel!

**The generator must not be operated with the cover removed.**

If the generator is being installed without a sound insulation capsule, it must be ensured 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 easily visible signs must show that the generator must only be switched on while the capsule is closed.

All servicing, maintenance, or repair work may only be carried out when the motor is not running.

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

### 1.6.1.1 Protective conductor and potential equalisation:

**Electric current below 48 V may be life-threatening. Fort this reason systems are grounded with a protective conductor. In connection with a RCD the current supply will be disconnected in case of a failure.**

**Appropriate safety precautions like the RCD and corresponding fuses have to be provided by the customer to guarantee a save operation of the generator.**

### 1.6.1.2 Protective conductor for Panda AC generators:

The generator is "earthed" as a standard (centre and ground are interconnected in the generator terminal box by a shunt). This is a basic first-level safety measure, which offers protection as long as no other measures are installed. Above all, it is designed for delivery and a possible test run.

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

**While the generator is being operated, the full voltage is applied to the AC control box, as well. Therefore, it is essential to ensure that the control box is closed and secured against touch while the generator is running.**

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

### 1.6.1.3 Switch off all loads while working on the generator

All loads must be disconnected prior to working on the generator to avoid damage to the devices. In addition, the semiconductor relays in the AC control box must be disconnected in order to avoid the booster capacitors being activated during set-up. The negative terminal of the battery must be disconnected.

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 store electrical energy. High voltages may remain across the capacitor contacts even after they have been disconnected from the mains. As a safety precaution, do not touch the contacts. If the capacitors must be replaced or inspected, the contacts shall be short-circuited by connecting an electrical conductor to discharge potentially remaining potential differences.

If the generator is switched off normally, the working capacitors are automatically discharged via the winding of the generator. The booster capacitors are discharged by means of internal discharge resistors.

For safety reasons, all capacitors must be discharged through short-circuiting before work is carried out on the AC control box.

### 1.6.1.4 Potential equalisation for Panda AGT DC generators

For further information specific to your generator, see the chapter installation.

### 1.6.1.5 Safety instructions concerning cables

**Cable types**

It is recommended to use cables that are in compliance with the standard UL 1426 (BC-5W2) with type 3 (ABYC section E-11).

**Cable cross-section**

The cable shall be selected taking into account the amperage, cable type, 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 to install a self-draining cable conduit classified as V-2 or higher in compliance with UL 94 in the area of the cable guide inside the capsule. It must be ensured that the cable guide is not routed along hot surfaces such as the exhaust manifold or the engine oil drain screw but instead is installed free from any influence due to friction and crushing.

## 1.6.2 Recommended starter battery sizes

Use only batteries approved by the manufacturer as starter batteries.

Use the battery capacity recommended by the engine manufacturer.

ATTENTION!

Prior to installation, verify that the voltage of the starter battery complies with the start-up system voltage.

e.g. 12 V starter battery for 12 V start-up system

e.g. 24 V starter battery for 24 V start-up system (e. g. 2x 12 V in series)

## 1.6.3 Important instructions for batteries - starter and/or traction batteries

**ATTENTION!!! Start-up**:

Installation of battery connection lines.

Observe the instructions installation guidelines of the battery manufacturer.

Observe the regulations "ABYC regulation E11 AC and DC electrical systems on boats“ and/or EN ISO 10133:2000 "Small craft -- Electrical systems -- Extra-low-voltage DC installations" as applicable!

**The battery compartment and the corresponding**

**installation shall be dimensioned adequately.**

The batteries can be separated mechanically or with an adequate power relay.

Observe the applicable instructions concerning fire and explosion protection of the battery manufacturer.

Install a fuse of appropriate size in the positive connection of the starter battery. Install as close to the battery as possible but with a max. distance of 300 mm (12 in) from the battery.

The cable from the battery to the fuse shall be protected with a conduit/protective sleeve against fraying.

Use self-extinguishing and fire-protected cables for installation that are designed for max. temperatures of 90 ℃, 195 ℉.

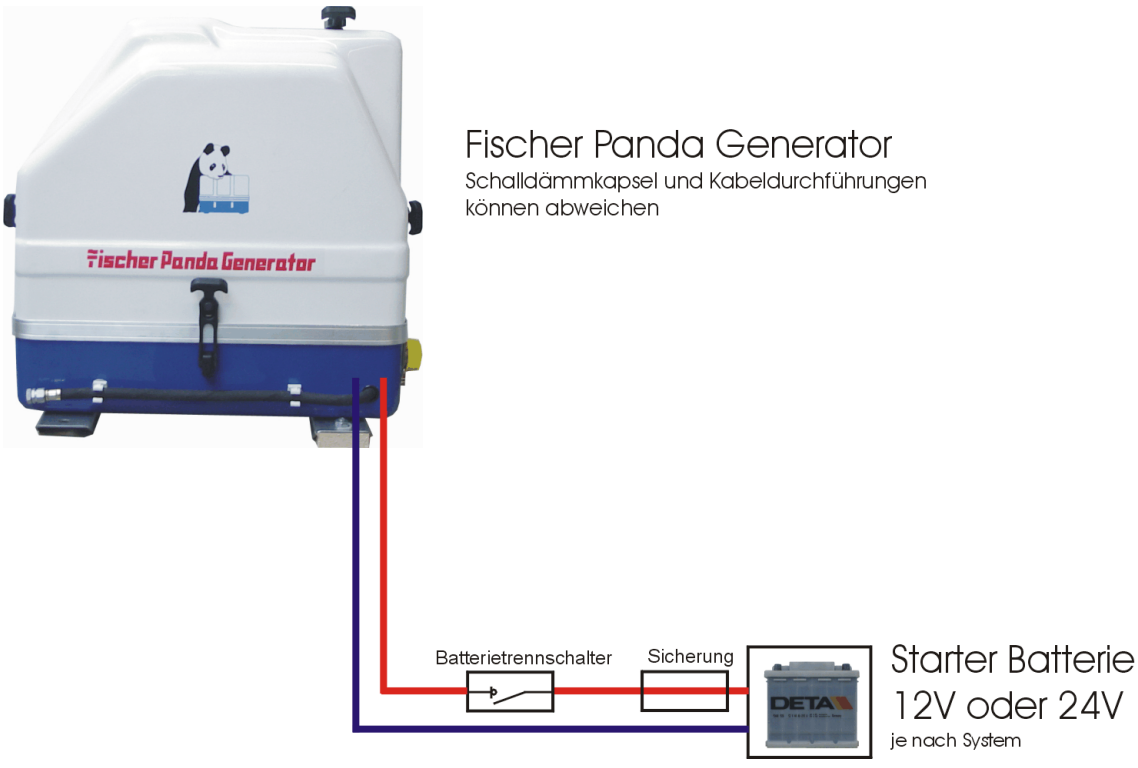
Install the battery cables in such a way that the insulation cannot be removed by chafing or other mechanical stresses.

The battery terminals must be protected against accidental short-circuiting.

Inside the Fischer Panda generator capsule, the positive battery cable must be routed so that it is protected from heat and vibrations by means of an adequate conduit/protective sleeve. It must be installed so that it does not come into contact with rotating parts or such that heat up during operation such as pulley, exhaust manifold, exhaust pipe, and motor itself. Do not overtighten the cable, as it may be damaged otherwise.

After completing the installation, perform a test run of the generator and check the battery cable installation during and after the test run. Implement corrections as necessary.

*Fig. 1.6-1: Sample diagram for starter battery installation*




## 1.6.4 General safety instructions for handling batteries

**These instructions shall apply in addition to the instructions of the battery manufacturer:**

- While you are working on the batteries, a second person should be within earshot to help you if necessary.
- Keep water and soap ready in case battery acid is burning your skin.
- Wear eye protection and protective clothing. Do not touch your eyes while handling batteries.
- If you have acid splashes on the skin or clothing, wash them out with lots of water and soap.
- If acid sprays into your eyes, immediately flush them with clean water until no more burning is felt. Immediately seek medical assistance.

- Do not smoke near the batteries. Avoid naked fire. The area around batteries is a potentially explosive atmosphere.
- Ensure that no tools are dropped on the battery terminals; cover them as necessary.
- Do not wear jewellery or watches on your arms during installation that might short-circuit the battery. Otherwise, there is a risk of skin burns.

- Protect all battery contacts against accidental contact.
- For battery banks: Use only deep cycle batteries. Starter batteries are not suitable. Lead-acid gel batteries are recommended. They are maintenance-free, cycle stable, and do not release gases.

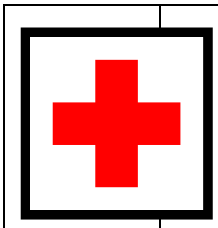
- Never charge a frozen battery.
- Avoid battery short-circuits.
- Ensure proper ventilation of the battery to vent gases that may be released.
- Battery connection terminals must be checked for proper seating before operation.

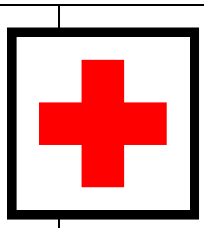
- Battery connection cables shall be installed with utmost care and shall be checked for excessive heating under load. Check the battery near vibrating components regularly for chafing and insulation defects.

**ATTENTION! For battery charger generators (Fischer Panda AGT-DC)!**

**Prior to installation, verify that the voltage of the battery bank complies with the output voltage of the generator.**

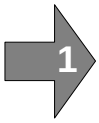
# 2. In case of Emergency First Aid / Im Notfall - Erste Hilfe



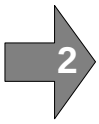


First Aid in case of accidents by electrical shocks

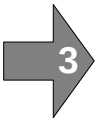
5 Safety steps to follow if someone is the victim of electrical shock



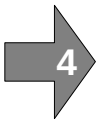

Do not touch the injured person while the generator is running.



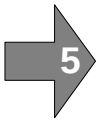

Switch off the generator immediately.




If you cannot switch off the generator, pull, push, or lift the person to safety using a wooden pole, rope or some nonconductive material.




Call an emergency doctor as soon as possible.



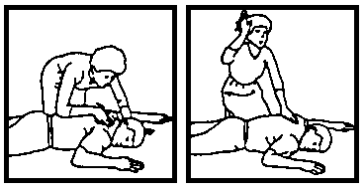

Immediately start necessary first aid procedures.

## 2.1 WHEN AN ADULT STOPS BREATHING

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.

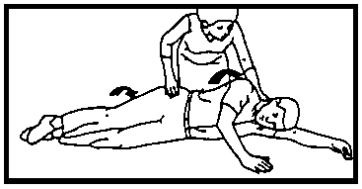
**Warning:**

1 Does the Person Respond?
Tap or gently shake victim.
Shout, "Are you OK?"

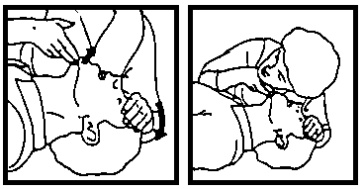


2 Shout, "Help!"
Call people who can phone for help.

3 Roll Person onto Back.
Roll victim towards you by pulling slowly.



4 Open Airway.
Tilt head back, and lift chin.
Shout, "Are you OK?"



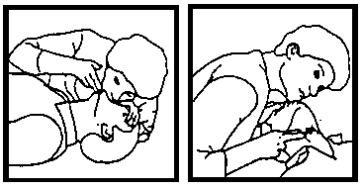
5 Check for Breathing.
Look, listen, and feel for breathing for 3 to 5 seconds.

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.

# 3. Basics

## 3.0.1 Intended use of the machine

The Fischer Panda generator is made to produce electrical energy out of diesel fuel.

The diesel fuel is converted to mechenical energy by the diesel engine. This mechanical energy drives the generator. In the genset, the mechanical energy is converted to electrical energy. This process is controlled by (sometims external) components, the remote control panel and the voltage control system (VCS).

For the process is a sufficent amount of fuel and combustion air necessary. Arising exhaust and heat must be lead away.

If the electrical power should be applyed to a local net, The regulation and installation instruktions of the Net owner and the regional authorities must be respected. This includes lightening conductor, personal protection switch etc.

Misaplication of the Product can damage and destroy the product and the electrical net inclusive all load which is attached to the net, and contain hazards like short circiut. It is not allowed to modify the product in any case. Never open the sound cover during operation. The safety and hazard notes of the manual must be respected.

## 3.0.2 Purpose of the manual und description of the definitions trained person/operator/ user

This manual is work instruction and  operation instruction for the owner and user of Fischer Panda generators.

The manual is the base and the guideline for the correct installation and maintenance of Fischer Panda Generators.

The manual does not substitute the technical evaluation and should be used as an example guide only.

The installation must be undertaken and proved by a suitable qualified/trained person and may in accordance with the law as required by the country and special situation.

### 3.0.2.1 Trained persons

**Trained persons for the mechanical components are motor mechanics or persons with similar education and training.**

**Trained persons for the electrical components are electricions or persons with similar education and training.**

**After the Installation, the trained person must instruct the owner for operation and maintenance of the generator. This must include the hazards of the generator use.**

## 3.0.3 Operator

**The operator is the for the operation of the generator responceble person.**

After the installation, the operator must be instructed for the operation ad maintenance of the generator. This must include the hazards during operation of the generator and a instruction for the maintenance.

The operator must read and follow the manual and must respect the hazard notes and safety instructions.

### 3.0.3.1 User

**Users are persons, established by the operator, to operate the generator.**

The operator must assure that the user read and understand the manual and that all hazard notes and safety instructions are respected. The user must be instructed by the opertor regarding his activity at the generator.

## 3.1 Panda Transport Box

### 3.1.1 Bolted Fischer Panda Transport Box

1. Remove the bolts for cover / sidewalls
2. Remove the cover
3. Remove the loose accessories
4. Remove the bolts for sidewalls / floor pallet
5. Remove the sidewalls
6. Open the generator attachment

### 3.1.2 Fischer Panda Transport Box with metal tab closure

1. Bend up the metal tab closures on the transport box lid.
2. Remove the cover
3. Remove the loose
4. Bend open the metal tab closures on the transport box bottom.
5. Remove the sidewalls
6. Open the generator attachment

## 3.2 Transport and Loading/Unloading

### 3.2.1 Transporting the generator

- The generator must always be upright for transport.
- For transport, the Fischer Panda Transport Box shall be used for the generator. The generator shall be securely attached to the bottom of the box.
- For loading/unloading, an adequate industrial truck shall be used.
- Depending on the transport distance (e.g. air cargo), the generator fluids (coolant, engine oil, fuel) may have to be drained. The corresponding instructions and warnings must be fitted to the transport packaging.

### 3.2.2 Loading/unloading of the generator

For loading/unloading the generator, appropriate ring eye bolts shall be installed in the holes in the support rails. The load bearing capacity of each ring eye bolt must at least equal the generator weight.

**An adequate lifting yoke shall be used for transport/loading**

*Fig. 3.2-1: Lifting yoke (example)*

## 3.3 Scope of delivery

The Fischer Panda PMS generator system contains following components:

### 3.3.1 Asyncron Genertoren:

**Fischer Panda Generator**

*Fig. 3.3-1: Fischer Panda Generator*

*representative picture*


**Remote control panel**

*Fig. 3.3-2: Remote control panel*

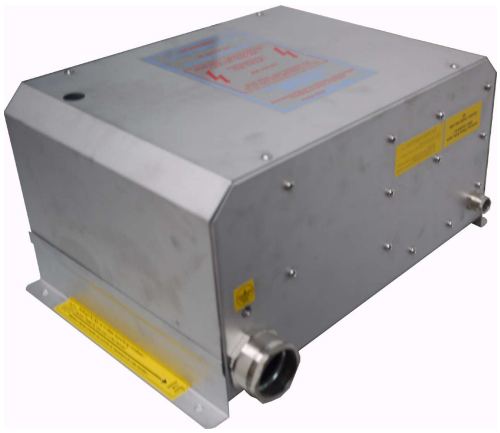
*representative picture*

**AC Control Box**

*Fig. 3.3-3: AC Control Box*

The AC Control Box contains the capacitors and the control circuit board (VCS) for the generator.

At ND generators and generators with mini VCS the capacitors and the VCS may mounted at the generator. The AC Control Box  is not required for this generators.



*representative picture*

**Fischer Panda Manual**

*Fig. 3.3.1-4: Fischer Panda Manual*

**The Fischer Panda Manual contains following components:**

- Clear foil bag with general informations ect.

- Generator manualwith added remote control panel manual

- Spare part catalog „Installation & Service Guide“

- Engine manual from the engine manufacturer.

- Wiring diagram for the generator


*representative picture*

**Optionales components**

**f.e.:**

**- Fuel pump**

**- Installation kit**

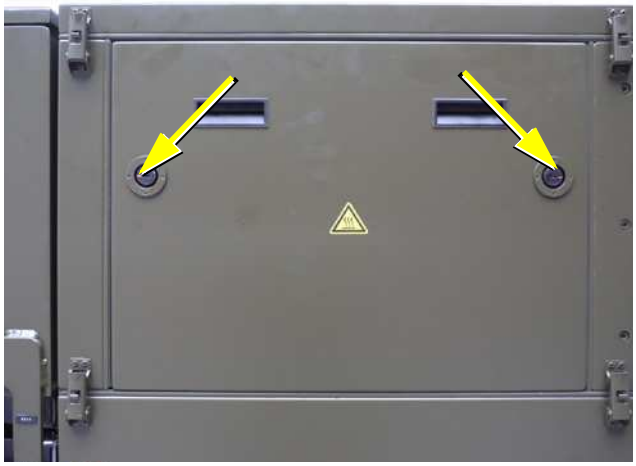
**- Water lock**

**- ect.**

## 3.3.2 Opening the MPL sound insulation capsule .

**To open the sound insulation capsule, the closures must be rotated roughly 180° counter-clockwise. Use a fl at head screwdriver. Pull the sidewalls out by gripping into the slots.**

*Fig. 3.3-1: Sound insulation capsule, side part*



**Closure locked**

*Fig. 3.3.2-2: Closure locked*

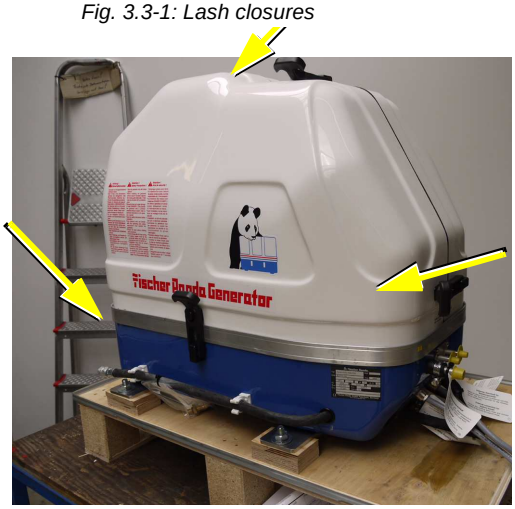
**Closure open**

*Fig. 3.3-3: Closure open*

## 3.3.3 Opening the GFK sound insulation capsule

**GFK sound insulation capsule with lash closures**

*Fig. 3.3-1: Lash closures*




**To open the lash closures pull the handle in arrow direction and lift the lash of the closure pin. After lifting of the lashes, the sound isolation cover upper pars can be removed.**

*Fig. 3.3-2: Lash closures*

## 3.4 Special maintenance notes and arrangements at long periods of stand still time or shutdown

Stand still is divided into the following groups:

- Short-term standstill (1 to 3 months).
- Medium-term standstill / winter storage (3 to 6 months).
- Long-term standstill (storage) / shutdown (more than 6 months).

### 3.4.1 Reference note for the starter battery at a long-term standstill

**Starter batteries**

Self-discharge of batteries is a physical and chemical process and cannot even be avoid by disconnecting the battery.

**Notice:**

- Disconnect the battery from the generator at a long-term standstill.
- Charge the battery on a regular basis. Follow the notes of the battery manufacturer.

Before charging the battery, check the acid level according to the type of battery and refill each cell with distilled

water up to the marking if necessary.

Today's starter batteries are normally maintenance-free.

**Deep discharge may damage the battery and may be useless afterwards.**

Keep the battery clean and dry. Continuously clean the battery terminals (+ and -) and clamps and lubricate with an acidfree and acid-resistant grease. Make sure there is a good contact of the clamp connections when assembling. If voltage is approx. below 1,95 Volt, the cell should not decline the open-circuit voltage of the battery. This equates approx. 2,1V / cell open-circuit voltage when battery is fully charged.

For a 12 V battery applies 11,7 V lower open-circuit voltage (battery flat) - conservation charging 13,2 V.

For a 24 V battery applies 23,4 V lower open-circuit voltage (battery flat) - conservation charging 26,4 V.

*These data relate to a battery temperature of 20-25℃. Consider the specifications of the battery manu facturer.*

**Fischer Panda recommendation:**

- Install a battery main switch and turn it to the off-position. (Disrupt the battery circuit)
- Install a sufficient fuse in the positive battery line close to the battery
- Check contacts for corrosion on a regular basis.

**Notice:**

## 3.4.2 Arrangements at a short-term standstill

Short-term standstill (1 to 3 months)

- Measure the charge of battery via the open-circuit voltage
- At stand still >7 days - disconnect the battery (e.g. put battery main switch to 0)
- Within 2-3 months - let the engine run for at least 10 min

## 3.4.3 Arrangements at a medium-term standstill / winter storage

Medium-term stand still (3 to 6 months)

### 3.4.3.1 Arrangements for conservation:

- Check the charge of battery and recharge approximately every 3 months if necessary. Consider the specifications of the battery manufacturer.
- Check anti-freeze protection of the cooling water and refill if applicable.

  The anti-freeze protection should not be older than 2 years. The content of the anti-freeze protection should be between 40% and 60% to ensure corrosion protection in the cooling water circuit; Refill anti-freeze if necessary.

  If cooling water will be drained, for example after a conservation of the engine, no water should remain within the engine during the stand still. At the control unit a correspondent note „NO COOLING WATER“ has to be placed.
- Drain engine oil as required. Refill engine with conservation oil up to maximum at the oil dip stick.
- Drain diesel fuel from tank and refill with conservation mixture (90% diesel and 10% conservation oil - up to max).

**Let engine run for 10 min.**

- Remove v-belt as required and store packed at a dry place. Protect from UV radiation.

**Cover alternator openings.**

No cleaning fluids or preserving agents may enter the alternator. Danger to destroy the alternator.

**Attention!**

- Clean engine according to the manufacturer.
- Inject engine parts and v-belt pulleys with a preserving agent.
- Clean air filter housing and inject with a preserving agent.
- Close suction hole and exhaust opening (e.g. with tape or end caps).
- Drain sea water circuit.
- Close sea cock.
- Clean sea water filter.
- Remove impeller and store.

**Carry out a deconservation before recommissioning.** **Attention!**

### 3.4.3.2 Arrangements for deconservation after a medium-term standstill (3 to 6 months).

- Check charge of battery and recharge if necessary. Consider the specifications of the battery manufacturer.
- Check anti-freeze protection of the cooling water and refill if applicable.
- Drain engine oil. Renew oil filter and oil according to specification.
- Remove preservation agent of the engine with petroleum.
- Degrease the v-belt pulleys and install v-belt correctly. Check v-belt tension!
- Disconnect turbocharger oilpressure line if existent and refill clean motor oil in pipe.
- Keep engine shut-off lever in 0-position and turn engine several times by hand.
- Clean air filter housing with petroleum, check air filter and renew if necessary.
- Remove covers of the exhaust opening and the suction holes.
- Connect battery. Close battery main switch.
- Install impeller.
- Open sea cock.
- Check sea water filter.
- Keep shut-off lever at generator in 0-position and activate starter for approx. 10 sec. Make a break for 10 sec. and repeat procedure twice.
- Visual inspection of the generator according to initial operation and start generator.

## 3.4.4 Arrangements at a long-term standstill / shutdown

Standstill (more than 6 months)

### 3.4.4.1 Arrangements for conservation:

- Check the charge of battery and recharge approximately every 3 months if necessary. Consider the specifications of the battery manufacturer.
- Check anti-freeze protection of the cooling water and refill if applicable.

  The anti-freeze protection should not be older than 2 years. The content of the anti-freeze protection should be between 40% and 60% to ensure corrosion protection in the cooling water circuit; Refill anti-freeze if necessary.

  If cooling water will be drained, for example after a conservation of the engine, no water should remain within the

engine during the stand still. At the control unit a correspondent note „NO COOLING WATER“ has to be placed.

- Drain engine oil as required. Refill engine with conservation oil up to maximum at the oil dip stick.
- Drain diesel fuel from tank and refill with conservation mixture (90% diesel and 10% conservation oil - up to max).

**Let engine run for 10 min.**

- Remove v-belt as required and store packed at a dry place. Protect from UV radiation
- Disconnect battery.Sprinkle terminals with acid-free grease.

**Cover alternator openings.** **Attention!**

No cleaning fluids or preservative agents may enter the alternator. Danger to destroy the alternator.

- Clean engine according to the manufacturer.
- Inject engine parts and v-belt pulleys with a preserving agent.
- Clean air filter housing and inject with a preserving agent.
- Sprinkle exhaust turbo charger (if existent) with conservation agent at intake and exhaust and close lines again. Sprinkle preserving agent to the intake and exhaust lines than attach again.
- Remove valve cover and sprinkle the inside of the cover, shafts, springs, rocker lever etc. with preserving agent.
- Remove injectors and sprinkle the cylinder area with preserving agent. Keep the shut-off lever on the 0-position and turn the engine by hand for several times. Screw in the injectors with new gaskets. Consider the torsional moments.
- Sprinkle slightly the radiator cap and tank lid and respectively the radiator cap at the expansion tank and reinstall.
- Close intake and exhaust openings (for example with tape or end caps).
- Drain sea water circuit.
- Close sea cock.
- Clean sea water filter.
- Dismount impeller and store.

**Carry out a deconservation before recommissioning.** **Attention!**

### 3.4.4.2 Arrangements after a long-term standstill (shutdown) / recommissioning (more than 6 months):

- Check the charge of battery and recharge if necessary. Consider the specifications of the battery manufacturer.
- Check anti-freeze protection and level of the cooling water and refill if applicable.
- Drain engine oil. Renew oil filter and oil according specification.
- Remove preservation agent of the engine with petroleum.
- Degrease the v-belt pulleys and install v-belt correctly. Check v-belt tension!
- Disconnect turbocharger oilpressure line if existent and refill clean motor oil in pipe.
- Keep engine shut-off lever in 0-position and turn engine several times by hand.
- Clean air filter housing with petroleum, check air filter and renew if necessary.
- Remove covers of the exhaust opening and the suction holes.
- Connect battery. Close battery main switch.
- Install impeller.

- Open sea cock.
- Check sea water filter.
- Keep shut-off lever at generator in 0-position and activate starter for approx. 10 sec. Make a break for 10 sec. and repeat procedure twice.
- Visual inspection of the generator according to initial operation and start generator.

**Fischer Panda recommendation:**

After a long-term standstill a complete 150 h inspection according to inspection schedule should be carried out.

**Notice:**

# 4. The Panda Generator

## 4.1 Type plate at the Generator

*Fig. 4.1-1: Type plate*

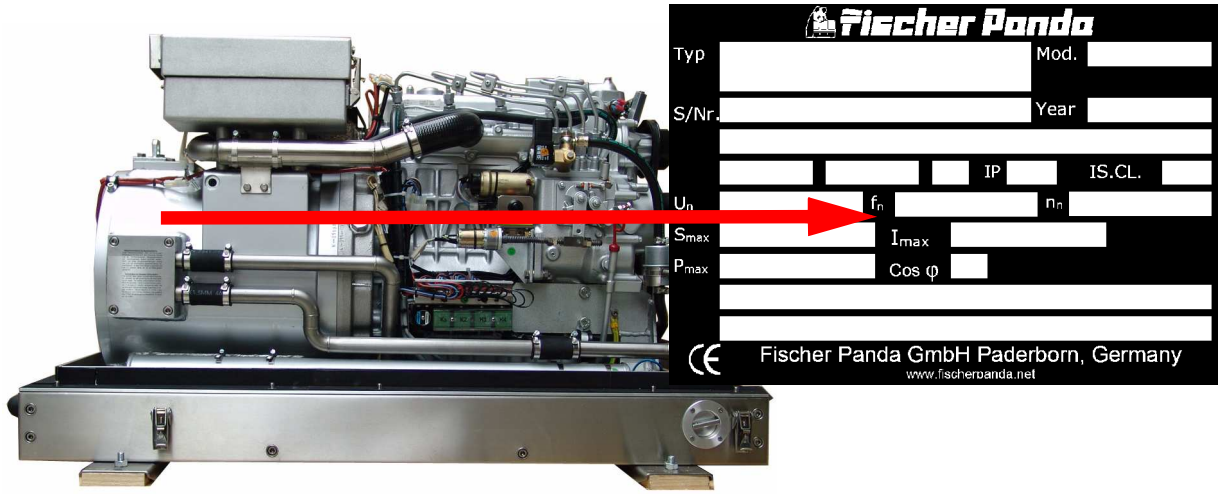
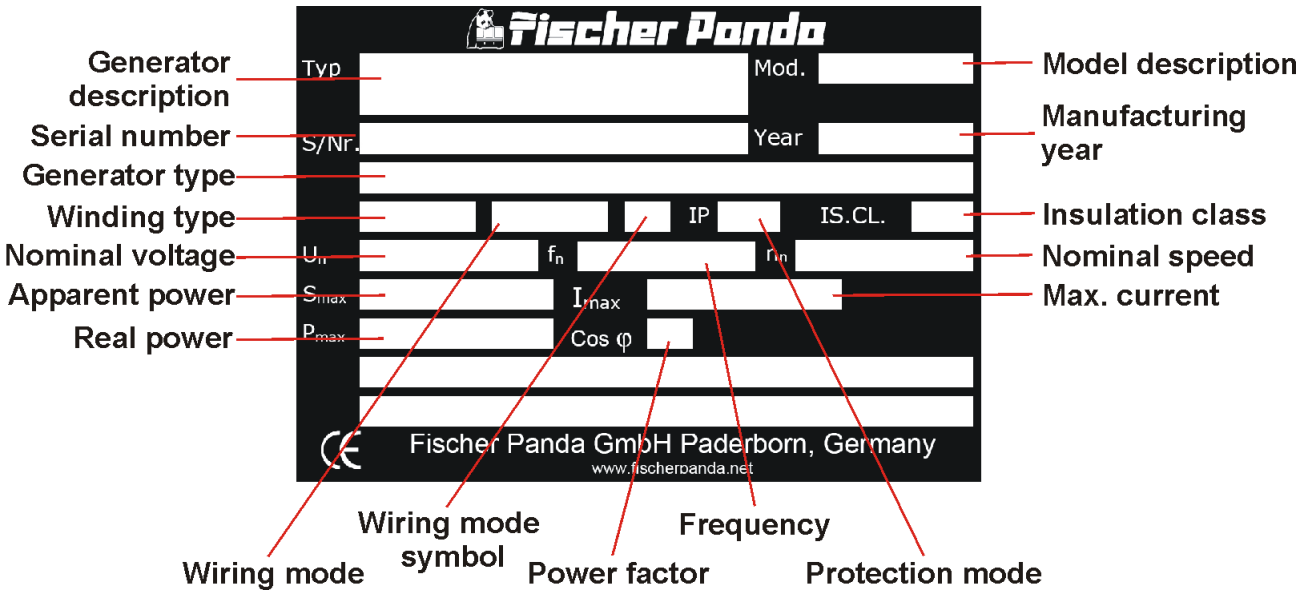


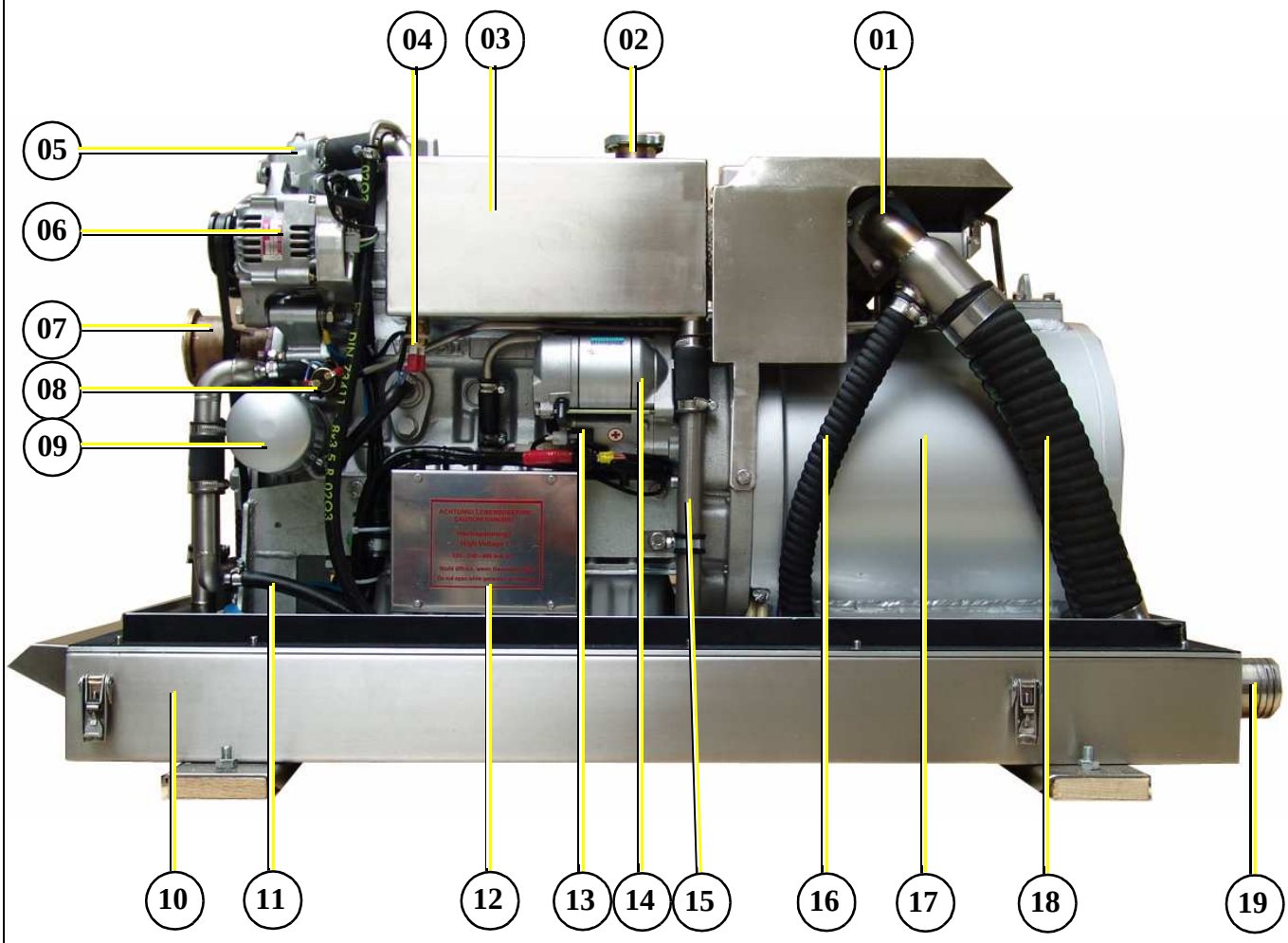

*Fig. 4.1-2: Discription type plate*



## 4.2 Description of the Generator

### 4.2.1 Right Side View

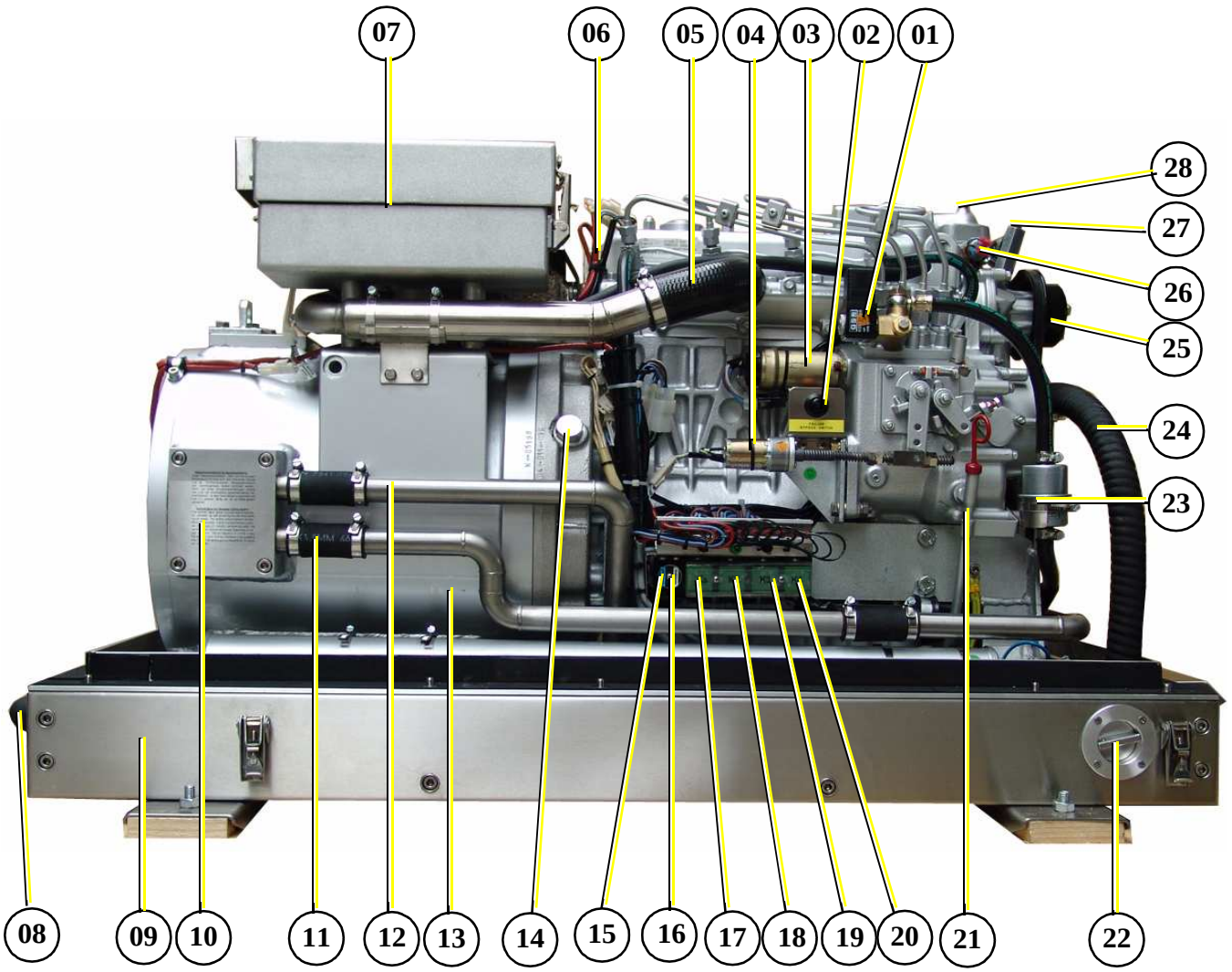
*Fig. 4.2.1-1: Right Side View*




01. Turbocharger under protection cover
02. Cooling water filler neck
03. Water-cooled exhaust manifold
04. Thermo-switch at the exhaust manifold
05. Thermostat housing with ventilation screw
06. 12 V DC-alternator
07. Raw water pump
08. Oil pressure switch
09. Engine oil filter
10. Sound cover - base part
11. Injection nozzle from external expansion tank
12. Generator power terminal box
13. Magnetic switch for starter motor
14. Starter motor
15. Cooling water return pipe
16. Injection hose from ventilation valve
17. Generator housing with coil
18. Exhaust hose
19. Exhaust connection

## 4.2.2 Left Side View

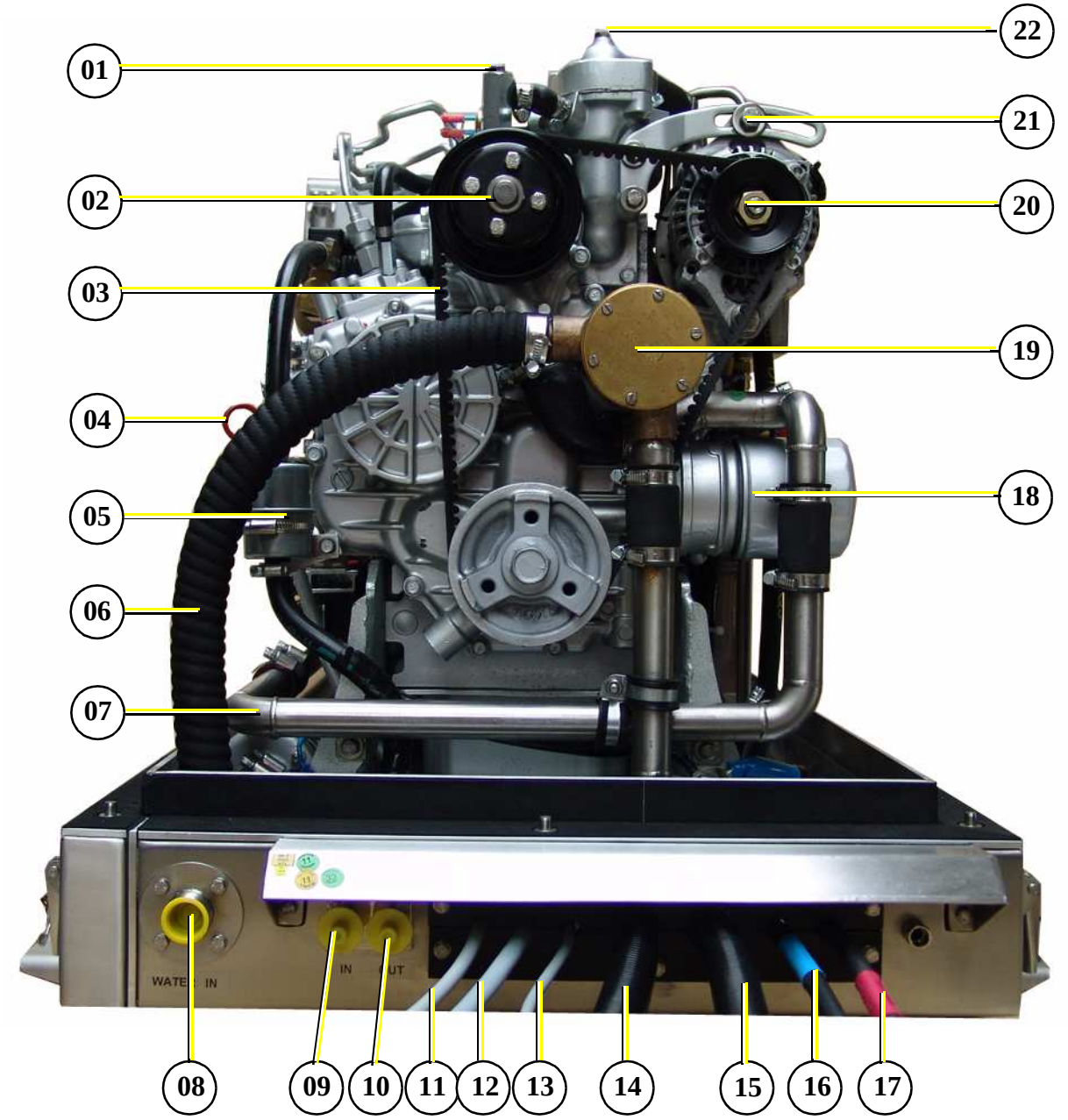
*Fig. 4.2.2-1: Left Side View*




01. Fuel solenoid valve
02. Failure bypass switch
03. Stop solenoid for engine stop
04. Actuator for speed control
05. Suction pipe, turbocharger - induction elbow
06. Thermo-switch cylinder head
07. Air suction housing with air filter
08. Connection external vent valve
09. Sound cover base part
10. Cooling water connection block
11. Cooling water pipe, connection block - cooling water pump
12. Cooling water pipe, heat exchanger - connection block
13. Generator housing with coil
14. Plug for speed sensor
15. Flat fuse 15 Amps (blue)
16. Flat fuse 25 Amps (white)
17. Starter relay Ks
18. Pre-glow relay (glow plugs) K2
19. Fuel pump start relay K3
20. Stop solenoid relay K4
21. Oil dipstick
22. Passage for oil drain hose
23. Fuel filter
24. Raw water hose
25. Pulley for internal cooling water pump
26. Thermo-switch at thermostat housing
27. Ventilation screw internal cooling water pump
28. Ventilation screw thermostat housing

## 4.2.3 Front View

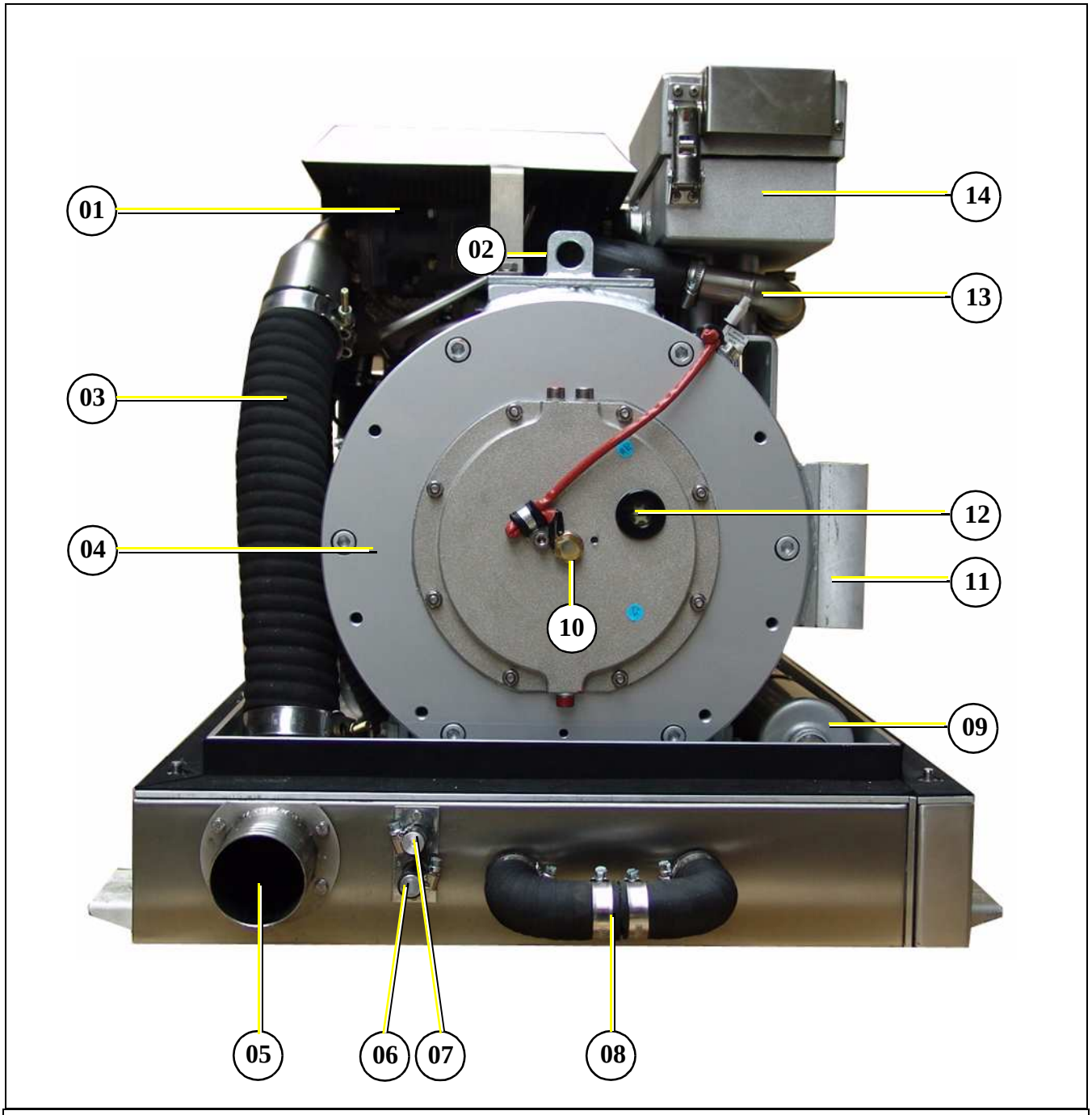
*Fig. 4.2.3-1: Front View*




01. Ventilation screw internal cooling water pump
02. Pulley for internal cooling water pump
03. V-belt for DC-alternator and internal cooling water pump
04. Oil dipstick
05. Fuel filter
06. Hose for raw water intake
07. Fresh water intake pipe
08. Raw water inlet
09. Fuel intake connection
10. Fuel backflow connection
11. Fuel pump cable (2 x 1,5 mm²)
12. Remote control panel cable (12 x 1 mm²)
13. Electronic Voltage Control cable VCS (5 x 1 mm²)
14. AC-Control box cable
15. Load
16. Starter battery minus (-)
17. Starter battery plus (+)
18. Engine oil filter
19. Raw water pump
20. 12 V DC-alternator
21. Clamp device for DC-alternator
22. Ventilation screw thermostat housing

## 4.2.4 Back View

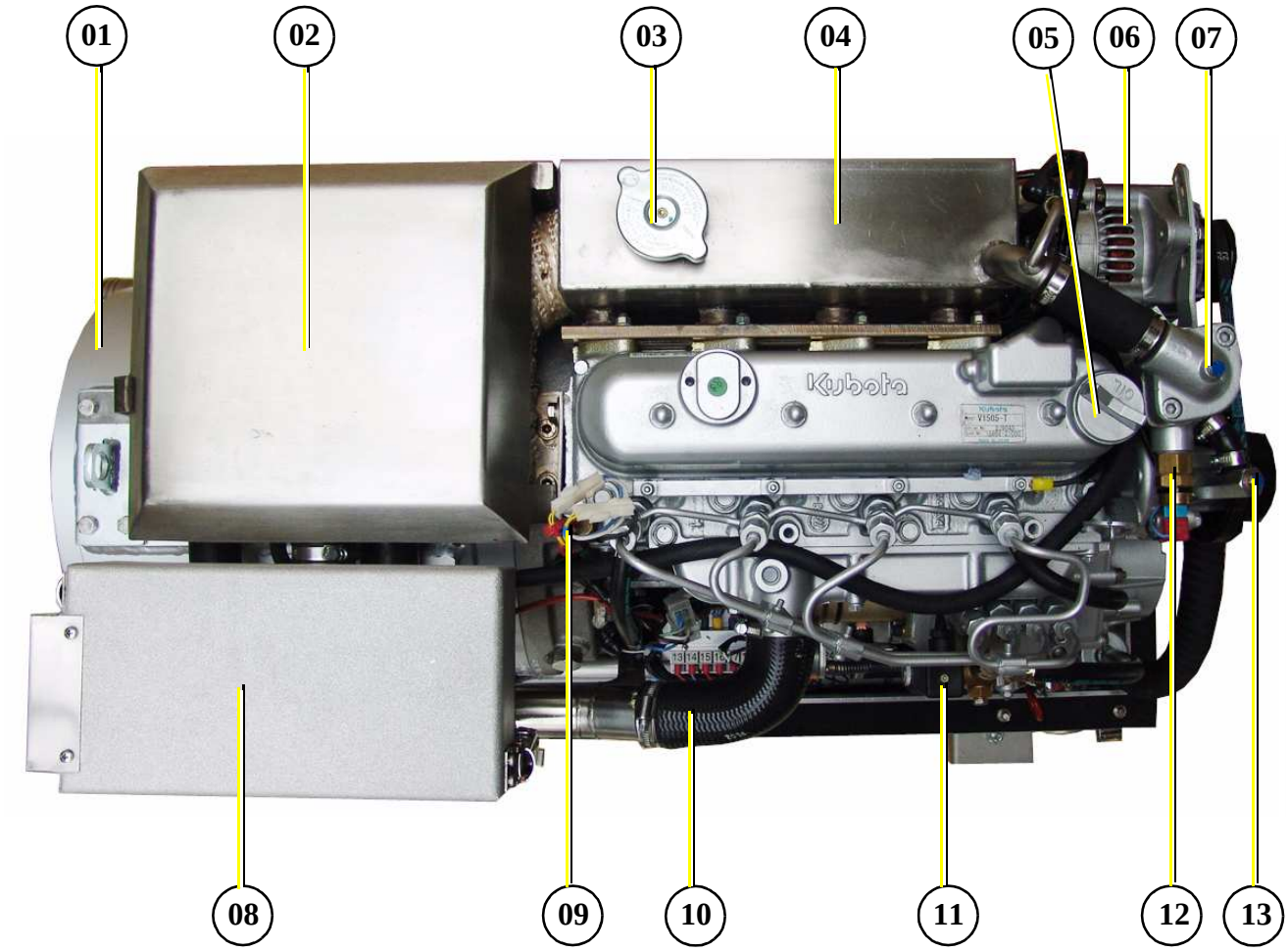
*Fig. 4.2.4-1: Back View*




01. Turbocharger under protection cover
02. Lifting device
03. Exhaust hose
04. Generator front cover
05. Exhaust outlet
06. Intake from external cooling water expansion tank
07. Backflow to external cooling water expansion tank
08. External ventilation valve connection
09. Heat exchanger
10. Thermo switch at oil cooled bearing
11. Cooling water connection block
12. Oil flow glas
13. Suction pipe, turbocharger - induction elbow
14. Air suction housing with air filter

## 4.2.5 View from above

*Fig. 4.2.5-1: View from above*



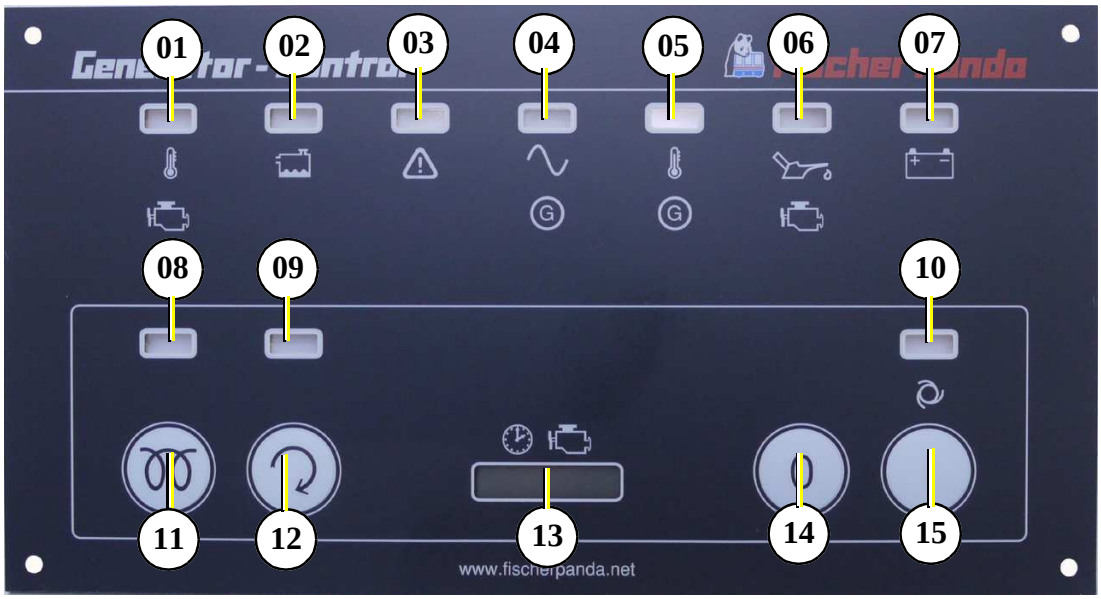

01. Generator housing with winding
02. Turbocharger under protection cover
03. Cooling water filler neck
04. Water-cooled exhaust manifold
05. Engine oil filler neck
06. 12 V DC-alternator
07. Ventilation screw thermostat housing
08. Air suction housing with air filter
09. Cylinder head thermo-switch
10. Suction pipe, turbocharger - induction elbow
11. Fuel solenoid valve
12. Thermo-switch at thermostat housing
13. Ventilation screw internal cooling water pump

## 4.3 Details of functional units

### 4.3.1 Control panel

The control panel is fitted with various monitoring functions, which increase functional reliability and operating safety of the generator. Various parts of the generator are monitored with sensors which, when triggered, generate an error message and can shut down generator operation under certain circumstances to prevent damage.

*Fig. 4.3.1-1: Control panel*




01. LED for cooling water temperature red[1]
02. LED for cooling water level red/yellow[1]
03. LED for fuel level and air filter replacement 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. Battery loading voltage DC charging light
08. LED for pre-heat "heat" orange[1]
09. LED for generator "start" green[1]
10. LED for generator "stand-by" green[1]
11. Pushbutton for pre-heat "heat"
12. Pushbutton for generator "start"
13. Operating hours counter
14. Pushbutton panel "off"
15. Pushbutton panel "on"

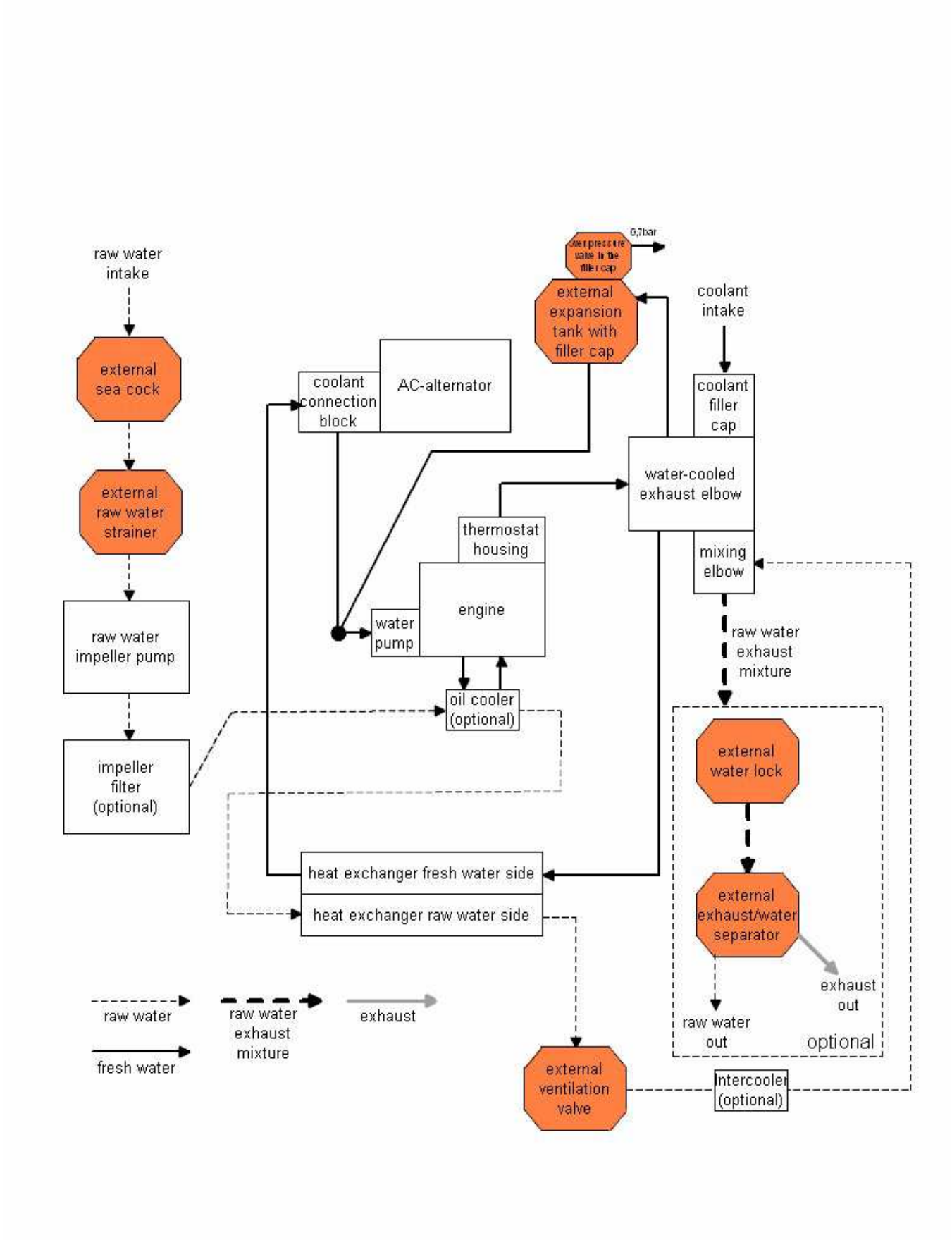
[1] LED green: normal operating mode, LED red: fault, LED yellow: warning, LED orange: active depending on jumper

**see remote control panel datasheet for details**

**Notice!:**

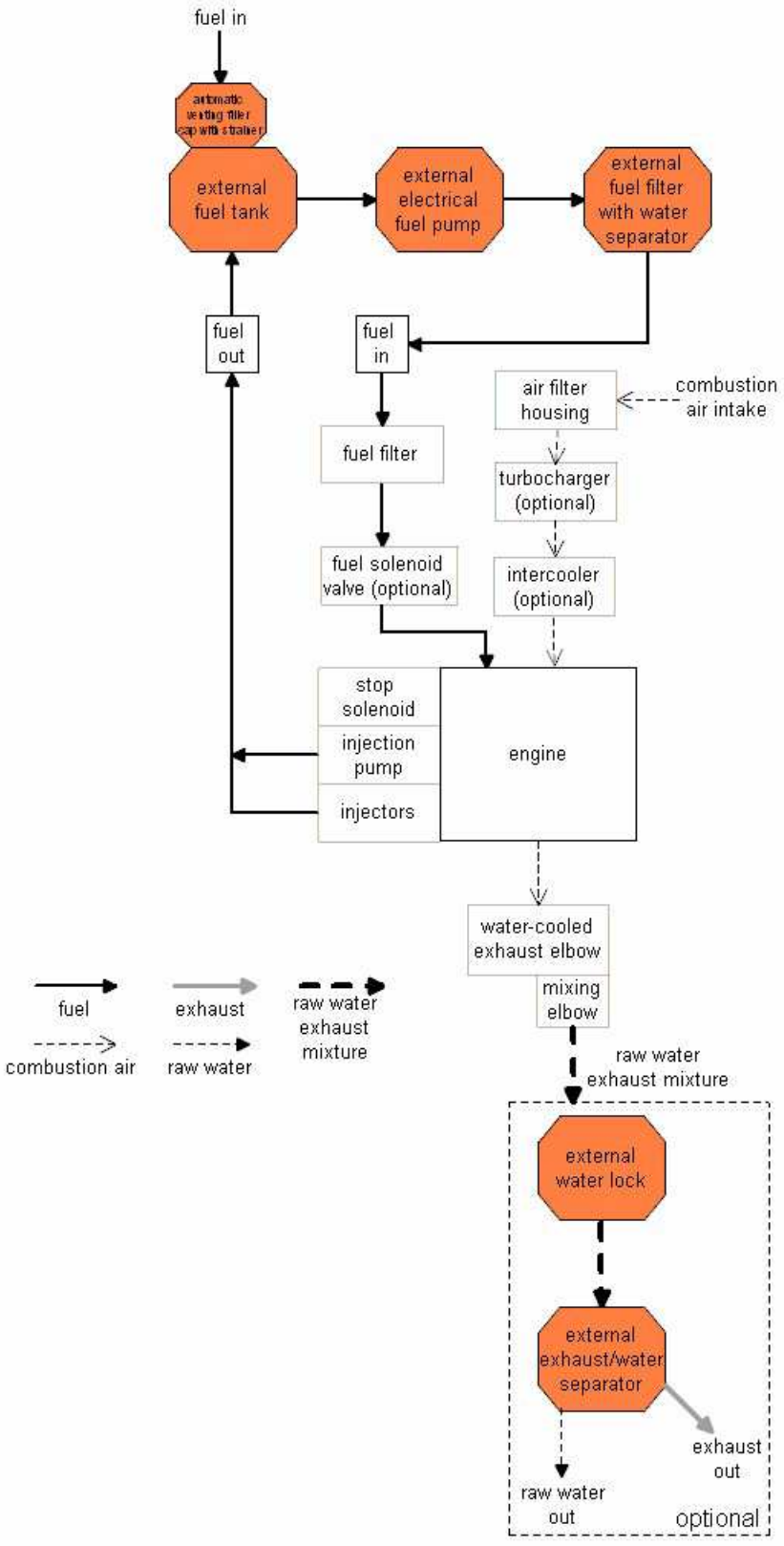
## 4.3.2 The cooling system

*Fig. 4.3.2-1: The cooling system*



## 4.3.3 The Fuel and combustion air system

*Fig. 4.3.3-1: The Fuel and combustion air system*



## 4.3.4 Components of the Electrical System

**Connection Starter Battery**

1. Cable for starter battery (plus)

2. Cable for starter battery (minus)

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

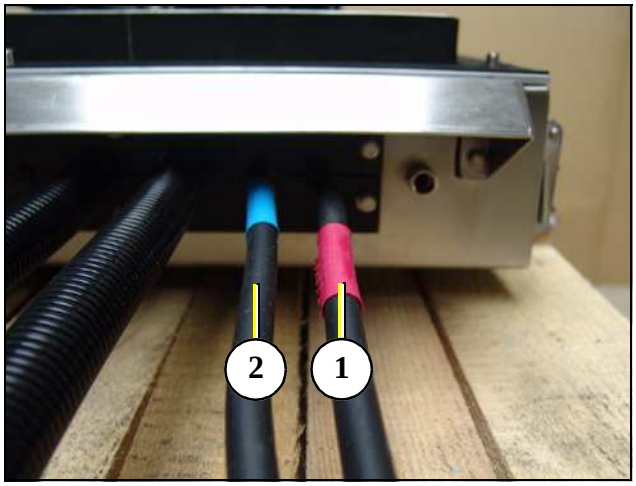



*Fig. 4.3.4-1: Cable for Starter Battery*

**Main Power**

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

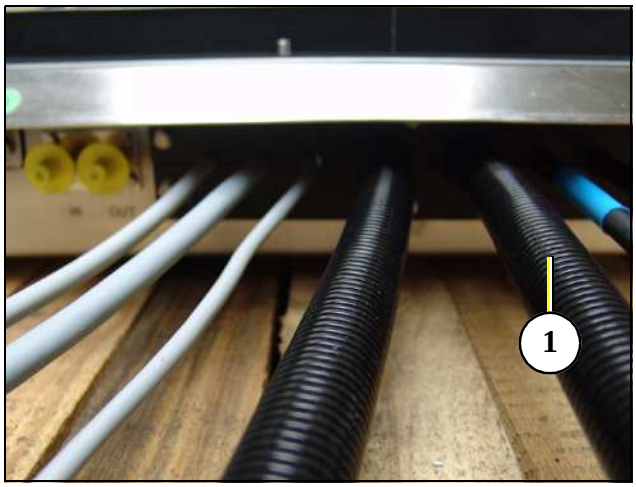



*Fig. 4.3.4-2: Main Power*

**Electrical connections for control**

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

1. Fuel pump

2. Remote control panel

3. VCS

4. AC-Control-Box

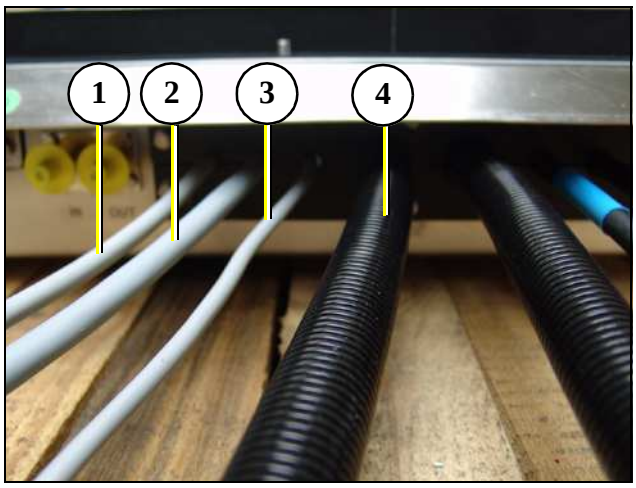



*Fig. 4.3.4-3: Electrical Connections*

**Starter motor**

1. Starter motor and

2. Solenoid switch

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

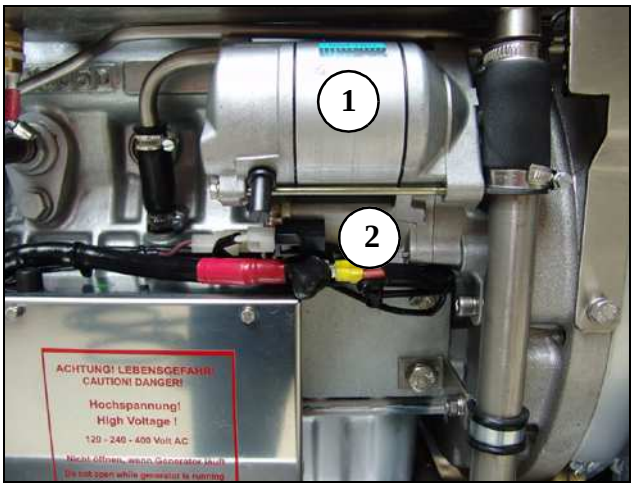



*Fig. 4.3.4-4: Anlasser*

**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.

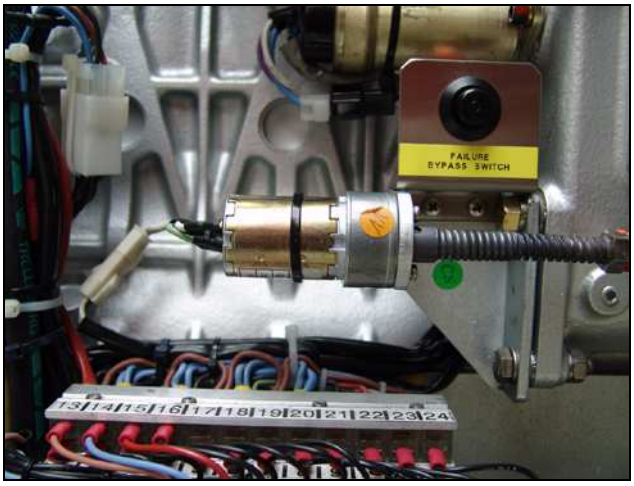



*Fig. 4.3.4-5: Actuator*

**DC Alternator**

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

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

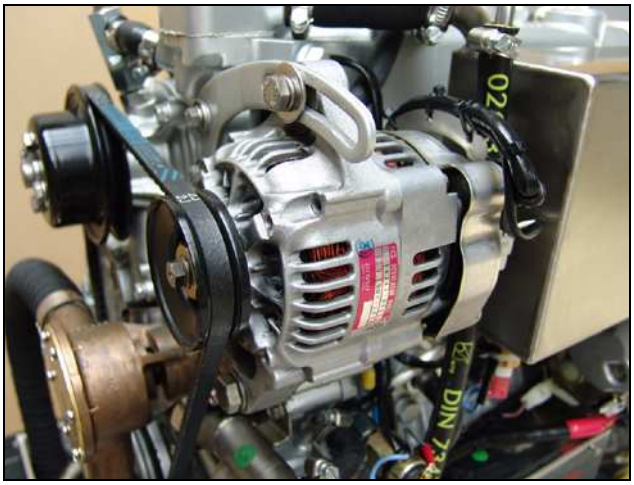


*Fig. 4.3.4-6: Lichtmaschine*

**Blind Plug for Speed Sensor**

All Panda Generators can be fitted with an external automatic starter. A separate speed sensor is necessary for this automatic starting system. The speed sensor is fitted as series in the case of some models. In the case of other models, the opening for the speed sensor is closed off by means of a sealing plug.

*Fig. 4.3.4-7: Blind Plug*

**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**

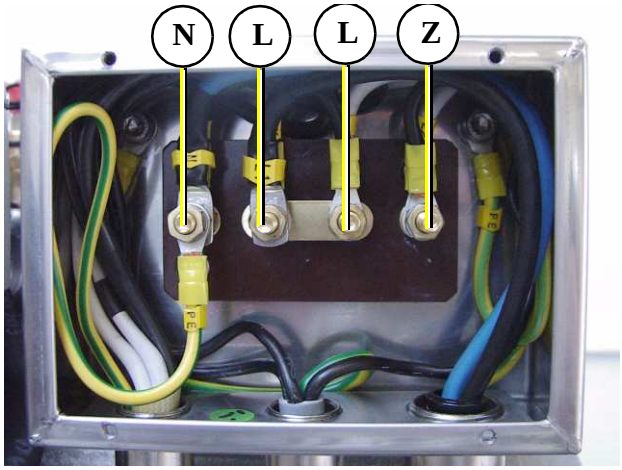



*Fig. 4.3.4-8: Generator Power Terminal Box 230V/50Hz*

**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**

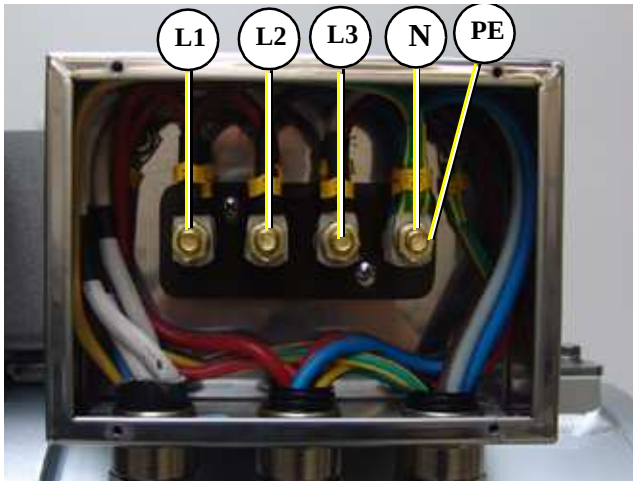



*Fig. 4.3.4-9: Generator Power Terminal Box 400V/50Hz*

**Terminal Block for Remote Control Cable with Fuses and Power Relais**

F1 fuse 15 A for DC wiring

F2 fuse 25 A for starter relay

Ks power relais for starter

K2 power relais for glow plugs

K3 power relais for fuel pump

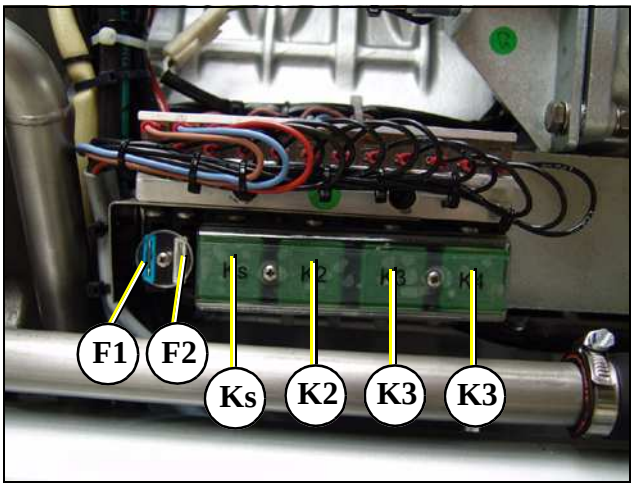


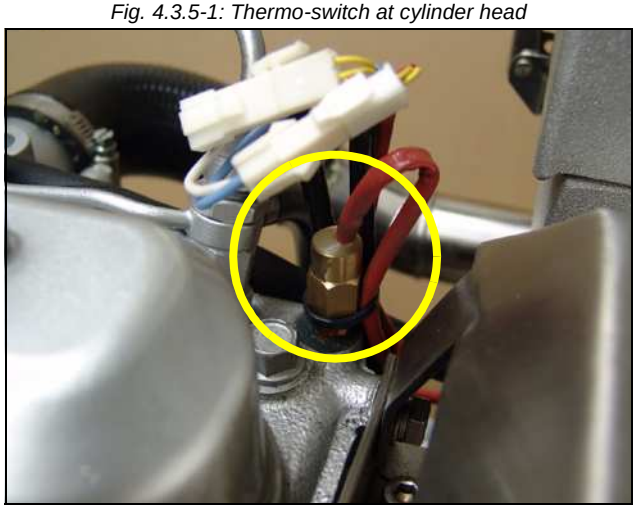

*Fig. 4.3.4-10: Power Relais and Fuses*

## 4.3.5 The Operation Surveillance System

**Thermo-switch at cylinder head**

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

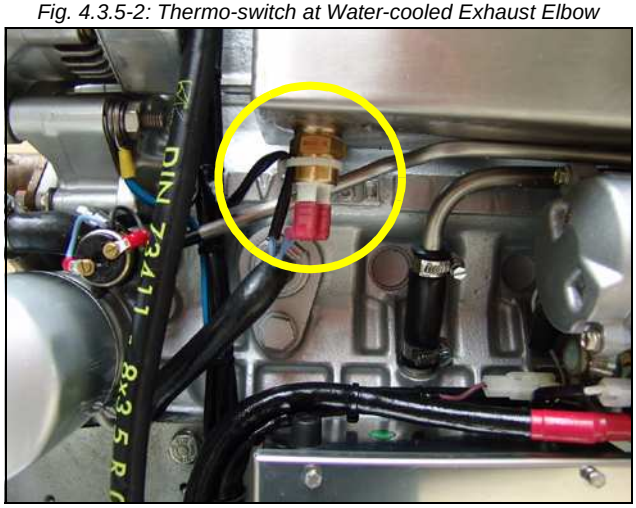
*Fig. 4.3.5-1: Thermo-switch at cylinder head*



**Thermo-switch at Water-Cooled Exhaust Elbow**

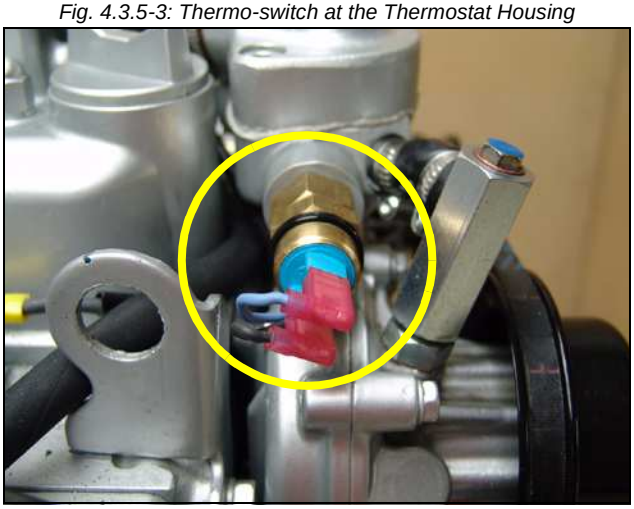
This Thermo switch is located at the water-cooled exhaust elbow and serves to monitor the freshwater circulation system. It takes a measurement at the warmest spot, since the combustion gases are guided from the cylinder head to the exhaust elbow.

*Fig. 4.3.5-2: Thermo-switch at Water-cooled Exhaust Elbow*



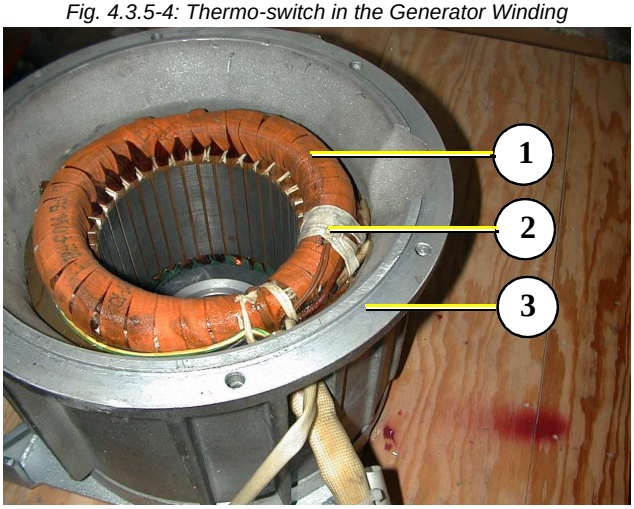
**Thermo-switch Thermostat Housing**

*Fig. 4.3.5-3: Thermo-switch at the Thermostat Housing*



**Thermo-switch in the Generator Winding**

*Fig. 4.3.5-4: Thermo-switch in the Generator Winding*




1. Generator winding

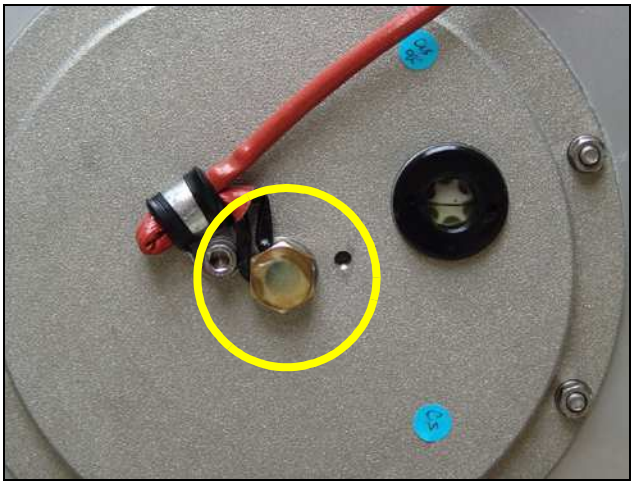
2. Thermo-switch

3. Housing

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

**Thermo-switch at the Front Plate**

*Fig. 4.3.5-5: Oil Temperature Switch*



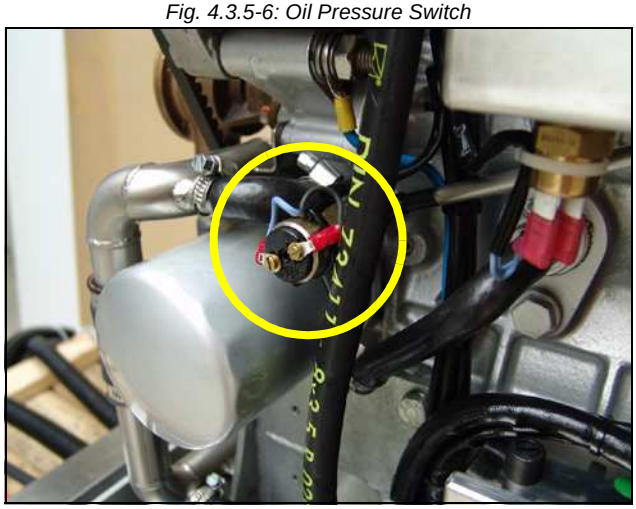
The generator bearing is equipped with an oil thermo-switch, which switches the engine off, if the oil temperature becomes too high.

*Generators with oil cooled bearing only*

**Oil Pressure Switch**

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

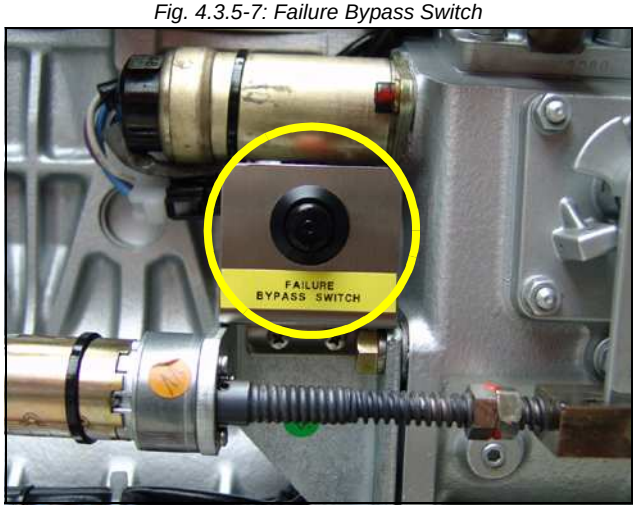
*Fig. 4.3.5-6: Oil Pressure Switch*



**Failure Bypass Switch**

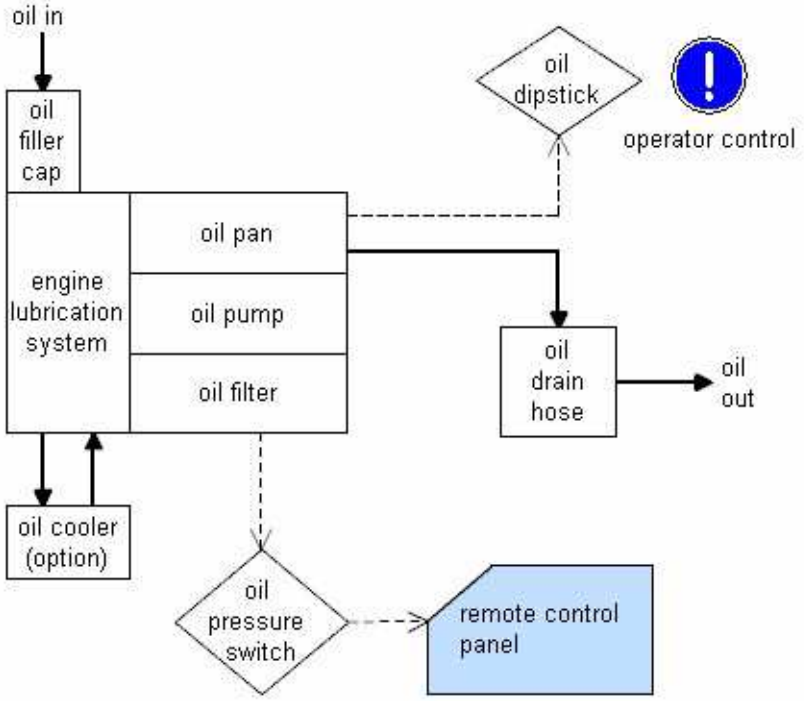
The failure bypass switch offers the possibility of starting the generator if the electrical control switches off due to overheating of the cooling system.

*Fig. 4.3.5-7: Failure Bypass Switch*



## 4.3.6 The oil circuit

*Fig. 4.3.6-1: tTe oil circuit*

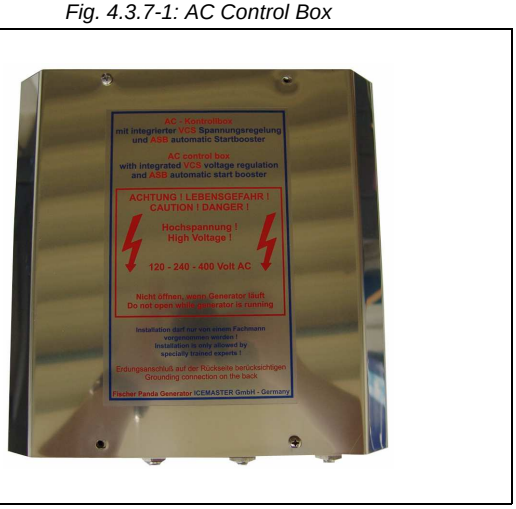


## 4.3.7 Other Components

**AC Control Box**

An AC-Control box is necessary for running the generator. This AC-Control Box contains electronics for the VCS control as well as different monitoring elements and condensers necessary for the excitation of the generator.

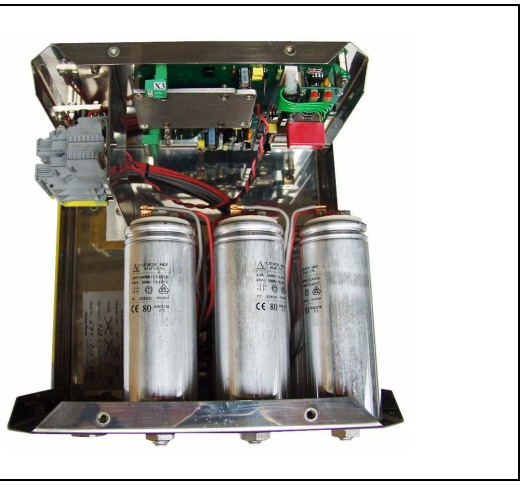
*Fig. 4.3.7-1: AC Control Box*




**AC Control Box - opened**

The AC-Control Box has an operating voltage of 120/230 and/or 230/400 Volts. 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 de-clamped when working on the electrical system.

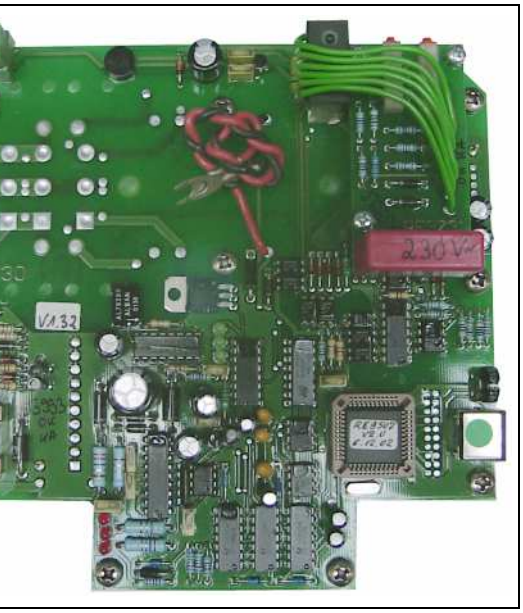
*Fig. 4.3.7-2: AC Control Box - Opened*



**Voltage Control (VCS)**

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

*Fig. 4.3.7-3: Control Circuit Board VCS*



## 4.4 Remote Control Panel - see separate Control Panel Manual

## 4.5 Starting the Generator - see separate Control Panel Manual

## 4.6 Stopping the Generator - see separate Control Panel Manual

# 5. Installation Instructions

All connections (hoses, wires etc) and installation instructions are designed and suited for “standard” installation situations.

In situations where Fischer Panda has no detailed information concerning certain installation requirements (such as vehicle specifications, maximum vehicle speed -and all other conditions concerning special operating situations) the installation instructions should be used as an example guide only.

The installation must be undertaken and proved by a suitable qualified/trained person and may in accordance with the law as required by the country and special situation.

Damages caused by faulty or incorrect installation are not covered by the warranty.

## 5.1 Personal requirements

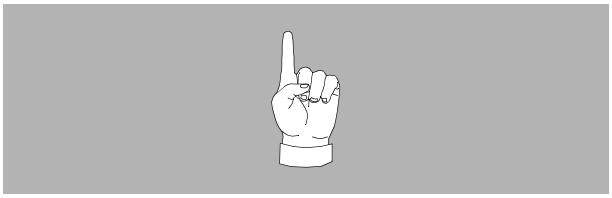
The described instrallation must be done by a technical trained person or a Fischer Panda service point.

### 5.1.1 Hazard notes for the installation

see “Safety first!” on Page 11.

Follow the general safety instruction at the front of this manual.

*Notice!:*



**Working at a running generator can result in severe personal injury. Therfore befor starting work at the generator:**

**Warning!: Risk of injuryr**

Make shure that the generator ist stopped and the starter battery is diconnected to guarantee that the generator cannot be inadvertently started.

Do not run the generator with removed sound isolation cover

**Impropper installation can result in servere personal injuries or material damage.**

**Warning!: Risk of injuryr**

- Always undertake installation work when the generator is switched off.

- Ensure there is sufficient installation clearance before start working.

- Ensure tidiness and cleanliness at the workplace. Loose components and tools lying around or on top of each other are sources of accidents.

- Only perform installation work using commercially avalilable tools and special tools. incorrect or damaged tools can result injuries.

**Oil and fuel vapours can ignite on contact with ignition sources. Therfore:**

- No open flames during work on the generator.

- Do  not smoke.

- Remove oil and fuel residues from the generator and floor.

**-Warning!: Danger of fire**

**Contact with engine oil, antifreeze and fuel can result in damage to health**. Therefor :

- Avoid skin contact with engine oil, fuel and antifreeze.

- Remove oil and fuel splashes and antifreeze from the skin immediatlly.

- Do not inhale oil and fuel vapours.

**Danger!: Danger of poisoning**

**Danger for Life. Improper handling, operation, installation and maintenance can result in sévere persoanl injury and/or material damage.**

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.

**ATTENTION!: Danger to Life - High voltage**

**Generator, oil and antifreeze can be hot during/after operation. Risk of severe burns.**

**Warning!: Hot surface/material**

**During Installation/mainenance personal protective equipment is required to minimize the helth hazards.**

- Protective clothing

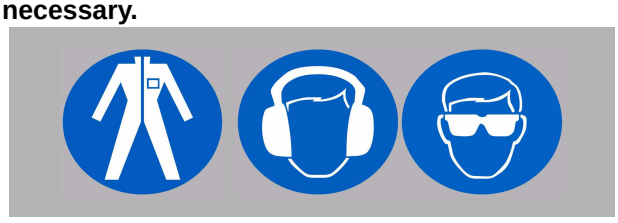
- safety boots

- protective gloves

- Ear defender

- safety glasses

**Instructiont!: Personal protective equipment necessary.**



**Disconnet all load during the work atthe generator to avoid damages at the load.**

**Attention!: disconnect all load**

## 5.2 Preparing the base - Placement

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

The generator should not be placed in the proximity of light walls or floors, which can have resonance vibrations because of airborne sounds. If this should be unavoidable, then it is recommended that this surface is lined with 1 mm lead foil, which will change the mass and the vibration behaviour.

You should avoid fixing the generator on a slippery surface with little mass (i.e.). This acts as an amplifier of airborne sounds in the most unreasonable case. An improvement can be achieved by reinforcing these surfaces with ribs. In addition, the breakthroughs, which interrupt these surfaces, should be sawed off. The lining of the surrounding walls with a heavy layer (i.e lead) and foam additionally improve the conditions.

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

High temperature of the intake air decline the power of the generator and increases the coolant temperature. Air temperatures of more than 40 °C reduce the power by 2 % per temperature rise of 5 °C. In order to keep th ese effects as small as possible, the temperature in the engine room should not be higher than 15 °C in rel ation to the outside temperature.

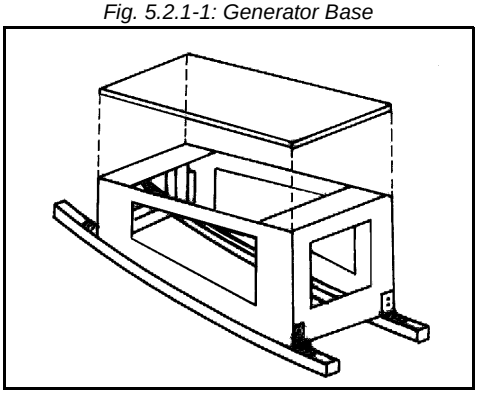
### 5.2.1 Advice for optimal sound insulation

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

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

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

*Fig. 5.2.1-1: Generator Base*



## 5.3 Generator Connections

Connect all electrical wires within the capsule tightly to the motor and the generator. This is also the case for fuel lines and cooling water lines.

The electrical connections MUST be carried out according to the respective valid regulations. This also concerns used cable materials. The cable supplied is meant for laying "protected" (i.e. in pipe) at a temperature up to a max of. 70 °C (160 °F). The on-board circuit must also be fitted with all essential fuses.

**Before working (installation) on the System read the section „Safety Instructions“ in this Manual.**

**ATTENTION!**

## 5.4 Installation of the cooling system - raw water

### 5.4.1 General Information

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

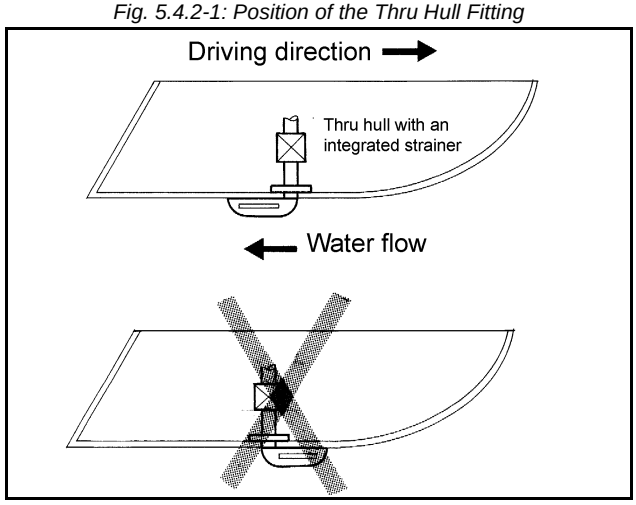
**For the avoidance of galvanic corrosion, refer to the chapter "Service instruction for marine generators (corrosion protection)".**

### 5.4.2 Installation of the thru hull fitting in Yachts

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

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

*Fig. 5.4.2-1: Position of the Thru Hull Fitting*




### 5.4.3 Quality of the Raw Water Sucking In Line

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

This applies also to installation components such as thru-hull fitting, sea cock, raw water filter etc.

The intake suction line should be kept as short as possible. Install the raw water inlet in close proximity to the gen-set.

**After start-up the cooling water quantity must be measured (e.g. by catching at the exhaust). The flow rate, as well as the necessary cross section of the cooling water pipe see section 8.10, “Diameter of conduits,” on page 208**

## 5.4.4 Generator Installation above Waterline

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

If the generator is installed above the waterline, it is possible that the impeller will wear out faster, because after starting, the pump runs dry for some seconds.

The raw water hose should form a loop as near as possible to the raw water inlet of the generator (see picture below). This ensures the pump only sucks in air for a short time. The impeller pump will be lubricated by raw water and the impeller life span will be increased.

By the installation of a check valve in the raw water inlet line, which is under the waterline, this problem can be restricted.

The impeller pump will remain intact longer, if an electrical booster pump is installed, and is strongly recommended in order to preserve the impeller pump.

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

**Replacement impeller and also a spare pump should always be on board. The old pump can be sent back to Fischer Panda.**

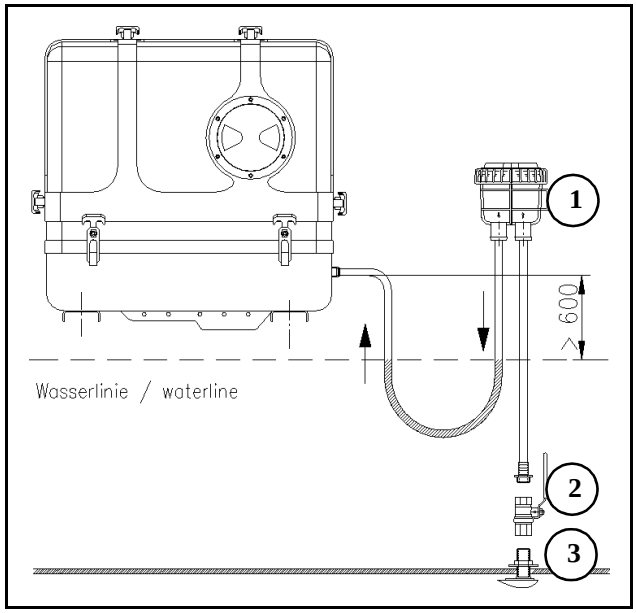
**NOTE:**

**Installation above water level**

1. Raw water filter
2. Water cock
3. Thru hull

Make certain that the raw water filter lies above the water level, otherwise when cleaning, water can penetrate by the thru hull. An external pre-pump can relieve the impeller.

*Fig. 5.4.4-1: Installing the generator above the water level*



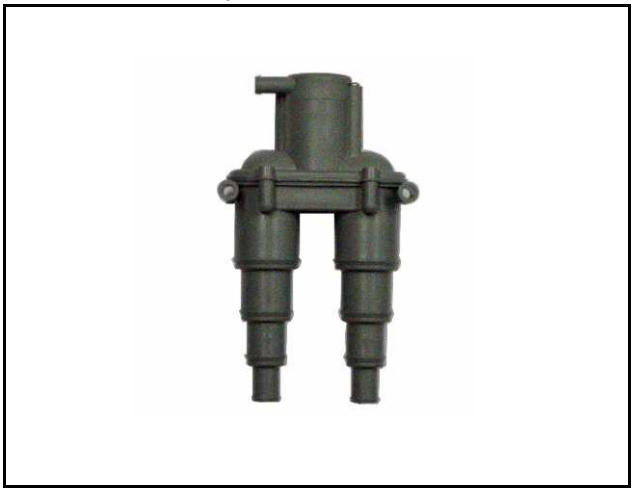
## 5.4.5 Generator Installation below Water-Line

If the generator cannot be attached at least 600 mm above the waterline, a vent valve must be installed at the raw water line.

Possible heeling must be taken into consideration if installed at the "mid-ship line"!

The water hose for the external vent valve is located at the back of the sound insulated cover. This hose is split in the middle and extended respectively at each end by an additional hose and a connecting nipple. Both hose ends must be led outside of the sound cover to one point, if possible 600 mm over the waterline in the mid-ship line. The valve is connected at the highest place to the two hose ends.

*Fig. 5.4.5-1: Vent Valve*



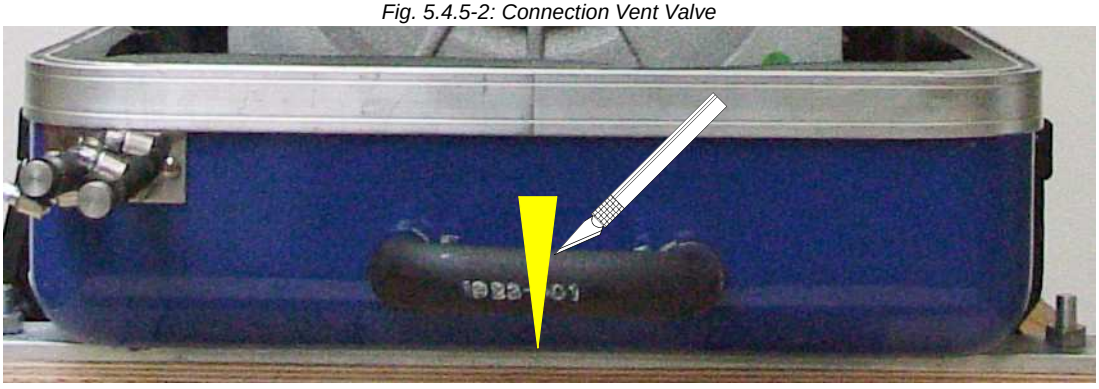
**Note:**

**The vent valve must be installed directly behind the water pump.**

**If the water pump ceases, the valve spring ensures that air can enter and therefore, a syphon effect is avoided.**

**The de-aeration valve must be regularly controlled. If the water pump stops, the valve spring ensures that air enters. It must be opened, cleaned and greased.**

*Fig. 5.4.5-2: Connection Vent Valve*

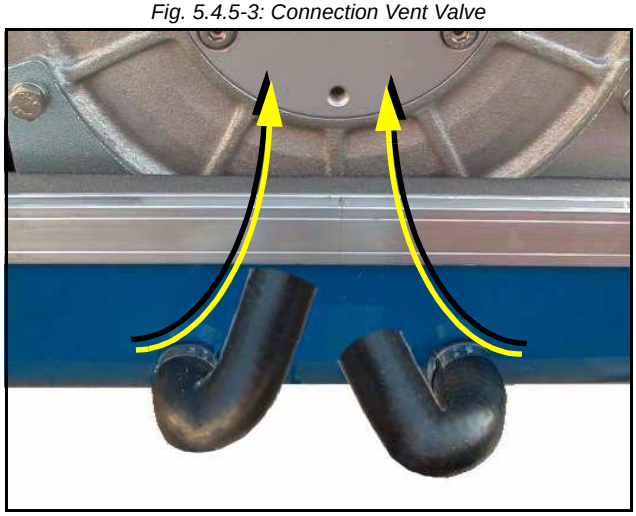


Cut the hose for the external vent valve....

...and bend it upwards.

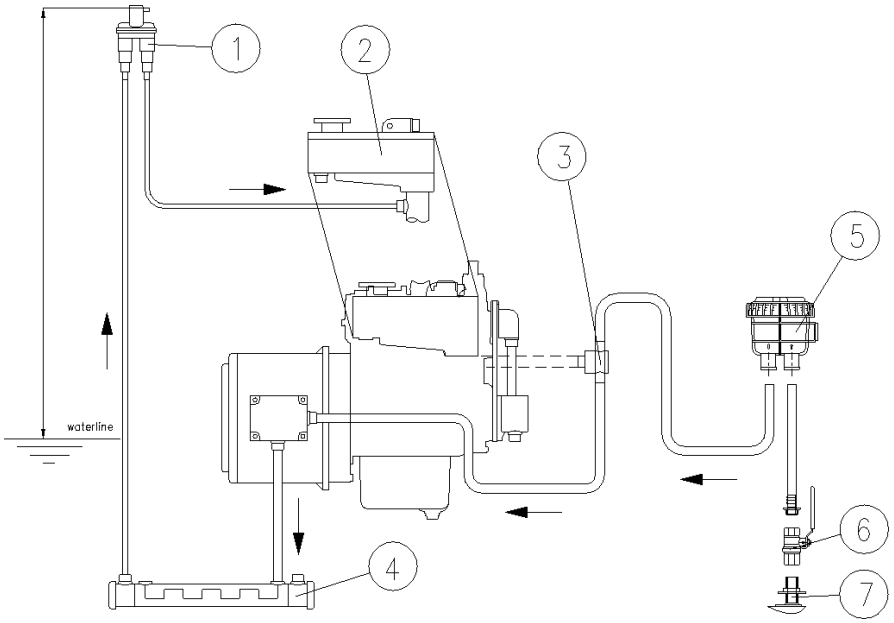
Both hose ends must be led out outside of the sound cover to one point, if possible 600 mm over the waterline at the mid-ships line. The valve is connected at the highest place with the two hose ends.

*Fig. 5.4.5-3: Connection Vent Valve*



## 5.4.6 Generator Housing cooled by Raw Water

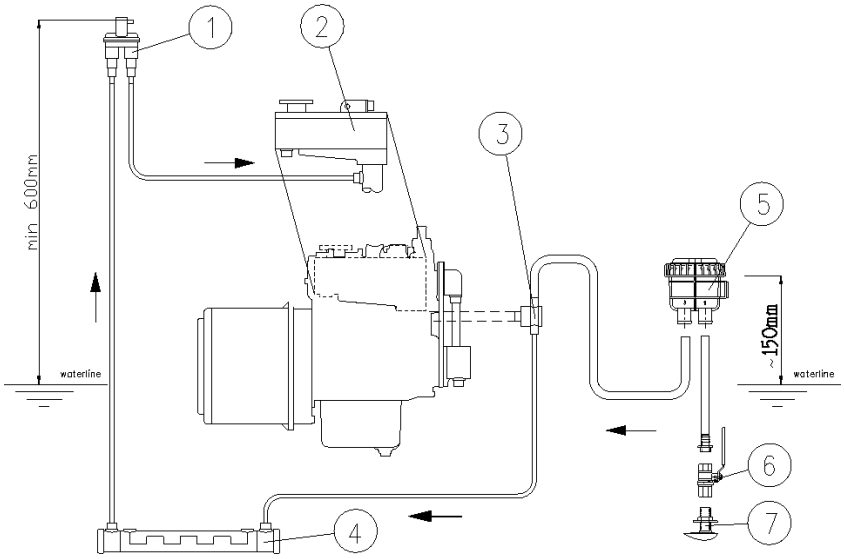
*Fig. 5.4.6-1: Installaton Scheme for Direct Cooling*




1. Vent valve
2. Coolant connection block
3. Raw water pump
4. Exhaust manifold
5. Raw water filter ø 1"
6. Water cock ø1"
7. Thru hull

### 5.4.7 Indirect Cooling of the Genset Housing (by the Heat Exchanger)

*Fig. 5.4.7-1: Installation Scheme Indirect Cooling of teh Genset Housing*




1. Vent valve
2. Exhaust manifold
3. Raw water pump (Raw water impeller pump)
4. Heat exchanger
5. Raw water filter
6. Water cock
7. Hull inlet

## 5.5 Installation of the cooling system - fresh water

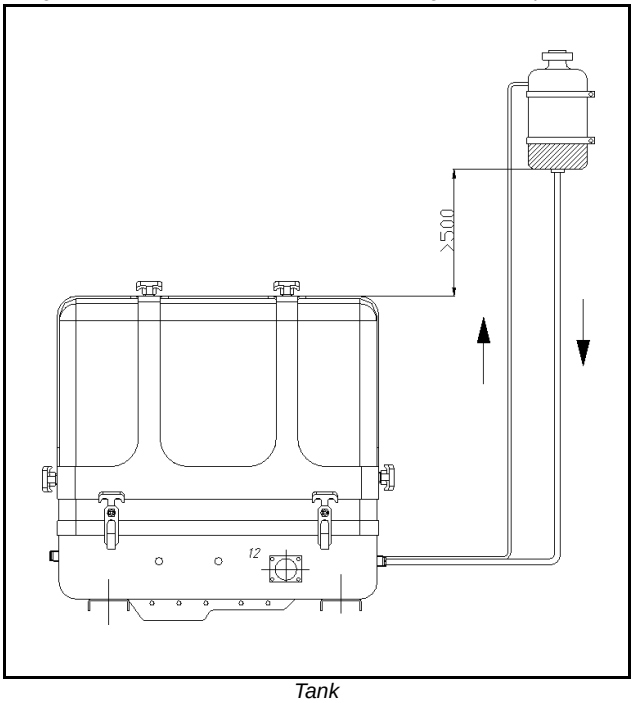
### 5.5.1 Position of the external cooling water expansion tank

**Position of the external cooling water expansion tank**

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

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

*Fig. 5.5.1-1: Position of the External Cooling Water Expansion Tank*



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

**ATTENTION!**

## 5.5.2 Ventilating at the first filling of the Internal Cooling Water Circuit

**Expansion Tank**

*Fig. 5.5.2-1: Expansion ttank*

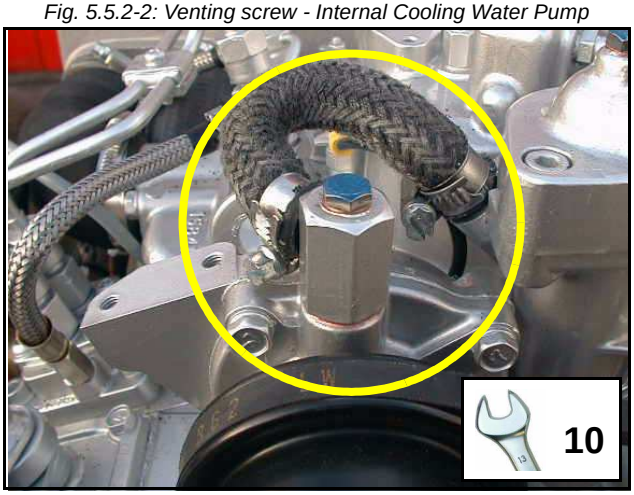
1. Fill up the external cooling water expansion tank with coolant.

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

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

**Venting Screws**

*Fig. 5.5.2-2: Venting screw - Internal Cooling Water Pump*




2. Open venting screw on the pipe socket of the internal cooling water pump. Close the vent screw when air free water comes out

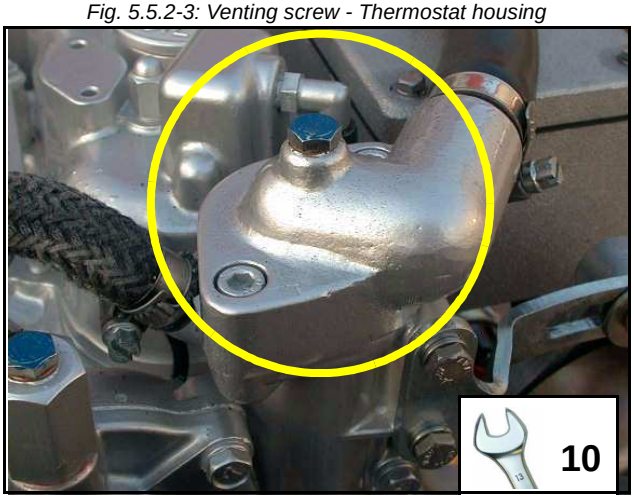
- Check the water level in the expansion tank during the vanting. Fill up if necessary.

Never open the vent screw while the generator is running.

*Sample picture*

3.Open vent screw on the thermostat housing. Close the vent screw when air free water comes out

*Fig. 5.5.2-3: Venting screw - Thermostat housing*




- Check the water level in the expansion tank during the vanting. Fill up if necessary.

Never open the vent screw while the generator is running

*Sample picture*

4. Start the Generator

After filling the generator it must be started. During this first phase of start-up, the generator may not be loaded. Switch the generator off after about 10 sek. of operation!

5. Repeat the steps 1-4 till no air comes out of the vent screw at tthermostat housing.

6. Close the vent screws.

7. Fill up the expansion tank.

8. Close the expansion tank.

9. Re-ventilating process 10 Operating hours after the first start-up (and if necessary)

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

**During the ventilating process repeated checks must be made to check the cooling water is indeed circulating. If there are air bubbles in the internal cooling water pump, it could be that the cooling water is not circulating. The generator will heat up very quickly and switch off, because of overheating.**

**ATTENTION!**

*Anti-freeze*

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

## 5.5.3 Pressure Test for Controlling the Cooling Water Circuit

Check if a temperature difference exists between cooling water in-flow and cooling water return flow by use of the hand.

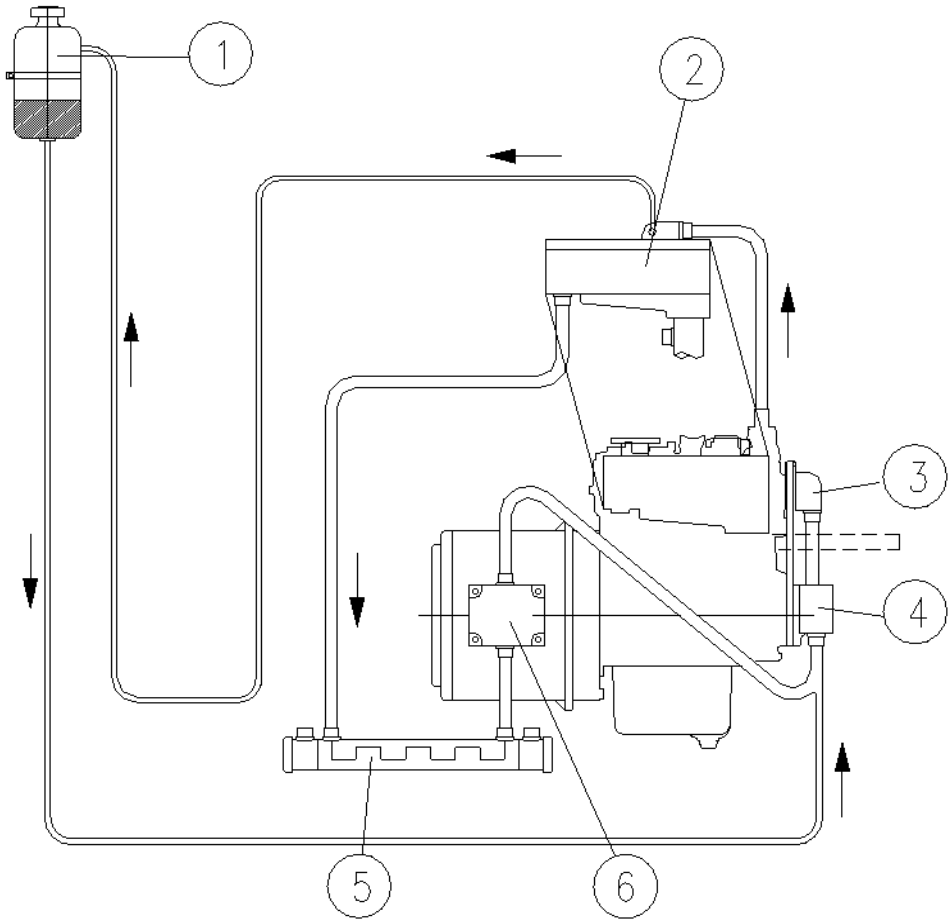
Feel the cooling water in-flow line at the internal cooling water pump.

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

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

## 5.5.4 Scheme for Freshwater Circuit at Two Circuit Cooling System

*Fig. 5.5.4-1: Scheme for Freshwater Circuit at Two Circuit Cooling System*




1. Expansion Tank
2. Exhaust Manifold
3. Thermostat Housing
4. Freshwater pump
5. Heat Exchanger
6. Cooling Water Connection Block

## 5.6 Installation of the water cooled exhaust system

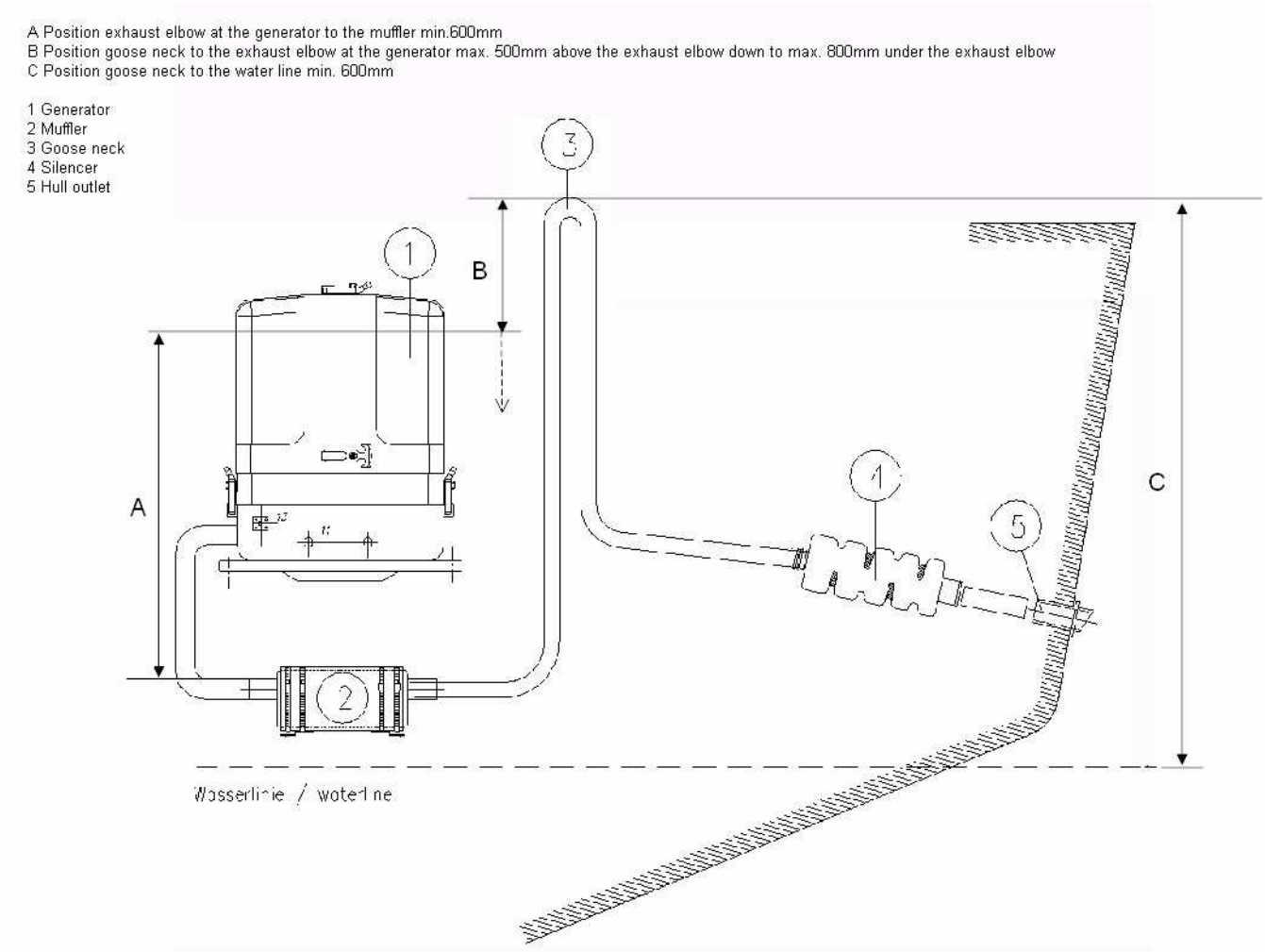
### 5.6.1 Installation of the standard exhaust system

The generator exhaust system must remain completely independent and separate from the exhaust system of any other unit(s) on board. The water lock must be installed at the lowest point of the exhaust system. An optional noise insulated water lock can also be installed. The exhaust hose descends from the capsule to the water lock. Then the hose rises via the "goose neck" to the silencer (see drawing). The goose neck must be vertical and sit preferably along the ship's keel centre line. In order that the back pressure inside the exhaust is not to high, the total length of the exhaust system should not exceed 6 m (20 ft.)

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

*Exhaust diameter see section 8.10, "Diameter of conduits," on page 208*

*Fig. 5.6.1-1: Installation Scheme Standard Exhaust System*




## 5.7 Installation of the waterlock

Unfortunately, it can occasionally occur that, because of an disadvantageous mounting position of the waterlock, sea water gets into the diesel engines' combustion chamber. This disables the diesel engine by irreversible damages. Quite frequently, this leads to discussions during which the parties involved in the yachts' construction or the installa-

tion of the generator have to explain themselves.

**One point in this situation can be clarified definitely:**

If sea water gets into the inner section of the engine, this is not possible due to constructional defects of the generator or to malfunctions on the engine itself. It can only reach the combustion chamber via the exhaust hose and thus get into the engine.

Thereby, the position of the generator and the waterlock, as well as the arrangement of the cooling water and exhaust hoses play the decisive role.

If the waterlock is arranged in an unfavourable position, the cooling water flowing back in the exhaust hose can rise so high, that it reaches the exhaust stack. Since at least one discharge valve is always open when the engine is shut off, the sea water has free access to the combustion chamber. By capillary action, this sea water then flows past the cocks and even reaches the engine oil in that way. (In fact, a surprisingly high oil level is a first indication of an upcoming catastrophe).

**If an usual high oil level can be detected and/or the oil is of a greyish colour, the engine must not be used anymore. This is a certain sign for cooling water that got into the oil pan. If the engine is started under these conditions, the water and the oil are mixed into an emulsion. The oil will quickly become so viscous that one will have to call it a paste. In this phase the fine oil hoses are blocked and a few moments later the machine gets destroyed because of insufficient lubrication. Before this happens, an immediate oil change should be made. Since the water can only reach the engine via the combustion chamber, it can be assumed that the compression rings will start to corrode. These effects have to be discussed with an engine expert. It will certainly be reasonable to immediately inject plenty penetrating oil through the intake stack and to slowly turn the engine with the starter motor.**

The cooling water can reach the exhaust area via the exhaust hose as well as via the cooling water feed.

## 5.7.1 Possible cause for water in the exhaust hose

### 5.7.1.1 Possible cause: Exhaust hose

If the cause is the exhaust hose itself, the following points are to be checked at the hose:

a) Position of the waterlock is too high. The water reaches the exhaust hose.

b) Position of the waterlock is too far away from the middle of the generator. The water reaches the exhaust hose in tilted position.

c) The waterlock is too small relating to the length of the exhaust hose.

### 5.7.1.2 Possible cause: cooling water hose

If the generator is not clearly installed 600 mm over the water line, the cooling water feed must be equipped with a „venting valve“ which is at least led out 600 mm over the water line. (This position must also be assured in every tilted position. Therefore, the venting valve should be located in the ships’ center line, so that it cannot move in tilted position).

a) Position of the venting valve is too low. The water flows into the exhaust area when the ship is tilted.

b) Position of the venting valve is too far from the ships’ center line. The water reaches the exhaust area when the ship is tilted.

c) The venting valve does not work, because it jams or it is clotted. (The venting valve’s function needs to be chekked regularly.)

As it consistently happens that functioning risks are not realised during the laying of the exhaust hose, the following explanations refer explicitly to the exhaust hose. Here, the location, the size and the position of the „waterlock“ play a very decisive part:

## 5.7.2 Installation area of the waterlock

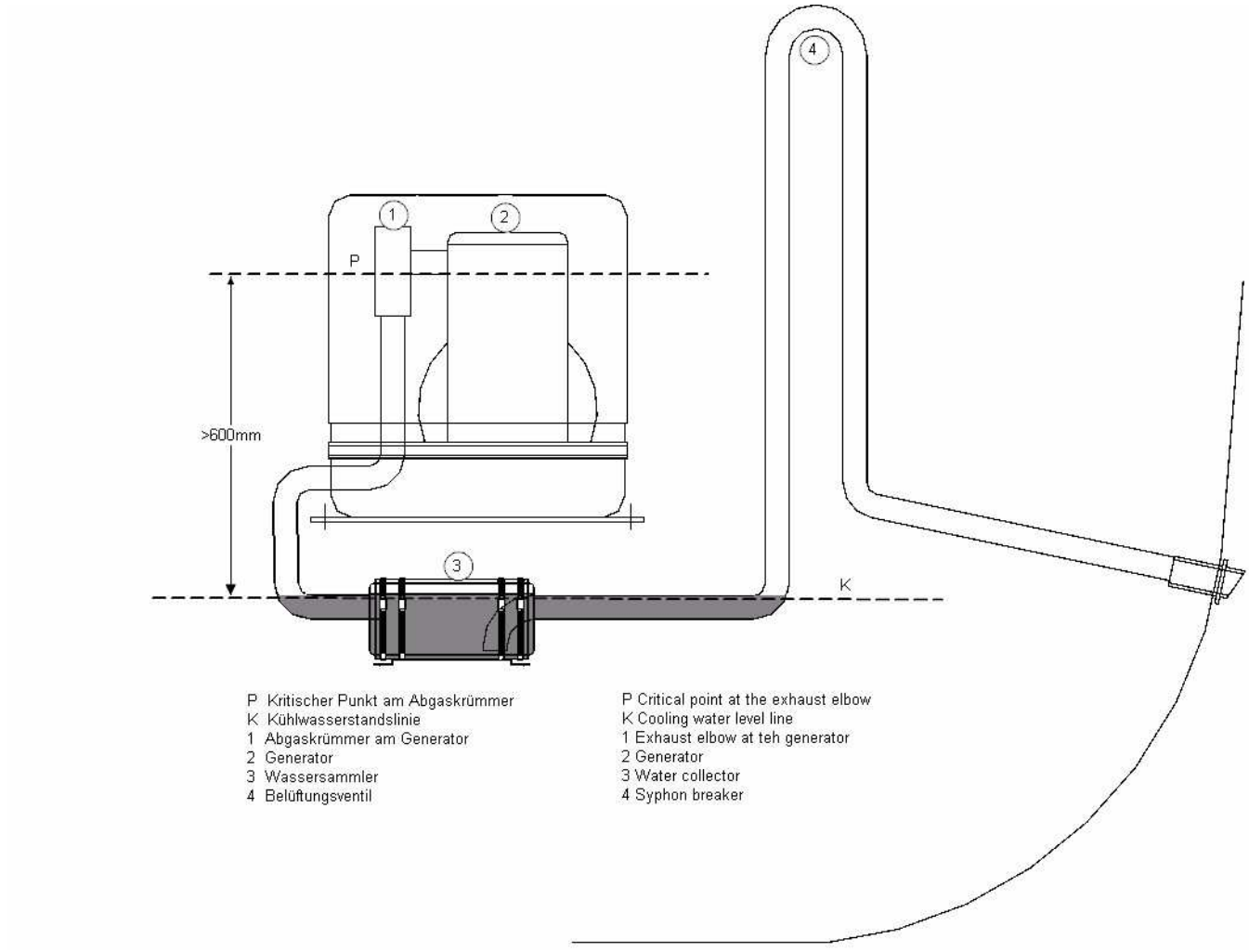
Concerning a water-cooled exhaust system, it must be regarded that - under no circumstances - cooling water from the exhaust hose can get into the exhaust elbow area at the engine. If this happens, the cooling water can get into the combustion chamber via an open discharge valve. This would lead to irreparable damage at the engine.

In addition to that, one has to reckon with possible tilted positions of sailing yachts, which makes the position of the waterlock even more important. In general one could say that:

The deeper the waterlock is located underneath the generator, the better the protection from entering water into the combustion chamber.

The pictures below show the distance between the critical point at the exhaust elbow and the maximum permissible water level in the exhaust hose is stated with 600 mm. This distance should be understood as a minimum distance.

*Fig. 5.7.2-1: Installation area of the waterlock*

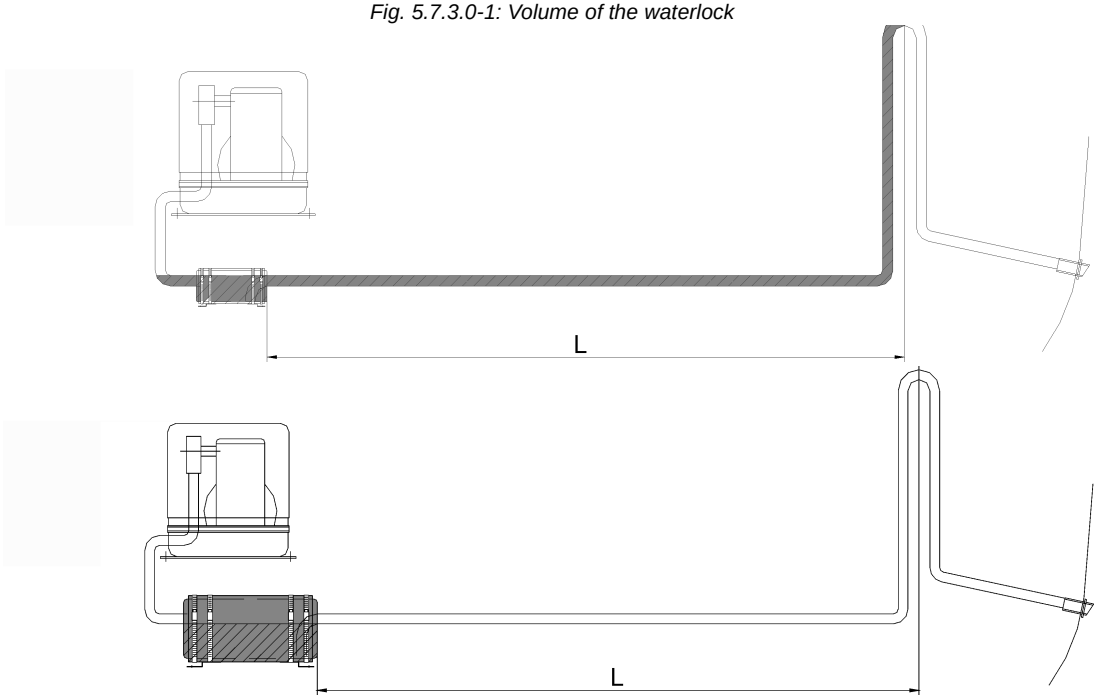



## 5.7.3 The volume of the waterlock

The waterlock must be measured so large, that it can take the entire amount of water flowing back from the exhaust hose. The amount of water depends on the hoses' length (L) and its cross section. While the diesel engine is running, cooling water is continuously injected into the exhaust system and is carted outside with the emissions by the exhaust gas pressure. When the engine is turned off, the number of revolutions sinks quite fast. By doing so, the point is reached where the exhaust gas pressure does not suffice anymore to cart the cooling water out. All cooling water remaining in the hose at that point flows back into the waterlock. At the same time, the diesel engine itself continues to cart cooling water through the cooling water pump, as long as it keeps on rotating.

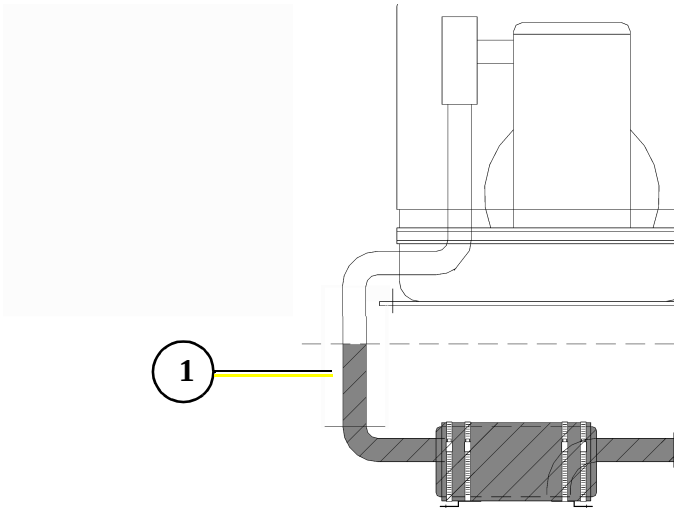
**The waterlock must necessarily be measured so large, that it can take the entire amount of cooling water and, and the same time, does not exceed the prescribed vertical height of 600 mm up to the critical point at the exhaust elbow.**

*Fig. 5.7.3.0-1: Volume of the waterlock*




If there are any doubts, a verifiction can easily be made by temporarily using a clear-sighted hose (1) as exhaust hose. In that way, the cooling water level can be checked very easily.

*Fig. 5.7.3.0-2: Testing the cooling water level*



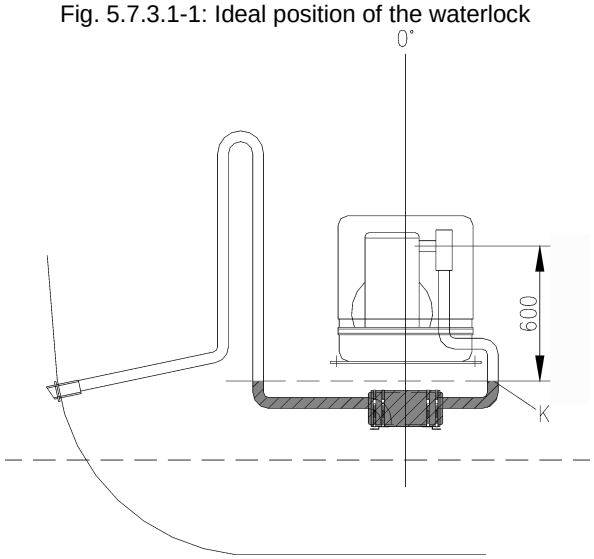
## 5.7.3.1 Ideal position of the waterlock

**Important Note!**

**The ideal position of the waterlock would be in center underneath the generator. Only in this position it is assured that the water level cannot change drastically in tilted position by the waterlock moving out of the center line. See the following pictures:**

In this picture, the waterlock is mounted in center underneath the generator. When the ship tilts, the position of the water-lock related to the critical point at the exhaust hose, changes only slightly.

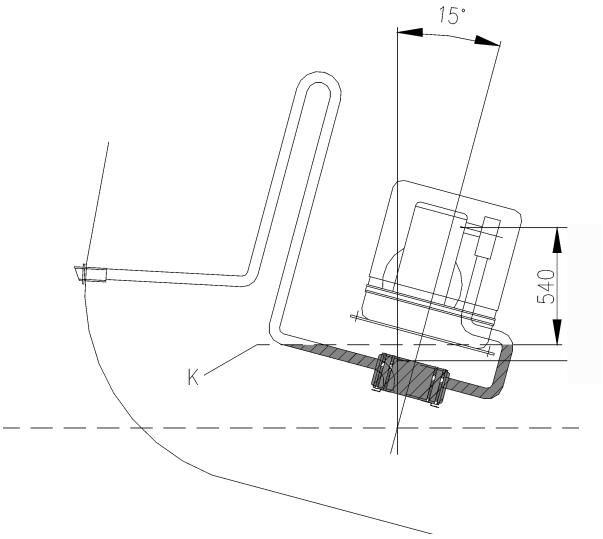
Fig. 5.7.3.1-1: Ideal position of the waterlock




**Tilted position 15 degrees**

The distance from the exhaust elbow to the hydrostatic head has derated to 540 mm.

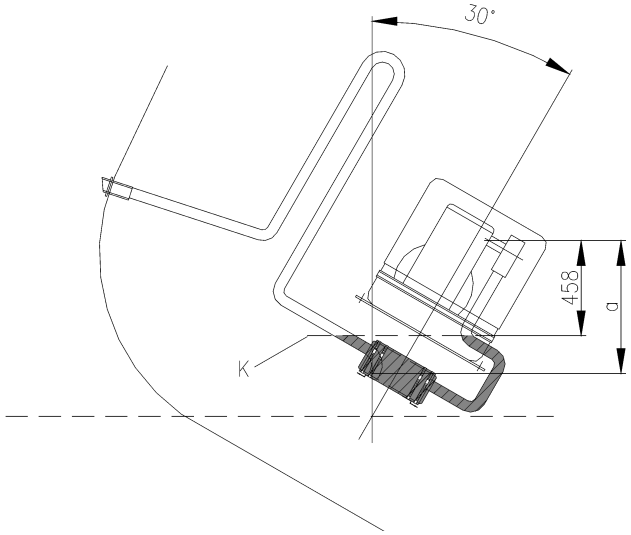
Fig. 5.7.3.1-2: Tilted position 15 degrees



**Tilted position 30 degrees**

The distance of the water level, even in ideal position, changes that only 458 mm distance remain. So the critical distance is under-run already.

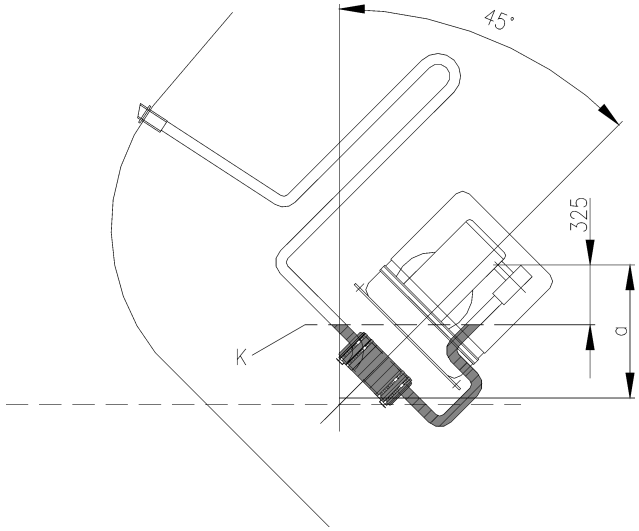
Fig. 5.7.3.1-3: Tilted position 30 degrees




**Tilted position 45 degrees**

In this case the water level rose so high, that the distance constitutes only 325 mm.

Fig. 5.7.3.1-4: Tilted position 45 degrees




Even when the collector is mounted in the ideal spot, at an extremely tilted position of 45 degrees there is still the risk that water can get straight into the discharge stack area through strong rocking motion („sloshing“). This shows that the distance of 600 mm represents a minimum size at which, even when installed ideally, the water can slosh into the exhaust elbow when the ship is very tilted or rocks very hard.

**Summary:**

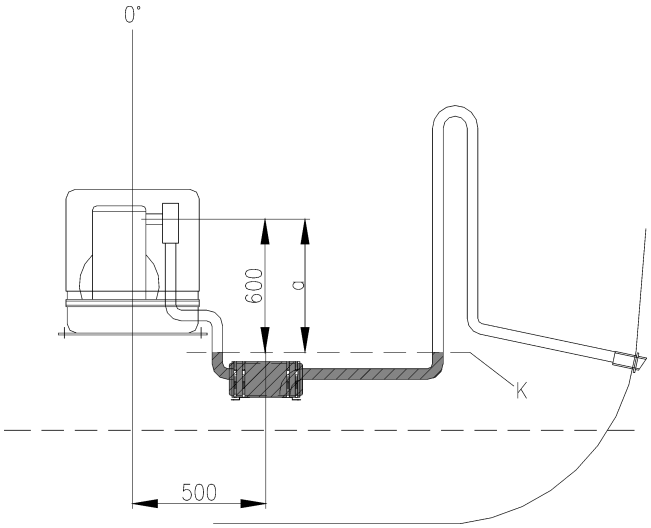
The preset minimum height of 600 mm must be regarded unconditionally and is only valid, if the waterlock is mounted in its ideal position in center underneath the generator. A higher position is highly recommended if it has to be reckoned with tilted positions of 45 degrees.

## 5.7.3.2 Example of the installation of the waterlock off-center and possible effects:

The following pictures are primarily relevant for an installation of the generator with the waterlock on sailing yachts. A change in the mounting position caused by tilted position does not have to be reckoned concerning motor yachts. Here it is only necessary to regard that the volume of the waterlock is measured so large, that it can take the entire amount of water flowing back, and at the same time, maintains the minimum distance of 600 mm.

**A) Installation of the waterlock 500 mm next to the generator's center line:**

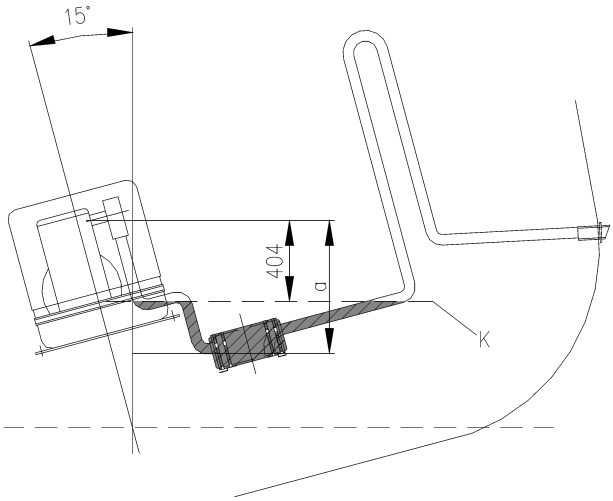
*Fig. 5.7.3.2-1: waterlock, 500 mm next to the center line*




**Tilted position 15 degrees**

Fig. 5.7.3.2-2: Tilted position, 15 degrees

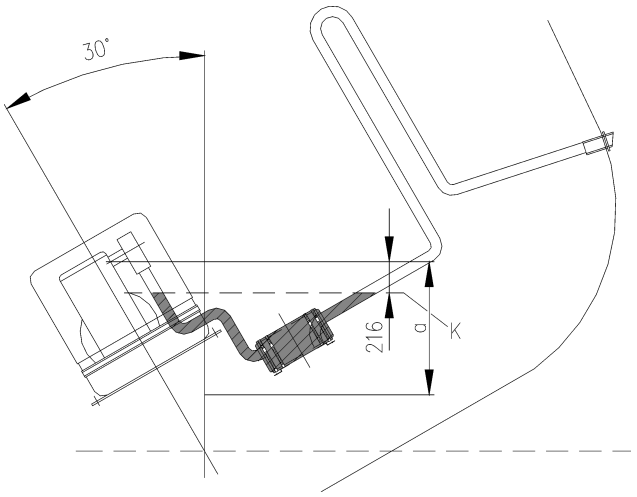
The distance is only 404 mm instead of the original 600 mm. So this is very close to the critical point.



**Tilted position 30 degrees**

The distance between the hydrostatic head and the critical point at the exhaust elbow is only 216 mm. This means that in a tilted position of 30 degrees you already face the highest risk of sea water sloshing into the combustion chamber.

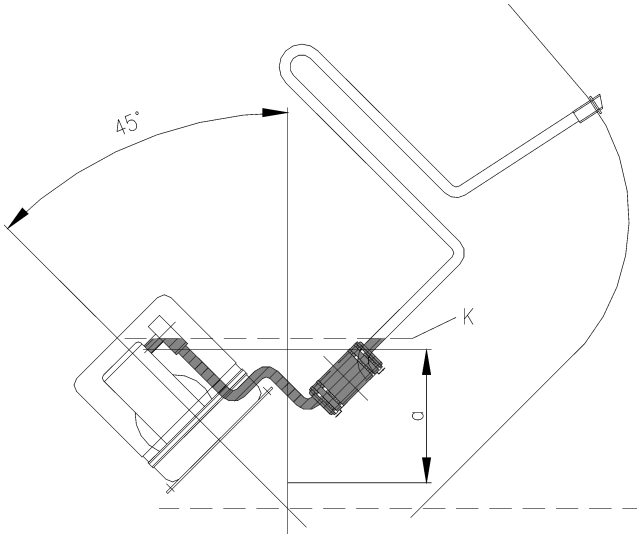
Fig. 5.7.3.2-3: Tilted position 30 degrees




**Tilted position 45 degrees**

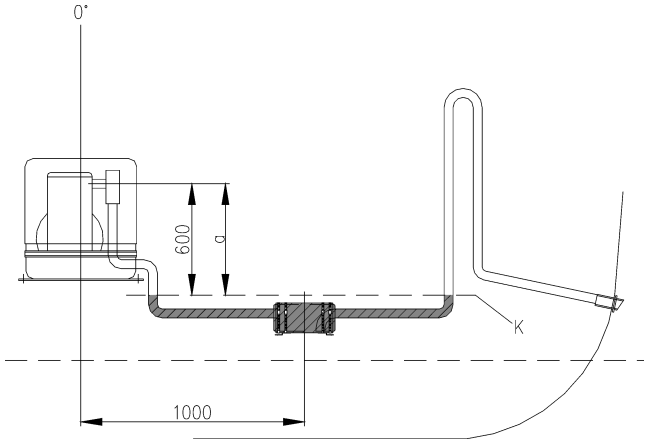
The water level is now at the same height as the critical point at the exhaust elbow. If the ship is sailed in a tilted position of 45 degrees with an installation like this, the ingress of cooling water into the combustion chamber is inevitable. Irreparable damages are preprogrammed.

Fig. 5.7.3.2-4: Tilted position 45 degrees




## B) Installation distance between waterlock and generator's center line 1000 mm

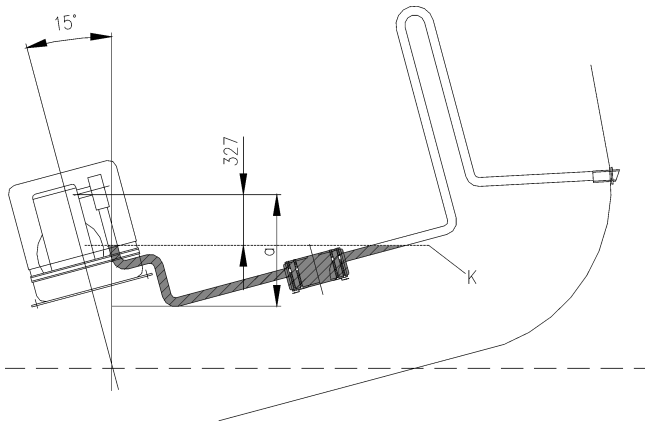
*Fig. 5.7-5: waterlock, 1000 mm next to center line*



**Tilted position 15 degrees**

The distance is, contrary to the original 600 mm, only 327 mm. This is very close to the critical point already.

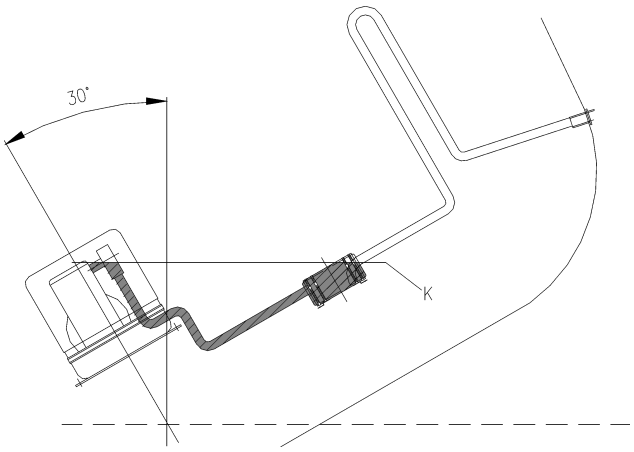
Fig. 5.7.3.2-6: Tilted position 15 degrees




**Tilted position 30 degrees**

The water level and the critical point at the exhaust elbow are at the same level now. If the ship is sailed in a tilted position of 30 degrees with an installation like that, the infiltration of cooling water into the combustion chamber is inevitable. Irreparable damages are preprogrammed.

Fig. 5.7.3.2-7: Tilted position 30 degrees




**Summary:**

Concerning sailing yachts it must be regarded, that the waterlock is mounted in center underneath the generator, at least in reference to the ships' center line. Thus the waterlock is prevented from „leaking" very strongly when the ship is tilted.

The „leaking"of the waterlock leads to a rise of the water level which then gets too close to the exhaust elbow's critical point.

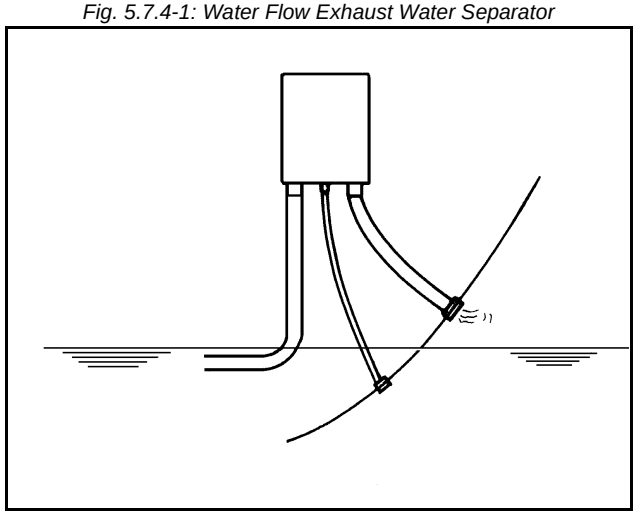
## 5.7.4 Exhaust / water separator

In order to reduce the noise level of the generator unit to a minimum, an optional exhaust outlet muffler can be mounted next to the thru-hull fitting. Additionally there is a component at Fischer Panda, which acts as both an "exhaust goose neck", and water separator. With this "exhaust/water separator" the cooling water is derived over a separate pipe. The exhaust noises emanating from the exterior of the yacht are strongly decreased. Particularly the "water splash".

**Water flow exhaust water Separator**

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

*Fig. 5.7.4-1: Water Flow Exhaust Water Separator*



(1) Raw water outlet

(2) Hose connector

(3) Reducer (if required)

(4) Hose

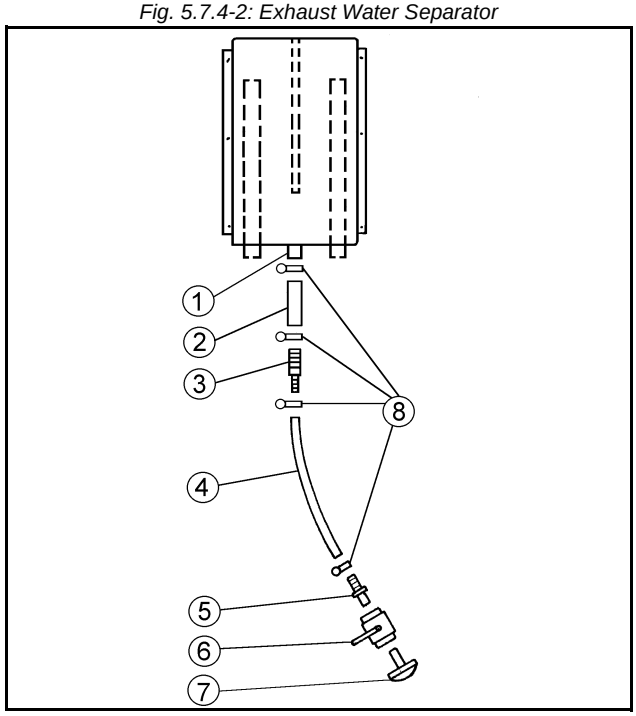
(5) Hose connector

(6) Sea cock

(7) Hull outlet

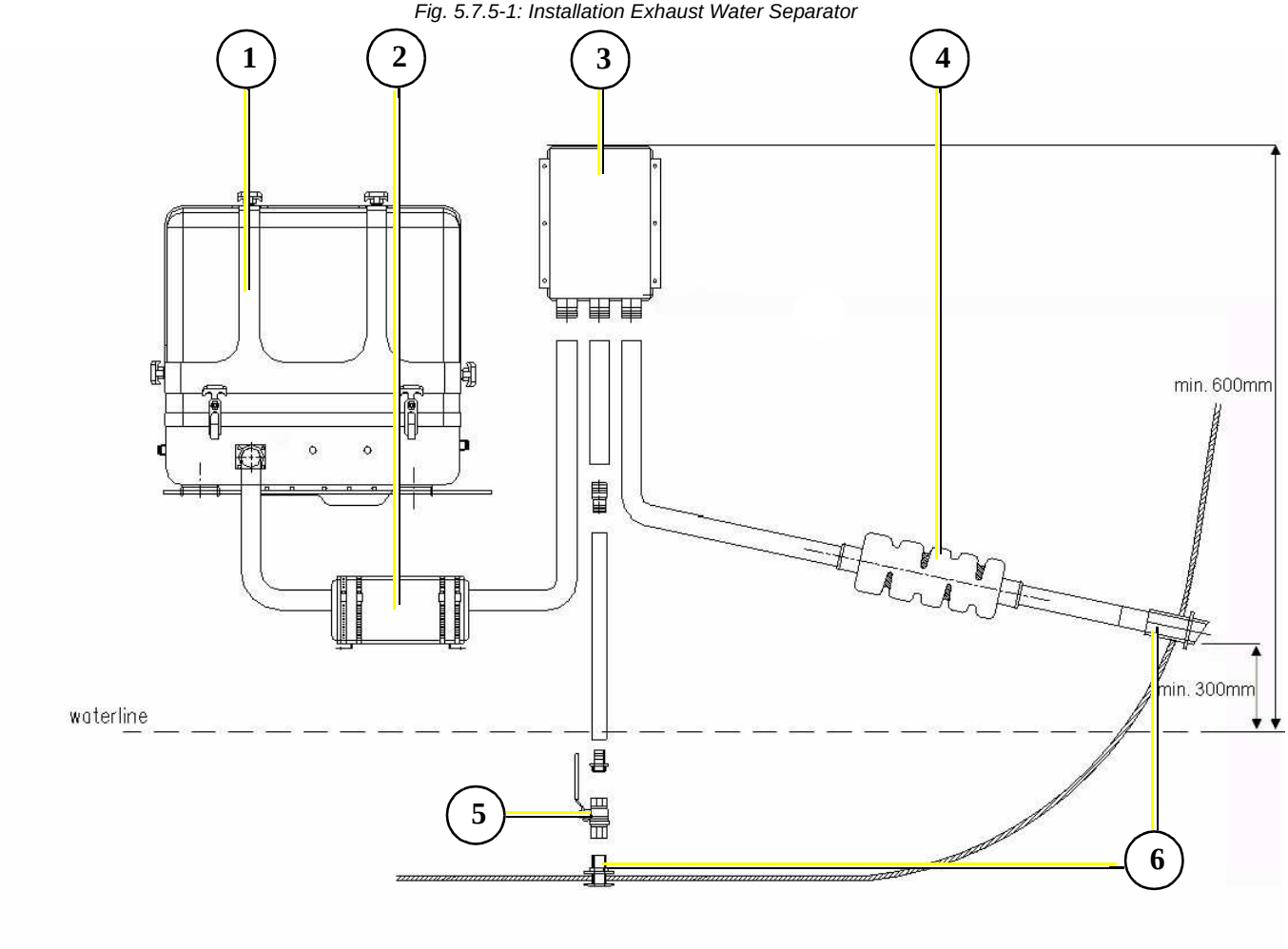
(8) Hose Clips

*Fig. 5.7.4-2: Exhaust Water Separator*



## 5.7.5 Installation exhaust water separator

*Fig. 5.7.5-1: Installation Exhaust Water Separator*



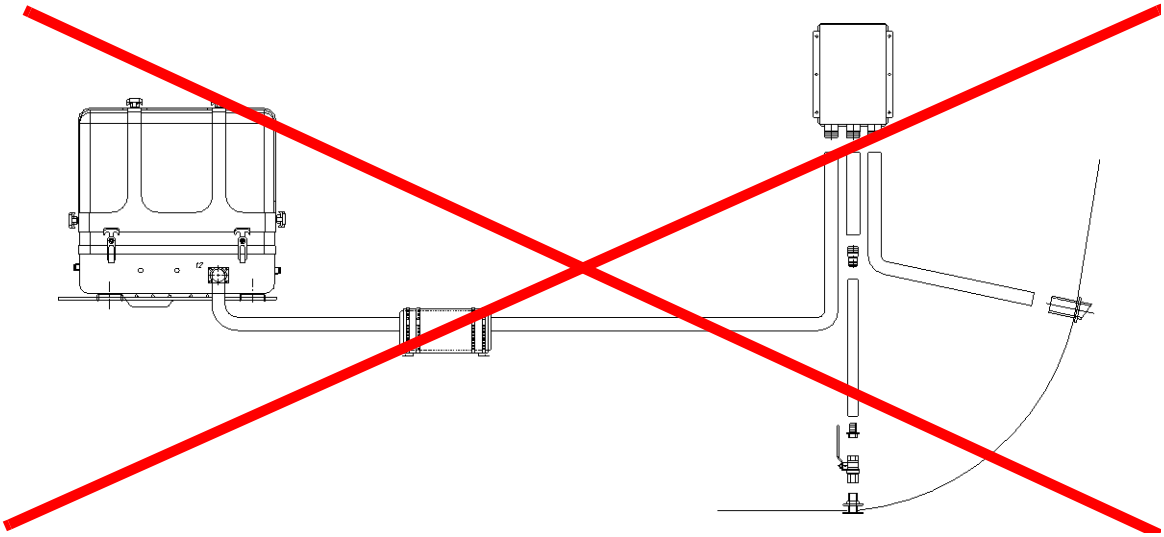

1. Generator
2. Silencer / Water lock
3. Exhaust-Water-Separator
4. Silencer
5. Sea cock
6. Hull outlet

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

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

The generator will not disturb your boat neighbours, if the "Super silent Exhaust System has been correctly installed. The exhaust noise should be almost inaudible.

*Fig. 5.7.5-2: Expample for an unfavourable Installation*



Example of an unfavourable installation:

- Water lock not far enough below the lowest level of the generator
- Distance water lock to exhaust/water separator too large

# 5.8 Installation of the fuel system

## 5.8.1 General references

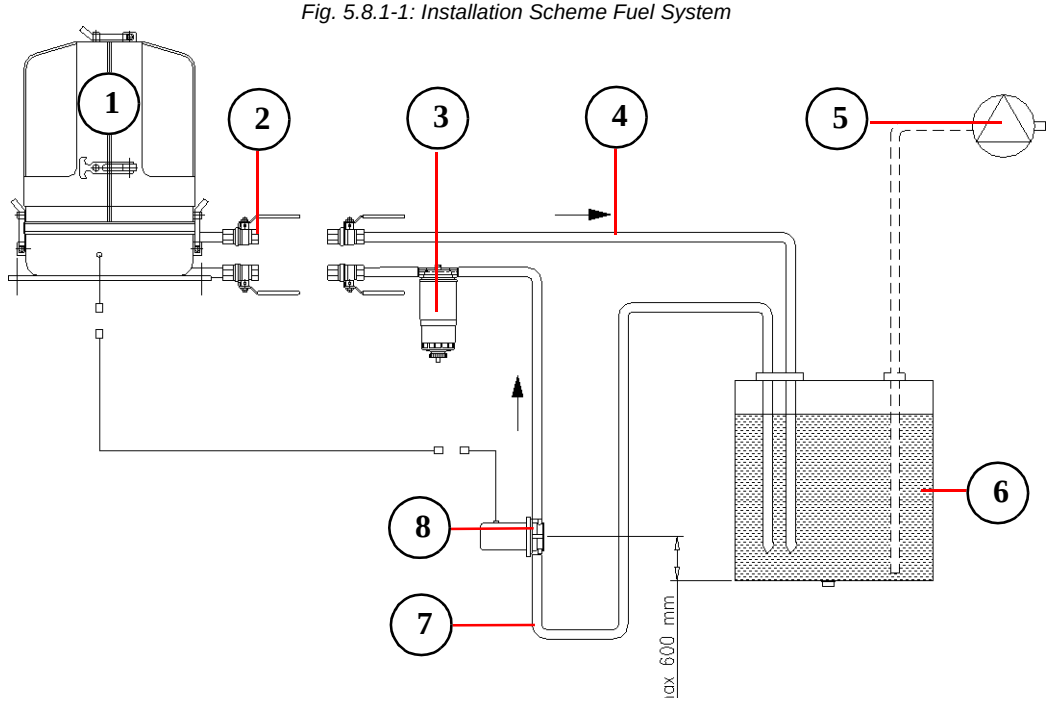
Inside the generator capsule itself, there is the fuel filter installed (exception: Panda 4200 and 4500). Additional fuel filters (with water separator) must be mounted outside the capsule in easily accessible places in the fuel lines between the tank intake fuel pump and the diesel motor's fuel pump.

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

- The following items need to be installed:
- Fuel supply pump (DC)
- Pre-filter with water separator (not part of the delivery)
- Fine particle fuel filter
- Return fuel line to fuel tank (unpressurized)

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

*Fig. 5.8.1-1: Installation Scheme Fuel System*




1. Generator
2. Fuel stopcock
3. Fuel filter
4. Fuel return
5. Condensation water suction pump (optional)
6. Fuel tank
7. Fuel supply
8. Electrical fuel pump (DC)

## 5.8.2 The Electrical Fuel Pump

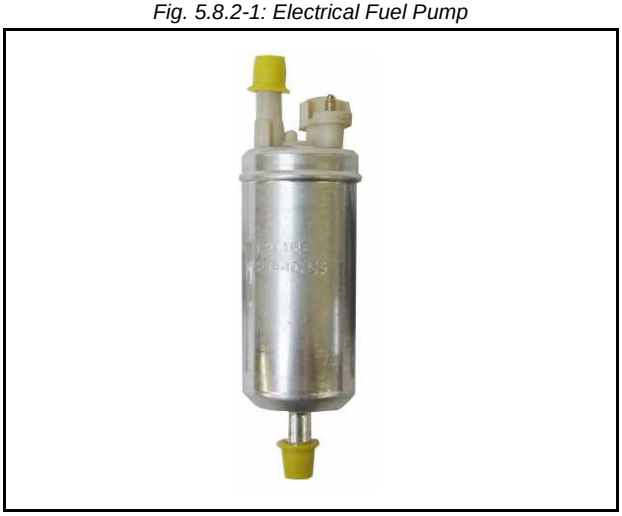
**Electrical fuel pump**

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

*Suction hight of the pump: max. 1,2 m at 02, bar*

*Diameter of fuel lines: section 8.10, “Diameter of conduits,” on page 208.*

*Fig. 5.8.2-1: Electrical Fuel Pump*



## 5.8.3 Connection of the fuel lines at the tank

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

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

**Non-return valve in the suction pipe**

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

**Non-return valve for the fuel return pipe**

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

**ATTENTION!**

## 5.8.4 Position of the pre-filter with water separator

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

*Fig. 5.8.4-1: Pre-filter with water separator*


## 5.8.5 Ventilating air from the fuel system

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

1. Switch main power switch on control panel "ON".
2. Push failure bypass switch and hold tight.

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

3. After the fuel pump has been running 3 to 4 minutes, because the failure bypass switch has been pressed down, the bleeding screw of the solenoid valve has to be unscrewed. The switch has to be continuously depressed, when opening the screw. A piece of cloth or absorbent paper should be put under the connection to avoid fuel entering the sound insulation cover.

4. The air vent screw can be screwed in again, as soon as fuel runs out without bubbles. Then release the depressing the failure bypass switch.

5. Starting the generator

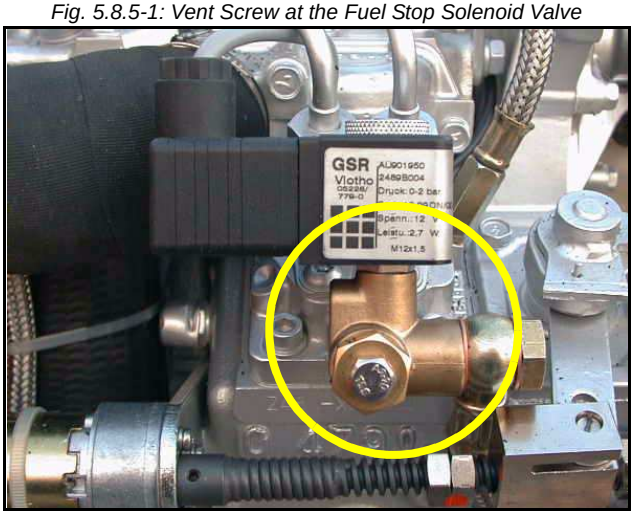
Now the generator can be started by pushing the "START"-button. The generator should start after a short while. One of the pipe union nuts of an injection hose has to be unscrewed, should the unit not start; then try to restart the generator. After the generator has started, the pipe union nut has to be tightened again.

Main power switch "OFF"

**Vent Screw at the fuel stop solenoid valve**

*Not installed at all models!*

*Fig. 5.8.5-1: Vent Screw at the Fuel Stop Solenoid Valve*




## 5.9 Generator DC system installation

The Panda generators from 6.500 NE upwards have their own dynamo to charge a DC starter battery.

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

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

The generator is then Earth/Ground free.

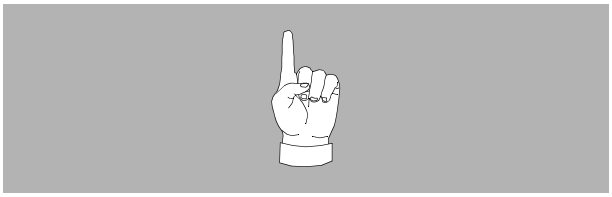
### 5.9.1 Connection of the starter battery block

**I**An own separate 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).

**Panda Generators Panda 6000 and higher normaly provided with an alternator/dynamo to charge the starter battery. At generators without alternator/dynamo it is needed to charge the starter battery with an external battery charger.**

**NOTE:**



**Make shure that the voltage of the starter battery fits to the start system voltage**

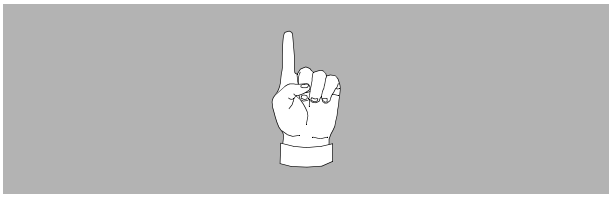
f.e. 12 V starter battery for a 12 V start system

f.e. 24 V starter battery for a 24 V start system (2x12 V batterys in a row)

**ATTENTION!**

**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.**

**NOTE:**



It must be guaranteed that first the cables are attached at the generator and then at the battery.

**Attention!: Consider correct connection sequence**

**Battery connection**

Wrong connection of the battery bank can cause a short-circuit and fire.

**Attention!: Right connection of the battery.**

Install an appropriate fuse and a battery circuit breaker in the plus pole cable of the batterie, but with a distance to the battery of up to 300 mm (12 inch) at maximum.

The cable from the battery to the safety device must be secured with protective pipe/sleeve against chafing through.

For the connection use self-extinguishing and fire-protected cables, which are appropriate for temperatures up to 90 ℃, 195 ℉.

The batteries must be layed in such a way that they do not chafe through or other mechanical load can be stripped.

The battery poles must be secured against unintentional short-circuit.

The positive battery cable within the generator must be shifted in such a way that it is protected against heat and vibrations by appropriate sleeve/protective pipe. It must be shifted in such a way that it does not affect rotary parts or parts, that become hot in operation, e.g. wheel, exhaust elbow union, tail pipe and the engine. Do not lay the cable too tautly, since otherwise it could be damaged.

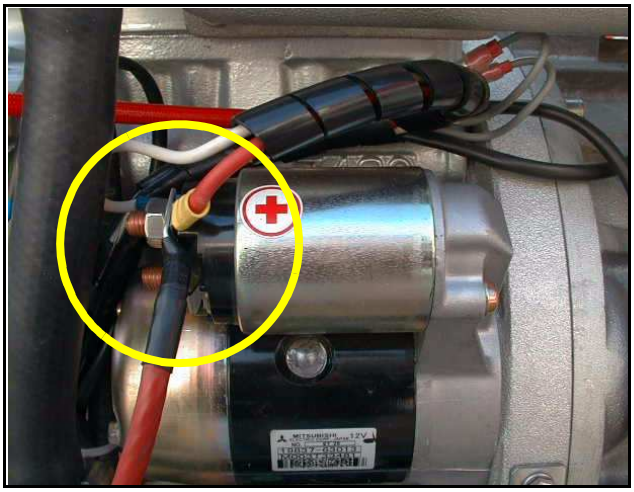
Make a test run after the installation and check the laying of the batteries during the test run and afterwards. If necessary, correct the laying.

Examine regularly the cable layings and the electrical connections.

**Positive battery cable**

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

*Fig. 5.9.1-1: Positive Battery Cable*

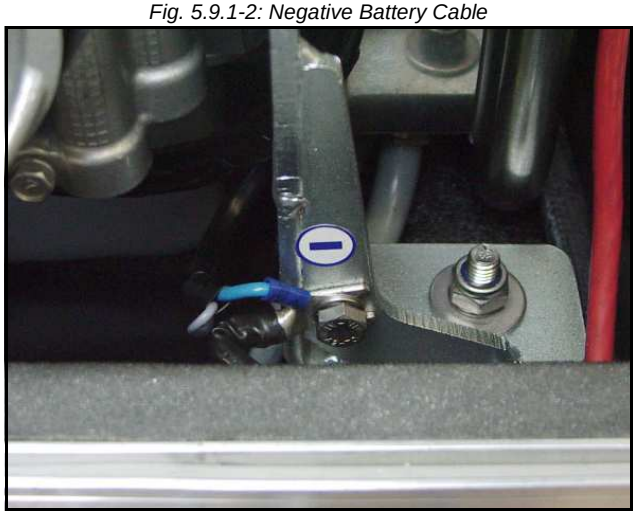


**Negative battery cable**

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

**Note! The battery negative pole may not be connected with the boat ground or with the protective grounding of the 120 V installation!**

*Fig. 5.9.1-2: Negative Battery Cable*



**DC-Relay**

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

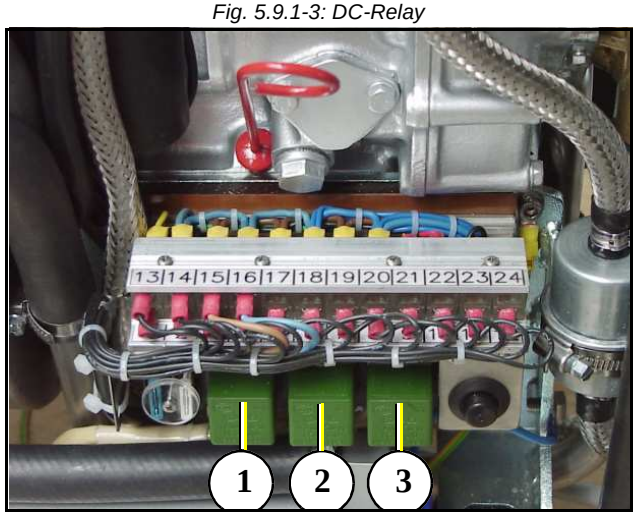
1. Starter motor relay

2. Pre-glow relay (glow plugs)

3. Fuel pump relay

*Sample Picture - See wiring diagram*

*Fig. 5.9.1-3: DC-Relay*




**DC Starter Motor**

All Panda generators are equipped with an independent DC starter motor.

1. Solenoid switch for starter motor

2. Starter motor

*Fig. 5.9.1-4: DC Starter Motor*

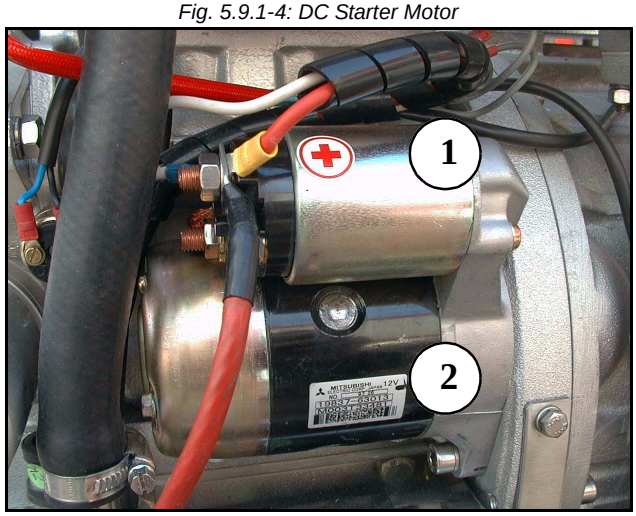
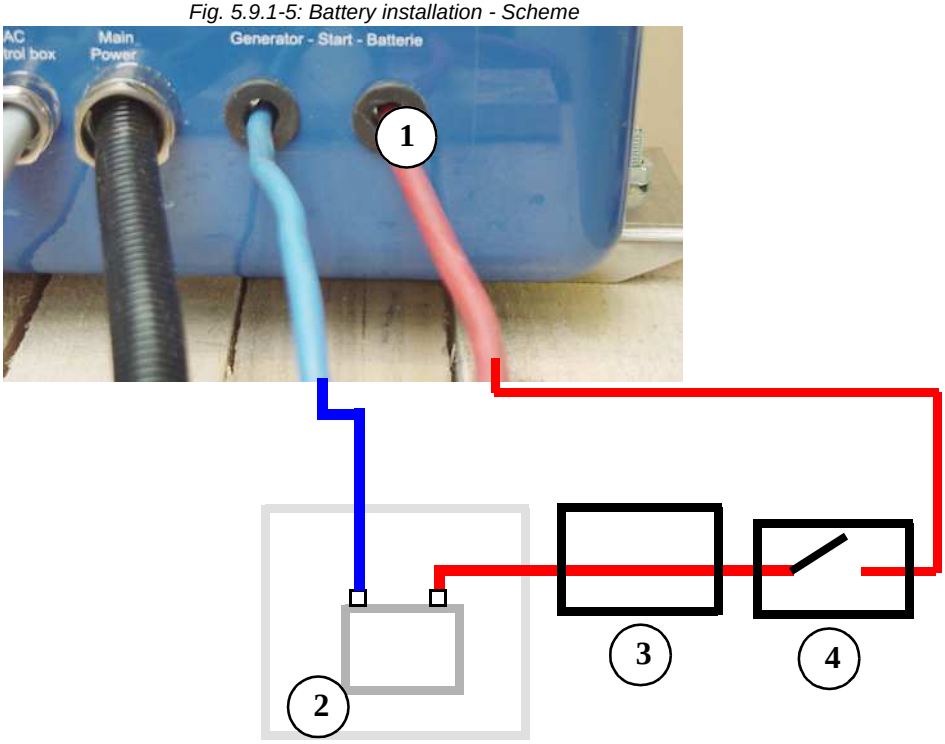


*Fig. 5.9.1-5: Battery installation - Scheme*




1. Generator
2. Battery block
3. Fuse
4. Battery main switch

## 5.9.2 Connection of the remote control panel - see separate control panel manual

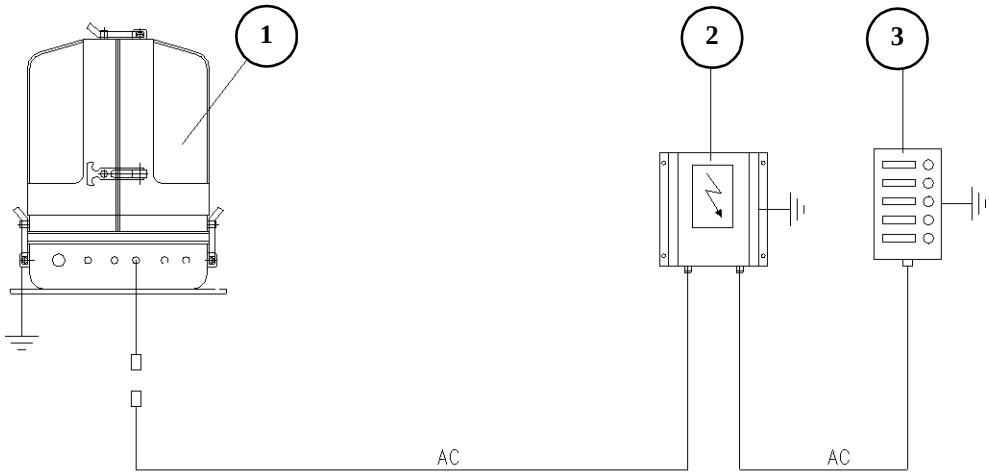
## 5.10 Generator AC System Installation

**Before the electrical system is installed, READ the SAFETY INSTRUCTIONS of this manual FIRST! Be sure that all electrical installations (including all safety systems) comply with all required regulations of the regional authorities. This includes lightening conductor, personal protection switch etc.**

**ATTENTION!**

### 5.10.1 Installation with looped in AC-Control box

*Fig. 5.10.1-1: Installation with looped in AC-Control box*

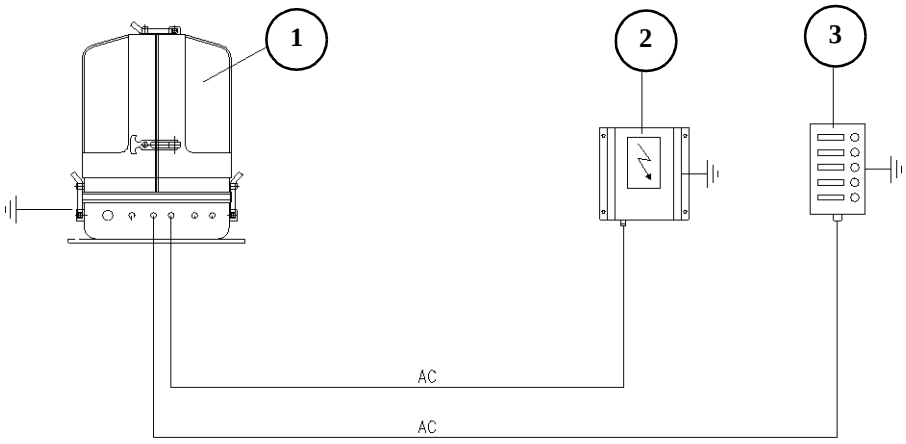



1. Generator
2. AC-Control Box
3. Distribution panel

**All electrical safety installations have to be made on board.**

## 5.10.2 Installation AC-Box / distribution panel separate connected

*Fig. 5.10.2-1: Installation AC-Box / distribution panel separate connected*

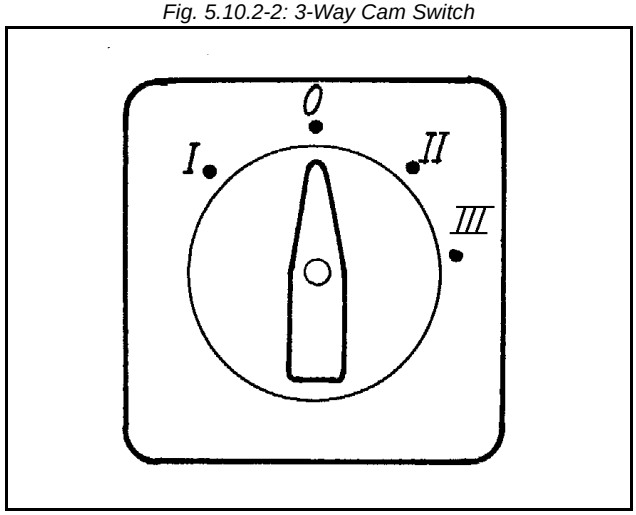



1. Generator
2. AC-Control Box
3. Distribution panel

**A power source selector switch must be installed between the generator (or if applicable, AC-Control box) and the ship's electrical supply system. This switch must used to ensure that all AC consumers can be switched off at once. This switch should also be installed to keep the generator and shore (grid) power systems separate.**

**3-Way Cam Switch**

*Fig. 5.10.2-2: 3-Way Cam Switch*




A 3-way cam switch should be used. This switch basic positions: "Shore power" - "OFF" - "Generator". If an (DC-AC) inverter is used, a fourth position will be required.

0. OFF

I. Generator

II. Shore power connection

III. Inverter

The cam-type switch must have 2 poles, so that "MP" and "phase" can be switched off.

If a 3-phase current system is also installed with the option of supplying from either the generator or shore power, an additional switch must be installed to keep these systems separate.

An alternative to a manual rotating switch is an automatic power relay. When the generator is not running, the relay remains in the shore power position. As soon as the generator is running, the power relay switches automatically to the generator position.

**Note: If the system has both single and 3-phase AC, it is CRITICAL that the two systems remain SEPARATE!**

**Protection conductor**

The generator is provided with a PEN safety system, as standard, which connects the 3-phase delta centre point "N" to the safety ground strap.

If a separate ground protection cable is necessary (i.e. due to national safety regulations), the bridge between the

generator housing and ground (in the AC-Control box) must be disconnected. Once such a ground protection cable is installed, it must be connected to the ground straps of all on board electrical devices.

In order to monitor the electrical system, it is recommended to install a voltmeter (and, if possible, a current meter) down line from the power source selector switch so that all respective power sources can be monitored. A separate voltmeter for the generator, itself, is therefore not required.

**Electrical fuses**

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

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

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

*Required fuses see rated currend on the type plate*

**Required cable cross-sections**

*The following recommended electrical cable dimensions (cross sections) are the minimum required sizes for a safe installation.* *(see “Cable cross section” on page 202.)*

## 5.10.3 AC-Control Box with VCS and ASB - not all models

The required capacitors for the excitation of the generator are located in the AC-Control box, as well as the electronic control for voltage/speed regulation (VCS) and the starting current re-inforcement (ASB). The AC-Control box must be connected by electrical wires (high voltage and low-voltage) to the generator.

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

**The AC-Control box must be electrically connected to the generator (high and low voltage).**

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

**Danger - High voltage**

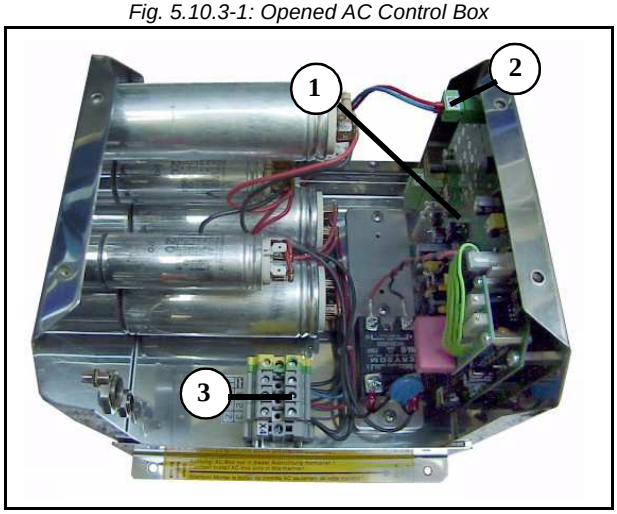
**AC-Control Box**

Inlet VCS-connection (X1)

Inlet measuring voltage (X3)

Excitation cable to generator (X4)

*Fig. 5.10.3-1: Opened AC Control Box*




**AC-Control Box - from Panda 30 upwards**

*Fig. 5.10.3-2: Opened AC Control Box from Panda 30 upwards*

## 5.10.4 VCS voltage control

All Panda generators from Panda 8000 upwards are fitted with the electronic voltage control "VCS" as standard.

The VCS controls the generator voltage and motor speed. A actuator on the injection pump can increase the engine speed by up to 8%.

If the generator is run without load, the voltage should be 231V with a frequency of approx 48.5 to 49Hz. The frequency (equates to the speed) can be increased by up to 8%. This ensures that the engine speed is increased when there is an extra load. The maximum speed is achieved when 80% load is reached.

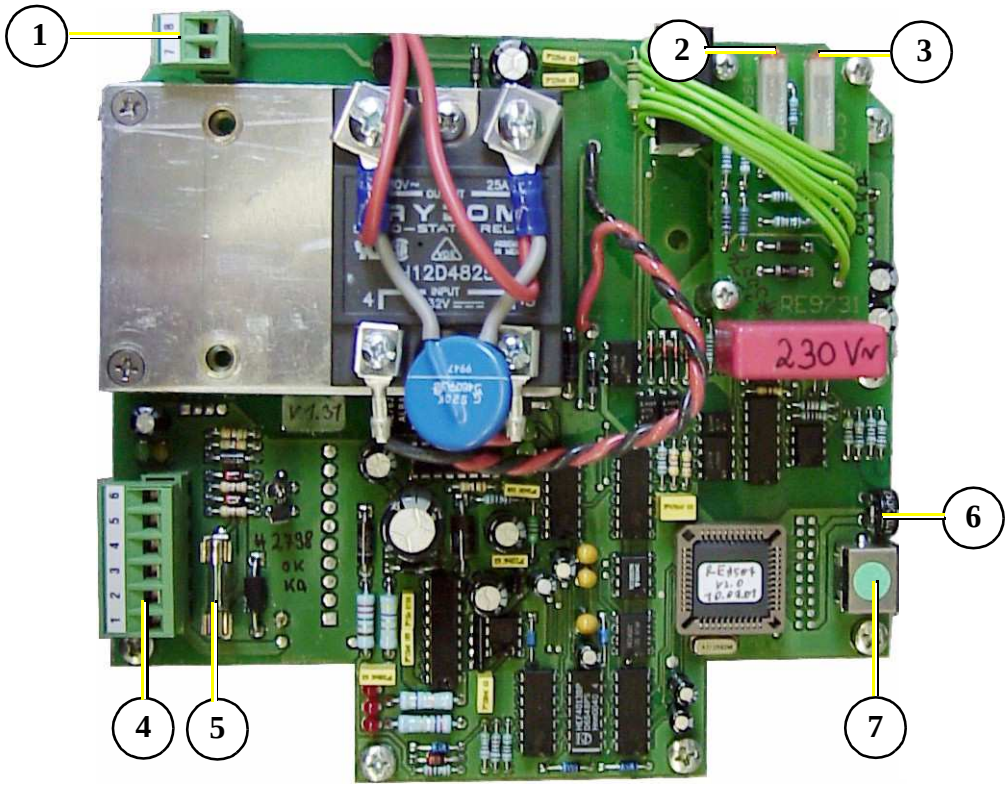
The speed gauge is governed by an adjusting screw, above and below. Adjustment of this screw may not occur without the expressive approval of the manufacturer.

All signals pass through the circuit board in the AC-Control box. The signal impulse for the actuator is passed to the electric motor by means of the 5 core wire.

The generator maintains its full capability if the VCS has a defect.

In this case the base current must be raised to at least 240 V by adjusting the minimum setting on the speed gauge, in order to ensure that the generator output voltage at 70% nominal load does not drop below 215 V.

*Fig. 5.10.4-1: VCS Control*




1. Connection measuring voltage
2. Adjusting booster voltage (do not adjust!)
3. Adjustment VCS-voltage
4. Connection VCS inlet
5. Electrical fuse (1.6 A, slow to blow)
6. Potentiometer for booster time
7. Connection for PC

### 5.10.4.1 Alternative Mini VCS

Alternative for generators without AC control box the Mini VCS.

The Mini VCS and the capacitators are is mounted at the generator.

**Mini VCS at the Panda 6500 NE PMS**

Fig. 5.10.4.1-1: Mini VCS at the Panda 6000 ND PMS


**Capacitors at the Panda 6500 NE PMS**

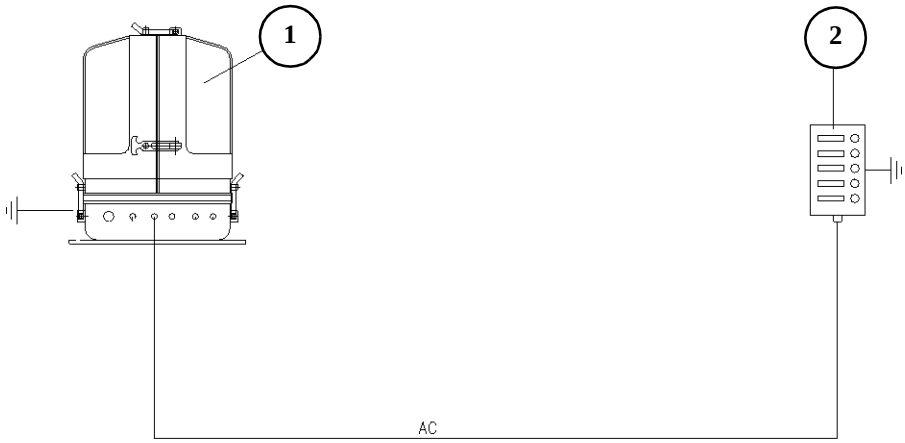
Fig. 5.10.4.1-2: Capacitors at the Panda 6000 ND PMS

**Note:**

*The Mini VCS has no internal fuse.*

## 5.10.5 Installation with mini VCS mounted at the generator

*Fig. 5.10.5-1: Installation with mini VCS mounted at the generator*




1. Generator
2. Distribution panel

**All electrical safety installations have to be made on board.**

## 5.10.6 Jump start at high starting current (Booster)

Additionally, the automatic start booster is located on the circuit control board. The starting current is increased by connecting a second group of capacitors (C2), if the voltage drops below a pre-set voltage. The starting current can be increased by 300% for a short period by combining both components voltage/speed control and ASB Start booster.

## 5.10.7 Insulation test

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

**ATTENTION:**

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

2.) Start the generator.

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

a) generator housing and AC-Control box

b) generator housing and ground.

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

6. Once the safety systems have been installed, they must be checked. If a RCD (Leakage Current Relay) has been installed, it also has to be tested, in order to ensure that it functions properly. The individual phrases must be checked against each other, and between phase and ground, (the single phase or 4th phase also needs to be checked in this fashion).
7. If the generator is protected by a ground connection, then ALL electrical devices must also be connected to this "common" ground (usually ground contacts are attached to the devices' metallic housings).

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

**Checking the electrical connections**

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

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

# 6. Maintenance Instructions

## 6.1 Personal requirements

All maintenance work - if not specially marked - can be made by the trained persons.

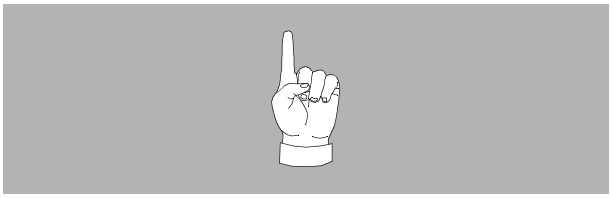
Further maintenance work must only be made by Technical personel or Fischer Panda service points.

## 6.2 Hazard notes for this chapter

see “Safety first!” on Page 11.

Follow the general safety instruction at the front of this manual.

*Notice!:*



**Danger for life! - The generator can be equipped with a automatik start device. This means the generator can be started by an external signal. To avoid an unexpected starting of the generator, the starter battery must be disconected before start working at the generator.**

**Warning!: Automatic start**

**Working at a running generator can result in severe personal injury. Therfore before starting work at the generator:**

Make shure that the generator ist stopped and the starter battery is diconnected to guarantee that the generator cannot be inadvertently started.

Do not run the generator with removed sound isolation cover.

**Warning!: Risk of injury**

**Improper installation/maintenance can result in servere personal injuries or material damage.**

- Always make installation/maintenance work only when the generator is switched off.

- Ensure that there is sufficient space for maintenance work before starting.

- Ensure tidiness and cleanliness at the workplace. Loose components and tools laying around or on top of each other are sources of accidents.

- Only use commercially avalilable tools and special tools for maintenance work. Incorrect or damaged tools can lead to injuries.

**Warning!: Risk of injury**

**Oil and fuel vapours can ignite on contact with ignition sources. Therfore:**

- No open flames during work on the generator.

- Do  not smoke.

- Remove oil and fuel residues from the generator and floor.

**Warning!: Danger of fire**

**Contact with engine oil, antifreeze and fuel can result in damage to health. Therefor :**

- Avoid skin contact with engine oil, fuel and antifreeze.

- Remove oil and fuel splashes and antifreeze from the skin immediatlly.

- Do not inhale oil and fuel vapours.

**Danger!: Danger of poisoning**

**Danger for Life. Improper handling, operation, installation and maintenance can result in sévere personal injury and/or material damage.**

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.

**ATTENTION!: Danger to Life - High voltage**

**Generator, oil and antifreeze can be hot during/after operation. Risk of severe burns.**

**Warning!: Hot surface/material**

**During Installation/mainenance personal protective equipment is required to minimize the helth hazards.**

- Protective clothing

- safety boots

- protective gloves

- Ear defender

- safety glasses

**Instruction!: Personal protective equipment necessary.**

**Disconnet all load during the work atthe generator to avoid damages at the load.**

**Attention!: Disconnect all load**

Batteries contains acid or alkalis.

Improper handling can result in battery explosion and leakage. Acid or alkalis can run out. An explosion of the battery is possible.

*See the operation and safety instruction from your battery manufacturer.*

**Warning!:**

## 6.3 Environmental protection

**Danger to the environment due to mishandling!**

Significant environmental damage can occur, particularly for incorrect disposal, if environmentally hazardous operating materials are mishandled. Therefore:

– Always observe the instructions mentioned below.

– Take immediate action if environmentally hazardous materials reach the environment. Inform the responsible local authorities about the damage in the case of doubt.

*The disposal must be performed by a specialist disposal company.*

**Environmental protection.**

## 6.4 General maintenance instructions

### 6.4.1 Checks before each start

- Oil level
- Leaks in the Cooling system
- Visual check for any changes, leaks in the oil drain system, v-belt, cable connections, hose clips, air filter, fuel lines

**Once a month**

- Grease/oil the servo motor - Trapezoid thread-spindle

**Maintenance intervals - see seperate datasheet**

### 6.4.2 Check of Hoses and Rubber Parts in the sound insulated capsule

Check all hoses and hose connections for good condition. The rubber hoses are very sensitive to environmental influences. They wear out quickly in an environment of dry air, oil and fuel vapours, and high temperatures. The hoses must be checked regularly for elasticity. There are operating situations, when hoses must be renewed once a year.

Additionally to usual tasks of maintenance (oil level check, oil filter control etc.) further maintenance activities are to be accomplished for marine generators, such as control of the sacrificial anode (cooling water connection block) and the front seal cover at the generator.

## 6.5 Oil Change Intervals

The first oil change is to be accomplished after a period of operation from 35 to 50 hours. Afterwards the oil is to be changed after 150 hours. For this, the oil SAE30 for temperatures over 20℃ and SAE20 for temperatures between 5℃ and 20℃ is to be used. At temperatures under 5 ℃ oil of the viscosity SAE10W or 10W-30 is prescri bed.

For filling quantity, see „Technical Data“ at page 107.

### 6.5.1 Checking oil-level

**You require:**

**paper towels / cloth for the oildipstick**

The generator must be placed at level.

- with vehicular generators: Place the vehicle on a leveled surface.
- with PSC generators: Place the generator on a leveled surface.
- with marine generators: Measure the oil-level when the ship is not lop-sided.

Run the generator for about 10 minutes to ensure that the engine is warm.
Wait for 3 minutes, so the oil can flow back into the oil pan.

**Generator and coolant can be hot during and after operating.**

**Caution: Burn hazard!**

Wear personal protective equipment. (Gloves, protective goggles, protective clothing and safety shoes)

- Assure generator against accidental start.
- Open the generator casing.
- Pull the oildipstick out of the check rail.
- Clean oildipstick.
- Put the oildipstick back into the check rail and wait for 10 seconds.
- Pull the oildipstick out of the check rail and read off the oil-level at the lower end of the stick.

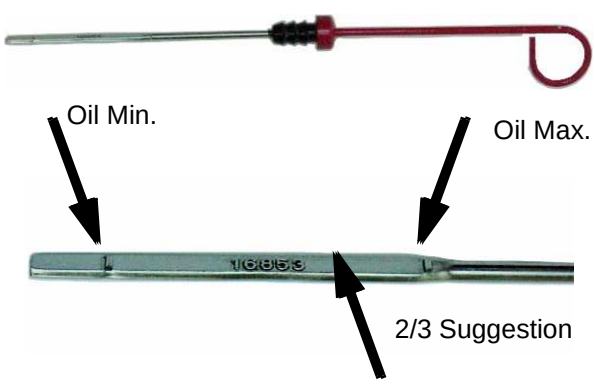
**Oildipstick**

The oil-level is to be checked by means of the oildipstick. The prescribed filling level must not cross the „Max“-mark.

*We recommend an oil-level of 2/3.*

*Sample picture*

*Fig. 6.5-1: Oildipstick - Sample*



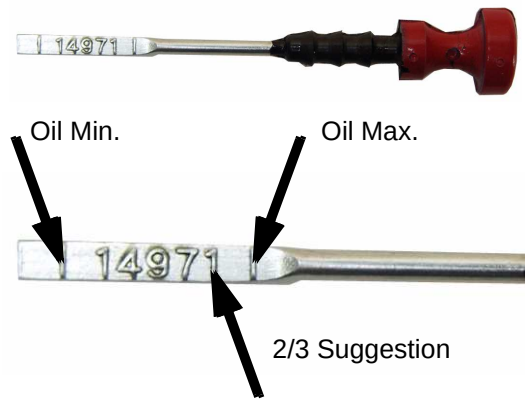

**Oildipstick EA 300 Engine**

The oil-level is to be checked by means of the oildipstick. The prescribed filling level must not cross the „Max“-mark.

*We recommend an oil-level of 2/3.*

*Sample picture*

*Fig. 6.5-2: Samplepicture Oildipstick*



Oil should be refilled, if the oil-level is under 1/3 between the minimum and the maximum mark.

Fischer Panda recommends an oil-level of 2/3 between the minimum and the maximum mark.

If the oil-level is under the MIN-mark, check how many operating hours went by since the last oil change, by means of your service manual or an existing oil change tag. - with operating hours between 50 and 150 hours it is only necessary to refill oil. See „Refilling oil“ on page 2.

- with 150 operating hours or more the oil should be changed (See your generators' service table)

*- if the oil-level is under the minimum mark by less than 50h, there might be a technical problem!*
*In that case, we recommend going to a shop or a Fischer Panda servicepoint.*

*- if the oil is cloudy or even „creamy“, coolant might have mixed with the oil. See a garage or a Fischer Panda servicepint immediately.*

## 6.5.2 Refilling Oil

**You require:**

**Engine oil**

1. Check oil-level as described under „Checking oil-level“ on page 1.
2. Oildipstick is pulled out of the check rail.
3. Open the oil filler cap.
4. Fill in oil (approx. 1/2 liter) and wait for about 2 min. so this it can flow into the oil pan.
5. Wipe off the oildipstick and put it into the check rail.
6. Pull the oildipstick out of the checkrail and check the oil-level. See „Checking oil-level“ on page 1.

If oil-level is still too low (under 2/3): repeat steps 4-6.

## 6.5.3 After the oil level check and refilling the oil

- Put the oildipstick back into the check rail.
- Close the oil filling cap.
- Remove potential oil stains and splashs from the generator and surroundings.
- Close the generator casing.
- Remove lock against accidental generator start.

## 6.6 Replacement of engine oil and engine oil filter

**You require:**

**- Engine oil. See attachment.**

**- New oil filter (not with generators with EA300 engines)**

**- Sealings for oil drain screw**

**- Personal protective gear**

**- Container to collect used oil (heat resistant and of sufficient size)**

**- Open-ended wrench for oil drain screw**

**- Paper towels and cloth**

**- Oil filter wrench**

**- Oil resistant mat, so prevent used oil from getting into underground water**

The generator must be placed at level.

- with vehicular generators: Place the vehicle on a leveled surface.

- with PSC generators: Place the generator on a leveled surface.

- with marine generators: Change the oil when the ship is not lop-sided.

Run the generator for about 10 minutes to ensure that the engine is warm.
Wait for 3 minutes, so the oil can flow back into the oil pan.

**Generator and coolant can be hot during and after operating.**

Wear personal protective equipment. (Gloves, protective goggles, protective clothing and safety shoes)

**Caution: Burn hazard!**

1. Prepare generator.
   - Assure generator against accidental start.
   - Open the generator casing.
   - with generators that have an external oil drain hose: Release the oil drain hose from the mounting.
   - with generators that have an internal oil drain hose: Open the lead-through for the oil drain hose (left turn of the sealing). Pull out the sealing with the oild drain hose.

   Place an oil resistant mat under the oil drain hose area and prepare the container.

2. Loosen oil filling cap

   Unscrew the oil filling cap. This is necessary, because otherwise a vacuum will form and the oil can not completely drain off.

   *Sample picture*

*Fig. 6.6-1: Oil filling cap*

3. Open oil drain screw.

   Unsrew the oil drain screw by means of the open-ended wrench from the oil drain hose (rotating direction left). Use a second open-ended wrench to lock. Make sure to do this over the container.

   Use spanner size 17mm.

*Fig. 6.6-2: Oil drain hose*

4. Discharge used oil.

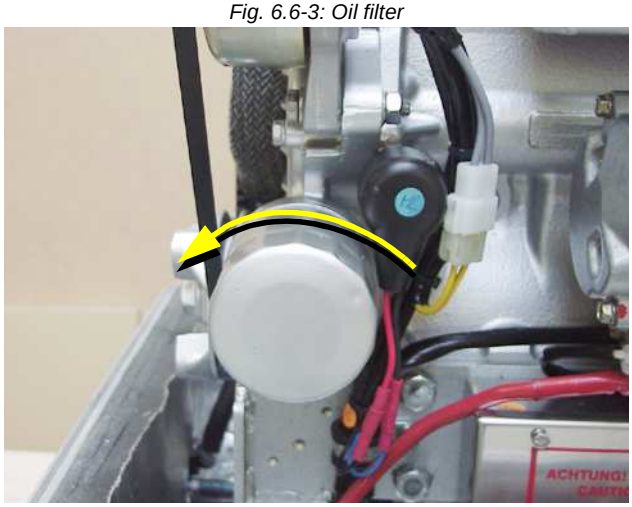
   Let the entire amount of oil drain out of the engine. This can take several minutes.

5. Remove used oil filter / clean oil screen

   Release the oil filter by turning the filter wrench counterclockwise. The filter might be full of oil. Make sure to not spill anything and avoid skin contact.

*Sample picture*

*Fig. 6.6-3: Oil filter*



**Oil screen with generators with EA300 engines**

The oil screen should be cleaned every 500 operating hours: to do so follow the instructions in the engine manual.

Use spanner size 17mm.

*Sample picture*

*Fig. 6.6-4: Oil screen*


6. Preparing a new filte

   Clean the engines' filter holder brush a thin oil layer on the sealing of the new filter.

*Fig. 6.6-5: Oil screen sealing ring*

7. Mounting the new filter

   Carefully screw in the new filter by hand. It must not be tightened too much. Screw in the oil drain screw again and tighten is with the wrench. Use a new sealing for the oil drain screw.

8. Fill in oil (oil fill capacity: see attachment)

   Fill the engine oil into the engine via feed hopper. Check oil-level after every 2 liters with the oildipstick.

9. Check proper filling level. See „Checking oil-level“ on page 1.

   When the proper filling level is reached, screw in the oil cap again. Run the engine for 10 minutes and then turn it off. Check the oil-level once more after several minutes with the oildipstick. If it is too low, refill some oil.

10. Clean up

    Wipe off all oil splashs from the generator and make sure that the drain screw has no leak.

## 6.6.1 After the oil change

- Put the oildipstick back into the check rail.
- Close the oil filling cap.
- Remove potential oil stains and splashs from the generator and surroundings.
- Close the generator casing.
- Remove lock against accidental generator start.

11. Duly disposure of used oil and filter

    Used oil is very toxic and must not be disposed with domestic waste. It is prohibited to dispose used oil with waste water! Make sure that used oil is disposed properly (e.g.: where oil is bought or at collection stations).

# 6.7 Verifying the starter batterie and (if necessary) the battery bank

Check the condition of the battery. Proceed here as prescribed by the battery manufacturer.

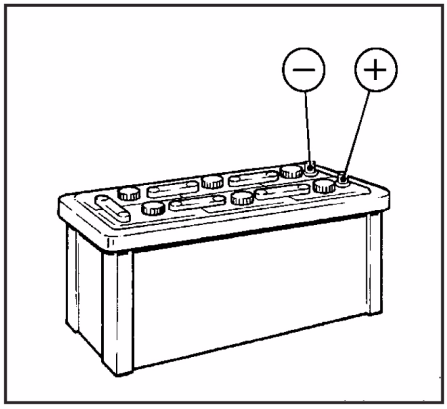
If from the battery manufakturer not otherwise mentioned

## 6.7.1 Battery

### 6.7.1.1 Check battery and cable connections

- Keep battery clean and dry.
- Remove dirty clamps.
- Clean terminal posts (+ and -) and clamps of the battery, and grease with acid-free and acid-resistant grease.
- When reassembling, ensure that clamps make good contact. Tighten clamp bolts hand-tight.

*Fig. 6.7.1-1: Battery*

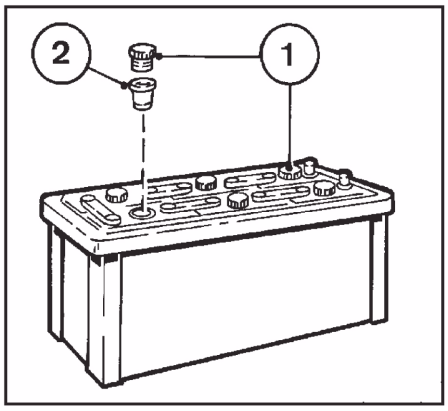


### 6.7.1.2 Check electrolyt level

- Remove sealing caps 1.
- If testers 2 are present:
- Electrolyte level should reach the base of these.
- Without testers:

  The electrolyte level should be 10-15 mm above the top of the plates.
- If necessary, top up with distilled water.
- Screw sealing caps back in.

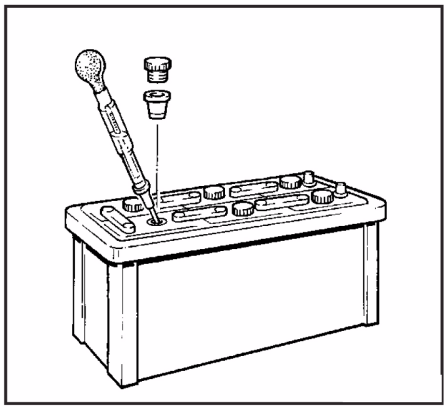
*Fig. 6.7.1-1: Battery*




### 6.7.1.3 Check electrolyt density

- Measure the electrolyte density of individual cells with a commercial hydrometer. The hydrometer reading (see table on following page) indicates the battery's state of charge. During measurement, the temperature of the electrolyte should preferably be 20 °C.

*Fig. 6.7.1-1: Battery*



| Electrolyte density | | |
|---|---|---|
| in [kg/ l] | | Charge status |
| Normal | Tropical | |
| 1.28 | 1.23 | well charged |
| 1.20 | 1.12 | semi-charged, re-charge |
| 1.12 | 1.08 | discharged, immediately charge |

**The gases emitted by the battery are explosive! Keep sparks and naked flames away from the battery!**

**Do not allow battery acid to come into contact with skin or clothing!**

**Wear protective goggles!**

**Do not rest tools on the battery!**

**Attention**

## 6.8 Grease lubricated generator backend bearing

**A bearing change should only be executed by a trained expert.**

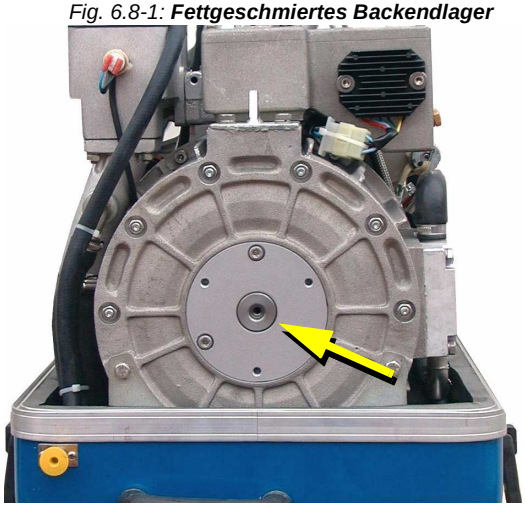
The bearing is, depending on the generator model, equipped with a black cooling disc.

The grease lubricated generator bearing is maintenance free over its durability, but should be exchanged every 1500 operating hours.

**Grease lubricated backend bearing without cooling disc.**

*Sample Picture*

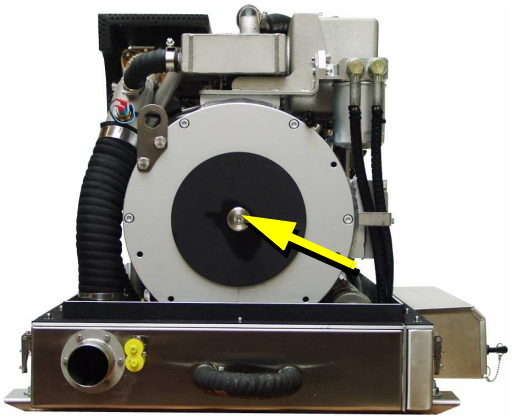
*Fig. 6.8-1:* ***Fettgeschmiertes Backendlager***



**Grease lubricated backend bearing with cooling disc.**

*Sample Picture*

*Fig. 6.8-2:* ***Grease lubricated backend bearing***



## 6.8.1 Exchange of grease lubricated bearing

**Only special trained persons are allowed to do this maintenance!**

**STOP!**

**DANGER FOR LIFE! - Inappropriate handling can lead to health damages and death.**

The battery bank must always be disconnected (first negative pole, then positive pole), while working at the generator or at the generators' electrical system, so that the generator can not be started unintentionally.

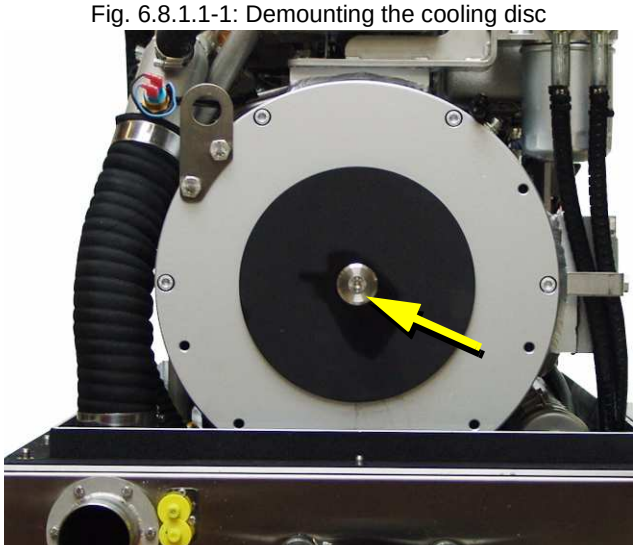
**Warning!: Automatic start**

### 6.8.1.1 Demounting the cooling disc (if existent)

**To demount the cooling disc, detach the cooling discs' holding nut and take off the disc.**

*Sample Picture*

Fig. 6.8.1.1-1: Demounting the cooling disc

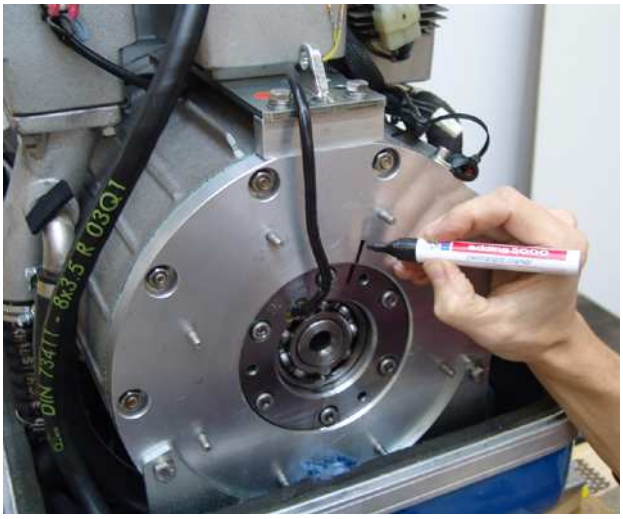


### 6.8.1.2 Demounting the backend bearing

**Degrease the spot with a fat solvent as shown, apply markings with a waterproof pen.**

*Sample Picture*

Fig. 6.8.1.2-1: Marking the bearing cover.


**Demounting the bearing cover**

- Unscrew fixing bolts (Tools Allen key SW6).
- Fasten fixing bolts by hand into the holes for disengaging as far as possible.
- Then alternately fasten these three bolts equaly.

**Thus the bearing cover will be pushed out of the generator cap equally.**

- Remove ball bearing with a usual extractor from the shaft.

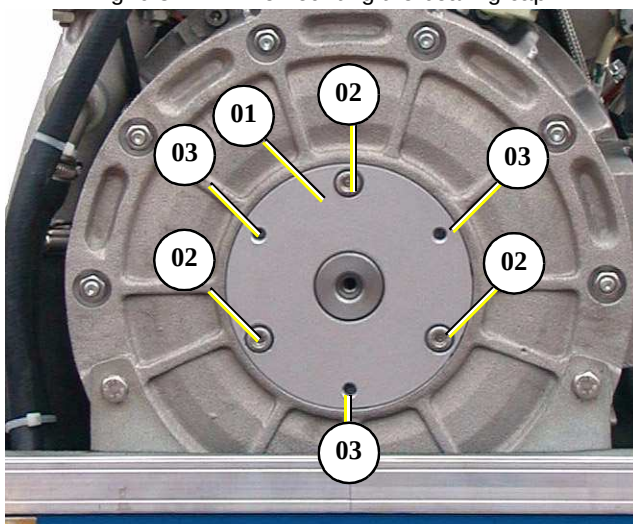
01. Bearing cover

02. Fixing screw

03. Holes for disengaging

*Sample picture*

Fig. 6.8.1.2-2: Demounting the bearing cap




**If there is no suitable extractor available, a suitable extractor can be purchased from Fischer Panda.**

**Check the O-ring seal which is mounted in the bearing cover and replaced if damaged.**

**Note:**

## 6.8.1.3 Installing the new backend bearing

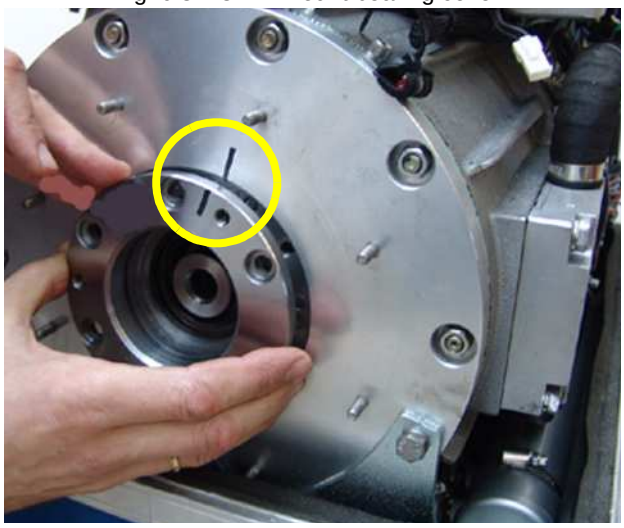
**Mount bearing case in the generator cap.**

**Place bearing case loosely into the generator cap, assure with one hand against falling out.**

**Thereby pay attention that the case is mounted in the same position as before - the previously added markings have to match again!**

*Sample Picture*

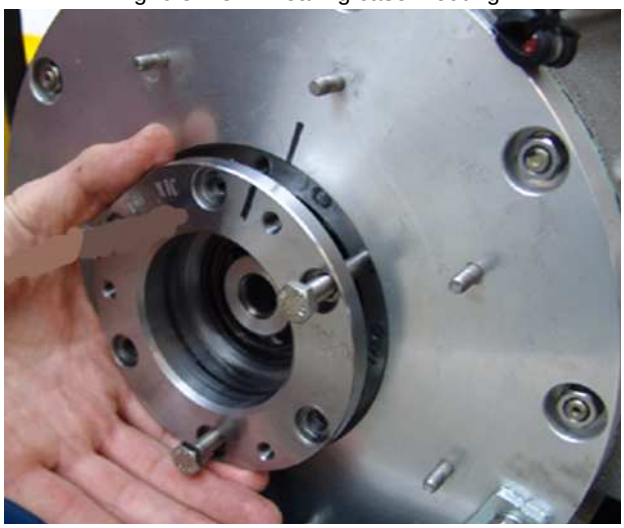
Fig. 6.8.1.3-1: 1Mount bearing cover



**With the other hand, loosely screw in the ejector screws as guide line.**

*Sample Picture*

Fig. 6.8.1.3-2: Bearing case mouting



**Carefully press the bearing case with a soft-head hammer (or a hammer plus mandrel) in its hub.**

**Thereby relocated mandrel rotatory after each hit to avoid canting.**

**Otherwise there is a risk that the case is slightly canted because of the material which is brought up by the ejector screws.**

**A canted bearing case causes a canted ball bearing, which will wear out quite fast!**

*Sample Picture*

Fig. 6.8.1.3-3: Press fit bearing case

**Tighten fixing bolts M8 with 22 to 25 Nm (Allen key SW6).**

**Now carefully press the bearing case with a soft-head hammer (or a hammer plus mandrel) in its hub.**

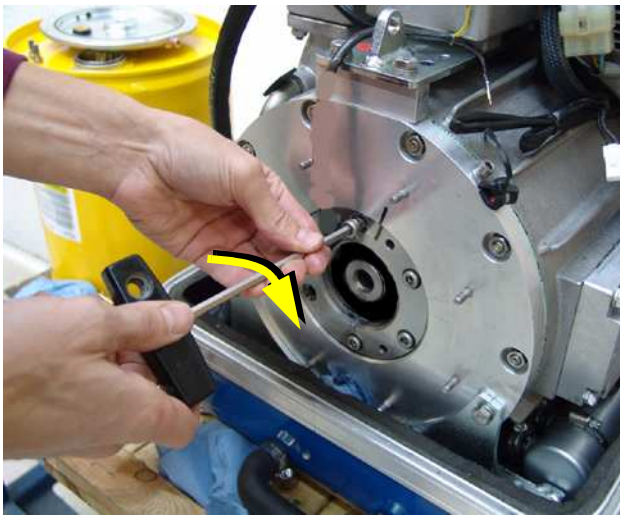
**Thereby relocate mandrel rotatory after each hit to avoid canting.**

**Otherwise there is a risk that the case is slightly canted because of the material which is brought up by the ejector screws.**

**A canted bearing case causes a canted ball bearing, which will wear out quite fast!**

*Sample Picture*

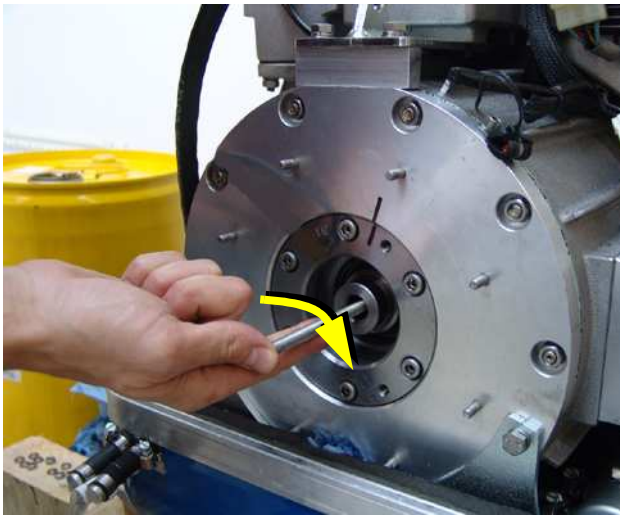
Fig. 6.8.1.3-4: 'Attach bearing case



**Screw in thread rod into the thread hole of the generator shaft as far as possible.**

*Sample Picture*

Fig. 6.8.1.3-5: Screw in thread rod



**Slide on ball bearing, pressure ladle, grommet up to the shaft, screw on long hexagon nut. Grease/Oil thread rod.**

**Guide ball bearing with one hand to avoid canting on the shaft.**

*Sample Picture*

Fig. 6.8.1.3-6: Put on ball bearing

**With the other hand, put a screw wrench on the long nut, fasten slowly.**

**Thus the ball bearing is pressed onto the shaft.**

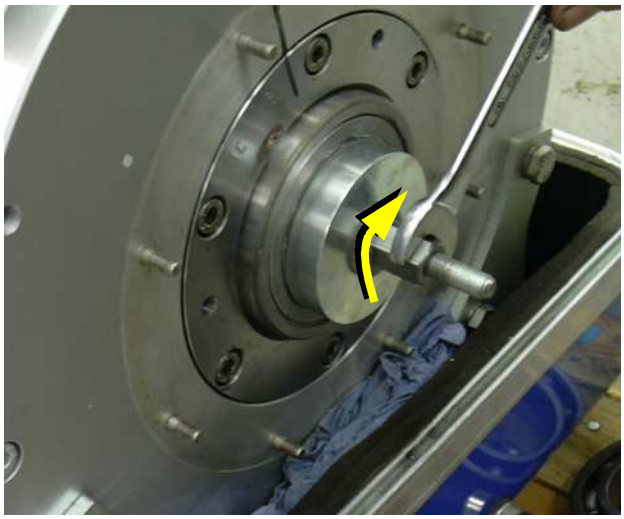
**If necessary hold driving shaft with suitable wrench, to prevent diesel engine from rotation simultaneously.**

**Press on ball bearing as far as possible.**

**(Tool Wrench SW13 and SW 22)**

*Sample Picture*

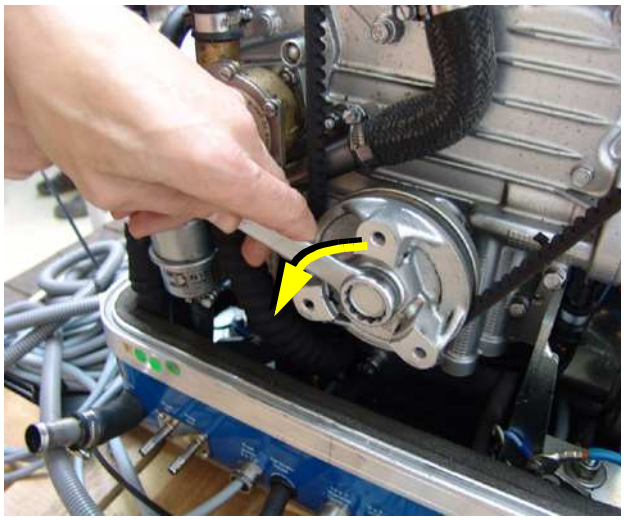
Fig. 6.8.1.3-7: Press in ball bearing



**Hold up the driving shaft.**

*Sample Picture*

Fig. 6.8.1.3-8: Hold up the driving shaft



- Remove tools.
- Remove markings.
- Mount cooling disc (if existent).
- Mount presilencer and circuit points.
- Refill cooling water and vent cooling water circuit (see generator manual.
- Remove starting lock.
- Reconnect starter battery.
- Run generator 3 to 5 minutes.
- Mount casing.

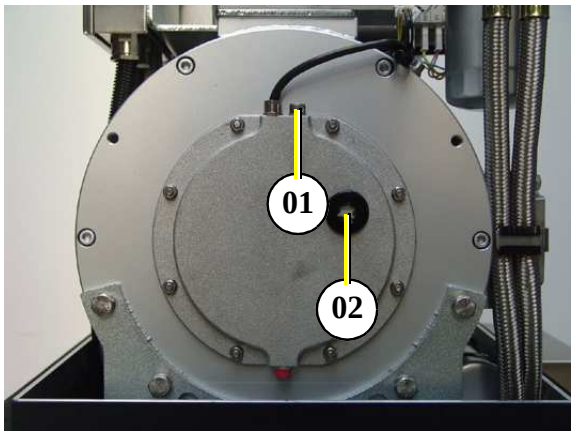
*Sample Picture*

Fig. 6.8.1.3-9: Remove tools and markings

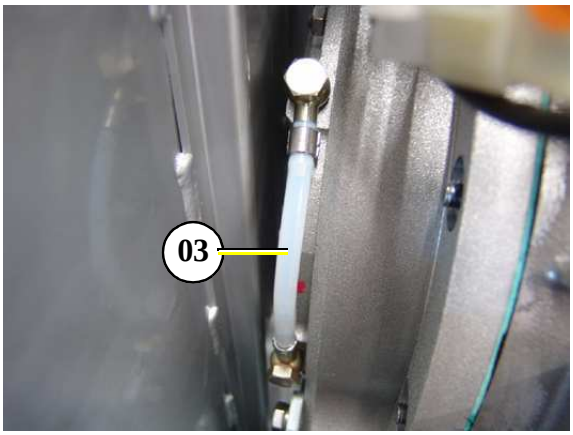
## 6.9 Checking the oil level of the generator end bearing at Fischer Panda generators

The oil level check is a visual check. Older generators are equipped with an sight glass, newer ones with an sight hose.

*Fig. 6.9-1: Oil check*




Older version




Newer version

01. Screw plug
02. Sight glass

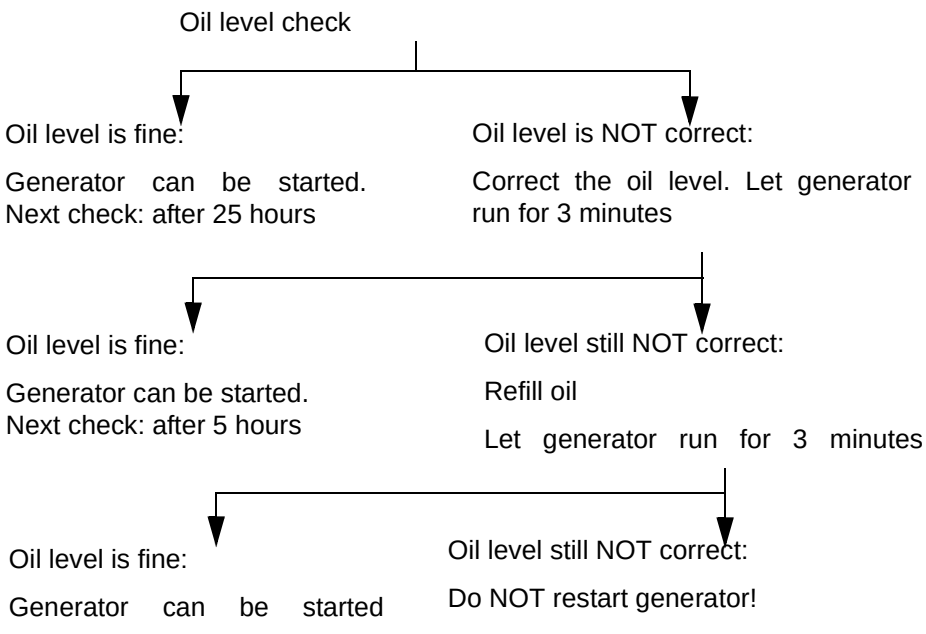
03. Sight hose

If your generator does not feature these control modules or if these are not accessable, please refer to your Fischer Panda distribution partner or to Fischer Panda directly. The correct oil level is at the middle of the sight glass/ sight hose.

Oil level check is only to be executed when the generator is switched off!

### 6.9.1 Oil level check

*Fig. 6.9-1: Oil level check*



## 6.9.2 Refilling oil

1. Remove the Allen screw M8 at the right side of the sensor cable.
2. Refill some oil by means of a small hopper or a syringe.
3. Now tighten the screw again and fasten it with 20 Nm.

## 6.9.3 Refiller-Set

An appropriate refiller set can be purchased at Fischer Panda.

The refiller set contains:

Oil: Shell Omala HD220.

Syringe plus hose

## 6.9.4 Screw plug

**ATTENTION:**

**The screw plug has a ventilation hole!**

**Do NOT replace it by a normal screw - this will cause oil loss!**

*Fig. 6.9.4-1: Screw plug*

# 6.10 Replacement of the oil-cooled backend bearing

**A bearing replacement should only be executed by a trained professional.**

## 6.10.1 Exchange oil-cooled bearing

**DANGER TO LIFE! - Inappropriate handling can lead to health damages or death.**

The battery bank must always be disconnected (first negative pole, then plus pole), to ensure that the generator can not be started by accident when operations at the generator itself or its electrical system shall be executed.

**Warning!: Automatic start**

## 6.10.2 Demounting the bearing

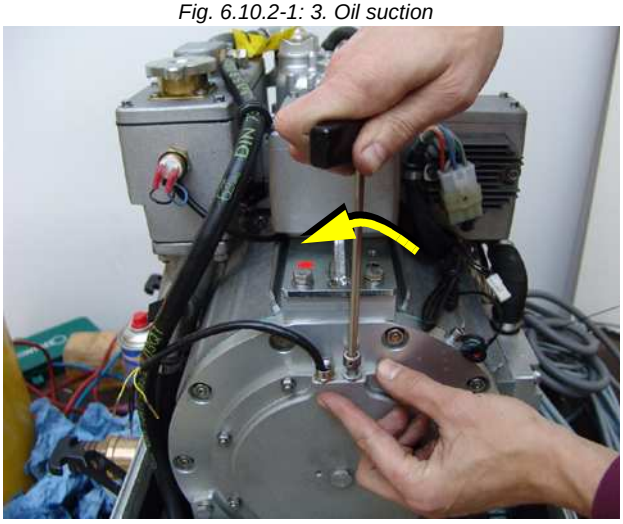
**Suction or discharging the oil**

It is difficult to access the drain screw.

Therefore we recommend to withdraw the oil by suction by means of a gun/ syringe plus hose (from tool package). Let the generator warm up 3-5 minutes, so the oil gets thinner.

Unscrew the ventilation screw (Tool: Allen wrench SW6)

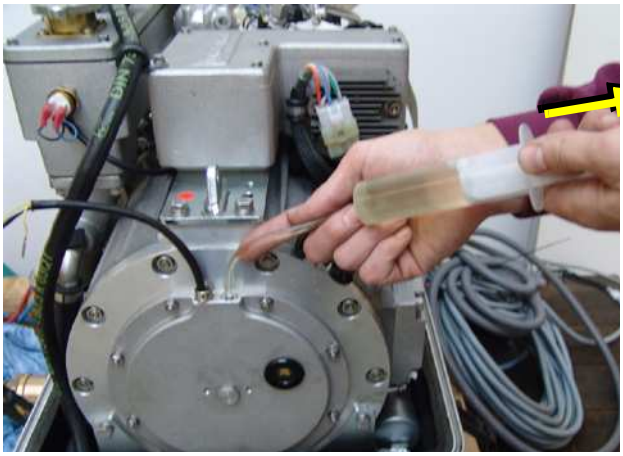
*Fig. 6.10.2-1: 3. Oil suction*



**Inserting the hose through the ventilation screws' tap hole.**

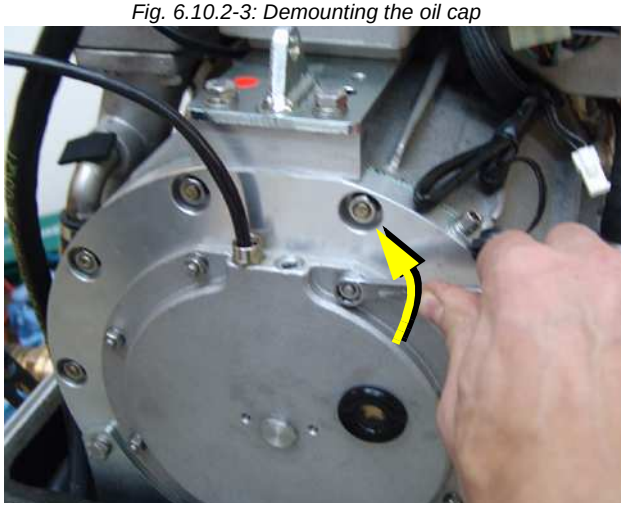
**Extract the oil.**

*Fig. 6.10.2-2: Oil suction (with syringe)*



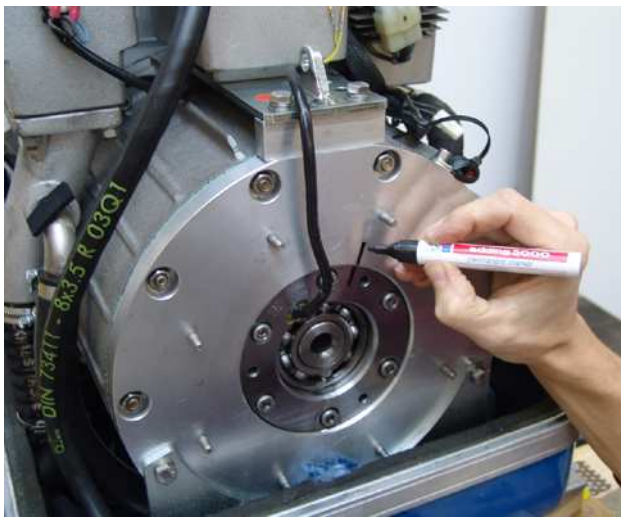
**Demount the oil cap by loosening the nuts M6 (Tool: Socket wrench SW10).**

*Fig. 6.10.2-3: Demounting the oil cap*



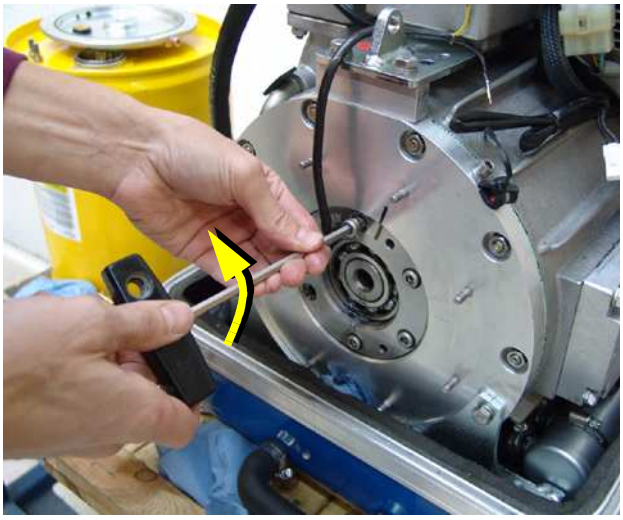
**As shown, degrease the spot with a fat solvent and make a mark with a waterproof pen.**

*Fig. 6.10.2-4: Marking the bearing position*

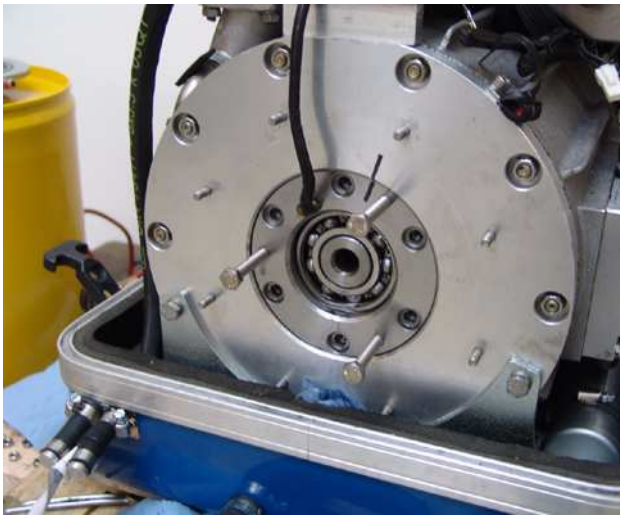
**Unscrew the fastening screws (Tool: Allen wrench SW6).**

*Fig. 6.10.2-5: Loosen fastening screws*



**As shown, screw in 3 lifting screws M8x50 as far as possible by hand.**

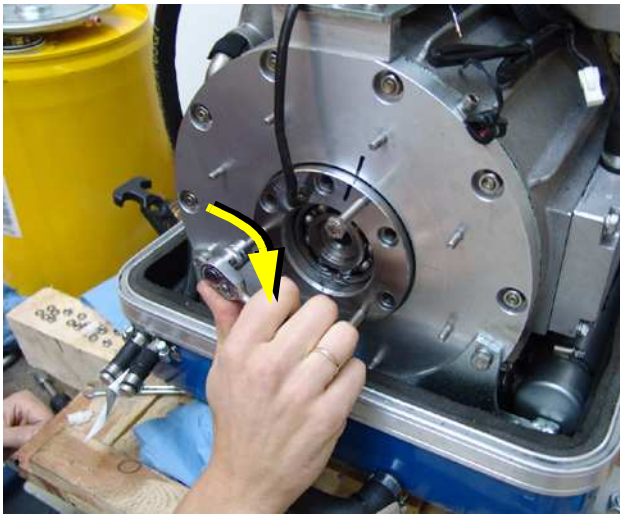
*Fig. 6.10.2-6: Insert lifting screws*



**Then screw in  those 3 screws with a screw wrench SW13 equally and in turns.**

By doing this, the bearing housing including the ball bearing and the shaft sealing ring are pushed out of the generator cap.

*Fig. 6.10.2-7: Pull off the bearing seat*



### Knocking out the ball bearing

Put the bearing housing horizontally on e.g. 2 wood ledges, the ball bearing pointing downwards. Alternatively, the bearing housing can rest on the lifting screws.

Place an appropriate bolt (e.g. extension of a ratch) on the inner bearing ring.

Knock the bearing out of the seat with several careful hammer scales.

Thereby move the bolt after each scale to keep the bearing from canting.

*Fig. 6.10.2-8: Knocking out the ball bearing*

### Dismounted ball bearing

*Fig. 6.10.2-9: Dismounted ball bearing*

**Dismount the shaft sealing ring:**

**We recommend our mandrel.**

**Put it in the sealing ring with the small end downwards.**

**Knock the sealing ring out of the seat with careful hammer scales.**

*Fig. 6.10.2-10: Dismount the shaft sealing ring*

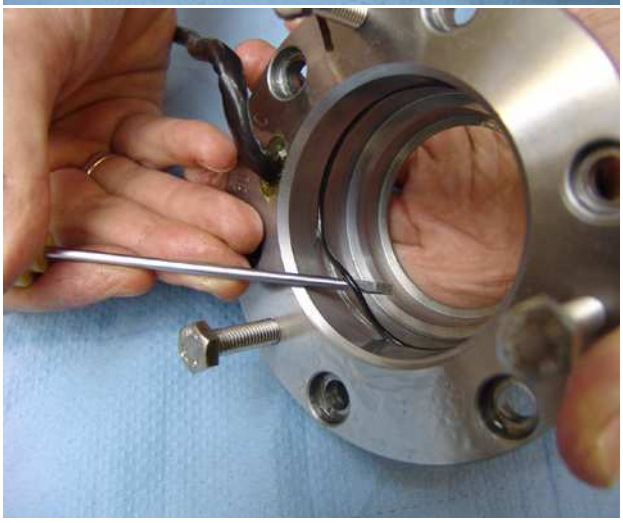
**Dismounted shaft sealing ring**

*Fig. 6.10.2-11: Dismounted shaft sealing ring*

**Remove O-rings from the bearing seat:**

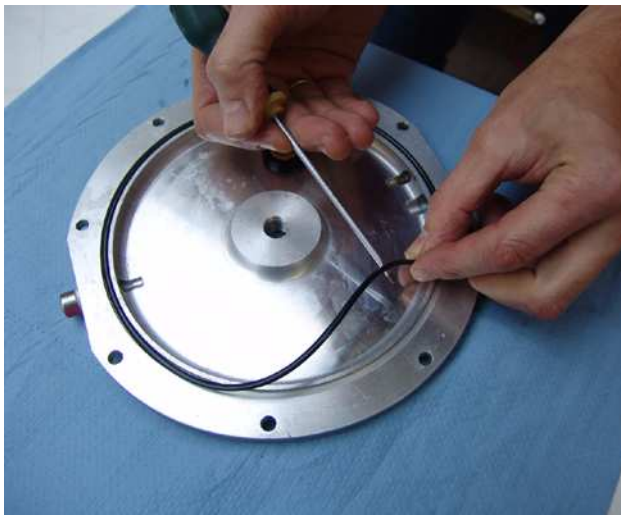
Take both O-rings out of the bearing seat.

*Fig. 6.10.2-12: Remove o-rings*



**Remove O-ring from the oil cap.**

*Fig. 6.10.2-13: Remove O-ring*



Clean the bearing seat and the oil cap.

Slightly lubricate the new O-rings and mount them.

**Mounting the NEW shaft sealing ring:**

*Fig. 6.10.2-14: Mounting the shaft sealing ring*

Lubricate/grease the shaft sealing rings' lip seal.

**Clean the mandrel, slightly grease/lubricate the connecting surface and the chamber-bevel.**

*Fig. 6.10.2-15:*

**Push the sealing ring on the mandrel, the open side should point towards the handle. The side marked with „X“ is to be used.**

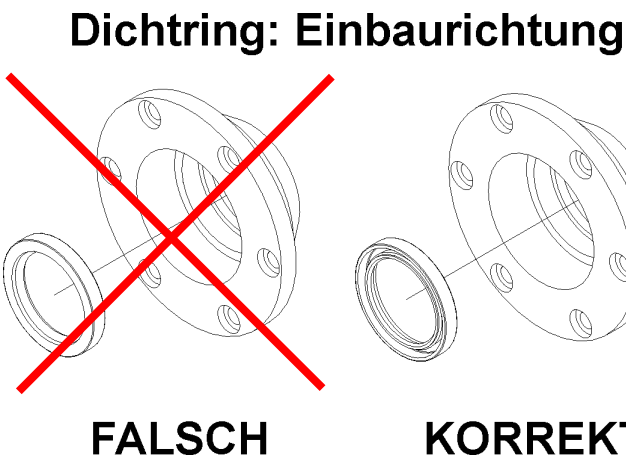
*Fig. 6.10.2-16:*

**Mounting of the shaft sealing ring**

*Fig. 6.10.2-17: Fitting the shaft sealing ring*

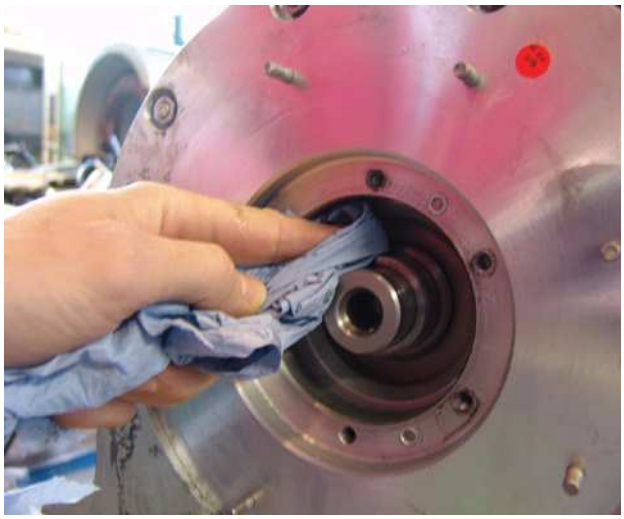
**Correctly mounted sealing ring**

*Fig. 6.10.2-18: shaft sealing ring*



### Clean the shaft

*Fig. 6.10.2-19: Cleaning the shaft*



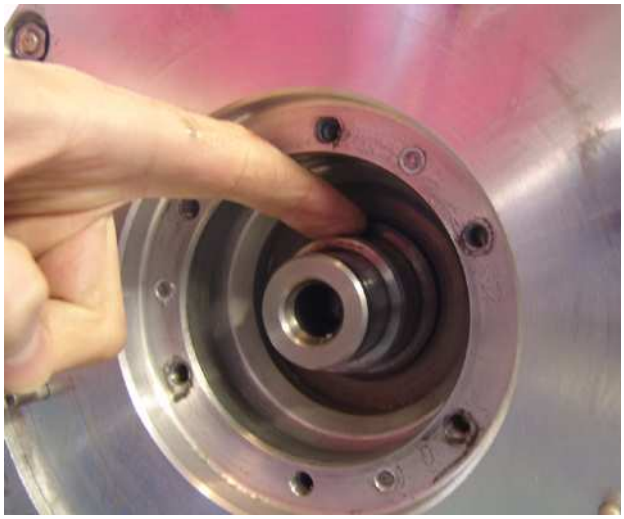
### Check the wheel tread for damages

*Fig. 6.10.2-20: Checking the wheel tread*

The wheel tread has to be

- clean

- free of partial damages (drafts, indentations, notches, scratches).

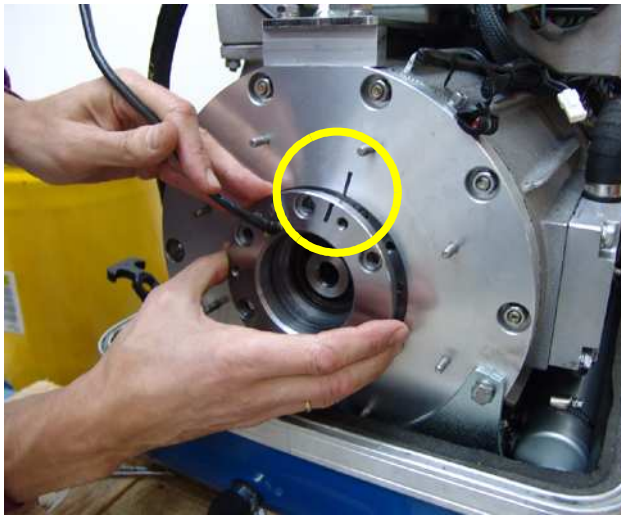


### Mounting the bearing housing inside the generator cap:

*Fig. 6.10.2-21: Mounting the bearing housing*

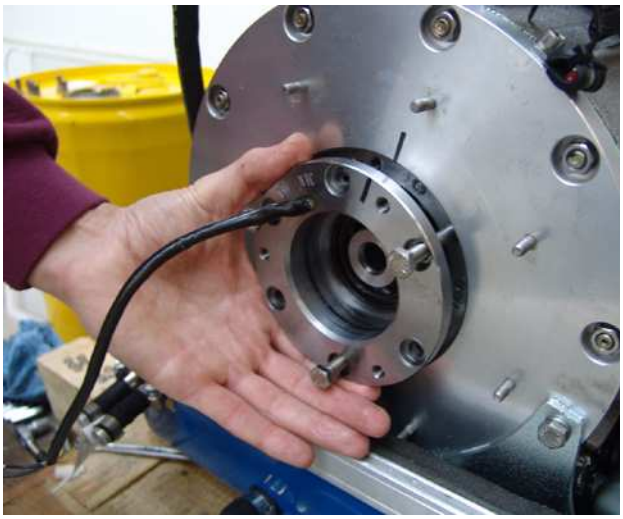
Put the bearing housing loosely into the generator cap; securing it against dropping out with one hand.

Please make sure the housing is mounted in the same position as it was before - the marking that have been made before dismounting have to fit to each other again!



**With the other hand, loosely screw in the lifting screws for guidance.**

*Fig. 6.10.2-22: Mount the bearing housing*



**Now carefully press the bearing housing in its seat with a soft headed hammer (or hammer plus mandrel).**

By doing that, shift the mandrel after each scale in a circle to avoid canting.

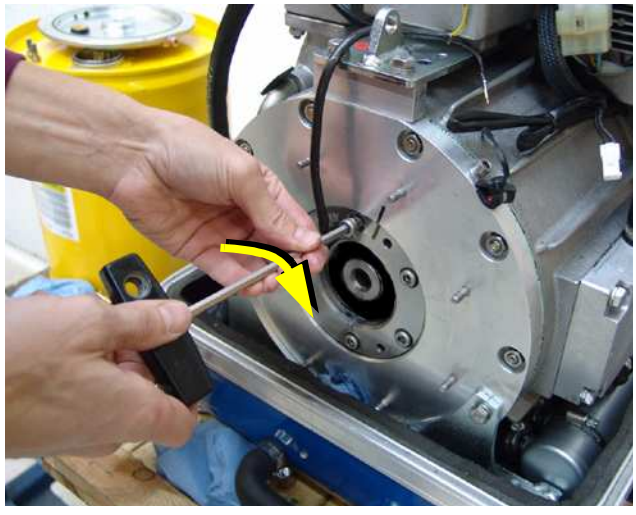
Otherwise you might risk that the housing is a little bit canted because of the material that is curled up by the lifting screws.

A canted bearing housing causes a canted ball bearing, which will wear out very quickly!

*Fig. 6.10.2-23: Mount the bearing housing*

**Tighten the fastening screws M8 with 22 to 25 Nm (Tool: Allen wrench SW6).**

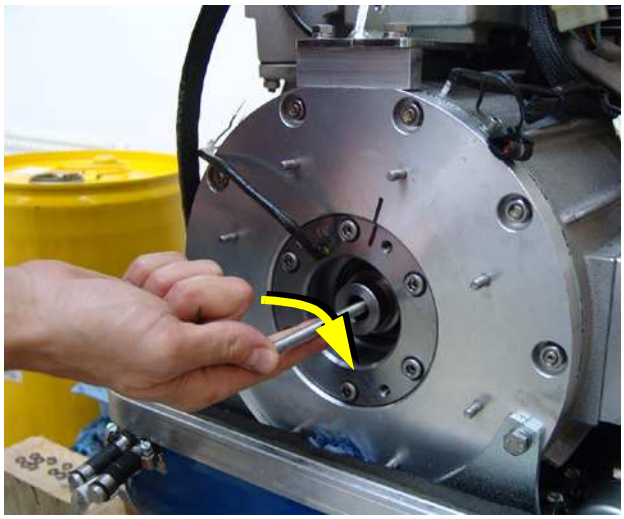
*Fig. 6.10.2-24: Tighten the fastening screws*



**Mounting the ball bearing:**

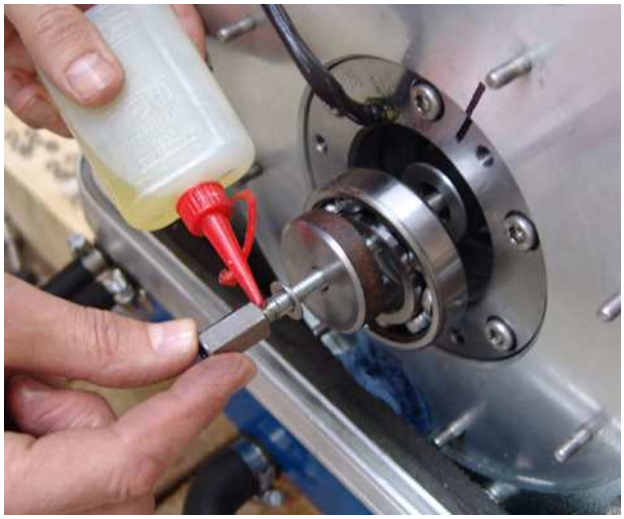
Screw the thread rod into the generator shafts' tap hole as far as possible.

*Fig. 6.10.2-25: Mount the thread rod*



**Push the ball bearing, the pressure ladle and the washer up against the shaft, then screw on the hex nuts. Grease/lubricate the thread rod.**

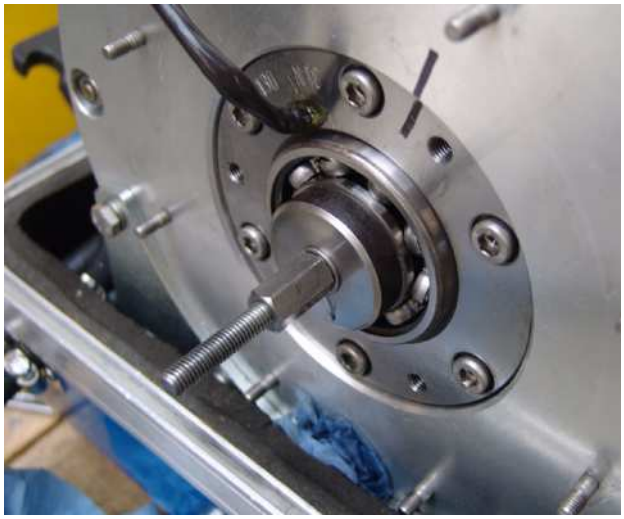
*Fig. 6.10.2-26: Mount the ball bearing*



**Guide the ball bearing with one hand to avoid canting on the shaft.**

**Put the screw wrench on the long nut with the other hand and tighten it slowly.**

*Fig. 6.10.2-27: Mounting the ball bearing*



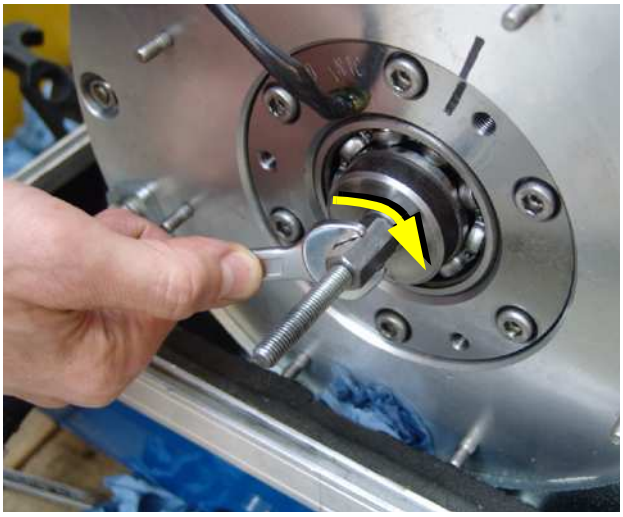
**By doing that, the ball bearing is pressed onto the shaft.**

**If necessary, hold the crank shaft with an appropriate wrench to keep the diesel engine from rotating concurrently.**

**Press the ball bearing on as far as possible.**

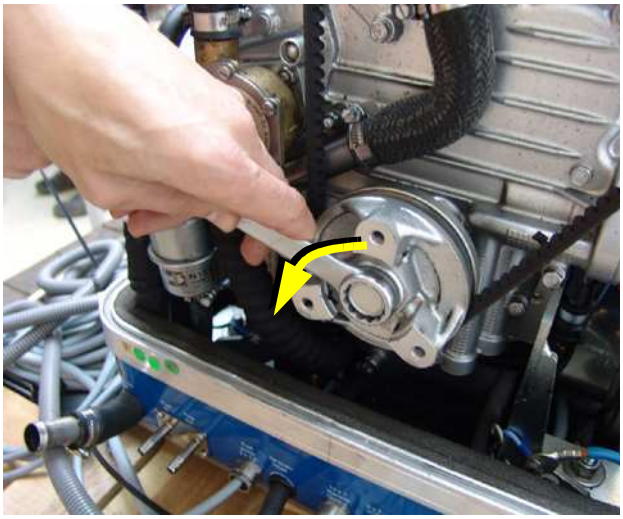
**(Tool: Wrench SW13 and SW22)**

*Fig. 6.10.2-28: Mount the ball bearing*



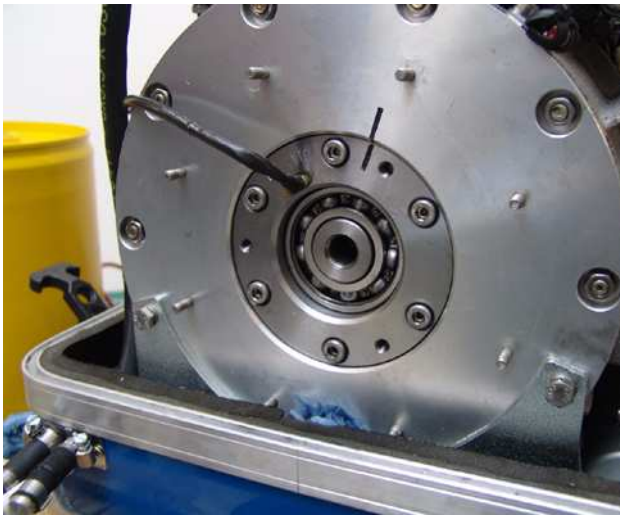
**Hold up the crank shaft**

*Fig. 6.10.2-29:*



**Remove tools**

*Fig. 6.10.2-30: Remove tools*

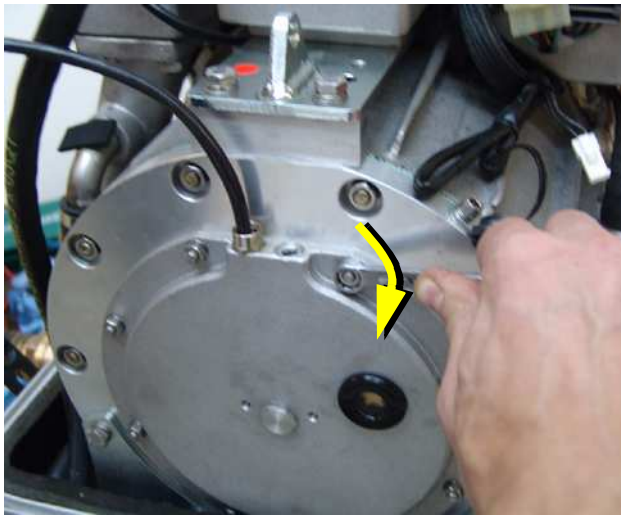


**Remove markings**

*Fig. 6.10.2-31: Remove markings*


**Tighten oil cap:**

*Fig. 6.10.2-32: Mounting the oil cap*

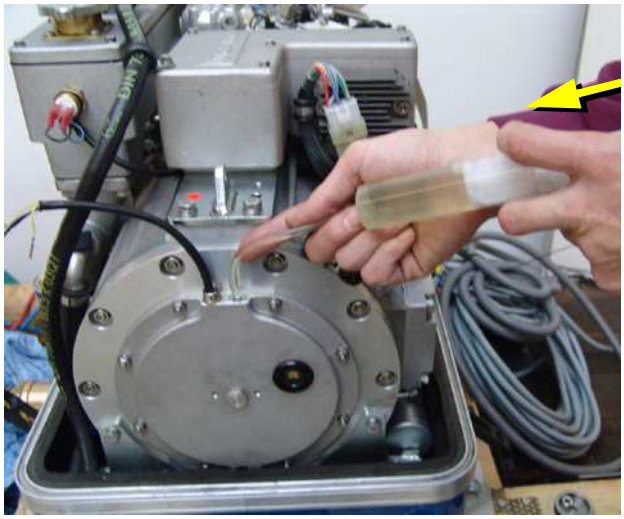


By doing that, pay attention that the O-ring stays in its flute. If necessary, fasten the O-ring with a bit of grease (Tool: Allen wrench SW6).

Nut torque M6: 10 Nm

**Filling up the oil:**

*Fig. 6.10.2-33: Fill up the oil*



Up to the middle of the inspection glass /-hose.

Oil type:

Shell Omala HD 220

Shell Omala HD 320 (Temperature over 35℃)*

Mobil 1 0W-40 **

Oils that have the following specifications, are classified as adequate:

synthetic gear oil (PAO)

Grades of oil 220 to 320

Minimum requirement gear oil: CLP HC

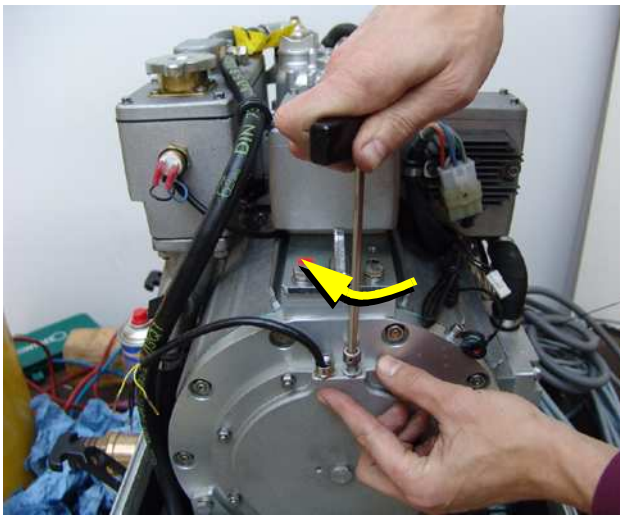
These oils are available at industrial lubricant commerces as well as Fischer Panda.

** Oil change intervals every 1500 hours*

*** Oil change intervals every 300 hours*

**Screw in the ventialtion screw and tighten it (Tool: Allen wrench SW6 - 20 Nm).**

*Fig. 6.10.2-34: Screw in the ventilation screw*



Remove the start interlock.

Re-connect the starter battery.

Run the generator for 3-5 minutes.

Check the oil level, if necessary refill/ discharge some oil.

Mount the capsule.

## 6.11 Checking the water separator in the fuel supply

The pre-filter with water separator has a cock underneath, by which means the water can be drained.

This water sinks to the bottom, due to the difference in the densities of water and fuel. Water is heavier than the diesel

*Sample picture*

*Fig. 6.11-1: Pre-filter with water separator*


### 6.11.1 Ventilating the fuel system

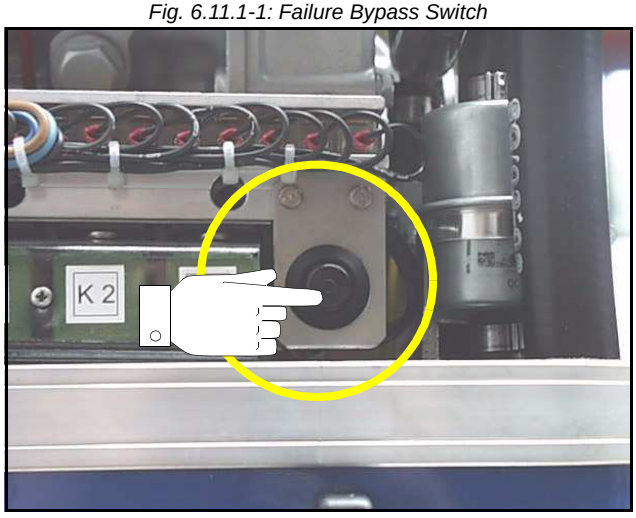
Normally, the fuel system is designed to ventilate air itself i.e. as soon as the electric starter motor starts operation the fuel pump starts working and the fuel system will be de-aerated after some time automatically. It is nevertheless essential to ventilate the system prior to the first operation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

1. Power switch "ON". Functional lights should light up.

2. Press failure bypass switch and keep firmly pressed. The electrical fuel pump must be audible. Switching on and off the solenoid valve at the generator will be audible by pressing the failure bypass switch (if capsule removed).

*Sample Picture*

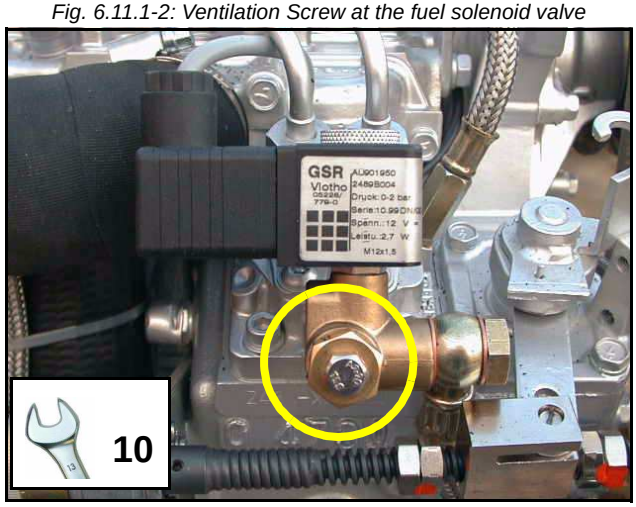
*Fig. 6.11.1-1: Failure Bypass Switch*



3. After pressing the failure bypass switch for approx 3 - 4 minutes the ventilation screw located at the fuel solenoid valve has to be loosened. The button must be kept pressed, whilst opening the screw. A large cloth or Kleenex tissue must be laid beneath the connection to prevent escaping fuel running into the capsule. If the fuel runs out without air bubbles, then the ventilation screw can be closed. Only then may the button be released.

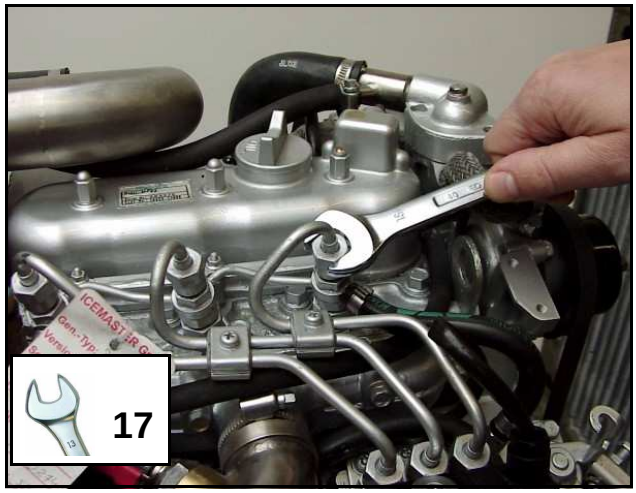
*Not installed in all models*

*Fig. 6.11.1-2: Ventilation Screw at the fuel solenoid valve*




4. Pressing the starter button can now start the machine. The machine should start after a short period.
5. If this does not occur, then a connecting nut fitted to the injection line must be loosened and starting procedure repeated. Retighten the washers after successfully starting. The injection line must be raised by several millimetres.
6. Switch power switch "OFF"

*Fig. 6.11.1-3: Injection nozzles*




## 6.11.2 Exchange of the Fuel Filter

Exchanging the filter, depending upon fuel contamination, should take place after 300 operational hours at the very least. T

**he inlet must be clamped, before exchanging the filter.**

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

*Fig. 6.11.2-1: Fuel Filter*

## 6.11.2.1 Optional fuel filter with sight glass

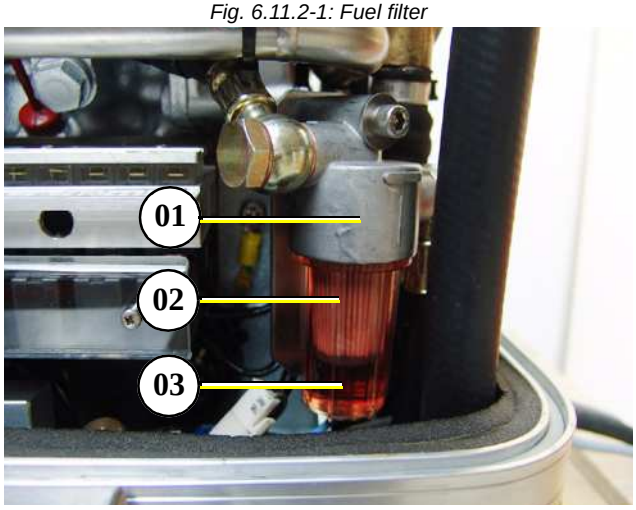
The filter change depends on the fuels' degree of pollution, but should be executed every 300 operating hours at the latest.

**01. Fuel filter housing**

**02. Fuel filter element**

**03. Sight glass**

*Fig. 6.11.2-1: Fuel filter*

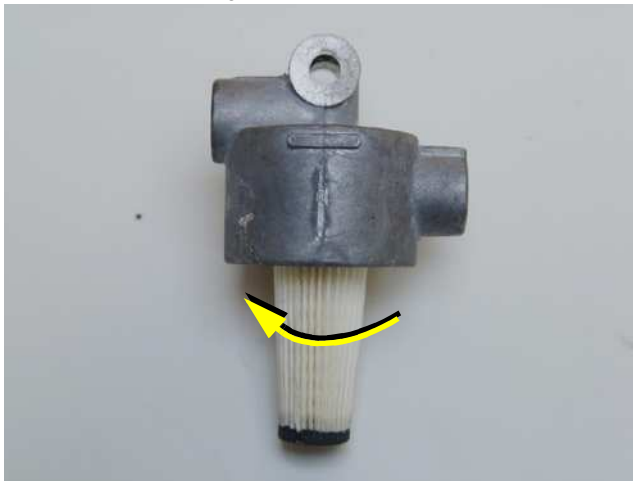



**Unscrew the housing from its mount (left hand rotation).**

*Fig. 6.11.2-2: Fuel filter*

**Unscrew the filter element from the mount (left hand rotation).**

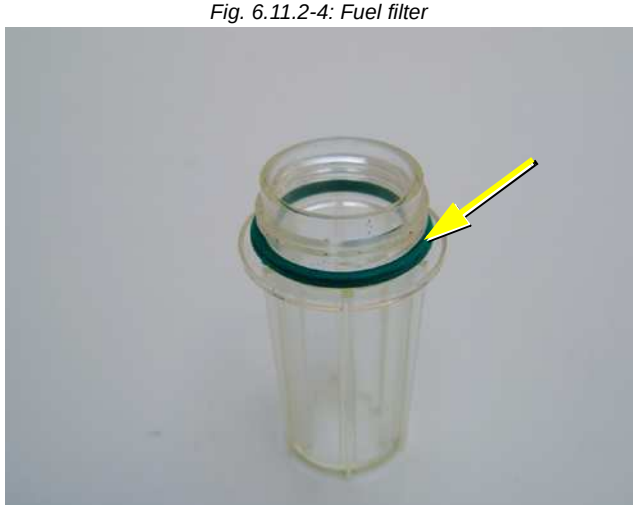
*Fig. 6.11.2-3: Fuel filter*



**Screw the new filter element into the mount.**

**Lubricate the sight glasses o-ring with a heat resistant grease (Specification: Antiseize) and screw the sight glass back into its mount (right hand rotation).**

*Fig. 6.11.2-4: Fuel filter*

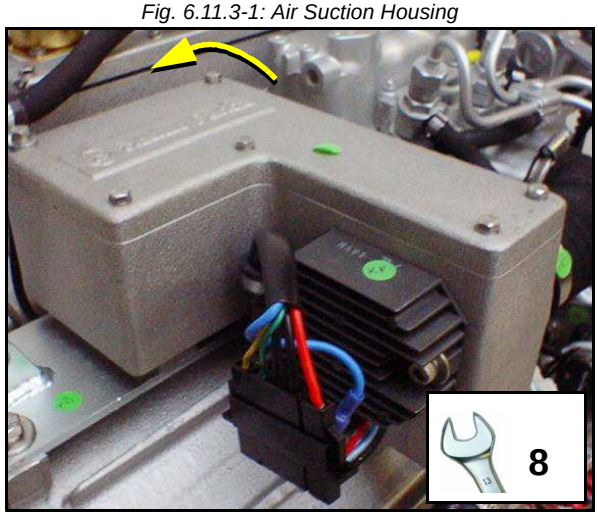


## 6.11.3 Replacement of the air filter mat

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

*Sample Picture*

*Fig. 6.11.3-1: Air Suction Housing*

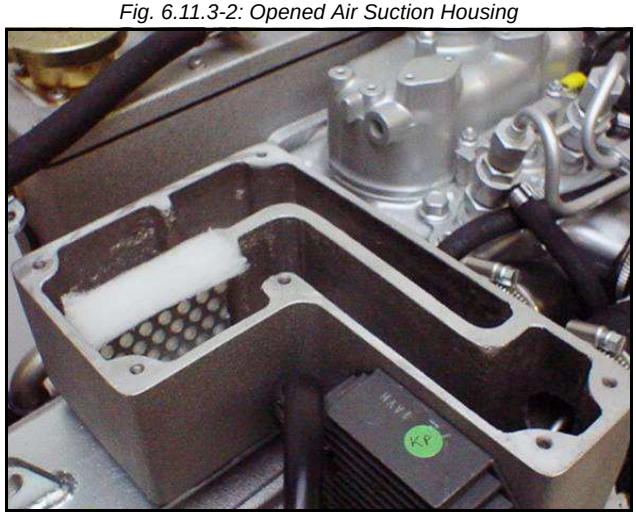



**Change the air filter mat**

**Close the suction air housing**

*Sample Picture*

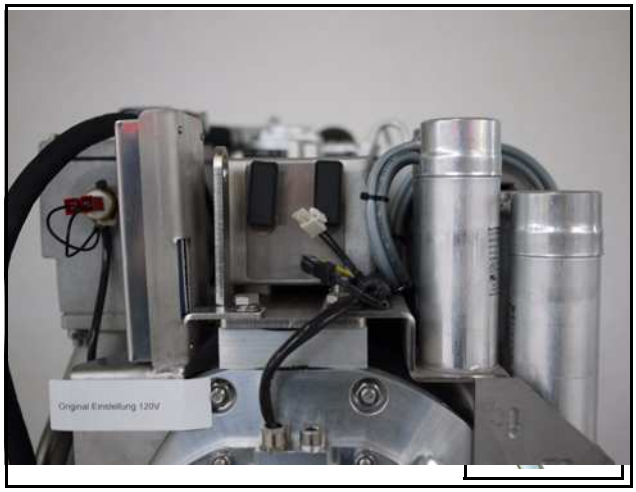
*Fig. 6.11.3-2: Opened Air Suction Housing*



## 6.11.3.1 Alternative replacement of the air filter mat with pull out holder

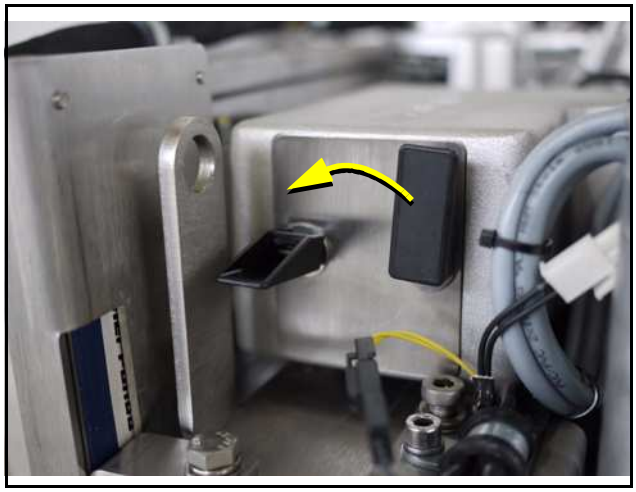
**Air filter housing with pull out holder**

*Fig. 6.11.3-1: Air Suction Housing with pull out holder*



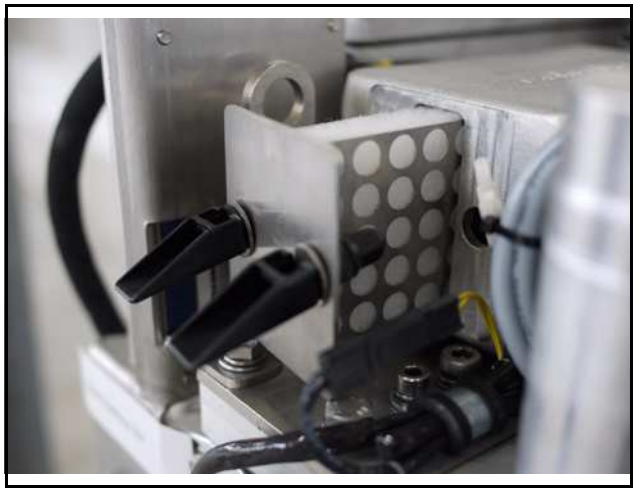
**Tip the two fasteners 90°**

*Fig. 6.11.3-2: Air Suction Housing with pull out holder*



**Pull the filter mat holder out**

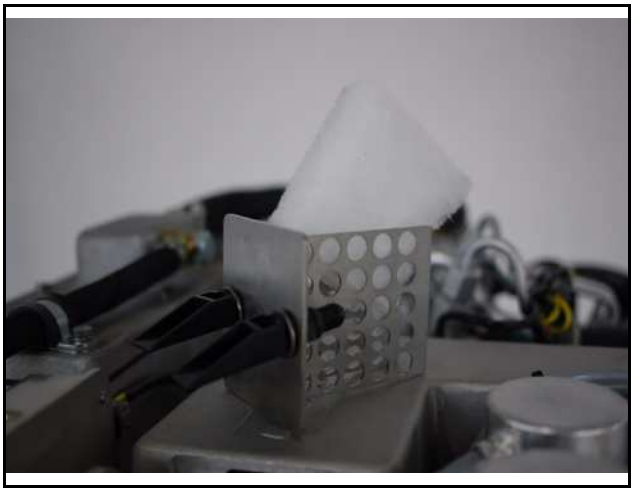
*Fig. 6.11.3-3: Air Suction Housing with pull out holder*



**Replace the air filter mat**

**Assembly in reversed order of steps 1-4**

*Fig. 6.11.3-4: Air Suction Housing with pull out holder*



## 6.12 Ventilation of the coolant circuit / freshwater

**Special notes for the ventilation of the cooling system**

If the cooling water is drained, or if other air has entered the cooling system, it is necessary to ventilate the cooling system.

**Attention**

**The generator must be switched off before opening the ventilating points!**

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

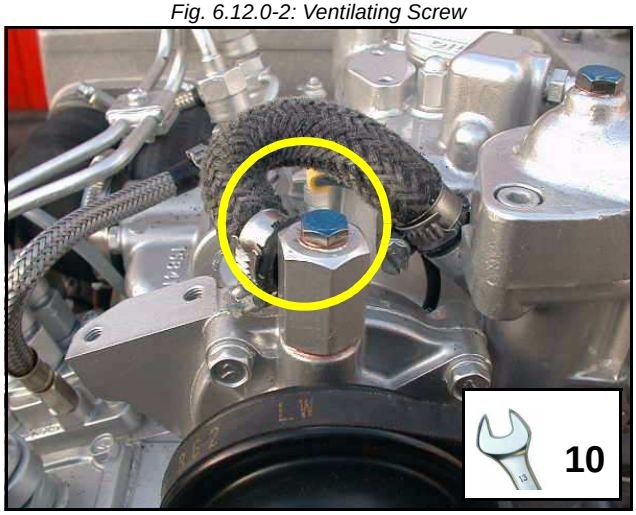
**Further it should be guaranteed that the expansion tank is attached in sufficient height (600 m) over the level of the generator exhaust elbow union. This ventilating procedure must be repeated several times:**

*Fig. 6.12.0-1: Expansion Tank*

**Open the ventilating screw above the cooling water pump casing.**

Sample Picture

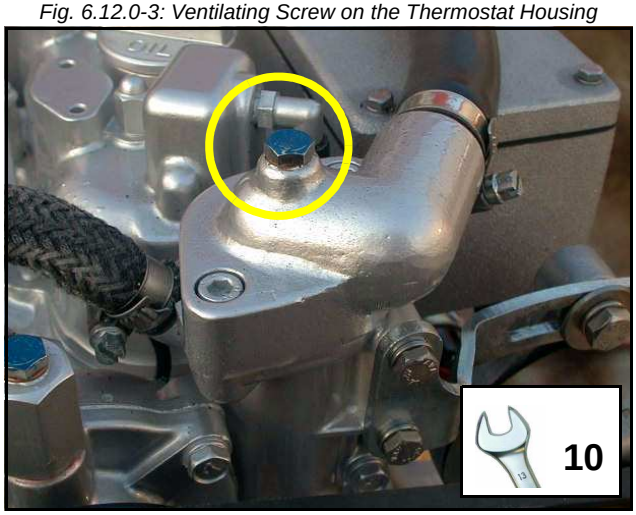
*Fig. 6.12.0-2: Ventilating Screw*




**Open the ventilating screw on the thermostat casing.**

Sample Picture

*Fig. 6.12.0-3: Ventilating Screw on the Thermostat Housing*




**The cooling water can be filled into the External expension tank.**

**If the cooling water level no longer drops (the cooling water level in cold waters must cover the tin in the exhaust elbow), close the filler cover and the cooling water screws and then start the generator.**

**Run the generator for approx. 60 seconds, then switch off**

**Refill cooling water via the compensation tank.**

**The external compensation tank should be filled to a max 20% in a cold state. It is very important that a larger expansion area is maintained above the cooling water level.**

*Fig. 6.12.0-4: Cooling Water Expansion Tank*

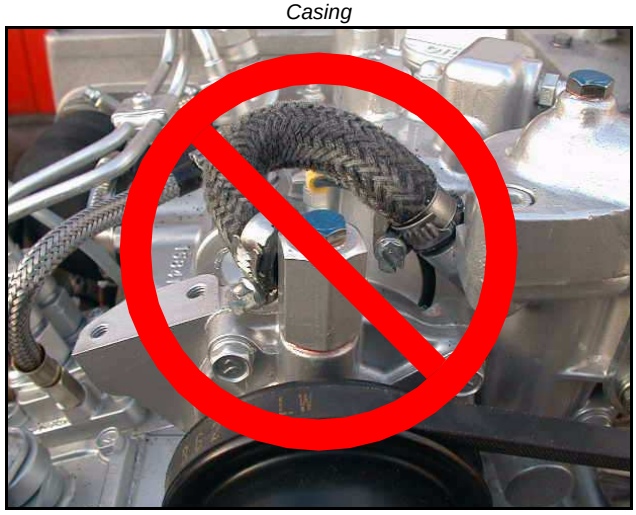
Repeat this procedure several times.

If there is no change to the state of the cooling water level, the generator is re-started for 5 minutes. Thereafter the de-aeration must be repeated two to three times.

It might be advisable to repeat the venting procedure a couple of days later, to ensure that all air that may have remained in the system is finally released.

**The ventilation screw above the cooling water pump casing may not be opened under any circumstances, while the generator is running. Air will be sucked through the opening, if this should happen by mistake. Venting the whole system afterwards is necessary and very difficult.**

*Fig. 6.12.0-5: Ventilation Screw above the Cooling Water Pump Casing*



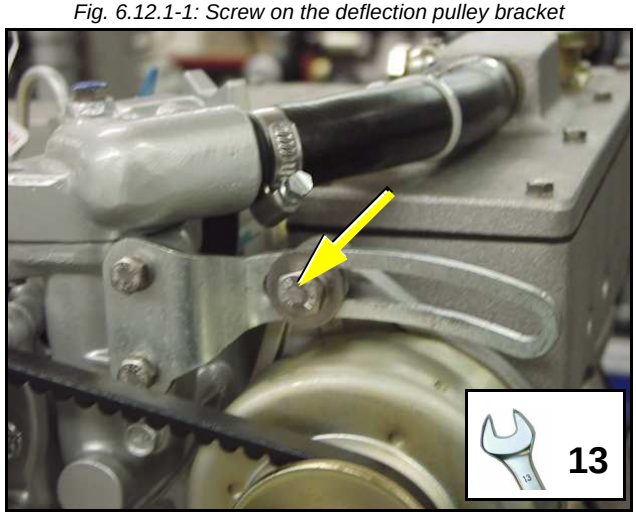
## 6.12.1 Replacement of the V-Belt for the internal cooling water pump

The relative high ambient temperature in the closed sound insulated capsule (about 85℃) can be a reas on for a reduced lifespan of the v-belts. It is possible that the "softeners" 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 at very short time intervals. It may be required to change the v-belt after several weeks because of unfavourable conditions. Therefore, control should be carried out after an interval of 150 operating hours. The v-belt is a wearing part. There should be enough spare v-belts on board. We recommend that you have the respective manual within reach.

**Loosen the screw on the deflection pulley bracket**

*Sample Picture*

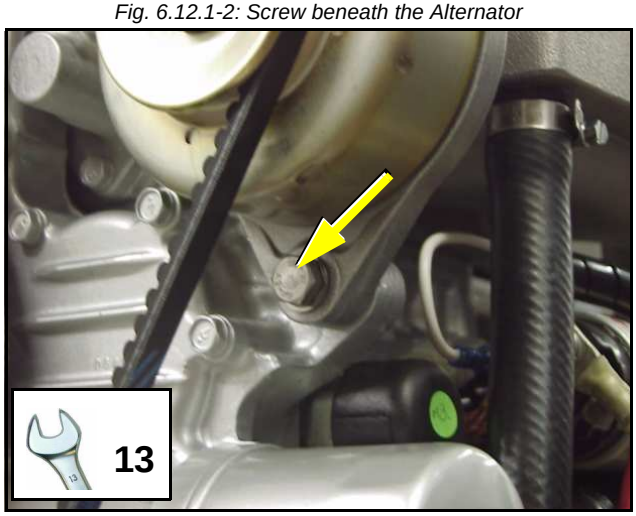
*Fig. 6.12.1-1: Screw on the deflection pulley bracket*



**Loosen the screw beneath the alternator**

*Sample Picture*

*Fig. 6.12.1-2: Screw beneath the Alternator*

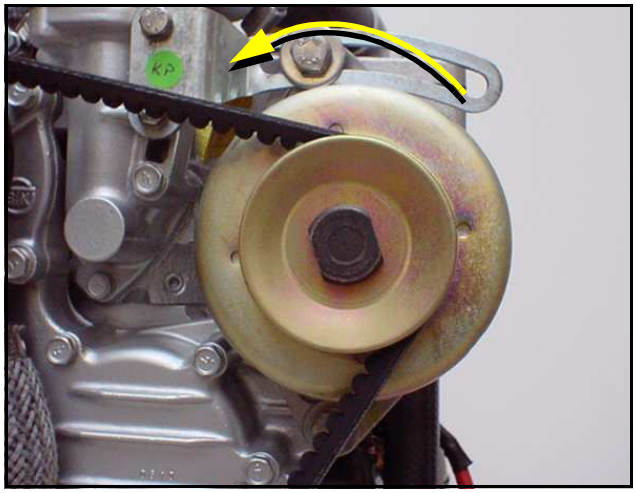



**Press the alternator in the direction of the thermostat casing**

**Exchange V-belt**

*Sample Picture*

*Fig. 6.12.1-3: DC Alternator*

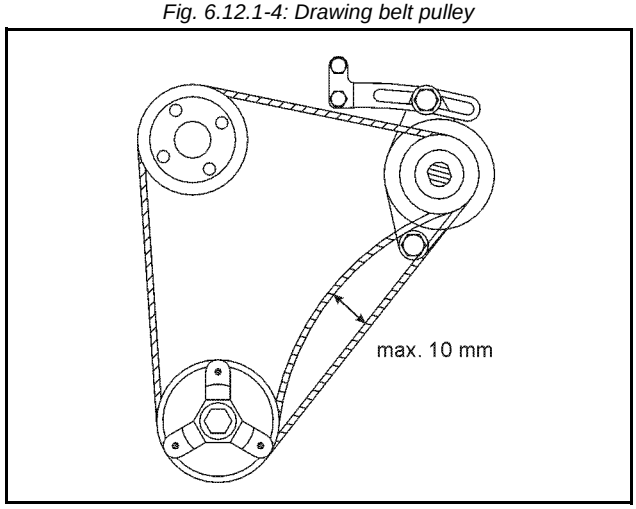


**Re-tighten V-belt**

The belt pulleys should only be tightened to the extent that it can still be pushed with a thumb (approx. 10 mm).

**Re-tighten the screws above and below the alternator**

*Fig. 6.12.1-4: Drawing belt pulley*



# 6.13 The seawater circuit

## 6.13.1 Cleaning the seawater filter

**Residue should be regularly removed from the seawater filter. The seacock must, in each case, be closed first. It often suffices to merely hit the filter punnet.**

If water should seep through the cover of the seawater filter, this may never be sealed with adhesive or sealant. The cause for the leakage must be sought. The sealing ring between caps and filter holders must be exchanged in the simplest cases.

*Sample picture*

*Fig. 6.13.1-1: Seawater Filter*

# 6.14 Reasons for frequent impeller wear

**1. Unreasonable operating conditions**

The Cooling water pump Impeller must be regarded as a wearing part. The life expectancy of an impeller can vary considerably and depends exclusively upon the operating conditions. The Fischer Panda Generator cooling pumps are designed in a way, that the speed of the pump in comparison to other generators is relatively low. This has a positive effect on the life expectancy of the pump.

**2. Longer Suction Distance of Cooling Water**

If the cooling water suction distance is long, or is blocked, this has a negative effect on the impeller, so that an underpressure occurs in the cooling water suction area. This can reduce the efficiency of the impeller and place strain on the blades. This can greatly reduce the life expectancy.

**3. Operating in contaminated waters**

The impeller is placed under great strain in waters with high contamination. The use of the impeller in coral waters is also critical. There are known cases, where the impeller was so fatigued after 100 hours use, that the lip seals were grinded away by the shaft. In these cases sharp crystal parts from the coral press into the rubber seals and act as a grinding material on the stainless steel shaft of the impeller pump.

**4. Generator mounted above the water level**

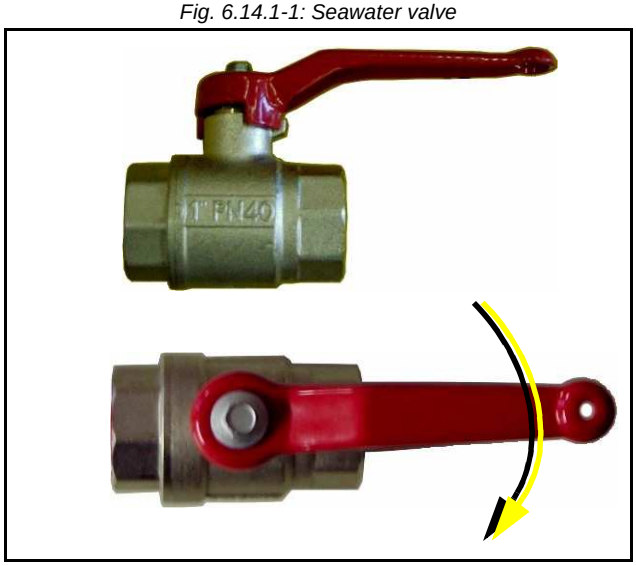
It is especially disadvantageous for the impeller pump, if the generator is mounted above the water level. This means that a few seconds will pass before the impeller can suck in cooling water. This short dry running period damages the impeller. The increased wear can also lead to a breakdown. (See special instruction: "Effect on the impeller pump, if the generator is mounted above the water line").

## 6.14.1 Replacement of the impeller

**Close the seawater valve.**

*Sample Picture*

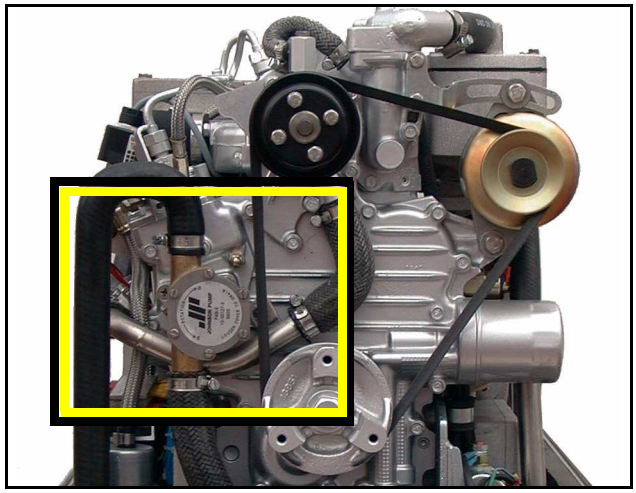
*Fig. 6.14.1-1: Seawater valve*



**The seawater pump is located on the front side of the genset.**

*Sample Picture*

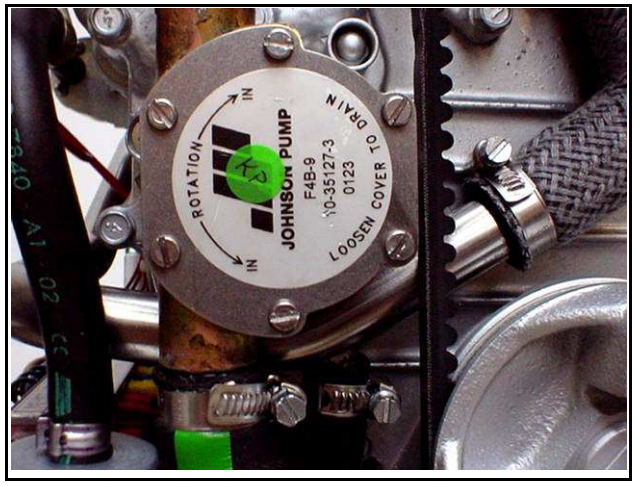
*Fig. 6.14.1-2: Seawater pump*



**Remove the cover of the seawater pump by loosen the 4 wing screws from the housing.**

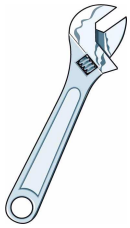
*Sample Picture*

*Fig. 6.14.1-3: Cover Seawater Pump*



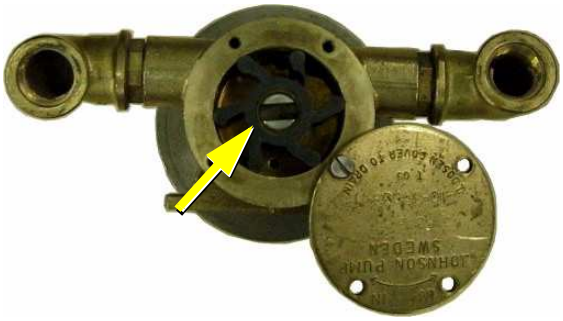
**Remove the impeller from the shaft by means of multi grip pliers.**

**Mark the impeller, to make sure that it is in the correct position when re-installation is carried out.**



*Sample Picture*

*Fig. 6.14.1-4: Impeller*




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

The impeller should have been lubricated with glycerine or with a non-mineral oil based lubricated e.g. silicone spray, before re-insertion into the housing. Attention: This is very important, because the impeller can quickly be damaged.

*Sample Picture*

*Fig. 6.14.1-5: Impeller*

**Attach the impeller to the pump shaft (if the old impeller is re-used, initially check the marking).**

**Fastening the cover and use a new seal.**

*Sample Picture*

*Fig. 6.14.1-6: Cover Pump Shaft*

# 6.15 Replacing the Actuator

The described procedure is representive for Fischer Panda genertors. The original location of the item must be taken from the generator describtion of this manual. All replacements and repairs should be done by a trained person.

**NOTE:Representive procedure**

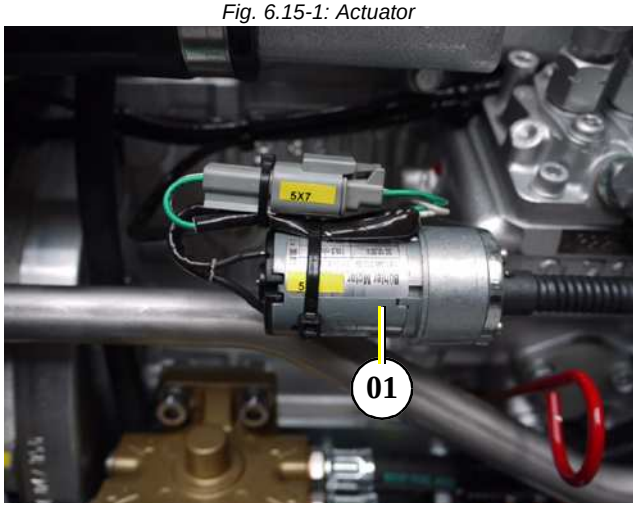
**Ensure that the generator cannot be started up accidentally. Remove battery main switch.**

**ATTENTION!**

For part numbers, refer to the spare parts catalogue.

1. Open the capsule.
   01. Actuator 5Y7

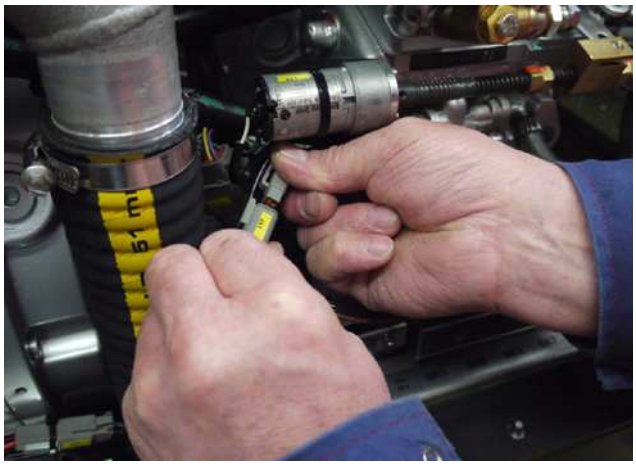
*Fig. 6.15-1: Actuator*




**Figures similar!**

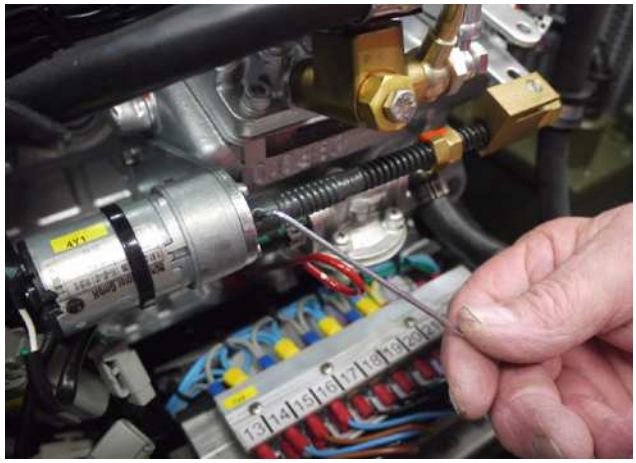
*Fig. 6.15-2: Actuator*

2. Disconnect electric supply line 5X7 from the actuator.



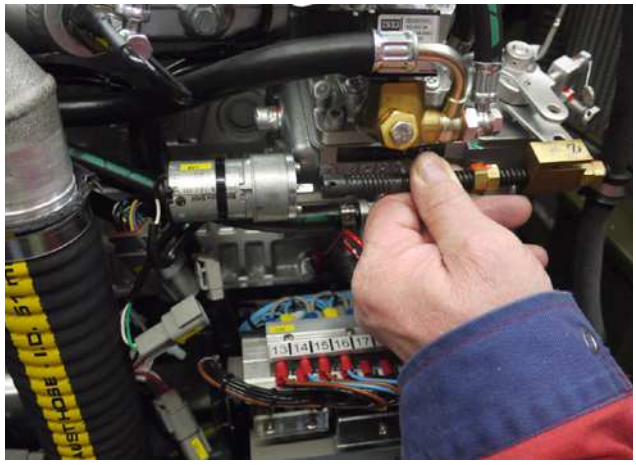
3. Unscrew the grub screw using a size 2 mm socket wrench.


*Fig. 6.15-3: Actuator*



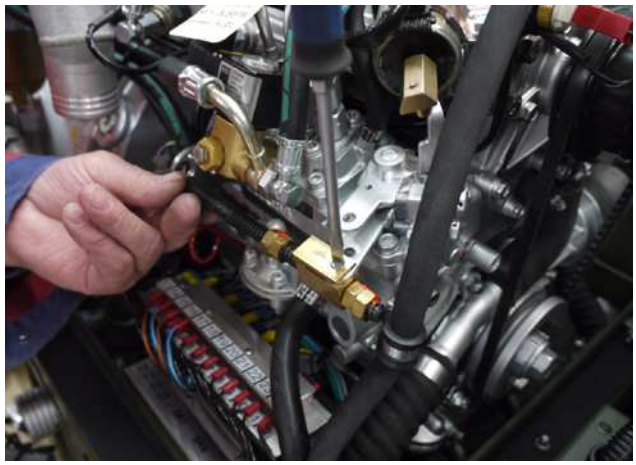
4. Slide spindle to the right.

*Fig. 6.15-4: Actuator*



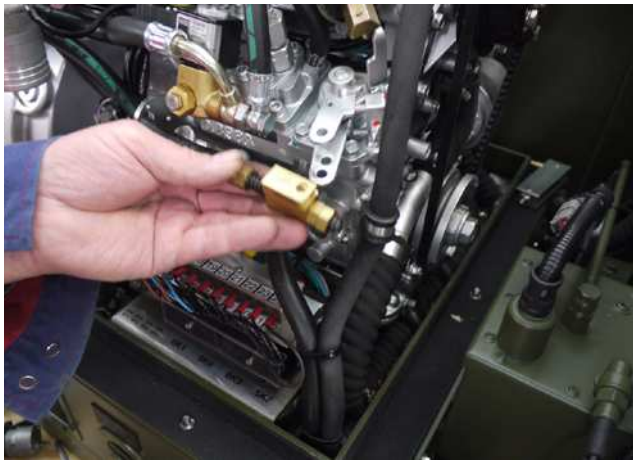
5. Remove screw with a size 0 or 1 screwdriver.

*Fig. 6.15-5: Actuator*



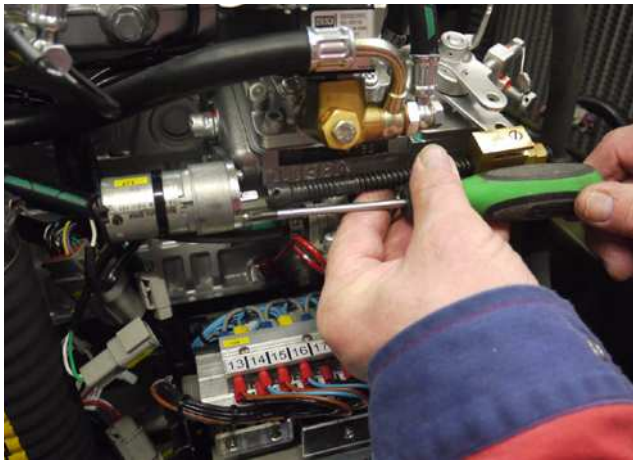
6. Remove the spindle.

*Fig. 6.15-6: Actuator*



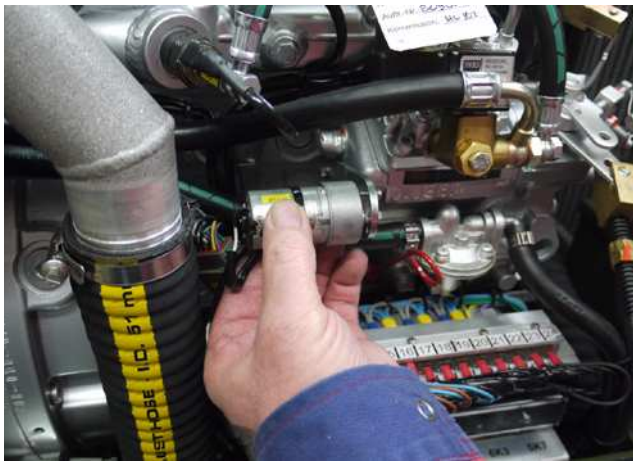
7. Unscrew three screws on the actuator with a size 0 or 1 phillips screwdriver.

*Fig. 6.15-7: Actuator*



8. Remove the actuator.
9. To reinstall, reverse the order of steps.
10. Pull out electric starter.
11. To reinstall, reverse the order of steps.

*Fig. 6.15-8: Actuator*



## 6.15.1 Check and discharge the capacitors

**NEVER 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 be discharged by bridging the capacitor terminals with a discharge reactor.**

**Attention!:**

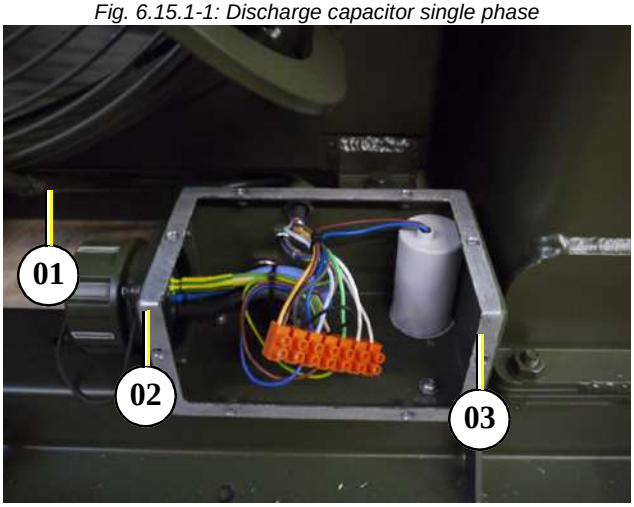
The capacitors can be checked using a multimeter with capacitor measuring.

The capacitors fitted inside the cabinet are discharged over the soldered resistor at every capacitor. The discharge over the discharge reactor (see special tools) is security because the capacitor voltage is lethal.

**Discharge the capacitor - single phase**

03. Capacitor

*Fig. 6.15.1-1: Discharge capacitor single phase*




**Discharge the capacitor - three phase**

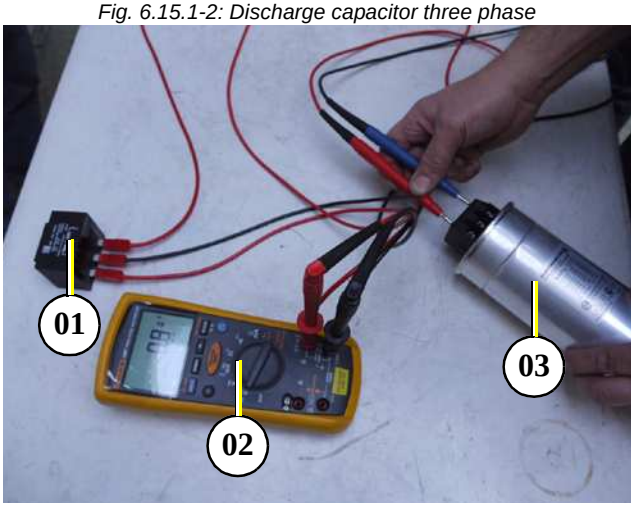
01. Discharge reactor (5-10kOhm)

02. Multimeter

03. Capacitor

At three phase capacitors the dicharge must be made between every phase (L1-L2; L2-L3; L1-L3)

*Fig. 6.15.1-2: Discharge capacitor three phase*




**Checking**

Switch the multimeter to capacitor measuring and connect the meter end probes to the capacitor terminals. Measure capacity of the capacitor.

*Fig. 6.15.1-3: Capacitor checking*

**Check all capacitors in the electrical cabinet**

Test each capacitor by touching the multimeter (set on capacitor measuring) probes on the capacitor terminals: measure the capacity of the capacitors.

The capacitors should not be removed from the electrical cabinet before the check is made.

**Checking the electrical connections to the Capacitor**

It must be ensured that the electrical connections to the capacitor are always tight fitting. Loose connections with

transitional resistance can mean that the contact surfaces will become heated externally. This can lead to faster deterioration of the capacitors.

## 6.15.2 Replacing the Electric Starter

The described procedure is representive for Fischer Panda genertors. The original location of the item must be taken from the generator describtion of this manual. All replacements and repairs should be done by a trained person.

**NOTE:Representive procedure**

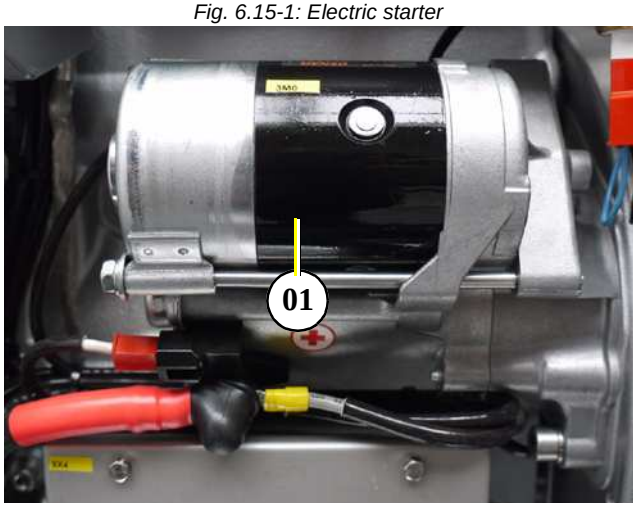
**Ensure that the generator cannot be started up accidentally. Remove battery main switch.**

**ATTENTION!**

For part numbers, refer to the spare parts catalogue.

1. Open the capsule.
   01. Electric starter 3M0

*Fig. 6.15-1: Electric starter*

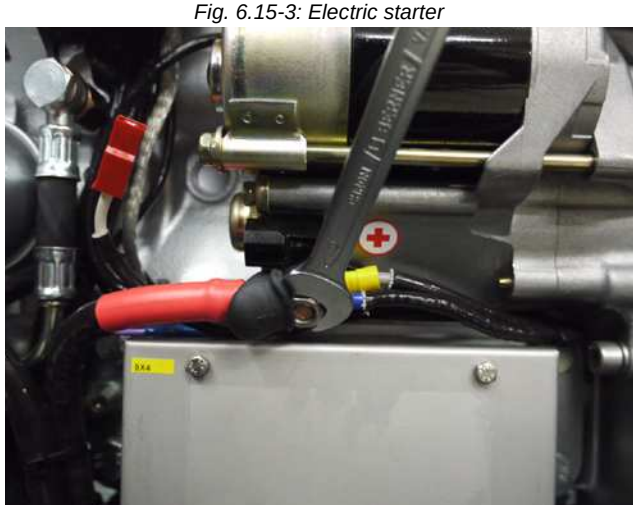



2. Pull off connector.

*Fig. 6.15-2: Electric starter*

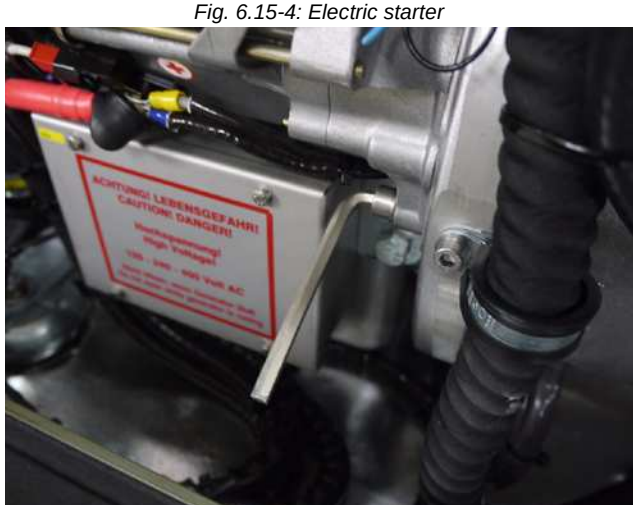
3. Pull off rubber cap.
4. Loosen hex nut with wrench with W.A.F. 13 mm and remove the electric connections.


*Fig. 6.15-3: Electric starter*



5. Loosen the lower attachment screw with a hex socket wrench.

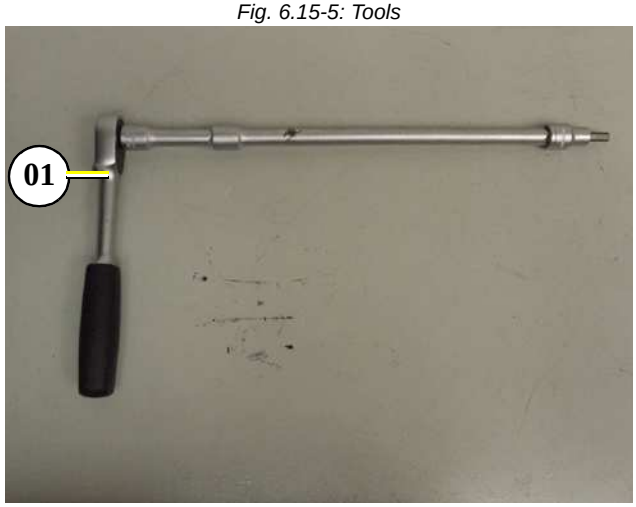

*Fig. 6.15-4: Electric starter*



**Tools needed:**

01. Socket wrench with long and short extension and size 6 mm socket

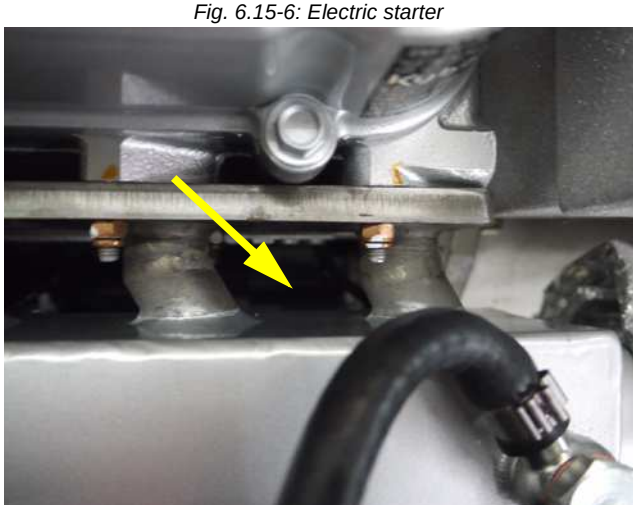
*Fig. 6.15-5: Tools*



**The upper attachment screw is visible from up top, view between engine and exhaust manifold.**

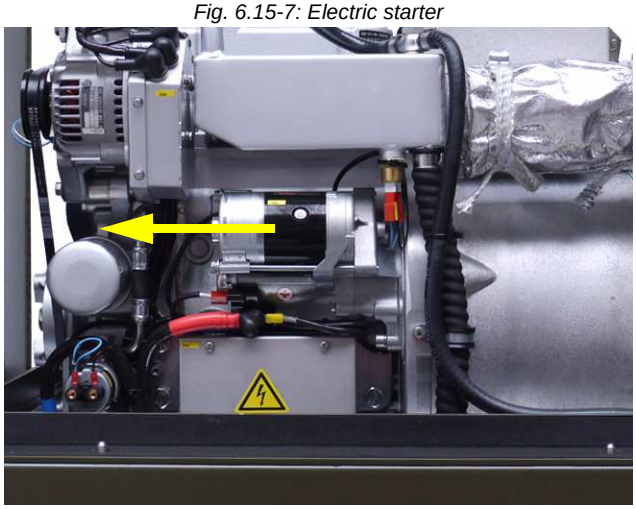
6. Slide the socket wrench fitted with both extensions under the exhaust manifold and insert in the hex socket screw. Loosen upper attachment screw.


*Fig. 6.15-6: Electric starter*



7. Pull out electric starter.
8. To reinstall, reverse the order of steps.

*Fig. 6.15-7: Electric starter*



## 6.16 Replacing the DC/DC Converter

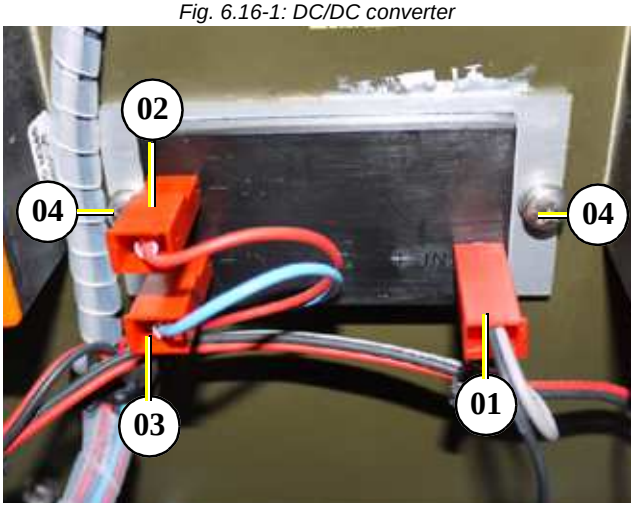
The described procedure is representive for Fischer Panda genertors. The original location of the item must be taken from the generator describtion of this manual. All replacements and repairs should be done by a trained person.

**NOTE:Representive procedure**

9. Disconnect the starter battery (first GND (-), then (+)).
10. Disconnect the three cable terminals.
11. Loosen the two filister head screws and dismount the DC/DC converter.
12. Proceed in the reverse order to reassemble.

01. 24V ...28.8V +
02. 12V ...14.4V +
03. GND -
04. Filister head screw with cross slot

*Fig. 6.16-1: DC/DC converter*



# 6.17 Replacing the DC Alternator

The described procedure is representive for Fischer Panda genertors. The original location of the item must be taken from the generator describtion of this manual. All replacements and repairs should be done by a trained person.

**NOTE:Representive procedure**

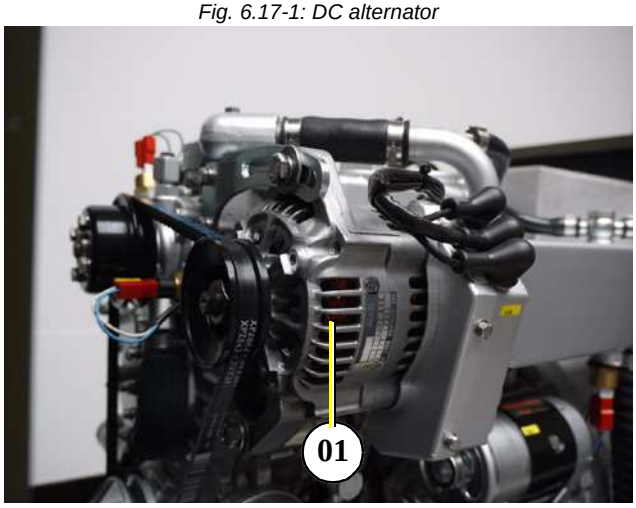
**Ensure that the generator cannot be started up accidentally. Remove battery main switch.**

**ATTENTION!**

For part numbers, refer to the spare parts catalogue.

1. Open the capsule.
   01. DC alternator 3G6

*Fig. 6.17-1: DC alternator*




**Figures similar!**

2. Remove cable ties.

*Fig. 6.17-2: DC alternator*

3. Pull off rubber caps on the electrical terminals.
4. Remove nut and washer of the 24 V DP+ terminal (red cable) using a wrench with W.A.F. 10 mm.


*Fig. 6.17-3: DC alternator*

5. Remove nut and washer of the exciter terminal (grey cable) with a wrench with W.A.F. 8 mm.


6. Remove nut and washer of the charging voltage fault terminal (green cable, bottom terminal) with a wrench with W.A.F. 8 mm.


*Fig. 6.17-4: DC alternator*

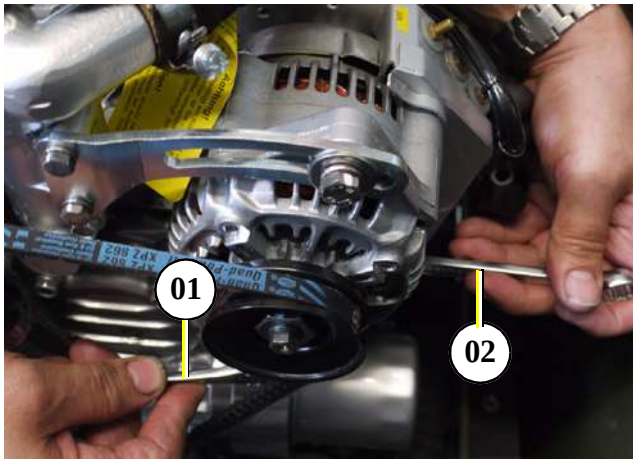
7. Loosen upper fixing screw of the DC alternator with a wrench with W.A.F. 13 mm.


*Fig. 6.17-5: DC alternator*

8. Loosen bottom fixing screw of the DC alternator with a wrench with W.A.F. 12 mm (01).

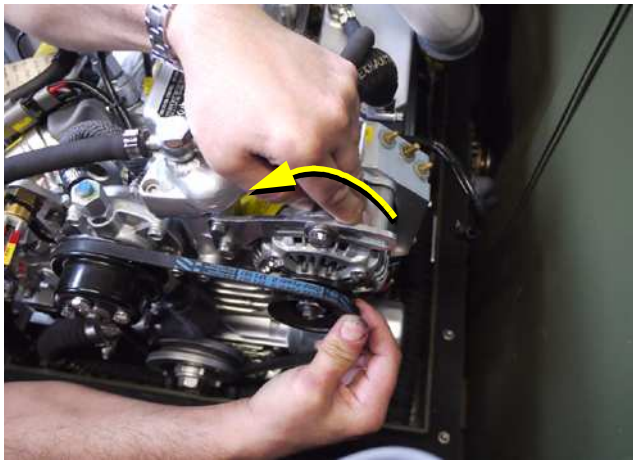

9. Use a wrench with W.A.F. 12 mm (02) for the counter nut.


*Fig. 6.17-6: DC alternator*




10. Push the DC alternator toward the thermostat housing.
11. Remove the V-belt.
12. Remove both fixing screws.

*Fig. 6.17-7: DC alternator*



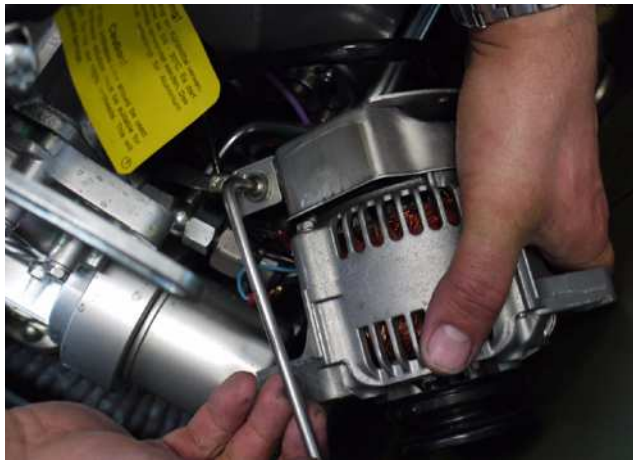
13. Remove spacer.

*Fig. 6.17-8: DC alternator*

14. Loosen and remove the earthing strip with a size 5 mm socket wrench.


15. Replace the DC alternator.
16. To reinstall, reverse the order of steps.

*Fig. 6.17-9: DC alternator*



# 6.18 Replacing the Oil Pressure Switch

The described procedure is representive for Fischer Panda genertors. The original location of the item must be taken from the generator describtion of this manual. All replacements and repairs should be done by a trained person.

**NOTE:Representive procedure**

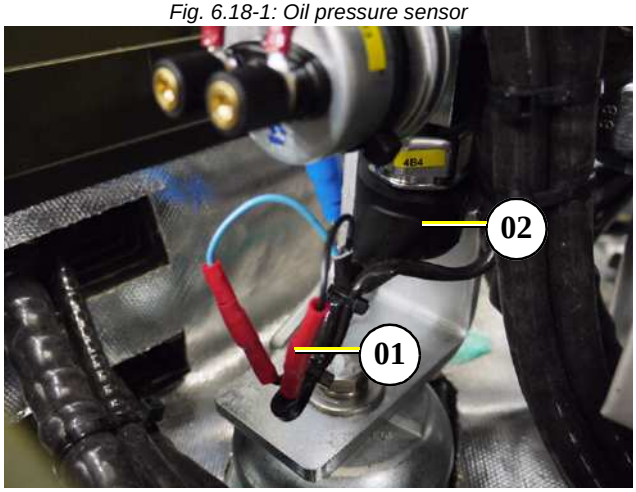
**Ensure that the generator cannot be started up accidentally. Remove battery main switch.**

**ATTENTION!**

For part numbers, refer to the spare parts catalogue.

1. Open both connectors (01) on the oil pressure switch.
2. Pull off rubber cap (02).

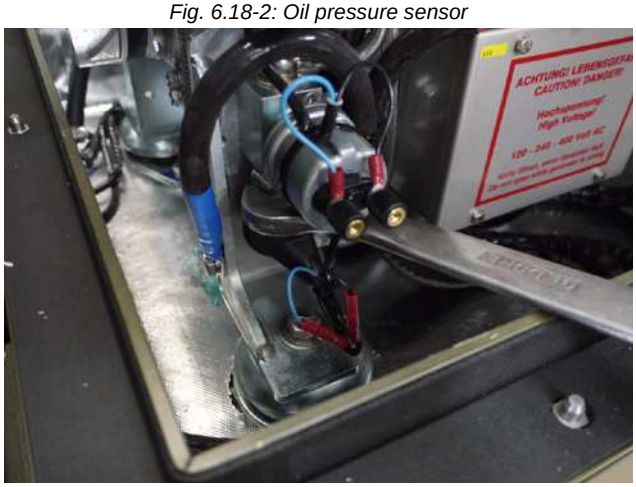
*Fig. 6.18-1: Oil pressure sensor*




3. Loosen and remove oil pressure switch 4B4 using a wrench with W.A.F. of 29 mm. A large piece of cloth or absorbent tissue must be placed under the connection to prevent escaping oil from running into the capsule.


4. To reinstall, reverse the order of steps. The switch is fitted with a tapered thread and requires no special seal.

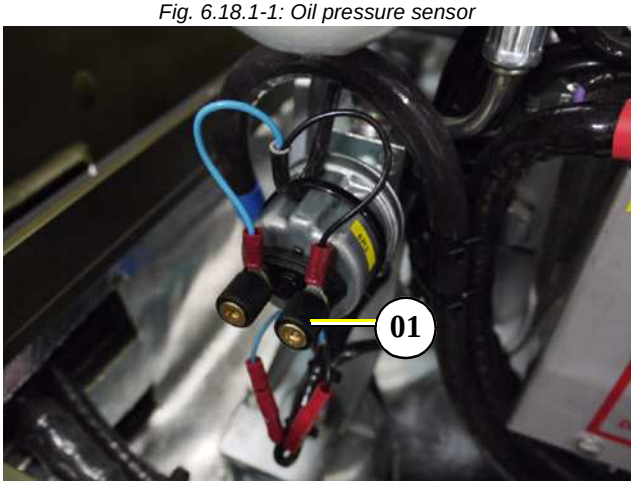
*Fig. 6.18-2: Oil pressure sensor*



## 6.18.1 Replacing the oil pressure sensor (optional component)

1. Unscrew both connectors (01) on the oil pressure sensor.

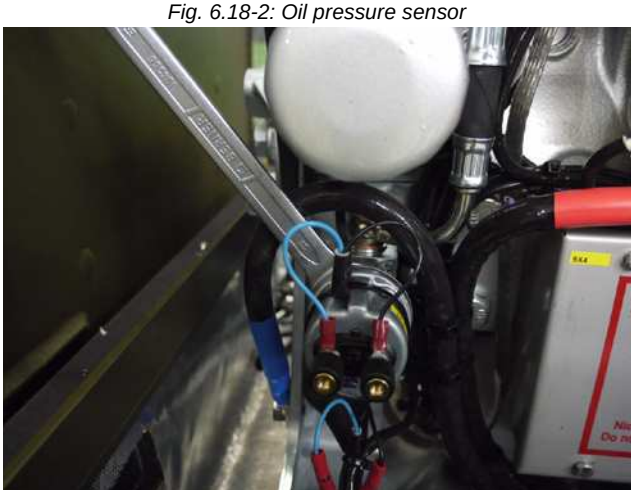
*Fig. 6.18.1-1: Oil pressure sensor*




2. Loosen and remove oil pressure sensor 6R3 using a wrench with W.A.F. of 17 mm. A large piece of cloth or absorbent tissue must be placed under the connection to prevent escaping oil from running into the capsule.


To reinstall, reverse the order of steps. The sensor is fitted with a tapered thread and requires no special seal.

*Fig. 6.18-2: Oil pressure sensor*



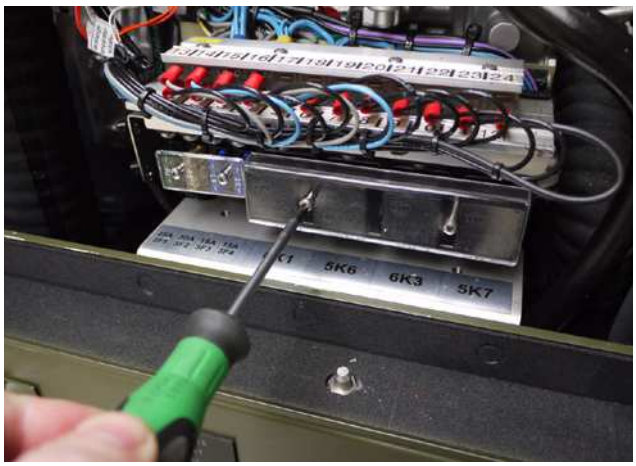
## 6.19 Replacing the Operating Current Relays

The described procedure is representive for Fischer Panda genertors. The original location of the item must be taken from the generator describtion of this manual. All replacements and repairs can be done by the user.

**NOTE:Representive procedure**

1. Remove the two fixing screws of the plastic cover using a size 0 or 1 phillips screwdriver.

*Fig. 6.19-1: Relay*



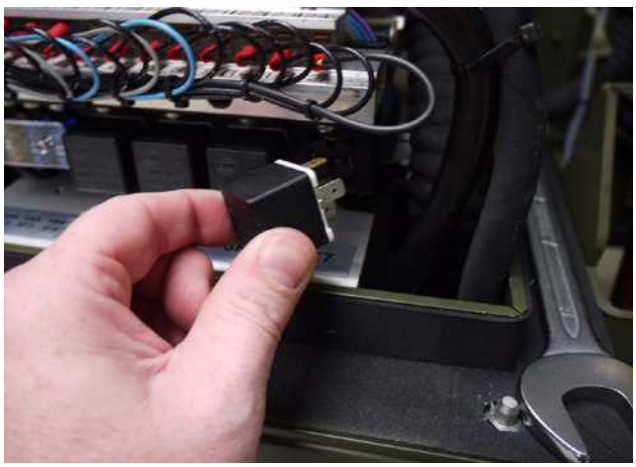

2. Remove the plastic cover.

*Fig. 6.19-2: Relay*

3. Pull relay from the socket and replace with new relay.

To reinstall, reverse the order of steps.

*Fig. 6.19-3: Relay*



## 6.20 Replacing the fuses

The described procedure is representive for Fischer Panda genertors. The original location of the item must be taken from the generator describtion of this manual. This replacement can be done by the user.

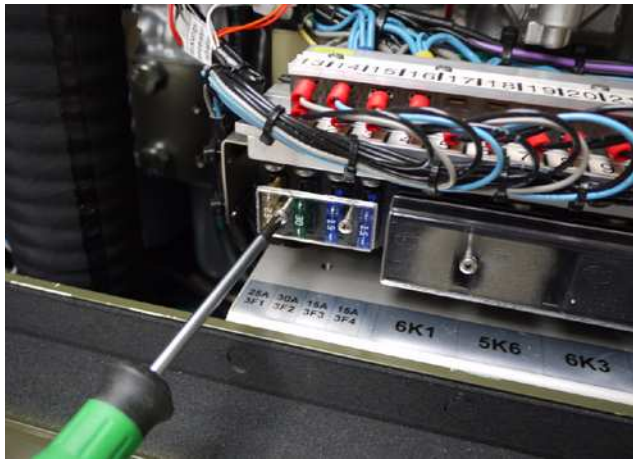
**NOTE:Representive procedure**

The fuses should be replaced every 2000 operating hours.

**Figures similar!**

1. Remove the two fixing screws of the plastic cover using a size 0 or 1 phillips screwdriver.

*Fig. 6.20-1: Fuse*

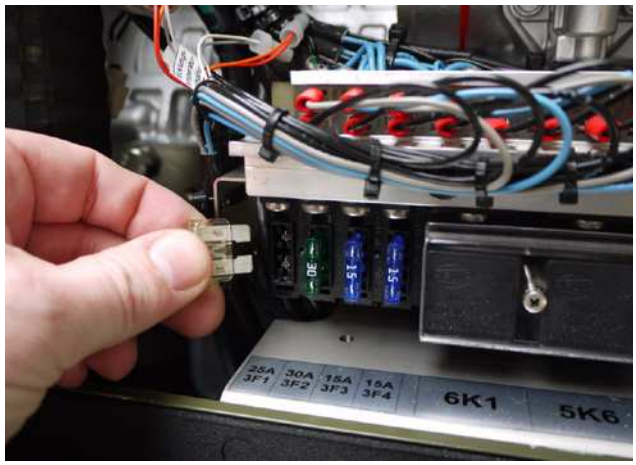



2. Remove the plastic cover.

*Fig. 6.20-2: Fuse*


3. Using the fuse extraction tool, remove the fuse and replace it with a new one.

*Fig. 6.20-3: Fuse*




4. To reinstall, reverse the order of steps.

# 6.21 Replacing a Thermoswitch

The described procedure is representive for Fischer Panda genertors. The original location of the item must be taken from the generator describtion of this manual. All replacements and repairs should be done by a trained person.

**NOTE:Representive procedure**

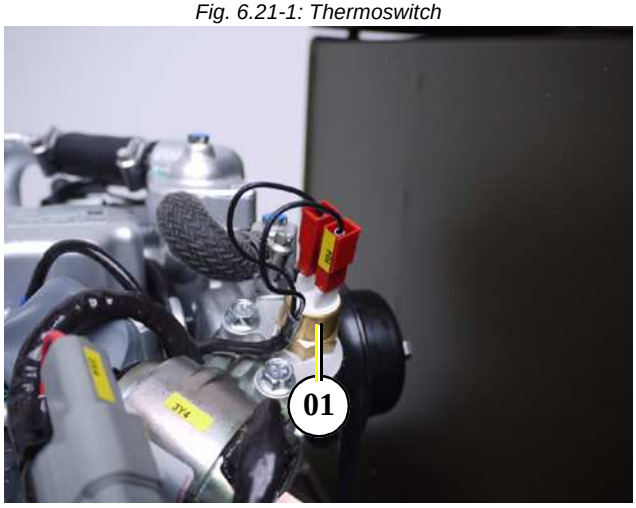
**Ensure that the generator cannot be started up accidentally. Remove battery main switch.**

**ATTENTION!**

For part numbers, refer to the spare parts catalogue.

1. Open the capsule.
   01. Thermoswitch

*Fig. 6.21-1: Thermoswitch*

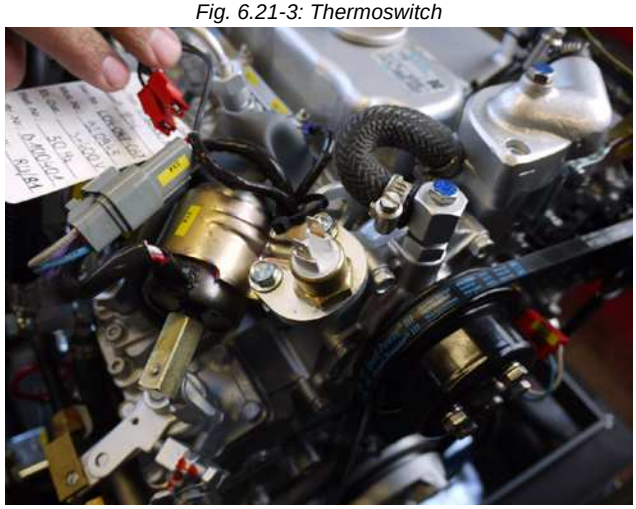



2. Remove cable ties.

*Fig. 6.21-2: Thermoswitch*

3. Disconnect electric supply line of the thermoswitch.

*Fig. 6.21-3: Thermoswitch*

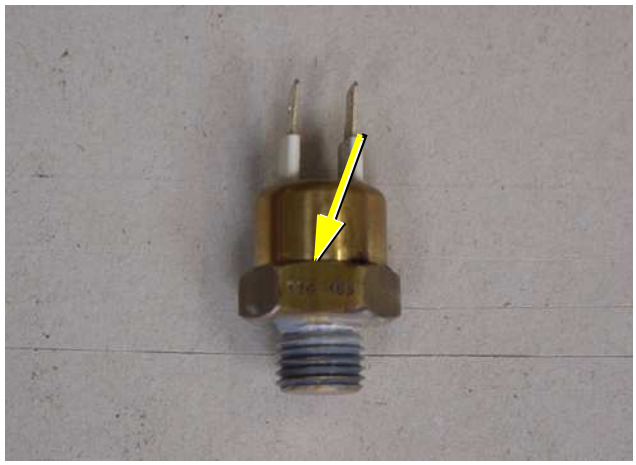


4. Loosen thermoswitch with a wrench with W.A.F. 22 mm.


*Fig. 6.21-4: Thermoswitch*

5. Before installing the new thermoswitch, check the label for correct item.
6. To reinstall, reverse the order of steps.

*Fig. 6.21-5: Thermoswitch*



## 6.22 V-belt Exchange for the Internal Cooling Water Pump

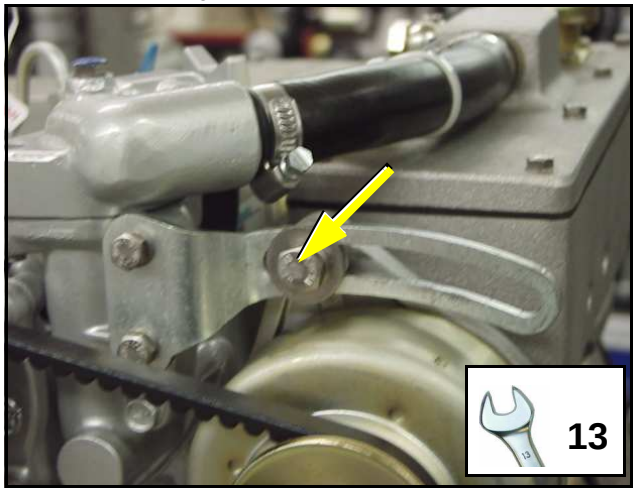
The v-belt wears in a short time due to high ambient temperature within the closed capsule (approx. 85 °C). The air in the generator capsule is not only warm but also very dry. Therefore it is possible, that the „softener“ in the rubber composers wear after a very short time of operation.

Therefore, the v-belt must be checked in short time distances. It may be possible, that the v-belt must be changed after a few weeks. Therfore the v-belt must be checked every 150 hours. The v-belt must be seen as a wearing part. Therefore it is necessary to have enough spare v-belts on board. We therefore recommend to have the Fischer Panda Service Kit on board.

**Loose the screw on the upper alternator mounting**

*Sample picture*

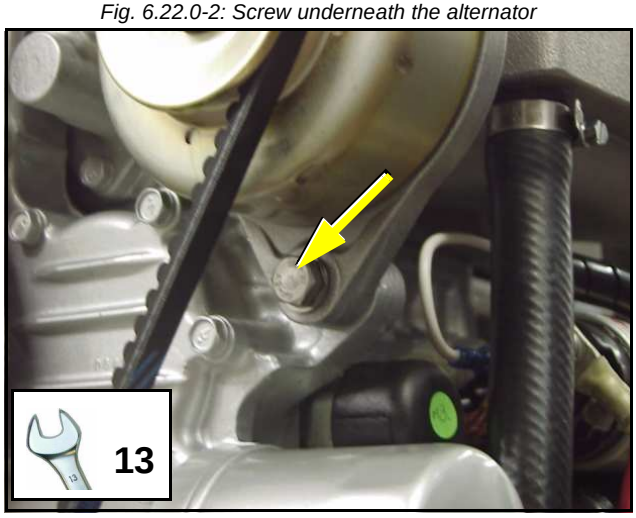
*Fig. 6.22.0-1: Alternator srew*




**Looese the screw underneath the alternator.**

*Sample picture*

*Fig. 6.22.0-2: Screw underneath the alternator*

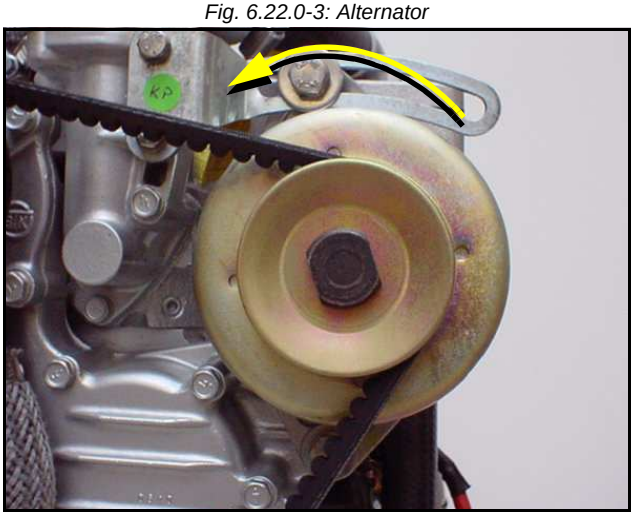


**The alternator must be pressed in the direction of the thermostat housing.**

**Exchange the v-belt.**

*Sample Picture*

*Fig. 6.22.0-3: Alternator*



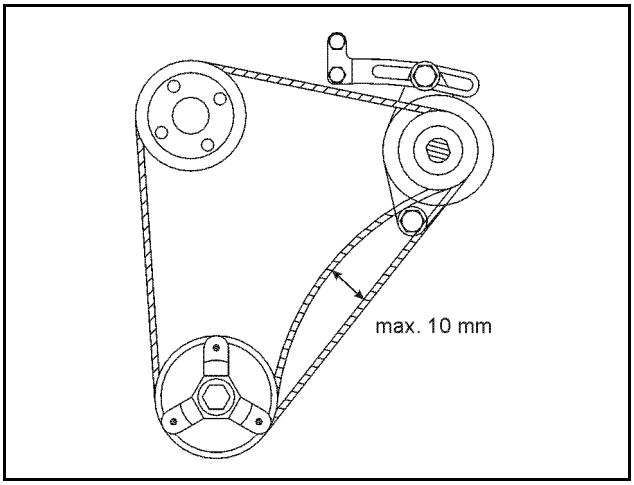
**Afterwards, the v-belt must be tightened again.**

The v-belt must be tightened in such a way, that it is possible to press it about approx. 10 mm.

**Tighten the screws above and unterneath the alternator.**

*Sample picture*

*Fig. 6.22.0-4: Zeichnung Keilriemen*



# 6.23 Replacing the Injection Nozzles

The described procedure is representive for Fischer Panda genertors. The original location of the item must be taken from the generator describtion of this manual. All replacements and repairs should be done by a trained person.

**NOTE:Representive procedure**

**Ensure that the generator cannot be started up accidentally. Remove battery main switch.**

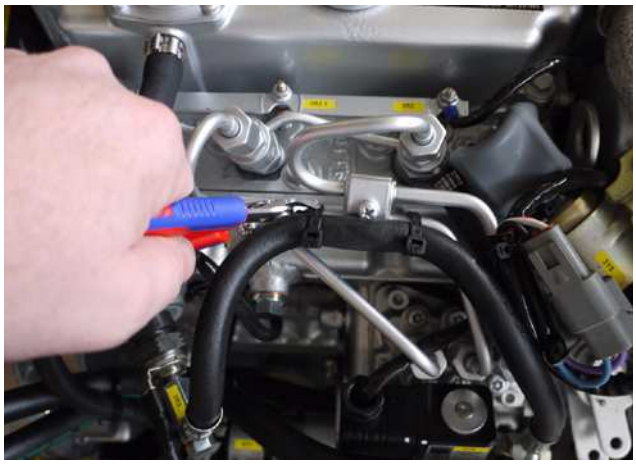
**ATTENTION!**

**Injection lines**

Figures similar!

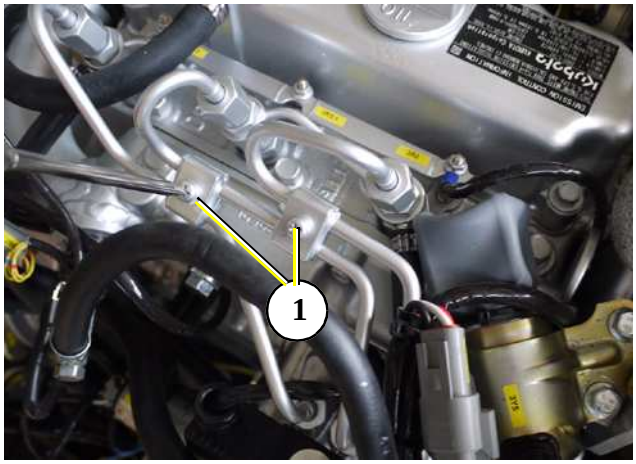
1. Remove cable ties from the injection lines.

*Fig. 6.23-1: Injection nozzles*



2. Loosen the pipe clamps (1) using a PH2 phillips screwdriver.

*Fig. 6.23-2: Injection nozzles*



3. Loosen the union nut on the injection lines (1). Wrench with W.A.F. of 17 mm.

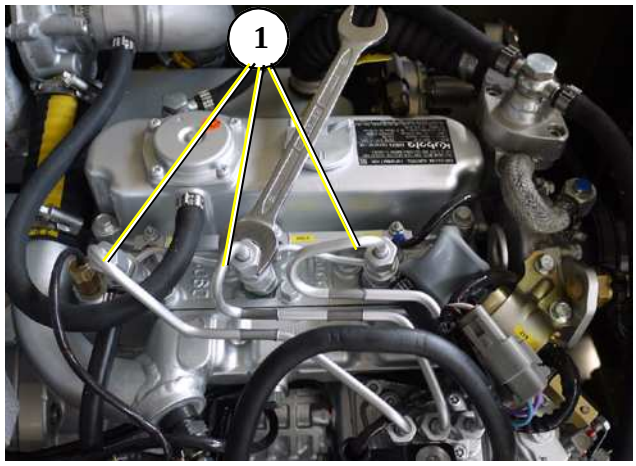

**For assembly:**

- Blast dust out of the lines using compressed air. Then, re-assemble the lines by proceeding in the reverse order of steps.

(1) Injection line

| | | |
|---|---|---|
| Torque | Injection line union nut | 24.5 to 34.3 Nm<br>2.5 to 3.5 kgm<br>18.1 to 25.3 pound-foot |

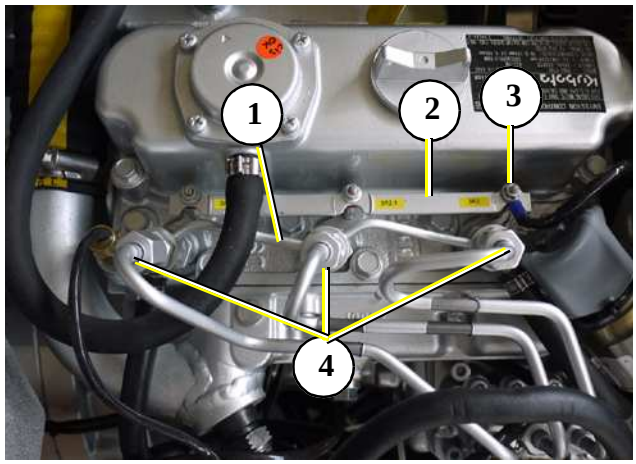
*Fig. 6.23-3: Injection nozzles*




**Nozzle holder assembly and glow plug**

1. Dismount the return line (1). Wrench with W.A.F. of 17 mm.
2. Remove the nozzle holder assembly (4). Wrench with W.A.F. of 21 mm.
3. Remove the copper seal (5) and the heat shield (6).
4. Dismount the connector (2) from the glow plugs (3) See Kapitel 6.26, “Replacing the Glow Plugs,” auf Seite 166.
5. Remove the glow plugs (3). See Kapitel 6.26, “Replacing the Glow Plugs,” auf Seite 166.

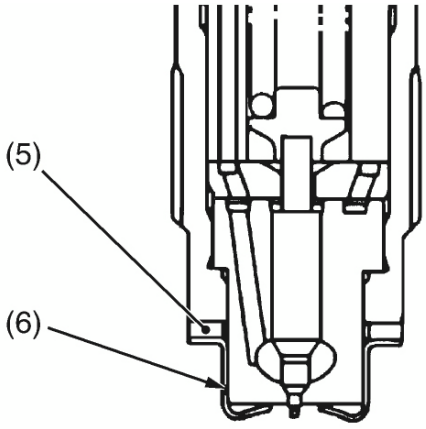
*Fig. 6.23-4: Injection nozzles*




**For assembly:**

- Replace the copper seal and the heat shield with new parts.

(1) Return line
(2) Connector
(3) Glow plug
(4) Nozzle holder assembly
(5) Copper seal
(6) Heat shield




| | | |
|---|---|---|
| Torque | Fixing nut for overflow oil line | 19.6 to 24.5 Nm.<br>2.0 to 2.5 kgm<br>14.5 to 18.1 pound-foot |
| | Nozzle holder assembly | 49.0 to 68.6 Nm<br>5.0 to 7.0 kgm<br>36.2 to 50.6 pound-foot |
| | Glow plug | 7.8 to 14.7 Nm.<br>0.8 to 1.5 kgm<br>5.8 to 10.8 pound-foot |

**Removing the nozzle heat shield ring seal within the scope of the maintenance work.**

**IMPORTANT!**

- Use a phillips screwdriver (1) with a diameter greater than the hole in the heat ring seal (approx. 6 mm (1/4 in)).

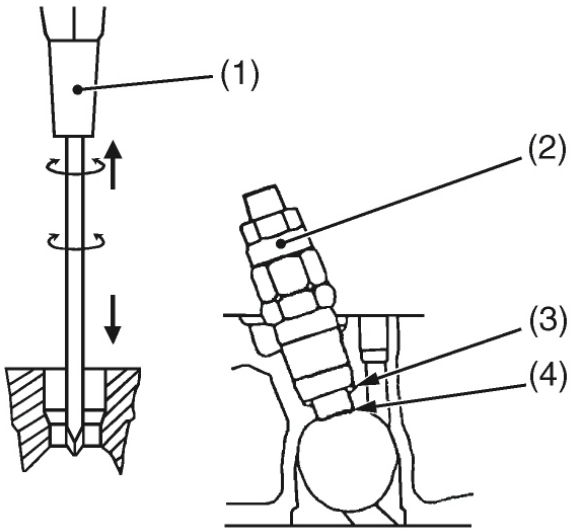
1. Lightly turn the screwdriver (1) into the hole in the heat ring seal.
2. Rotate the screwdriver three to four times in each direction.
3. When rotating the screwdriver, slowly extract the heat ring seal (4) together with the injection nozzle gasket (3).
4. If the heat ring seal drops back in, repeat the procedure above.

**For assembly:**

- If the injection nozzle is uninstalled for cleaning or maintenance purposes, the heat seal ring and the injection nozzle gasket must be replaced.

(1) Phillips screwdriver(2) Injection nozzle
(3) Injection nozzle gasket (4) Heat ring seal

*Fig. 6.23-5: Injection nozzles*



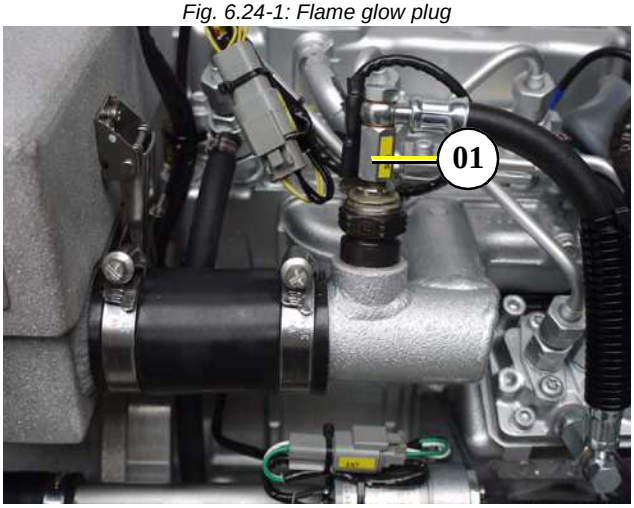
# 6.24 Checking the Flame Glow Plug (optional unit)

The described procedure is representive for Fischer Panda genertors. The original location of the item must be taken from the generator describtion of this manual. All replacements and repairs should be done by a trained person.

**NOTE:Representive procedure**

01. Flame glow plug

*Fig. 6.24-1: Flame glow plug*



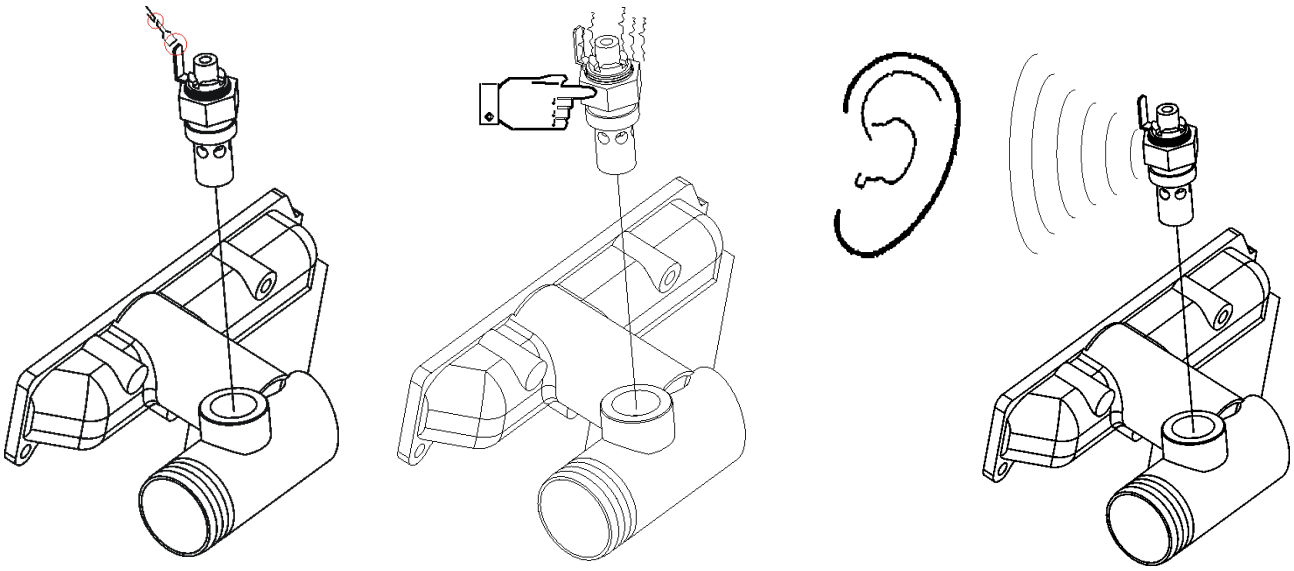

**Symptoms indicating a faulty start-up aid:**

- Hesitant start-up
- Black exhaust smoke
- Irregular operation
- Increased fuel consumption, engine is "knocking".

**Electrical test**

1. Check cable connections.
2. Check power consumption: approx. 8A.
3. Uninstall and check intake port for diesel residue. Replace flame glow plug if necessary.

*Fig. 6.24-2: Flame glow plug*



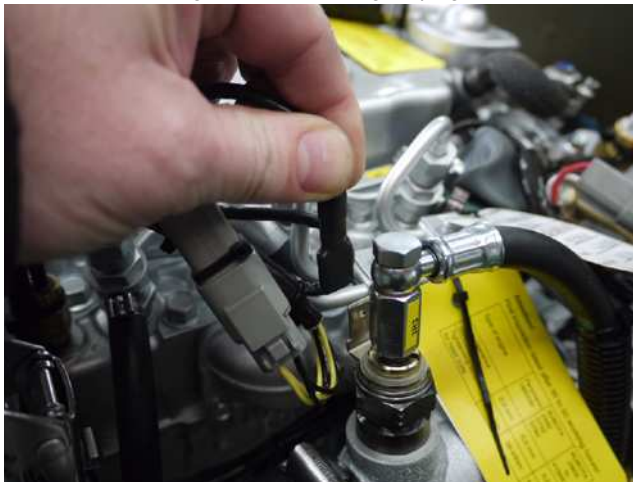
## 6.24.1 Replacing the Flame Glow Plug

The described procedure is representive for Fischer Panda genertors. The original location of the item must be taken from the generator describtion of this manual. All replacements and repairs can be done by the user.

**NOTE:Representive procedure**

1. Pull connector off the flame glow plug.

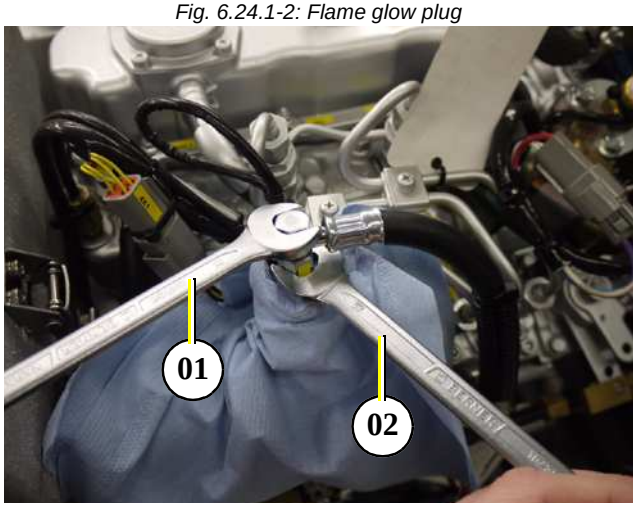
*Fig. 6.24.1-1: Flame glow plug*



2. A large piece of cloth or absorbent tissue must be placed under the connection to prevent escaping fuel from running into the capsule.
3. Loosen the screw on the flame glow plug using a wrench with a W.A.F of 12 mm (01).


Use a wrench with a W.A.F of 13 mm (02) for the counter nut.


*Fig. 6.24.1-2: Flame glow plug*

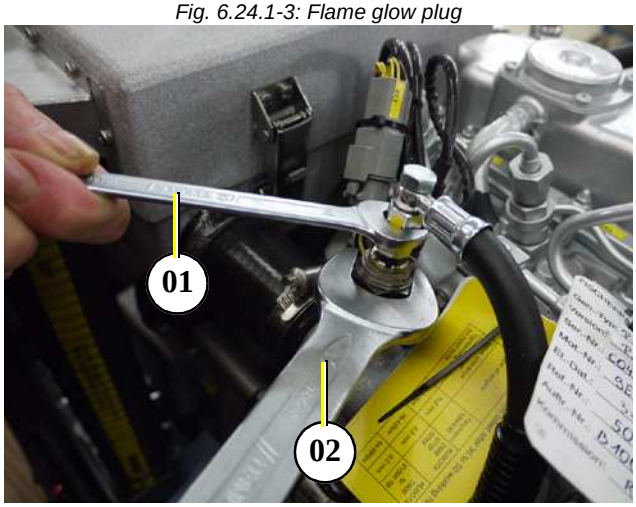



4. Remove the fuel hose.
5. Loosen flame glow plug with a wrench with W.A.F. of 13 mm (01) and remove flame glow plug.


Use a wrench with a W.A.F of 24 mm (02) for the counter nut.


To reinstall, reverse the order of steps.

*Fig. 6.24.1-3: Flame glow plug*



# 6.25 Replacing the Stop Solenoid (Energize to stop)

The described procedure is representive for Fischer Panda genertors. The original location of the item must be taken from the generator describtion of this manual. All replacements and repairs should be done by a trained person.

**NOTE:Representive procedure**

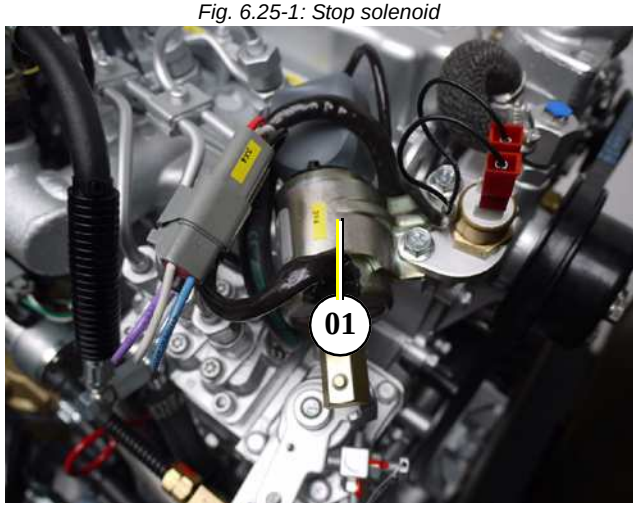
**Ensure that the generator cannot be started up accidentally. Remove battery main switch.**

**ATTENTION!**

For part numbers, refer to the spare parts catalogue.

1. Open the capsule.
   01. Stop solenoid 3Y4

*Fig. 6.25-1: Stop solenoid*




2. Remove cable ties.

*Fig. 6.25-2: Stop solenoid*

3. Disconnect electric supply line 3X4 from the stop solenoid.

*Fig. 6.25-3: Stop solenoid*

4. Remove cable ties.

*Fig. 6.25-4: Stop solenoid*

5. Remove the two fixing screws using a size 10 mm socket wrench.


*Fig. 6.25-5: Stop solenoid*

6. Replace the stop solenoid.
7. To reinstall, reverse the order of steps.

*Fig. 6.25-6: Stop solenoid*

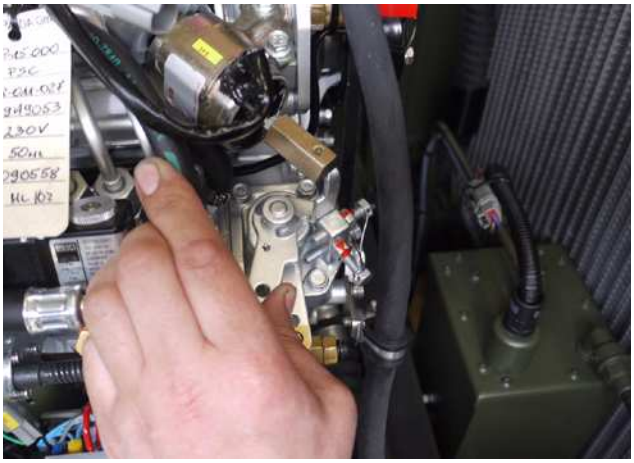
**Please note for reinstallation:**

8. Slide the pin into the throttle.

*Fig. 6.25-7: Stop solenoid*

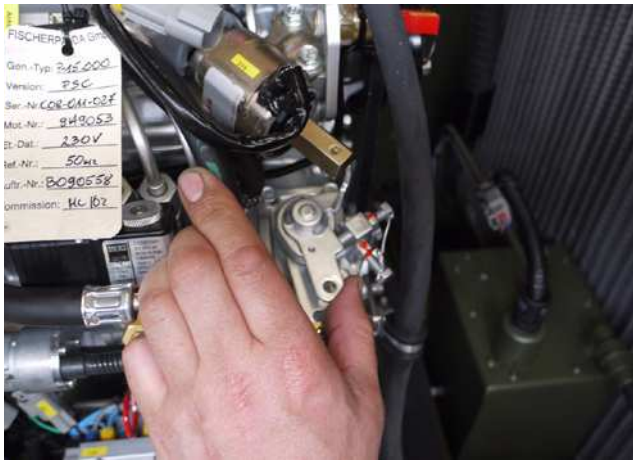
9. Push the throttle to the left and release.

*Fig. 6.25-8: Stop solenoid*



10. Ensure that the throttle jumps back to its starting position without friction .

*Fig. 6.25-9: Stop solenoid*



## 6.26 Replacing the Glow Plugs

The described procedure is representive for Fischer Panda genertors. The original location of the item must be taken from the generator describtion of this manual. All replacements and repairs should be done by a trained person.

**NOTE:Representive procedure**

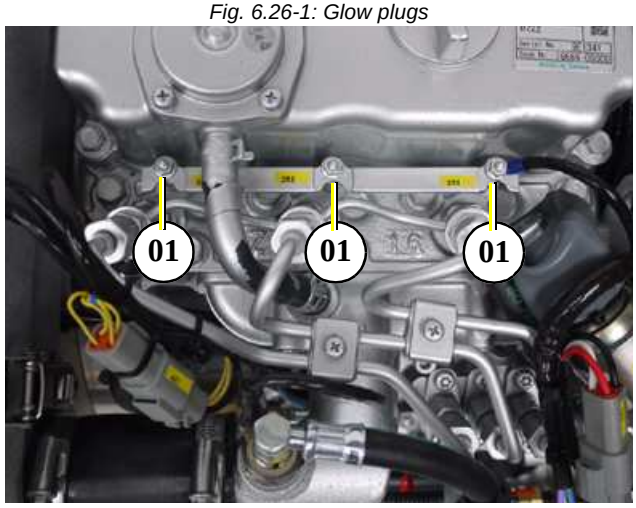
**Ensure that the generator cannot be started up accidentally. Remove battery main switch.**

**ATTENTION!**

1. Open the capsule.

   01. Glow plugs

*Fig. 6.26-1: Glow plugs*



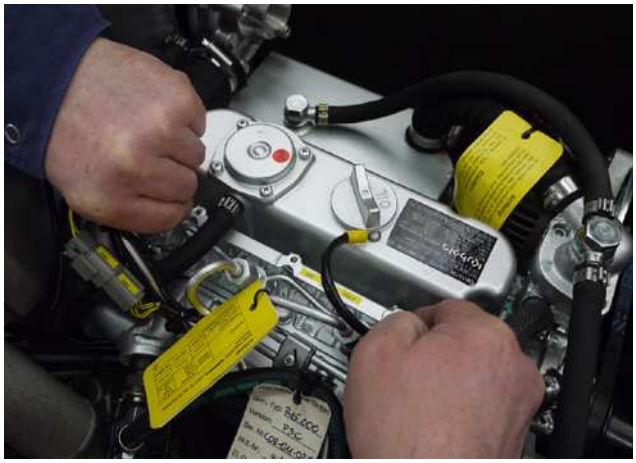

**Figures similar!**

*Fig. 6.26-2: Glow plugs*

2. Remove the three hex screws using a size 7 mm socket wrench .

3. Remove the glow plug connector.

*Fig. 6.26-3: Glow plugs*



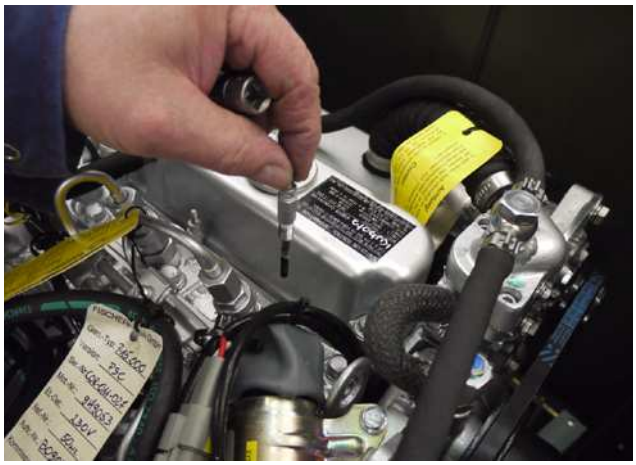
4. Loosen the glow plug using a socket wrench with a long size 10 mm socket.


*Fig. 6.26-4: Glow plugs*

5. Remove glow plug.

To reinstall, reverse the order of steps.

*Fig. 6.26-5: Glow plugs*



# 7. Generator Faults

## 7.1 Personal requirements

The work described here, unless otherwise indicated, are performed by the operator.

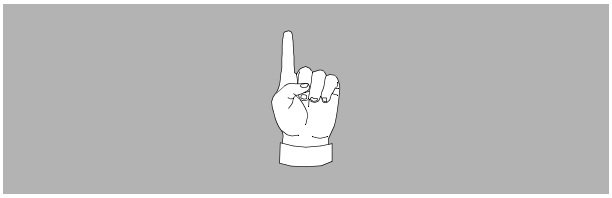
Any further repair work may be performed only by specially trained personnel or by authorized repair shops (Fischer Panda service points). This is especially for working on the valve timing, fuel injection system and the engine repair.

## 7.2 Hazard notes for this chapter

see “Safety first!” on Page 11.

Also consider the general safety instructions at the first pages of this manual.

*Note!:*



**Danger for life! - The generator can be equipped with a automatik start device. This means the generator can be started by an external signal. To avoid an unexpected starting of the generator, the starter battery must be disconected before start working at the generator.**

**Warning!: Automatic start**

**Working at a running generator can result in severe personal injury. Therefore before starting work at the generator:**

Make sure that the generator ist stopped and the starter battery is diconnected to guarantee that the generator cannot be inadvertently started.

Do not run the generator with removed sound isolation cover.

**Warning!: Risk of injury**

**Improper installation/maintenance can result in servere personal injuries or material damage.**

- Always undertake installation/maintenance work when the generator is switched off.

- Ensure there is sufficient installation clearance before start working.

- Ensure tidiness and cleanliness at the workplace. Loose components and tools lying around or on top of each other are sources of accidents.

- Only perform installation work using commercially avalilable tools and special tools. incorrect or damaged tools can result injuries.

**Warning!: Risk of injury**

**Oil and fuel vapours vcan ignite on contact with ignition sources. Therfore:**

- No open flames during work on the generator.

- Do not smoke.

- Remove oil and fuel residues from the generator and floor.

**Warning!: Danger of fire**

**Contact with engine oil, antifreeze and fuel can result in damage to health. Therefor :**

- Avoid skin contact with engine oil, fuel and antifreeze.

- Remove oil and fuel splashes and antifreeze from the skin immediatlly.

- Do not inhale oil and fuel vapours.

**Danger!: Danger of poisoning**

**Danger for Life. Improper handling, operation, installation and maintenance can result in severe persoanl injury and/or material damage.**

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.

**ATTENTION!: Danger to Life - High voltage**

**Generator, oil and antifreeze can be hot during/after operation. Risk of severe burns.**

**Warning!: Hot surface/material**

**During Installation/mainenance personal protective equipment is required to minimize the helth hazards.**

- Protective clothing

- safety boots

- protective gloves

- Ear defender

- safety glasses

**Instruction!: Personal protective equipment necessary.**

**Disconnet all load during the work atthe generator to avoid damages at the load.**

**Attention!: Disconnect all load**

## 7.3 Tools and Measuring Instruments

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

- Multi-meter for voltage (AC), frequency and resistance
- Measuring instrument for inductance
- Measuring instrument for capacity
- Current absorbing clamps
- Thermometer (ideal is a infra-red thermometer)
- Pressure device (pincer) for coolant circuit

# 7.4 Troubleshooting Table and Flowchart

## 7.4.1 Generator output voltage too low

**For 50 Hz versions: less than 200 V**

| 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. |

## 7.4.2 Generator voltage too high (more than 240 V - 50 Hz

| 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. |

## 7.4.3 Generator voltage fluctuates

| Cause | Solution |
|---|---|
| 1. Disturbances on the electrical system/user side.<br>2. Motor disturbances. | 1. Check if electrical load is fluctuating.<br>2. Refer to section: "Motor runs irregular". |

## 7.4.4 Generator not able to start electric motor

| Cause | Solution |
|---|---|
| If the generator is unable to supply enough power to start an electric motor 1-phase, it is usually because the motor draws too much current during starting process. | Check the motor's current draw required for starting (switch to 3-phase, if possible). This could be remedied by providing stronger capacitors or installing an optional "Easy Start Booster Set" (see Appendix).<br>Enquire at your nearest Panda dealer or directly at the manufacturer. |

## 7.4.5 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. |

## 7.4.6 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. |

| Cause | Solution |
|---|---|
| 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. |

## 7.4.7 Motor does not 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.<br>2. Remove the glow plug (see Kubota-manual).<br>3. Rotate the motor by hand carefully.<br>4. Check if there is water in the oil and change both oil and filter if necessary.<br>5. Determine cause for excess water in the combustion chamber. The excess water can be caused by a defective air vent in the cooling water system, which should be checked and cleaned, or replaced if faulty. |

## 7.4.8 Motor runs unsteady

| Cause | Solution |
|---|---|
| Disruption in the area of the injection systems' automatic advance. | Repair / Check the automatic advance via the motor service. |
| Air in the fuel system. | Ventilate the fuel system. |

## 7.4.9 Motor speed drops

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

## 7.4.10 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 "Fuel Solenoid Valve" or in the trottle shut off solenoid sections. Replace if necessary. |

## 7.4.11 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.<br>Check motor's oil-pressure and have repaired by Kubota-Service if necessary. |

## 7.4.12 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 Farymann-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. |

## 7.4.13 Generator must be shut off immediately if:

| Cause | Solution |
|---|---|
| - motor rpm suddenly rises or drops<br>- unusual noise comes from genset<br>- exhaust colour suddenly becomes dark<br>- leakage in the cooling water system. | Refer to respective section of manual and if necessary, have repaired by Kubota-Service, or Panda representative. |

## 7.4.14 Troubleshooting for the VCS-Voltage Control

| Cause | Solution |
|---|---|
| No movement of the actuator. | Voltage supply for electronics active?<br>Motor connected?<br>230 V measurement voltage attached? |
| Actuator controls in idle speed or full throttle. | Correct or change polarity of the motor.<br>230 V measurement voltage attached? |
| If it occurs that all electronic components break down or any other failure emerges, the generator can still be operated when the electronic system is overridden. For this the plug is pulled out and the two cables are tide over it.<br>1. Loosen the speed lever between motor and injection pump controller and adjust to max. 240 V.<br>OR<br>2. Loosen connection plus motor VCS-electronic, directly feed the motor with 12 V voltage and adjust to max. 240 V. | |

## 7.4.15 Troubleshooting Flowcharts

*Fig. 7.4.15-1: Troubleshooting Flowchart - Page 1*

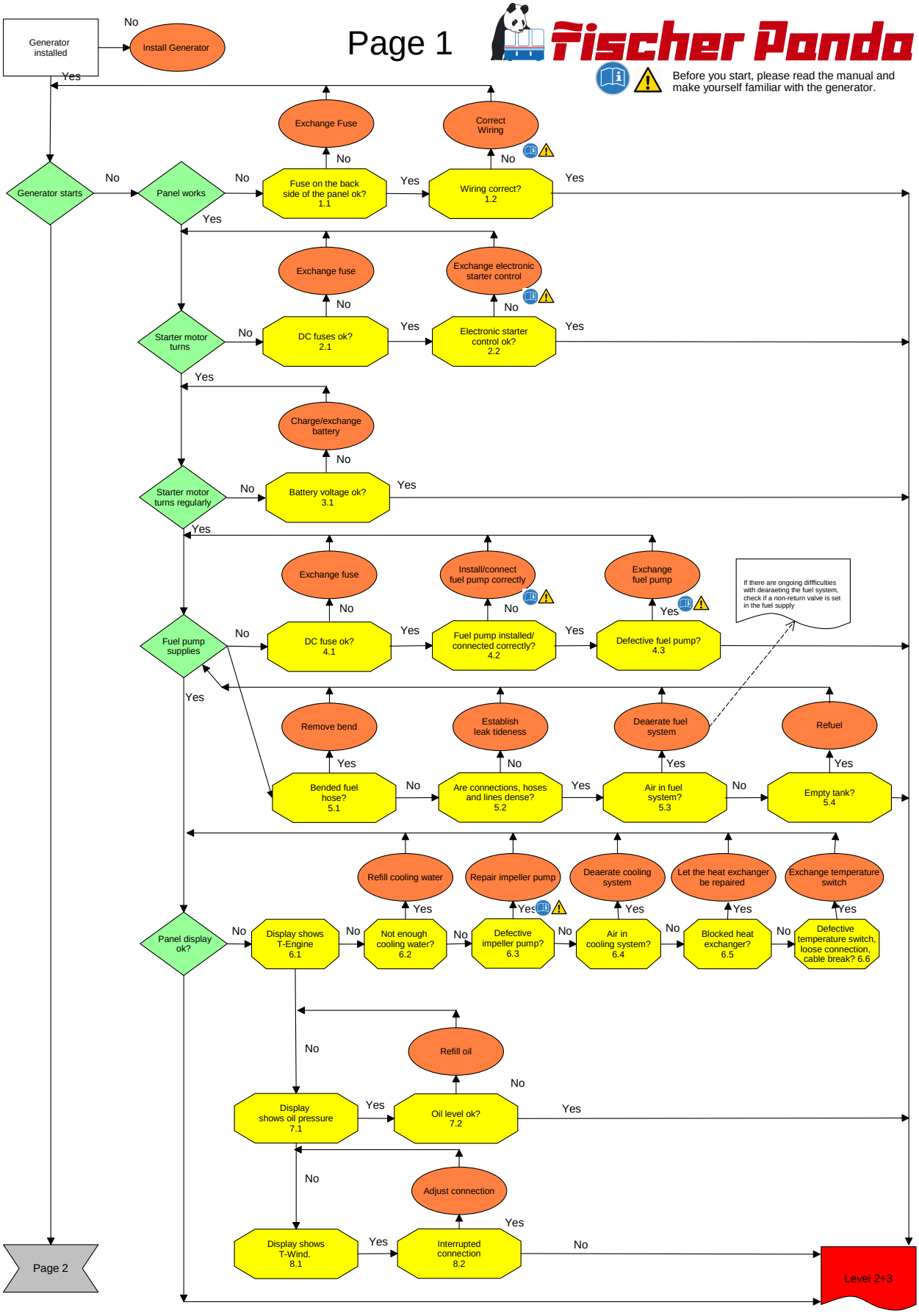
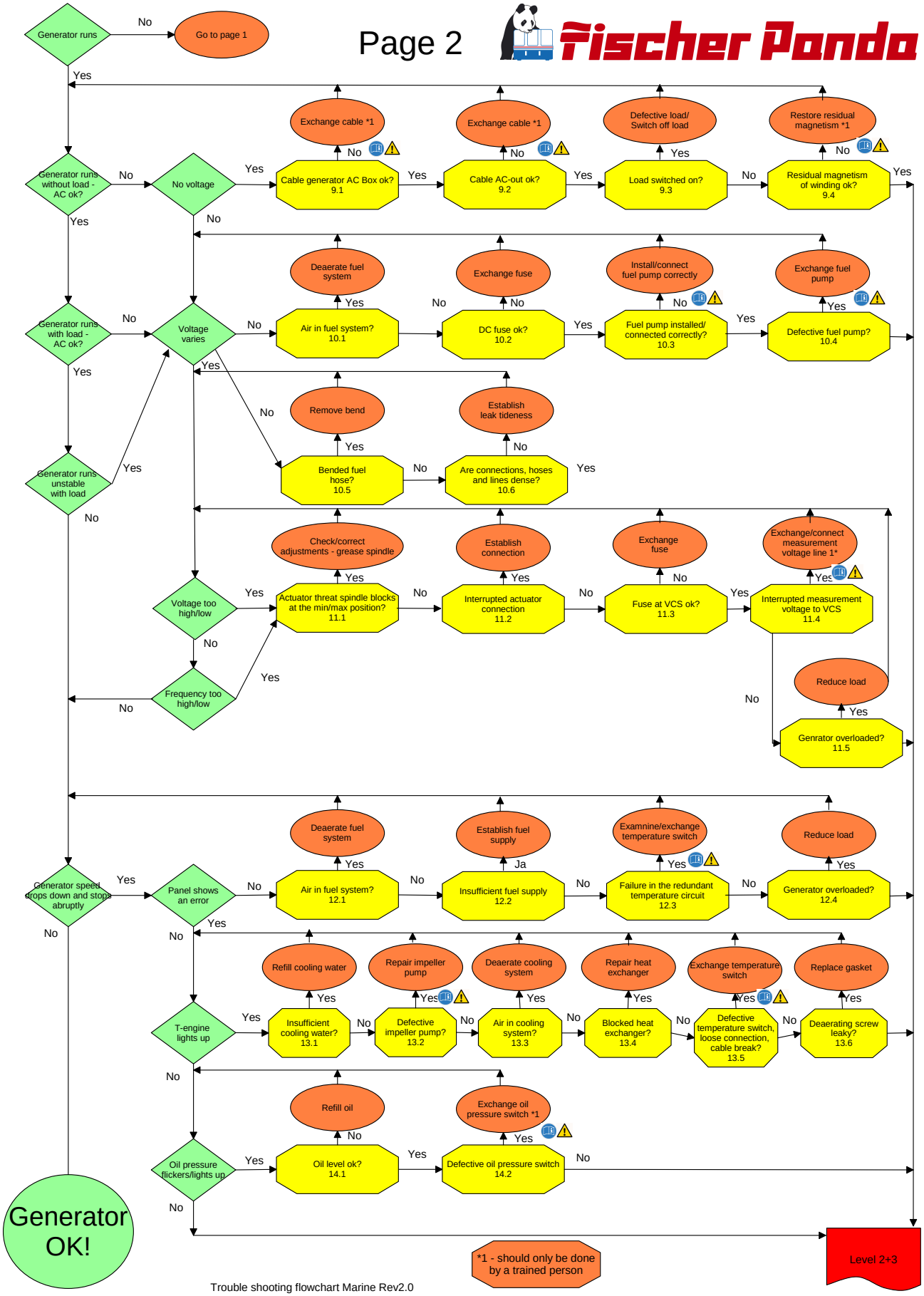


*Fig. 7.4.15-2: Troubleshooting Flowchart - Page 2*



## 7.4.15.1 Details and explanations concerning the troubleshooting flowchart

Each failure position in the flowchart above contains a reference number.

With this reference number, the corresponding work steps can be taken from the list below.

**1.1 Fuse at the remote control panel.**

Execute the fuse exchange as indicated in the data sheet of your remote control panel. Please note that not all remote control panels do have a corresponding fuse.

**1.2 Correct the wiring.**

Get the wiring of the generator and the wiring of the external components checked according to the installation instructions in this manual and the data sheets, as well as desciptions of the external components and correct them if necessary.

**These operations are to be executed by a trained professional only!**

**Attention: Voltage up to 400V - Danger to life!**

**2.1 Exchange DC fuse (Fuse for the starter circuit) - see wiring scheme**

Exchange the relevant fuses at the generators' terminal block.

A defective fuse is not always visually detectable. Measure the fuse with a multimeter for connecting passage.

**2.2 Exchange anti-repeat starter device.**

Loosen the connecting plug of the anti-repeat starter device.

Loosen the holding screws of the anti-repeat starter device.

Mount the new anti-repeat starter device in reversed order.

**3.1 Charge/exchange starter battery.**

Proceed according to battery manufacturer instructions.

**4.1 Exchange DC fuse (Fuse for the fuel pump) - see wiring scheme**

Exchange the relevant fuses at the generators' terminal block.

A defective fuse is not always visually detectable. Measure the fuse with a multimeter for connecting passage.

**4.2 Correct mounting/connection of the fuel pump.**

Check the appropriate polarity at the connections and the tight fit of the connections at the fuel pump.

**4.3 Exchange fuel pump.**

Loosen the electric connections of the fuel pump.

Loosen the holding screws of the fuel pump.

Mount the new fuel pump in reversed order.

**5.1 Remove buckling from the fuel hose.**

Remove any buckling and improve the installation to avoid further disruptions.

**5.2 Sealing the connections.**

Seal the system in an appropriate way. The system has to be checked for leakage at frequent intervals.

**5.3 Ventilating the fuel system.**

Ventilate the fuel system as stated in the chapter 'Installation'. If air keeps entering into the fuel system, this might be an indication for a leaking connection or porose hoses. Then the fuel system should be inspected by a professional.

**5.4 Refuelling**

Refuel your vehicle/the generator as described in the bord manual.

**6.2 Refill cooling water.**

Refill the cooling water as described in the chapter 'Maintenance'.

**6.3 Defective impeller pump.**

Replace the defective impeller as described in the chapter 'Maintenance'.

**6.4 Air in the cooling system.**

Ventilate the cooling system as described in the chapter 'Maintenance'.

**6.5 Heat exchanger blocked.**

Get the heat exchanger repaired at a Fischer Panda Servicepoint/Service Center.

**6.6 Defective temperature switch, possibly loose contact/cable break.**

Get the temperature switch repaired at a Fischer Panda Servicepoint/Service Center.

**7.2 Oil level too low.**

Refill oil as described in the chapter 'Maintenance'.

**8.2 Connection assembly interrupted.**

Repair the connection assembly.

**9.1 Defective cable to the AC-Box.**

Get the cable to the AC-Box exchanged by a Fischer Panda Servicepoint/Service Center.

**The operations are to be executed by a trained professional only!**

**Attention: Voltage up to 400V - Danger to life!**

**9.2 Defective cable AC out.**

Get the cable AC out exchanged by a Fischer Panda Servicepoint/Service Center.

**The operations are to be executed by a trained professional only!**

**Attention: Voltage up to 400V - Danger to life!**

**9.3 Defective consumer load.**

Exchange consumer load/do not operate anymore.

**9.4 Missing residual magnetism.**

Let the residual magnetism be restored.

**The operations are to be executed by a trained professional only!**

**Attention: Voltage up to 400V - Danger to life!**

**10.1 Air in the fuel system.**

Ventilate the fuel system as described in the chapter 'Installation'.

**10.2 Defective DC fuse fuel pump**

Exchange the relevant fuses at the generators' terminal block.

A defective fuse is not always visually detectable. Measure the fuse with a multimeter for connecting passage.

**10.3 Incorrect attachment of the fuel pump.**

Get the installation corrected at a Fischer Panda Servicepoint/Service Center.

**10.4 Defective fuel pump.**

Get the fuel pump exchanged at a Fischer Panda Servicepoint/Service Center.

**10.5 Buckled fuel hose.**

Arrange the fuel hose in a way that no buckles can form.

**10.6 Leaky connections/pipes.**

Seal the connections professionally - Exchange leaky pipes.

**11.1 Actuator arbor is jammed.**

Check the Max/Min-adjustments and grease the actuator arbor, as described in the chapter 'Geneator Faults'.

**11.2 Connection assembly actuator disrupted.**

Rebuild connection assembly.

**11.3 Defective DC fuse on the VCS.**

Get the relevant fuses exchanged at a Fischer Panda Servicepoint/Service Center.

The exchange is described in the chapter 'Generator Faults'.

A defective fuse is not always visually detectable. Measure the fuse with a multimeter for connecting passage.

**The operations are to be executed by a trained professional only!**

**Attention: Voltage up to 400V - Danger to life!**

**11.4 Disrupted measuring voltage to VCS.**

Get the measuring voltage cable connected/exchanged by a Fischer Panda Servicepoint/Service Center.

**The operations are to be executed by a trained professional only!**.

**Attention: Voltage up to 400V - Danger to life!**

**11.5 Generator is overloaded.**

Reduce the load. Ensure that the generator does not get overloaded.

**12.1 Air in the fuel system.**

See 10.1

**12.2 Lack of fuel**

Re-assemble the fuel supply.

**12.3 Faults in the redundant temperature circuit.**

Get the temperature switch as well as the connection assemble and electric cables checked and repaired by a Fischer Panda Servicepoint/Service Center

**12.4 Generator is overloaded.**

See11.5

**13.1 Lack of cooling water.**

Refill the cooling water as described in the chapter 'Maintenance'.

**13.2 Defective impeller pump.**

Replace the defective impeller as described in the chapter 'Maintenance'.

**13.3 Air in the cooling system.**

Ventilate the cooling system as described in the chapter 'Maintenance'.

**13.4 Heat exchanger blocked.**

Get the heat exchanger checked and repaired by a Fischer Panda Servicepoint/Service Center.

**13.5 Defective temperature switch, possibly loose contact/cable break.**

Get the temperature switch checked and repaired by a Fischer Panda Servicepoint/Service Center.

**13.6 Leaky ventilation screw.**

Renew the ventilation screw sealing.

**14.1 Oil level too low.**

Refill oil as described in the chapter ’Maintenance’.

**14.2 Defective oil pressure switch.**

Get the oil pressure switch exchanged by a Fischer Panda Servicepoint/Service Center.

## 7.5 Versions of the generator power terminal box

### Generator Power Terminal Box 230 V / 50Hz

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. 7.5.0-1: Generator output terminal box 230V / 50 Hz*

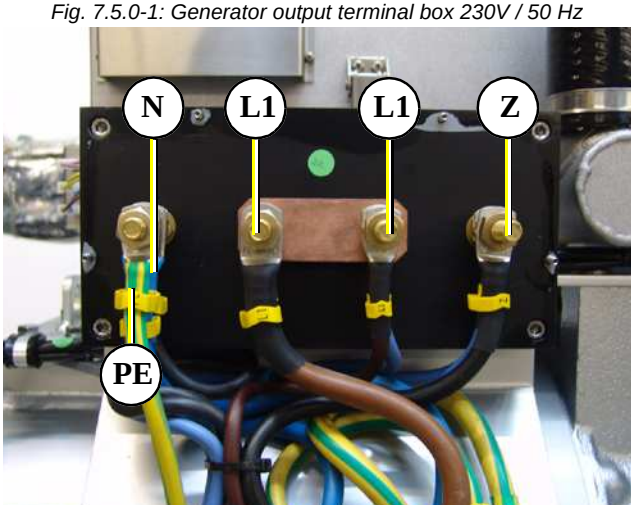
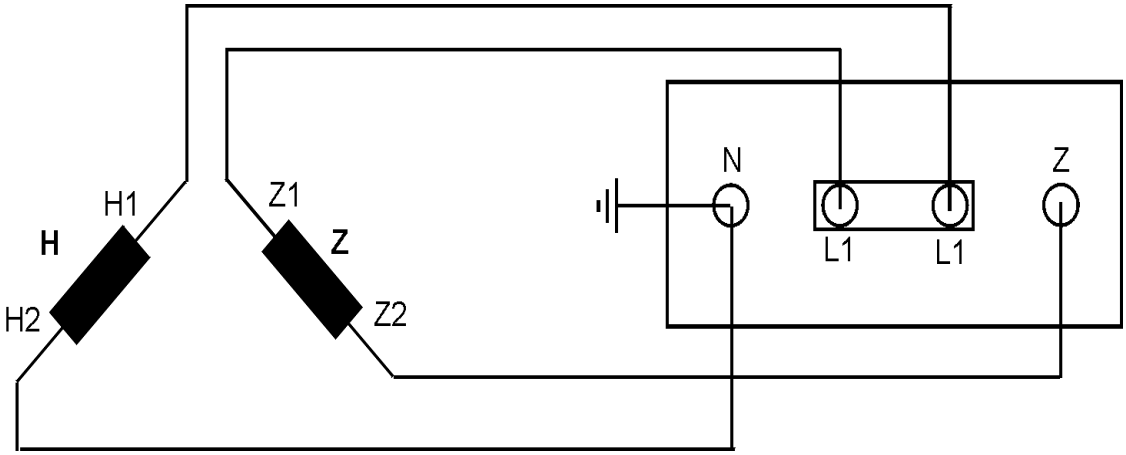



*Fig. 7.5.0-2: Wiring diagram HP1 - 230 V / 50 Hz*




### Generator Power Terminal Box 400 V / 50 Hz

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. 7.5.0-3: Generator Power Terminal Box 400 V / 50 Hz*

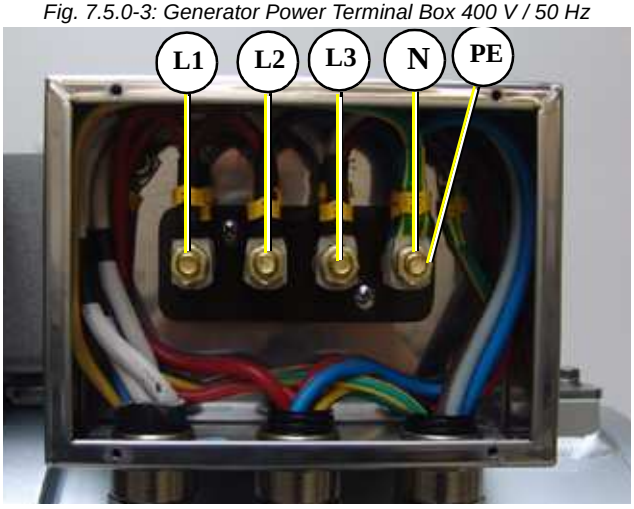
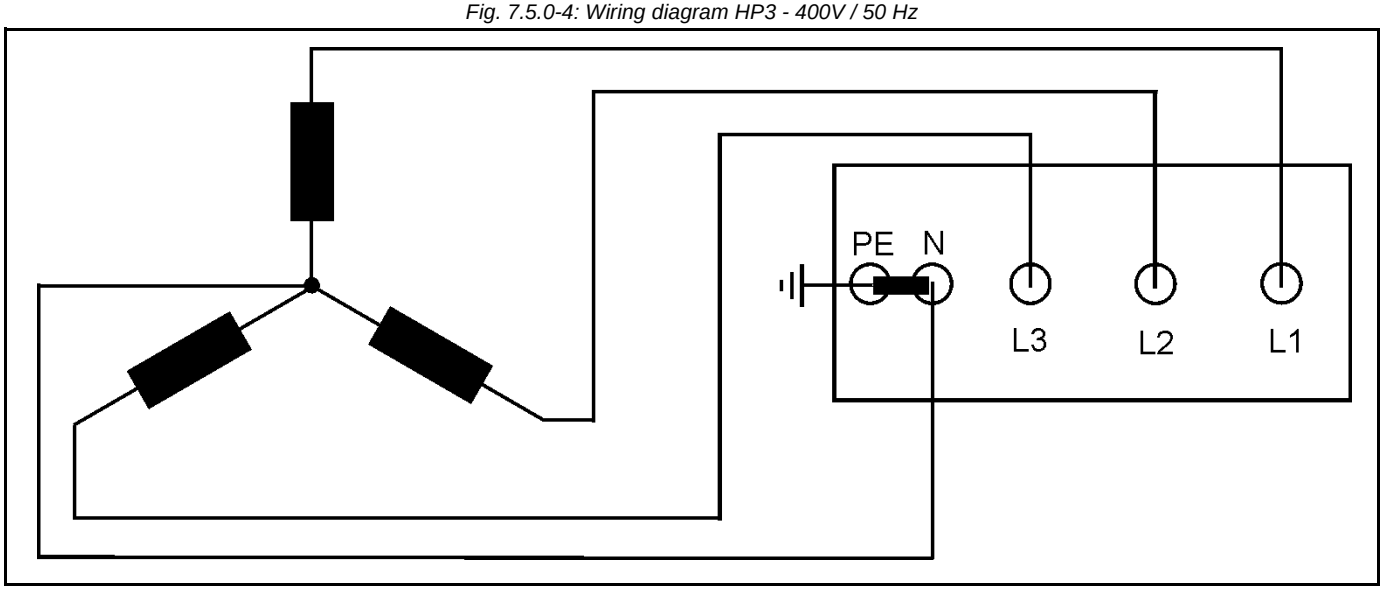


*Fig. 7.5.0-4: Wiring diagram HP3 - 400V / 50 Hz*




**Generator Power Terminal Box 120 V / 60 Hz**

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. 7.5.0-5: Generator power terminal box 120 V / 60 Hz*

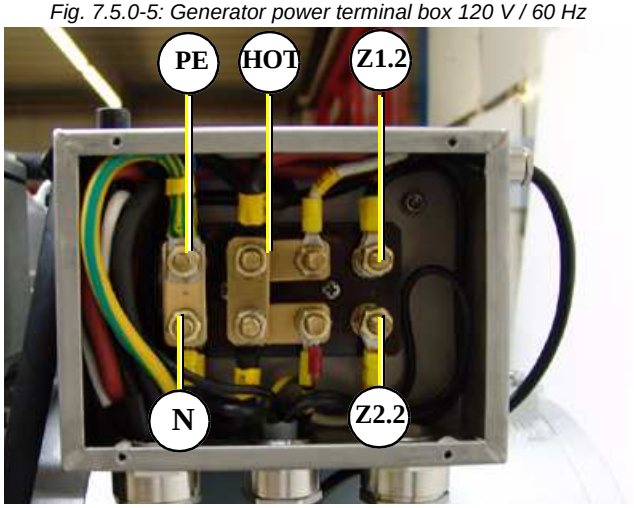
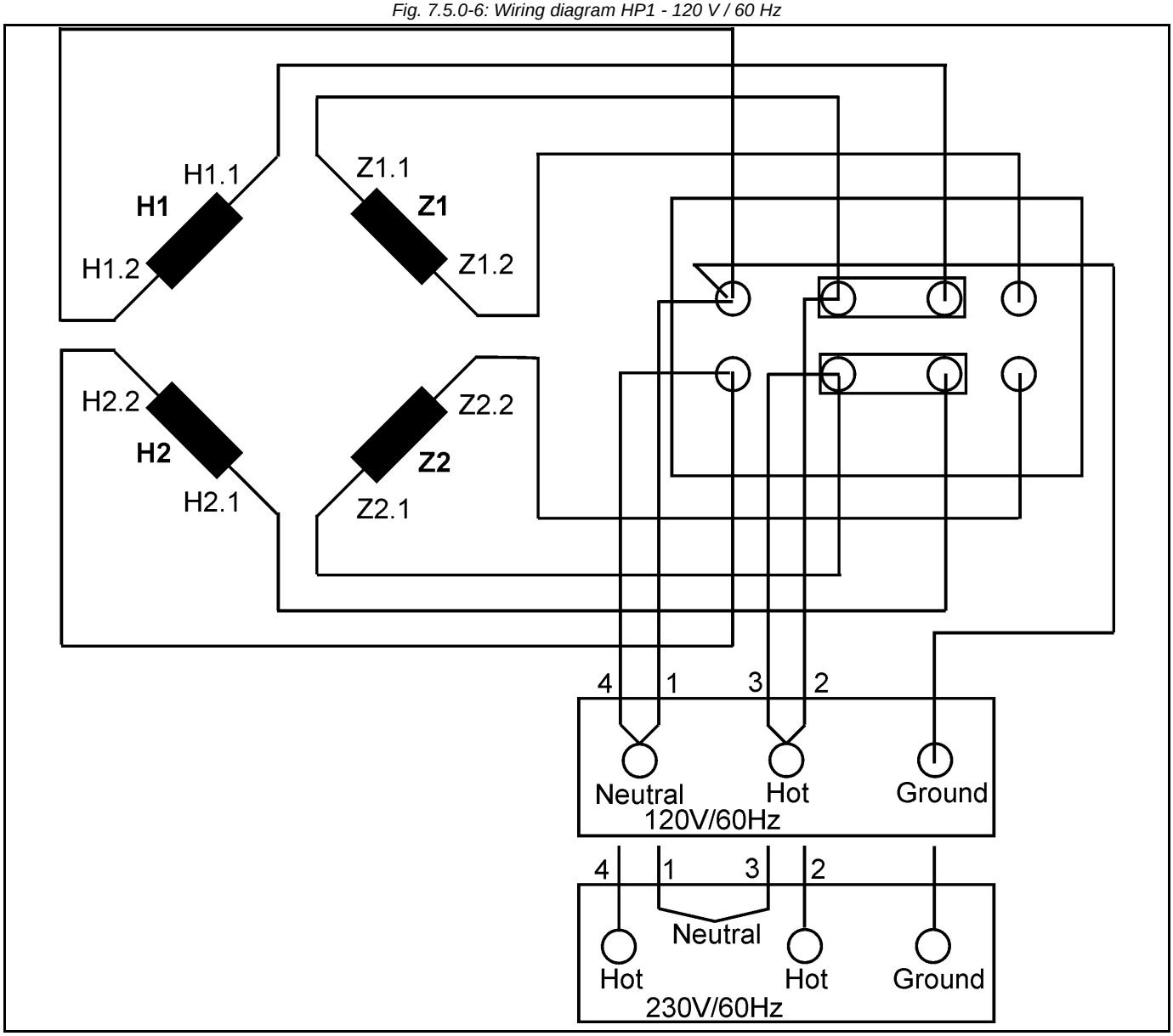


*Fig. 7.5.0-6: Wiring diagram HP1 - 120 V / 60 Hz*




**Generator Power Terminal Box 240 V / 60 Hz (208 V / 60 Hz)**

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. 7.5.0-7: Generator power terminal box 240 V / 60 Hz*

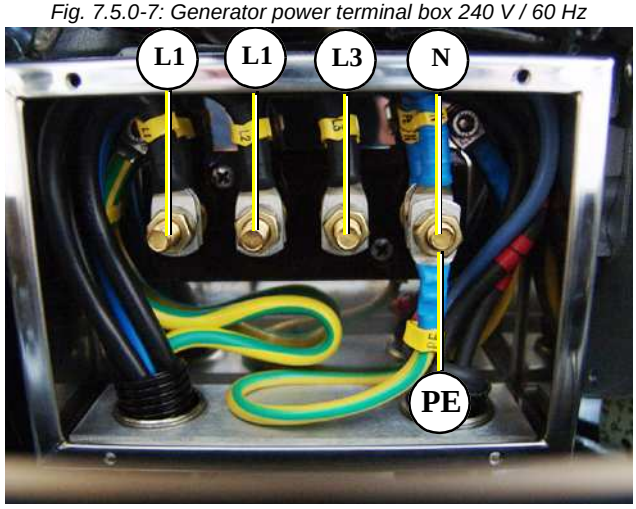
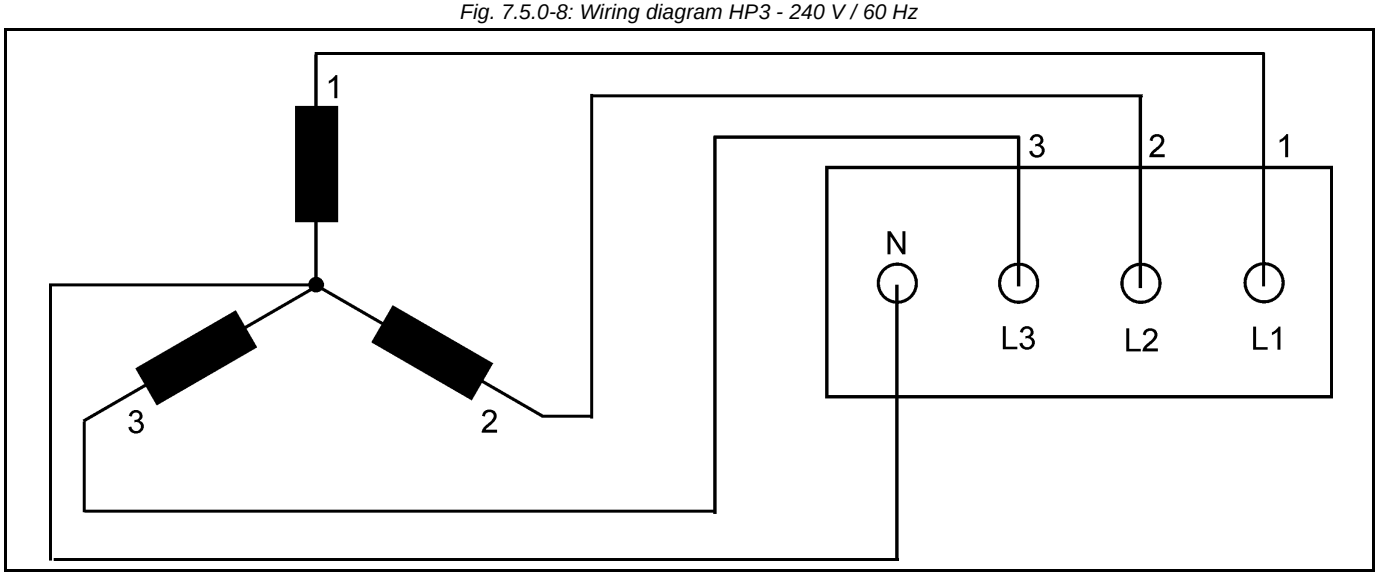


*Fig. 7.5.0-8: Wiring diagram HP3 - 240 V / 60 Hz*




**Generator Power Terminal Box DVS - 120 V + 240 V / 60 Hz**

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. 7.5.0-9: Generator power terminal box DVS*

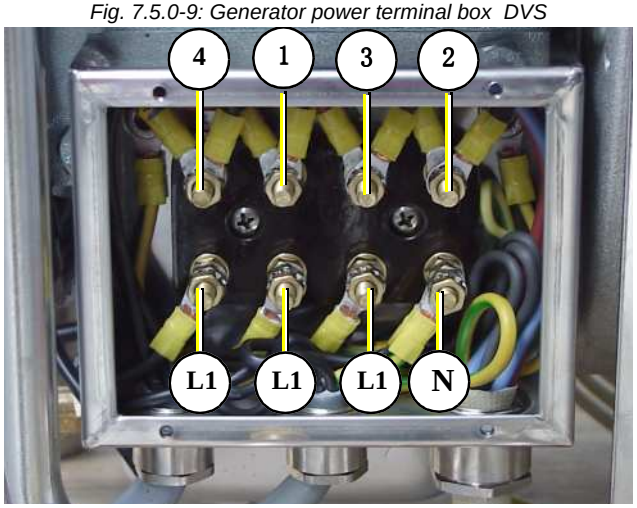



*Fig. 7.5.0-10: Wiring diagram DVS - 120 V + 240 V / 60 Hz*

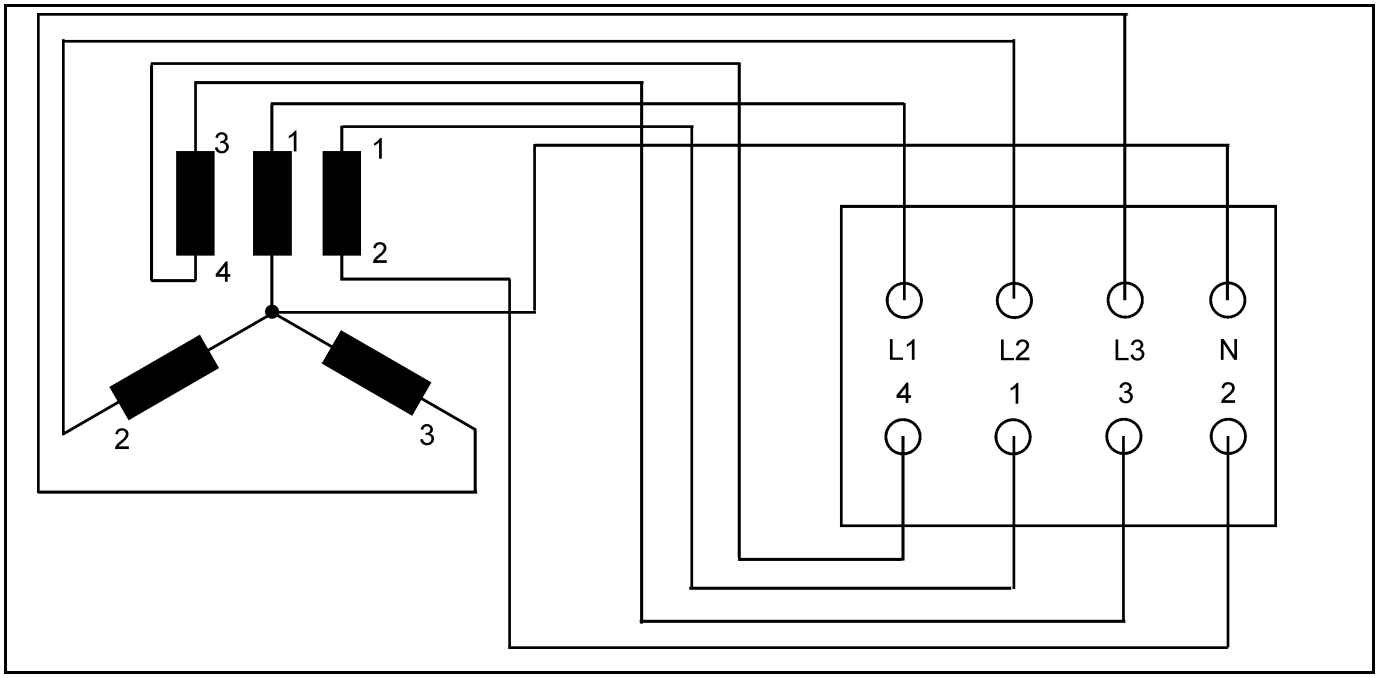
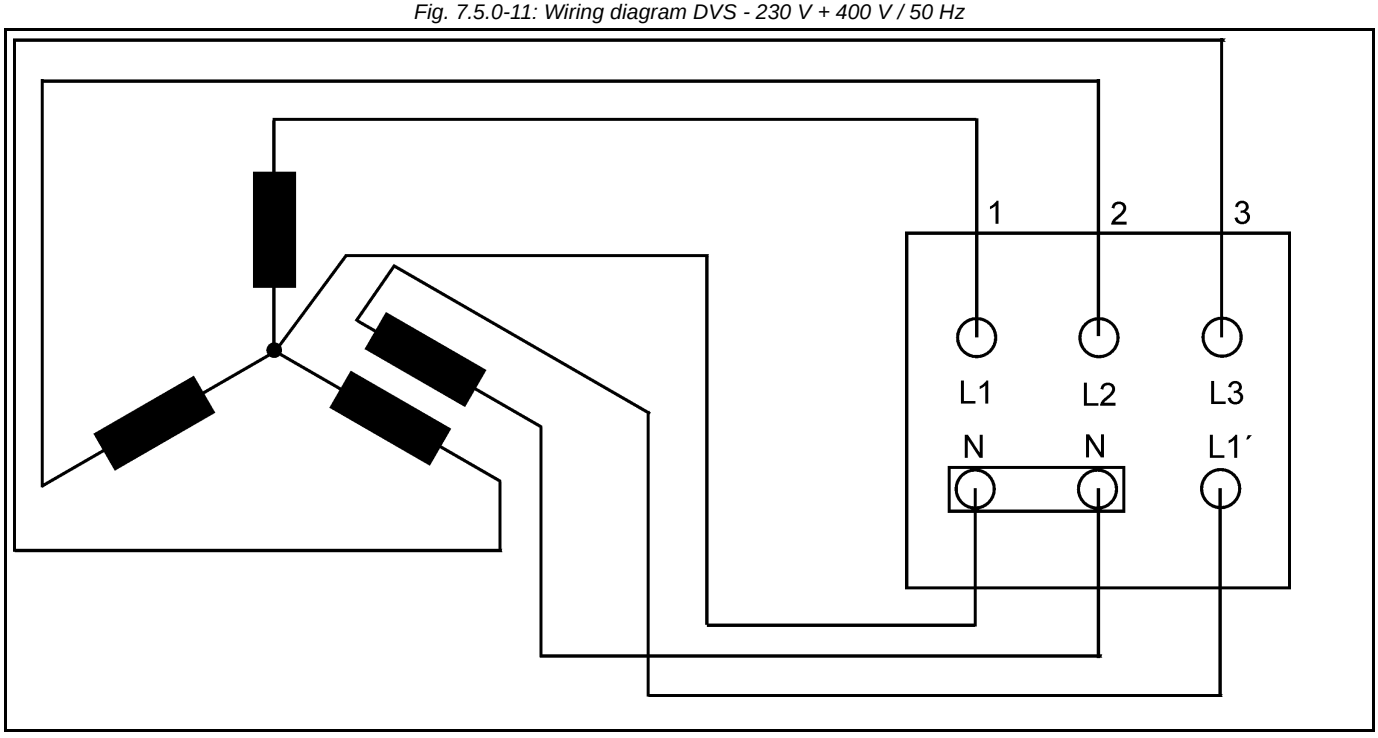


*Fig. 7.5.0-11: Wiring diagram DVS - 230 V + 400 V / 50 Hz*




## 7.6 Overloading the generator

Please ensure that the generator is not overloaded. This must be considered, especially with regards to multi power generators. In this case the extra load including the electrical performance can be considerably greater than the drive performance of the motor, which can eventually lead to a damaged motor.

The full nominal performance of the generator is fore-mostly for short term use. It is, however, required to start electric motors with high starting current or achieve special starting procedures at peak loads. 70% nominal load is ideal for a long motor life. (Continual use means uninterrupted use of the generator for many hours). This should be taken into consideration when connecting devices. This ensures extended motor life.

It is no problem for the motor to be run occasionally for 2 - 3 hours at full load. The complete conception of Panda Generator ensures that even during extreme conditions, an overheating of the motor will not occur. Accumulation of soot will occur if run for long periods at full load.

**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**

With the operation of electric motors it must be considered that these take up a multiple of their rated output as starting current (six to tenfold).

If the power of the generator for the engine is not sufficient, the voltage in the generator breaks down after switching on the engine. For special approach problems the manufacturer can give recommendations regarding the accomplishment of the situation (e.g. amplified condensers, gradual start switch or extra developed starting unit for electric motors).

The system efficiency can be improved up to 50 % and the starting current can be improved up to 100 % by a professional adjustment of the engines. If the inductive load (electrical motors etc.) lies over 20 % of the generator rated output compensation is appropriate (see in addition also the writing: "Operation Instructions for Generators with Inductive Loads").

## 7.6.1 Monitoring the Generator Voltage

**see “Safety first!” on Page 11.**

**ATTENTION!**

The voltage range of the power stations normally lies between 200 and 240 V (100 - 130 V in the 60 Hz version). In some countries even substantially larger tension deviations are being called "normally". The Fischer Panda generators are aligned that they keep these default values during normal load.

With high load or overload it can occur that the voltage drops on 190 V (95 V in the 60 Hz version) and partly still more deeply. That can become critical for certain devices (e.g. for electric motors, cooling compressors and possibly for electronic devices). It must be paid attention that the voltage for such consumers are sufficient. This can be supervised by a voltmeter.

The voltmeter should be always installed behind the change over switch generator/land power, so that each voltage source is shown. No further voltmeter is provided for the generator itself.

If additional consumers are switched on, the voltage must be controlled in each case at the voltmeter. Sensitive devices must be switched off so long, until the voltage exceed the critical parameter.

Under certain circumstances the generator provides overvoltage. This arises if the number of revolutions of the generator is increased. Changing the number of revolutions may be made only with a tachometer and/or a voltmeter.

If sensitive and/or valuable devices are used, which are to be protected against this risk, an automatic overvoltage protection must be mounted (voltage control with disconnection).

## 7.6.2 Automatic voltage monitoring and auto-shut down

If air conditioning units (compressors) or other such valuable equipment is installed on-board, it is recommend that an automatic voltage monitoring unit be installed to protect this equipment from possible sharp voltage drops. The voltage monitoring system shuts down the entire system (and therefore all users) by means of 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). Such a relay with contactor can be obtained from the installator or as a complete unit from your Fischer Panda dealer.

## 7.7 Setting the speed governor of the actuator

The speed of the generator is determined by two independent settings; an upper and lower speed governor:

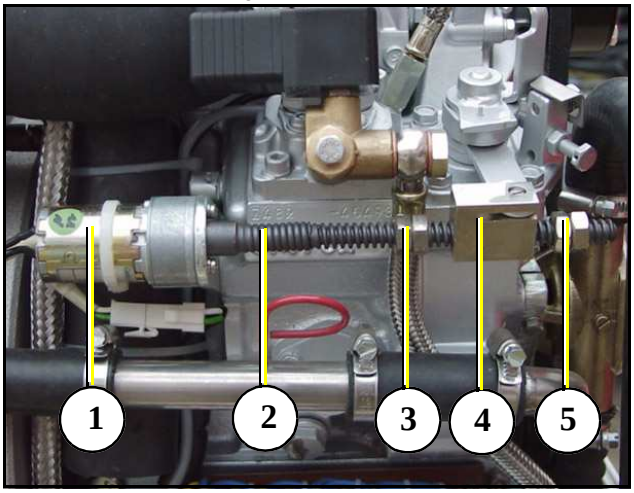
- By means of the adjusting nuts on the spindle of the servomotor right and left from the spindle nut (Setting of the normal speed limit).
- By means of an adjusting screw that is located on the base of the speed control lever. (Setting of the maximum upper speed).

After working on the components of the actuator, the speed must be checked.

**Actuator**

1. Servo motor
2. Trapezoidal Thread Spindle
3. Adjusting nuts for max. speed
4. Spindle nut with speed adjusting lever
5. Adjusting nuts for the lower setting

*Fig. 7.7-1: 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.

### 7.7.1 Setting the maximum upper speed setting

1. Remove the plug from the electrical input for the actuator.
2. Loosen the counter nuts of the speed governor screws with a combination wrench SW 10.
3. Connect a voltmeter with a range up to 300 Volts AC to the AC Output of the AC Control Box.
4. Ensure that no electrical load has been set.
5. Start generator.
6. Raise the speed of the generator by turning the spindle of the servomotor until the voltmeter reaches 260 Volts (130 Volts).
7. Turn the governor screw firmly against the stop setting of the speed adjustment lever.
8. Secure the governing screw by means of the counter nut.
9. Once again check whether the generator voltage is governed to 260 Volts (130 Volts).

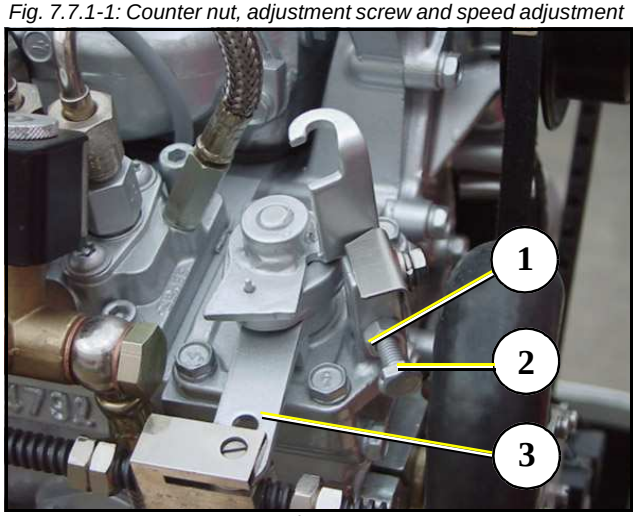
The upper speed settings serve as an additional safety factor. The value for the maximum voltage is therefore approx 5 volts above the normal running limit.

**Speed adjustment lever**

1. Counter nut
2. Adjustment screw for upper setting
3. Speed Adjustment Lever

**This setting should not be changed otherwise the guaranty will expire.**

*Fig. 7.7.1-1: Counter nut, adjustment screw and speed adjustment lever*




## 7.7.2 Setting the normal speed settings

**Setting the lower speed limit**

1. Remove the plug from the electrical input.
2. Loosen the counter nuts against each other by means of two combination spanners SW 10.
3. Connect an electrical voltmeter in the range up to 300 Volt AC to the AC Control Box output.
4. Ensure there is no electrical load.
5. Start generator.
6. By turning the servo meter spindle downwards by hand until the voltmeter shows a value of 225 volts (110V).
7. Tighten both nuts tightly against each other.
8. Once again check whether the lower generator voltage of the generator without load is limited to 225 volts (110 volts).

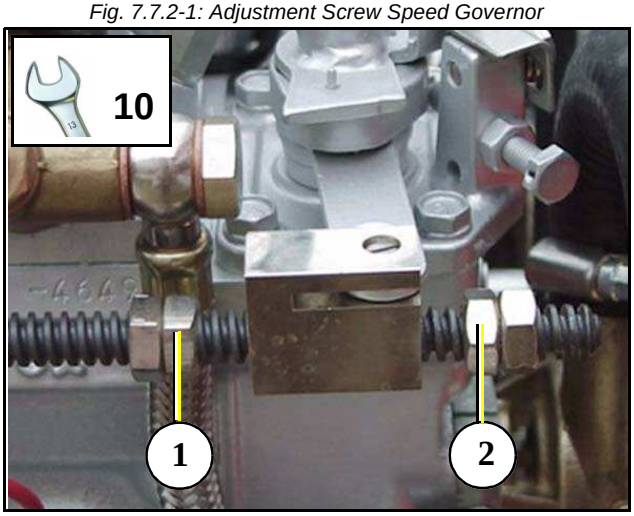
**Setting the upper speed limit:**

1. Continue as above and tighten the counter nuts at a voltage of max. 260 volts (130 volts).
2. Once again check whether the upper generator voltage without load is limited to 260 V (130 V)

**Adjustment Screw Speed Governor**

1. Adjustment screw for the upper speed limit
2. Adjustment screw for the lower speed limit

*Fig. 7.7.2-1: Adjustment Screw Speed Governor*




The electrical plug must be reconnected to drive the actuator servo motor, once the adjustment has been completed.

The connection must be remade should the electrical input wires have been removed from the AC control box.

## 7.7.3 Greasing the trapezoidal thread spindle on the speed actuator

The speed setting of the trapezoidal thread spindle must be regularly greased. Only high temperature-resistant grease (up to 100 °C) may be used. The end of the nu ts must also be smeared with grease.

If the spindle has not been sufficiently greased, then it can jam. The generator then cuts out when over or under-heated.

All screws on the rotary servomotor and the spindle should be secured with a screw securing solution, so that they can be easily loosened.

The trapezoidal thread spindle must be checked, if the generator has cut out, because of under or over voltage.

Servicing intervals also includes the checking of cut out functions in cases of defect. Only by making regular checks can it be ensured that the generator switches off, if there is a fault. The generator will not switch off, if the cut out control of the solenoid valve does not function.

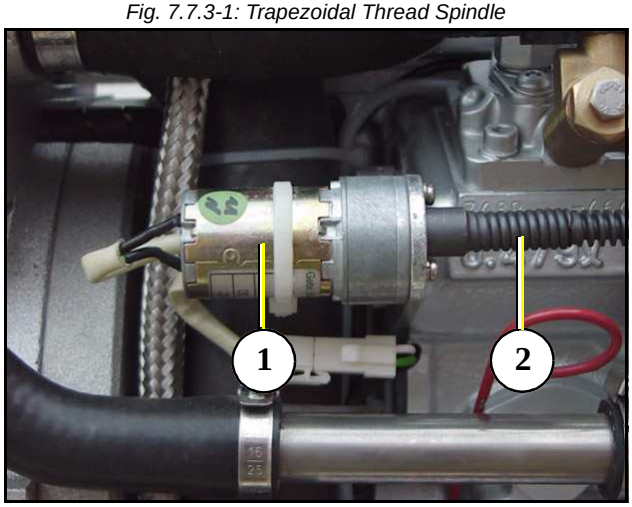
**Trapezoidal Thread Spindle**

**1. Speed actuator**

**2. Trapezoidal Thread Spindle**

*Sample Picture*

*Fig. 7.7.3-1: Trapezoidal Thread Spindle*



## 7.7.4 Consequences of a continual overloading of the Actuator

If the generator is overloaded, the voltage falls under the nominal value due to insufficient engine power. The actuator is already at the upperst speed limit and still tries to rise the rev. speed of the engine. There is an internal control which limits the actuator current, but an overloading over a longer period of time can still damage the winding of the actuator.

This will not effect the operation ability of the engine, but it can happen that the cranking torque of the actuator is getting weak. This has the consequence that the rev. spindle can not be turned to all positions correctly. Therefore the voltage regulatiron of the generator is very bad or the generator is temporarily not beeing regulated at all.

If you should notice that the actuator for the spindle sometimes does not run smoothly, then a check must be made to determine whether the generator has been effectively overloaded for periods, therefore causing damage to the internal winding of the actuator. The actuator must then be exchanged.

**The electrical fuses on the circuit board must be checked, if the actuator for controlling the speed does not turn.**

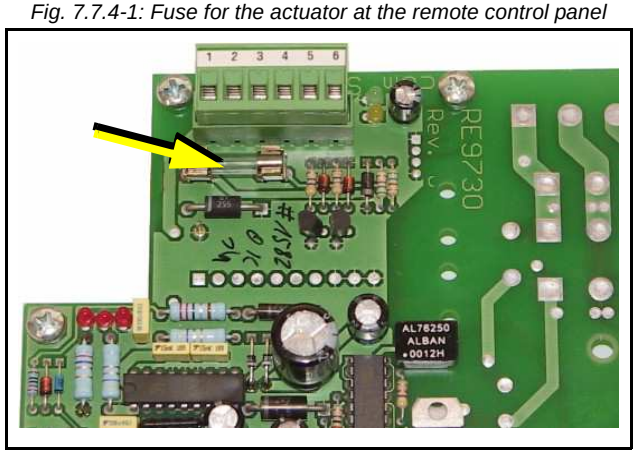
**Change fuse for the actuator at the remote control panel here**

*Note: The Mini VCS has no internal fuse*

Change this fuse at standard VCS

(1,6 A slow to blow)

*Fig. 7.7.4-1: Fuse for the actuator at the remote control panel*




True, overloading cannot damage the actual generator, since the windings are safe from overloading and short circuiting, but damage is always possible to peripheral consumers. This is especially the case for connected consumers, which can easily be damaged because of current that is too low.

## 7.7.5 Possible faults concerning the speed control „VCS“

| Problem | Possible Cause |
|---|---|
| The spindle of the actuator jams | Not regularly lubricated.<br>Surface has mechanical damage.<br>Actuator is defective (evtl. winding short cut).<br>Defect of the VCS control.<br>Signal 230 V (115 V) AC missing.<br>Limiting nut jams the spindle. |
| Fuse on the printed circuit board of the VCS control is melted. | Constant overload of the generator. |

1.

## 7.7.6 Steps to check the voltage control in case of a failure:

1. Switch the load off .
2. Remove plug from the actuator.
3. Turn the actuator by hand to determine whether the adjusting nut has jammed against the speed governor.
4. Turn the actuator by hand to check whether the adjusting nut runs smoothly on the spindle.

If the above test produces no result, it can be assumed that the actuator operates smoothly. The electrical groups of components must then be checked:

1. Re-connect plug.
2. Start generator.
3. Turn the actuator by hand to check whether the Spindle is reversed by the motor.
4. It can be assumed that the actuator is faultless, if the turning of the actuator is too much for the hand (It is not normally possible to stop the motor with the fingers). It must be assumed that there is a fault with the voltage control (VCS).

### 7.7.6.1 The following measures are necessary if the actuator is jammed:

1. If the actuator only turns weakly:

- Actuator has a destroyed winding and must be exchanged. (In future it should be ensured that the generator is not overloaded).

2. If the actuator does not move, but the spindle can be turned by hand:

- Remove plug from the actuator and temporarily connect it to an external 12 volt direct current source. The motor is defective if the actuator still does not turn when connected to the external electrical source. Exchange the motor.

**Actuator operates with external voltage source and works without flaws**

1. Check VCS board fuse.
2. Check if measuring voltage is applied to the VCS board.
3. Check if supply voltage is applied to the VCS.
4. Check if the activation signal of the actuator is applied to the VCS' output.

**The VCS circuit board should be exchanged if these measures do not produce clarity.**

### 7.7.6.2 Checking the generator voltage limitation

The mechanical voltage limitation must be checked regularly.

1. Switch the load off
2. Disconnect the plug of the actuator.
3. Connect an electrical voltmeter.
4. Start the generator.
5. Turn the actuator to the lowest limit point by hand. The min voltage is 220 V (110 V).
6. The voltage must be 225 V (110 V).
7. Turn the actuator to the upper limit by hand. The max. voltage is 260 V (130 V).A new adjustment is necessary in case of deviants.

*see "Setting the speed governor of the actuator" on Page 186. for adjustment details*

## 7.8 Generator-Output Voltage is too low

If the AC generated is too low, then the consumers should be disconnected, one after the other, in order to reduce the load on the generator. Generally the problem is then solved. The frequency should be checked, if the output voltage is correct after the consumers have been disconnected. Should this be above the prescribed generator idling speed, it can be assumed that one or several condensers are defective.

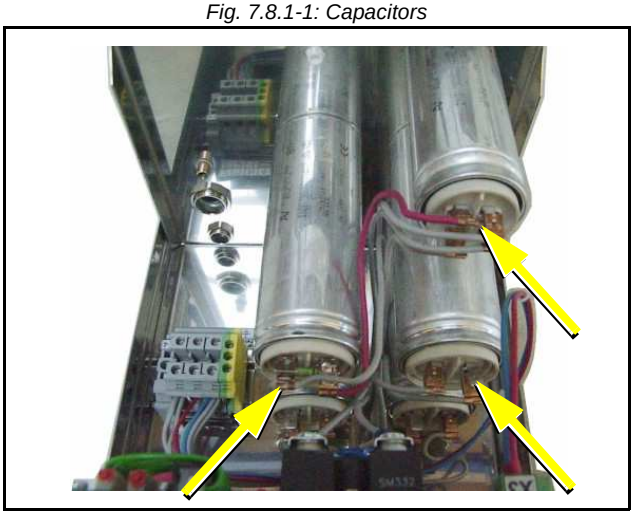
### 7.8.1 Discharging the Capacitors

**Never work on the control box, if the generator is running! Do not touch the capacitors contacts, see “Safety first!” on Page 11.**

**ATTENTION!**

**Capacitors**

*Fig. 7.8.1-1: Capacitors*



1. **Switch off the generator.**
2. **Remove the starter battery.**
3. **Open the AC-Control Box.**

**The capacitors are discharged by short fusing both contacts. The contacts (Flat plug) can be bridged by means of a screwdriver with an insulated handle (short-circuiting).**

## 7.8.2 Checking the Capacitors

**If the capacitors are to be checked, make sure that the capacitors has been discharged.**

**ATTENTION!**

A visual check can give information on whether the capacitors are defective:

- Dielectric leak?

- Did the capacitor become longer?

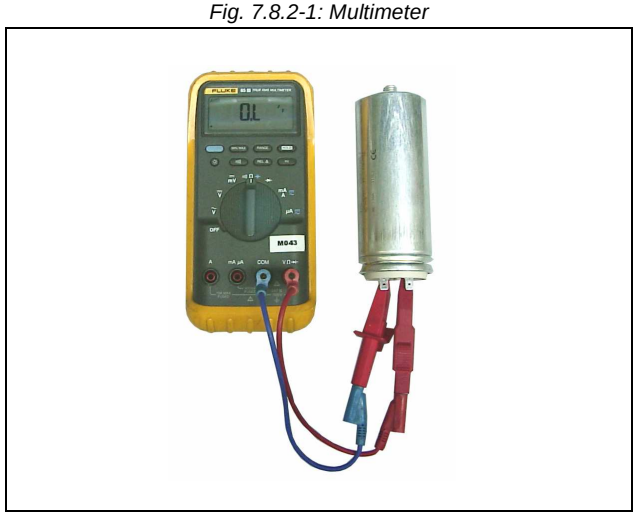
**Multimeter**

The capacitors can be tested by means of a multi-meter, which is fitted with a buzzer. The multi-meter should be switched to open and both capacitor connections connected to the multi-meter.

The capacitors can be tested with a multi-meter. Switch the measuring instrument to "pass" and connect both connections of the capacitors to the connections at the measuring instrument.

Touch the two contacts of the capacitors by means of the test prods. A charge should be fed to the capacitor by the internal battery.

*Fig. 7.8.2-1: Multimeter*



Should a steady sound or no sound be heard, the capacitors are defective and must be replaced.

A capacity measuring instrument must be used in order to check whether the capacitors have full capacity.

The capacitors, which do meet the prescribed capacity value at this measurement, should be exchanged as fast as possible. If all capacitors prove to be still functional, then a check must be made, as to whether the connections to the strip are correct.

### 7.8.2.1 Checking the electrical connections to the capacitors

It must be ensured that the electrical connections to the capacitors are always tight fitting. Loose connections with transitional resistance can mean that the contact surfaces will become heated externally. This can lead to an increased deterioration of the capacitors.

## 7.8.3 Check the Generator Voltage

**The following steps must be taken, in order to test whether the stator winding generates sufficient voltage:**

1. The following steps must be taken, in order to test whether the stator winding generates sufficient voltage:
2. Ensure that the connection to the shipboard circuit is interrupted.
3. Remove all electrical wires in the generator junction box.
4. Starter battery must be connected to the generator.
5. Start generator.
6. Measure the voltage between the phases and neutral. It can be assumed that damage has been caused to the windings, if the measured values are below the values given in Table 8.9 on Page 208

Both partial windings must be connected for the 60Hz Version, i.e. there must be a connection made between wire 1 and 3 (see circuit plan).

*(Note: The current arises from the rest magnetism of the rotor, which induces a voltage in the winding).*

### 7.8.4 Measuring the Ohm Resistance of the Generator Windings

**If a short circuit could not be found by using a multi-meter, then the windings parts of the generator must be checked by means of an Ohmmeter that is suitable for low resistance values.**

- Set the measuring device to measure resistance. If you hold the poles of the measuring device against each other, then 0.00 Ohms should be shown. If the pole has been isolated then the display should show an overflow. Please carry out this test to check the device.
- Measure the resistance within the individual windings.

If there are large deviations, it must be assumed that there is a windings short circuit. This also leads to non-excitation of the generator.

The actual values between the windings parts and the earth cannot, however, be exactly determined. Fore-mostly, the values of all three measurements must be the same, if possible. Deviations from each other show there is windings short-circuit. In this case, the generator windings must be renewed by an electrician.

### 7.8.5 Check the Windings for Short Circuiting

Ensure that the generator has been switched off and cannot be inadvertently switched on. Disconnect the wires to the battery for this.

1. All wires in the junction box or - if necessary - in the circuit distribution box must be disconnected. Ensure that the wires are no longer carrying an electrical current, before being disconnected (see “Discharging the Capacitors” on Page 191.)
2. Remove the Bridges between "N"and "PE", so that the windings and casing do not come into electrical contact.
3. Make a check, by means of a Multimeter, as to whether there is a current between the individual winding terminals and the casing (PE).

The contacts to measured are not relevant to the type of generator (see type plate):

HP1 - 50 Hz: L, Z

HP1 - 60 Hz: L, Z

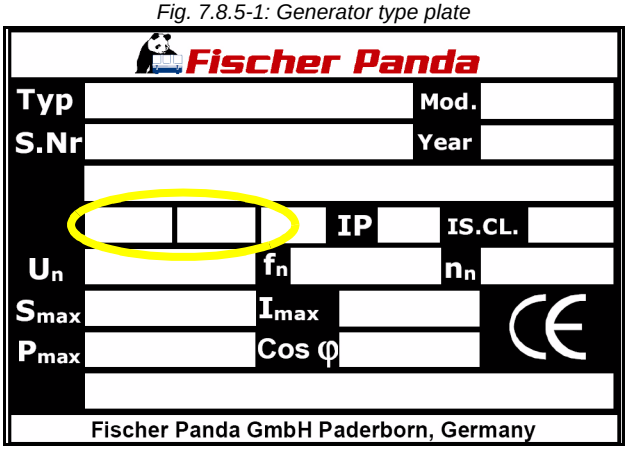
HP3 - 50 Hz: L1, L2, L3

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

DVS - 50 Hz: L1, L2, L3, L1’

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

*Fig. 7.8.5-1: Generator type plate*




The generator must be sent for a check to the factory or be re-winded locally, when a pass (beep) should be detemined. Windings data can be requested for this, if it is necessary.

### 7.8.6 Measuring the Inductive Resistance

An Ohm measurement of a winding does not always give reliable information concerning the state of the winding. If there are resistance irregularities between the windings parts, this is a sure sign that the winding is defective. This means the opposite cannot be concluded. This means a winding can also be defective, if the resistance values between the windings parts do not show great deviation.

Measurement of the inductive resistance gives a better reading. A Special measuring device is necessary for this.

The inductivity is measured in the same manner as the resistance, i.e. the windings parts are compared. The value of the inductive resistance is given in mH (milli Henry).

The correct values for the inductive resistance can be obtained from Table 8.8 on Page 207.

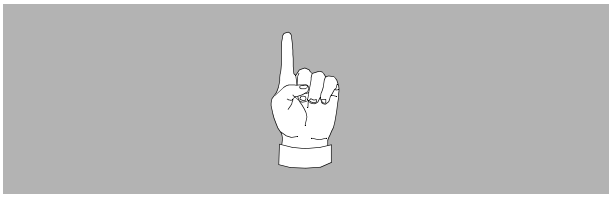
Note: The values are greatly dependent upon the measuring method (type of ohmmeter).

## 7.9 Generator provides no voltage

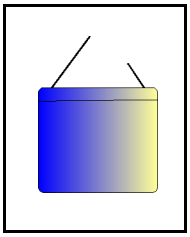
### 7.9.1 Rotor Magnetism Loss and "Re-magnetising"

**“Safety Instructions” on Page IV**

**ATTENTION!**



In the case of asynchronous generators, the generator cannot independently increase voltage after standing still, or, if it is switched off under full load. This is because the rotor has lost its remaining magnetism.



This remaining magnetism can be restored simply by use of a DC battery. In addition the "shore power"must be switched off and any connection to an AC-source must be interrupted.

Likewise the generator must be switched off, i.e. also the starter may not be operated. The power source selector is switched to "generator". Only the plug socket must be connected with the generator.

Now the two poles of a 9 Volt battery are connected to the plug socket or held against the appropriate contacts of the on-board current distributor. Do not use a battery bank or the generator starter battery, this could damage the winding. The DC voltage only may be applied for a short time (1-2 seconds). In the winding the remaining magnetism is restored by a short current pulse, and the generator can normally be started.

# 7.10 Engine Starting Problems

## 7.10.1 Electric Fuel Solenoid Valve

The fuel solenoid valve is located in front of the injection pump. It opens automatically, if the "START"-button is pressed on remote control panel. If the generator is switched to "OFF", the solenoid valve closes. It takes some seconds, before the generator stops.

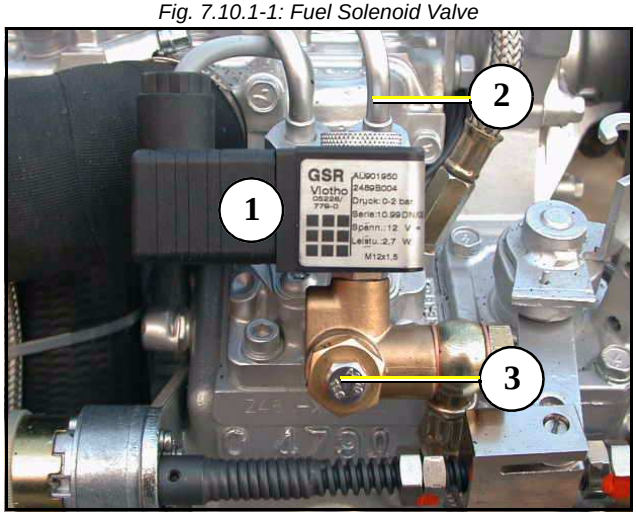
If the generator fails to start, runs rough, does not reach the proper RPM, or does not stop properly, the first item to suspect in most cases it is the fuel solenoid valve and should be inspected first.

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.

1. Fuel solenoid valve
2. Fuel injector
3. Ventilation screw

*Sample Picture*

*Fig. 7.10.1-1: Fuel Solenoid Valve*



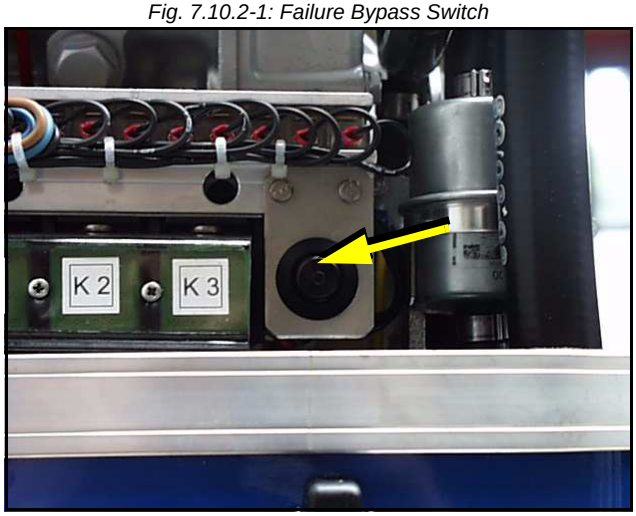

## 7.10.2 Re-start with Failure Bypass Switch

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**

*Sample Picture*

*Fig. 7.10.2-1: 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, check the oil level with thge dip stick 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 temperature compensation occurs. Heat accumulation can cause the generator to overheat, even after it 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.

## 7.10.3 Lifting solenoid for motor stop - optional

There are two different versions of lifting solenoids:

**A. Energized to stop**

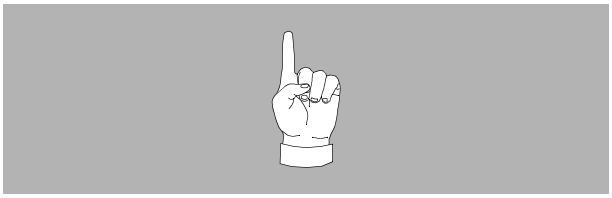
The lifting solenoid is furnished with voltage and pulled by pushing the „OFF“-button on the remote control panel. By doing that, the injection pump is set on zero lift and the generator stops.

**B. Energized to run**

This version is equipped with two solenoids, an operation- and a holding solenoid. After applying voltage, the operation solenoid pulls the adjusting lever of the injection pump, which gives way to the fuel. After reaching its end position, the operation magnet is switched off and the holding solenoid keeps that position as long as the generator is operating.

**The „START“-button should not be pressed any longer than 5 sec. during the starting process, or the lifting solenoid draws too much current over the starter motor. Otherwise the lifiting solenoid needs to be disconnected.**

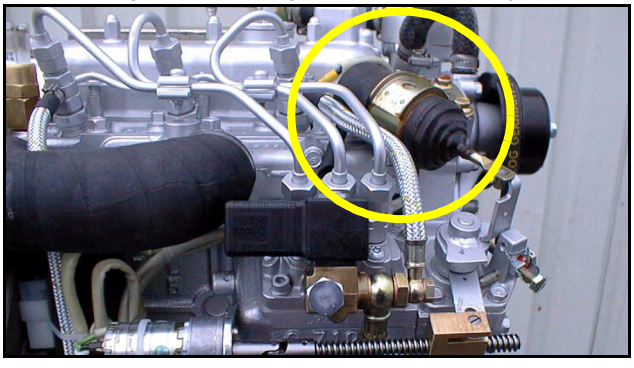
**ATTENTION!**



**Lifting solenoid for motor stop**

*Sample Picture*

*Fig. 7.10.3-1: Lifting solenoid for motor stop*



**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.**

## 7.10.4 Troubleshooting Table

**For Troubleshooting see Table “Troubleshooting” on Page I.**

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# 8. Tables

## 8.1 Technical Data

*Fig. 8.1-1: Technical Data*

| | Panda 6000 ND | Panda 8000 NE | Panda 9000 ND | Panda 1000NE | Panda 12000 NE |
|---|---|---|---|---|---|
| **Type** | Z482 | Z482 | D722 | Z602 | D722 |
| **Govenor** | MIni VCS | VCS | mechanisch | VCS | VCS |
| **Automatic startbooster** | nein | ja | nein | ja | ja |
| **Cylinder** | 2 | 2 | 3 | 2 | 3 |
| **Bore** | 67mm | 67mm | 67mm | 72 mm | 67mm |
| **Stroke** | 68mm | 68mm | 68mm | 73,6 mm | 68mm |
| **Stroke volume** | 479cm³ | 479cm³ | 719cm³ | 599cm³ | 719cm³ |
| **Max. power (DIN 6271-NB) at 3000rpm** | 9,32kW | 9,32kW | 14,0kW | 11,6kW | 14,0kW |
| **Rated speed 50 Hz** | 3000rpm | 3000rpm | 3000rpm | 3000rpm | 3000rpm |
| **Idle running speed ²** | 3120rpm | 2900rpm | 3120rpm | 3100rpm | 2900rpm |
| **Valve clearance (engine cold)** | 0,2mm | 0,2mm | 0,2mm | 0,2mm | 0,2mm |
| **Cylinder head nut torque** | 42Nm | 42Nm | 42Nm | 42Nm | 42Nm |
| **Compression ratio** | 23:1 | 23:1 | 23:1 | 24:1 | 23:1 |
| **Lubrication oil capacity** | 2,8l | 2,8l | 3,8l | 2,8l | 3,8l |
| **Fuel consumption ³** | ca. 0,5-1,4l | ca. 0,7-1,8l | ca. 0,8-2,1l | ca. 1,0-2,66l | ca. 1,1-2,8l |
| **Oil consumption** | max. 1% of fuel consumption | | | | |
| **Cooling water requirement for seawater circuit (Marine generators only)** | 16-28l/min | 16-28l/min | 16-28l/min | 16-28l/min | 16-28l/min |
| **Permissible max. permanent tilt of engine** | a) 25°across the longitudinal axis<br>b) 20°in the longitudinal direction | | | | |
| **Recommend starter battery size** | 12V 28Ah äquiva-lent | 12V 28Ah äquiva-lent | 12V 36Ah äquiva-lent | 12V 36Ah äquiva-lent | 12V 36Ah äquiva-lent |
| **Recommend cable cross size starterbattry-cablet**<br>*Length 4 meter max.* | 25mm² | 25mm² | 25mm² | 25mm² | 25mm² |
| **Max. exhaust backpressure** | 9,3 kPa<br>93 Millibar | 9,3 kPa<br>93 Millibar² | 9,3 kPa<br>93 Millibar | 9,3 kPa<br>93 Millibar | 9,3 kPa<br>93 Millibar |

*² progressive speed by VCS*

*³ 0,35l/kW electrical power, the randomized values between 30% and 80% of the rated speed*

*Fig. 8.1-2: Technical Da*

| | Panda 14000 NE | Panda 15000NE | Panda 18 NE | Panda 24 NE | Panda 30 NE |
|---|---|---|---|---|---|
| **Type** | D782 | D902 | D1105 | V1505 | V1505 TD |
| **Govenor** | VCS | VCS | VCS | VCS | VCS |
| **Automatic startbooster** | ja | yes | yes | no | no |
| **Cylinder** | 3 | 3 | 3 | 4 | 4TD |
| **Bore** | 67mm | 72mm | 78mm | 78mm | 78mm |
| **Stroke** | 73,6mm | 73,6mm | 78,4mm | 78,4mm | 78,4mm |
| **Stroke volume** | 782cm³ | 898cm³ | 1123cm³ | 1498cm³ | 1498cm³ |
| **Max. power (DIN 6271-NB) at 3000rpm** | 13,5kW | 17,5kW | 18,7kW | 23,3kW | 31,3kW |
| **Rated speed 50 Hz** | 3000UpM | 3000UpM | 3000rpm | 3000rpm | 3000rpm |
| **Idle running speed ²** | 2900UpM | 2900UpM | 2900rpm | 2900rpm | 2900rpm |
| **Valve clearance (engine cold)** | 0,2mm | 0,2mm | 0,2mm | 0,2mm | 0,2mm |
| **Cylinder head nut torque** | 68Nm | 42mm | 68Nm | 68Nm | 68Nm |

| | Panda 14000 NE | Panda 15000NE | Panda 18 NE | Panda 24 NE | Panda 30 NE |
|---|---|---|---|---|---|
| **Compression ratio** | 23:1 | 24:1 | 22:1 | 22:1 | 23:1 |
| **Lubrication oil capacity** | 3,8l | 3,7l | 5,1l | 6,0l | 6,7l |
| **Fuel consumption [3]** | ca. 1,3-3,4l | ca. 1,3-3,6l | ca. 1,7-4,5l | ca. 2,2-5,9 | ca. 2,7-7,2l |
| **Oil consumption** | max. 1% of fuel consumption | | | | |
| **Cooling water requirement for seawater circuit (Marine generators only)** | 16-28l/min | 6-28l/min | 28-40l/min | 28-40l/min | 40-50l/min |
| **Permissible max. permanent tilt of engine** | a) 25° crosswise to the longitudinal axis<br>b) 20° in longitudinal direction | | | | |
| **Recommend starter battery size** | 12V 36Ah äquiva-lent | 12V 52Ah äquiva-lent | 12V 65Ah äquiva-lent | 12V 70Ah äquiva-lent | 12V 70Ah äquiva-lent |
| **Recommend cable cross size starterbattry-cablet**<br>*Length 4 meter max.* | 25mm² | 25mm² | 25mm² | 25mm² | 25mm² |
| **Max. exhaust backpressure** | 9,3 kPa<br>93 Millibar | 9,3 kPa<br>93 Millibar[2] | 10,7 kPa<br>107 Millibar | 10,7 kPa<br>107 Millibar | 10,7 kPa<br>107 Millibar |

*[2] progressive speed by VCS*
*[3] 0,35l/kW electrical power, the randomized values between 30% and 80% of the rated speed*

*Fig. 8.1-3: Technical data*

| | Panda 30 IC PMS | Panda 45LN | | |
|---|---|---|---|---|
| **Type** | Kubota V 1505 TB | LDW 2204 MT | | |
| **Govenor** | VCS | VCS | | |
| **Automatic startbooster** | yes | no | | |
| **Cylinder** | 4 | 4 | | |
| **Bore** | 78mm | 88 mm | | |
| **Stroke** | 78,4mm | 90,4 mm | | |
| **Stroke volume** | 1498cm$^3$ | 2199 ccm | | |
| **Max. power (DIN 6271-NB) at 3000rpm** | 31,3kW | 47 kW | | |
| **Rated speed 50 Hz** | 3000rpm | 3000 rpm | | |
| **Idle running speed [2]** | 2900rpm | 3000 rpm | | |
| **Valve clearance (engine cold)** | 6,7l | 0,2 mm | | |
| **Cylinder head nut torque** | 22,5:1 | 68 Nm | | |
| **Compression ratio** | 63,7 - 68,6Nm | 22:16 | | |
| **Lubrication oil capacity** | 0,145 - 0,185mm | 6,4l | | |
| **Fuel consumption [3]** | ca. 2,7 - 7,1l | ca. 4,9-13,1l | | |
| **Oil consumption** | max. 1% of fuel consumption | | | |
| **Cooling water requirement for seawater circuit (Marine generators only)** | 40-50l/min | 40-50l/min | | |
| **Permissible max. permanent tilt of engine** | a) 25° crosswise to the longitudinal axis<br>b) 20° in longitudinal direction | | | |
| **Recommend starter battery size** | 12V 70Ah äquiva-lent | | | |
| **Recommend cable cross size starterbattry-cablet**<br>*Length 4 meter max.* | 25mm² | | | |
| **Max. exhaust backpressure** | 10,7 kPa<br>107 Millibar | | | |

*[2] progressive speed by VCS*
*[3] 0,35l/kW electrical power, the randomized values between 30% and 80% of the rated speed*

*Fig. 8.1-4: Technical Data*

| | Panda 30/4 | Panda 40/4 | Panda 50/4 | Panda 70/4 | |
|---|---|---|---|---|---|
| **Type** | V3600 | V3600 | V3800 DI-T | BF4M 1013EC | |
| **Govenor** | VCS | VCS | Mechanical + GAC | VCS | |
| **Automatic startbooster** | no | no | no | nein | |
| **Cylinder** | 4 | 4 | 4 | 4 | |
| **Bore** | 98 mm | 98 mm | 100 mm | 108 | |
| **Stroke** | 120 mm | 120 mm | 120 mm | 130 | |
| **Stroke volume** | 3620 ccm | 3620 ccm | 3769 ccm | 4764 | |
| **Max. power (DIN 6271-NB) at 3000rpm** | 45,8 kW | 58,8 kW | 62,0 kW | 85,0 kW | |
| **Rated speed 50 Hz** | 1500 rpm | 1500 rpm | 1500 rpm | 1500 rpm | |
| **Idle running speed [2]** | 2800 rpm | 2800 rpm | 1800 rpm | 1800 rpm | |
| **Valve clearance (engine cold)** | 0,2 mm | 0,2 mm | 0,2 mm | Inlet 0,3 $^{+0,1}$ / Outlet 0,5 $^{+0,1}$ | |
| **Cylinder head nut torque** | 68 Nm | 68 Nm | 68 Nm | | |
| **Compression ratio** | 22,6:1 | 22,6:1 | 19,0:1 | 17,6:1 | |
| **Lubrication oil capacity** | 13,2 l | 13,2 l | 13,2 l | 14,0 l | |
| **Fuel consumption [3]** | ca. 3,15-8,4 l | ca. 3,78-10,1 l | 4,2-11,2 l | 6,5-17,3 l | |
| **Oil consumption** | max. 1% of fuel consumption | | | | |
| **Cooling water requirement for seawater circuit (Marine generators only)** | 40-50l/min | 40-50l/min | 40-50l/min | | |
| **Permissible max. permanent tilt of engine** | a) 25° crosswise to the longitudinal axis<br>b) 20° in longitudinal direction | | | | |
| **Recommend starter battery size** | 12V 136Ah äqui-valent | 12V 136Ah äqui-valent | 12V 136Ah äqui-valent | | |
| **Recommend cable cross size starterbattry-cablet**<br>*Length 4 meter max.* | 70mm² | 70mm² | 70mm² | | |
| **Max. exhaust backpressure** | 10,7 kPa<br>107 Millibar | 10,7 kPa<br>107 Millibar | 10,7 kPa<br>107 Millibar | | |

*[2] progressive speed by VCS*
*[3] 0,35l/kW electrical power, the randomized values between 30% and 80% of the rated speed*

## 8.2 Rated current

*Fig. 8.2-1: Rated current*

| | | | | |
|---|---|---|---|---|
| **Panda 8000 - 230 V / 50 Hz**<br>**Panda 8000 - 400 V / 50 Hz**<br>**Panda 8000 - 120 V / 60 Hz** | 27,0 A<br>8,3 A<br>61,8 A | | **Panda 18 - 230 V / 50 Hz**<br>**Panda 18 - 400 V / 50 Hz**<br>**Panda 18 - 120 V / 60 Hz** | 60,3 A<br>20,0 A<br>128,0 A |
| | | | | |
| **Panda 9000 - 230 V / 50 Hz**<br>**Panda 9000 - 400 V / 50 Hz**<br>**Panda 9000 - 120 V / 60 Hz** | 34,9 A<br>11,1 A<br>74,5 A | | **Panda 24 - 230 V / 50 Hz**<br>**Panda 24 - 400 V / 50 Hz**<br>**Panda 24 - 120 V / 60 Hz** | 89,1 A<br>30,1 A<br>161,1 A |
| | | | | |
| **Panda 12000 - 230 V / 50 Hz**<br>**Panda 12000 - 400 V / 50 Hz**<br>**Panda 12000 - 120 V / 60 Hz** | 41,7 A<br>13,7 A<br>89,0 A | | **Panda 30 - 230 V / 50 Hz**<br>**Panda 30 - 400 V / 50 Hz**<br>**Panda 30 - 120 V / 60 Hz** | Anfrage<br>35 A<br>219 A |
| | | | | |

| | | | | |
|---|---|---|---|---|
| **Panda 14000 - 230 V / 50 Hz**<br>**Panda 14000 - 400 V / 50 Hz**<br>**Panda 14000 - 120 V / 60 Hz** | 48,0 A<br>15,2 A<br>112,7 A | | | |

## 8.3 Cable cross section

*Fig. 8.3.0-1: Kabelquerschnitte/Cable cross sectiion*

| Länge/length | 1 - 3 m | 4 - 6 m | 7 - 10 m | 11 - 15 m | 16 - 20 m |
|---|---|---|---|---|---|
| **16 mm²** | 70 A | 63 A | 55 A | 48 A | 42 A |
| **25mm²** | 112 A | 100 A | 88 A | 75 A | 63 A |
| **35mm²** | 145 A | 130 | 110 | 100 A | 90 A |
| **50mm²** | 225 A | 200 A | 175 A | 150 A | 125 A |
| **70mm²** | 275 A | 250 A | 225 A | 195 A | 170 A |
| **95mm²** | 340 A | 300 A | 280 A | 260 A | 220 A |

## 8.4 Fuel

Use a clean No. 2 Diesel fuel oil (SAE J313 JUN87) according to ASTM D975 and EN 590.

Do not use alternative fuel, because its quality is unknown or it may be inferior in quality. Kerosene, which is very low in cetane rating, adversely effects the engine.

## 8.5 Engine oil

### 8.5.1 Engine oil classification

#### 8.5.1.1 Operating range:

The operating range of an engine oil is determined by SAE class. "SAE" is for the union of American auto engineers (Society of Automotives Engineers).

The SAE class of an engine oil only informs over the viscosity of the oil (larger number = more viscous, smaller number = more highly liquidly) e.g. to 0W, 10W, 15W, 20, 30, 40. The first number shows the liquid of the oil with cold weather, the second number refers to the fluidity with heat. Complete yearly oils have usually SAE classes of SAE 10W-40, SAE 15W-40 etc..

#### 8.5.1.2 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 quality.

API C for diesel engine

Examples for diesel engine oil:

API CCEngine oil for small demands

API CDEngine oil for suction- and turbo diesel engine

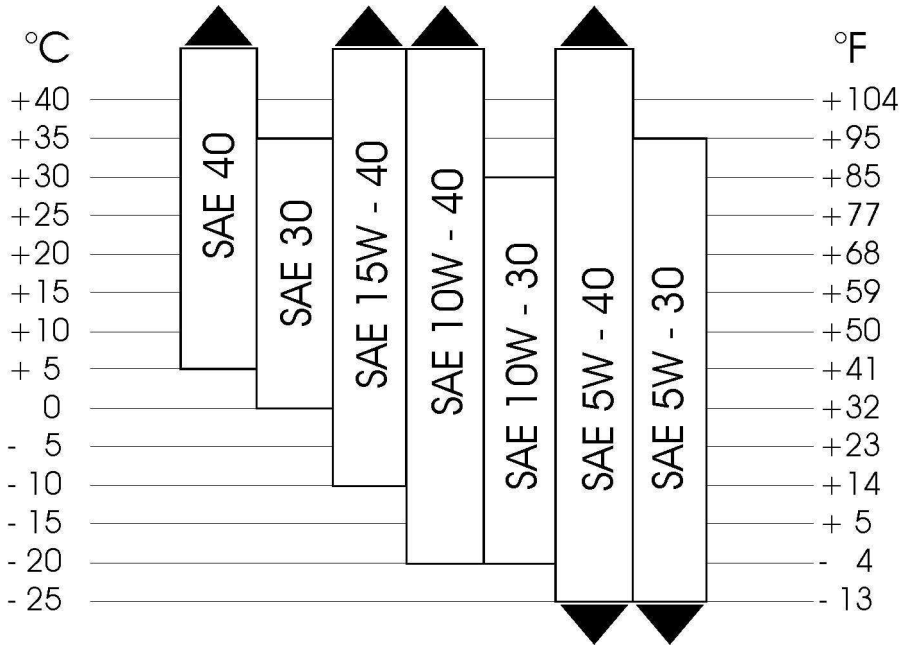
API CFReplace the specification API CD since 1994

API CGEngine oil for highest demands, turbo-tested

For the Fischer Panda Generator the API CF Oil is needed.

| Engine oil type | |
|---|---|
| over 25℃ | SAE30 or SAE10W-30<br>SAE10W-40 |
| 0℃ to 25℃ | SAE20 or SAE10W-30<br>SAE10W-40 |
| below 0℃ | SAE10W or SAE10W-30<br>SAE10W-40 |

*Fig. 8.5.1-1: Temp. range of the SAE classes*




## 8.6 Coolant specifications

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

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

| Engine coolant automotive industry Product description | |
|---|---|
| Product name | GLYSANTIN ® PROTECT PLUS / G48 |
| Chemical nature | Monoethylenglycol with inhibitors |
| Physical form | Liquid |

| Chemical and physical properties ..... | | |
|---|---|---|
| Reserve alkalinity of 10ml | ASTM D 1121 | 13 – 15 ml HCl 01 mol/l |
| Density, 20℃ | DIN 51 757 procedure 4 | 1,121 – 1,123 g/ $cm^3$ |
| Water content | DIN 51 777 part 1 | max. 3,5 % |
| pH-value undiluted | | 7,1 – 7,3 |

### 8.6.1 Coolant mixture ratio

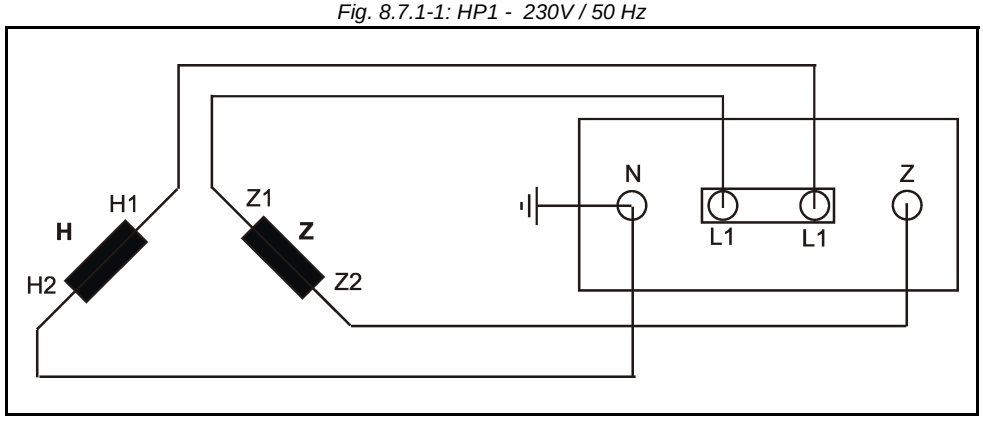
| **Water/antifreeze** | **Temperature** |
|---|---|
| 70:30 | -20℃ |

| Water/antifreeze | Temperature |
|---|---|
| 65:35 | -25℃ |
| 60:40 | -30℃ |
| 55:45 | -35℃ |
| 50:50 | -40℃ |

## 8.7 Types of coil

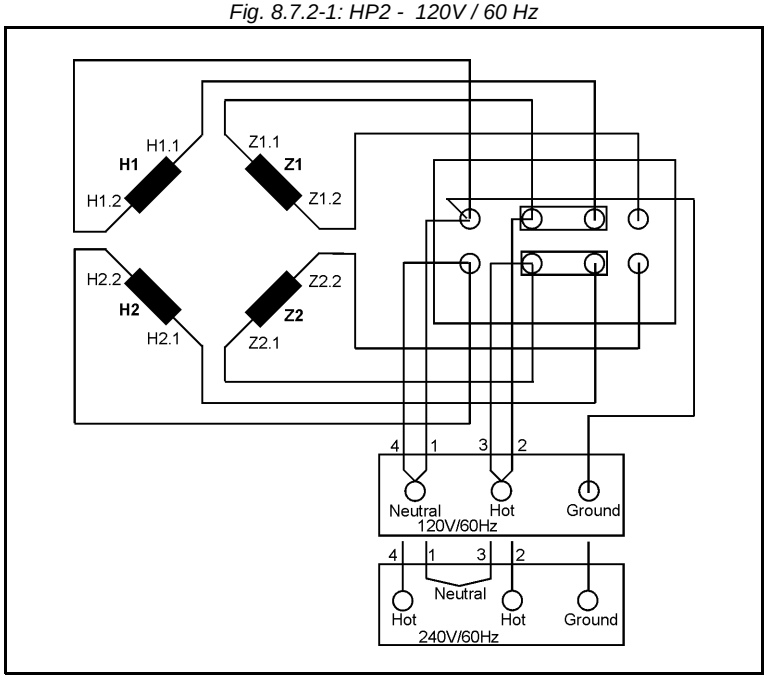
### 8.7.1 HP1 - 230V / 50 Hz

*Fig. 8.7.1-1: HP1 - 230V / 50 Hz*



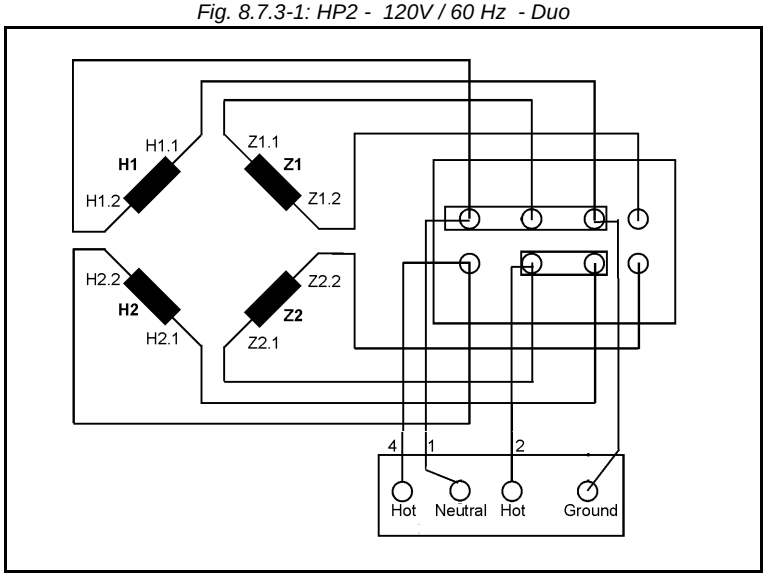

### 8.7.2 HP2 - 120V / 60 Hz

*Fig. 8.7.2-1: HP2 - 120V / 60 Hz*



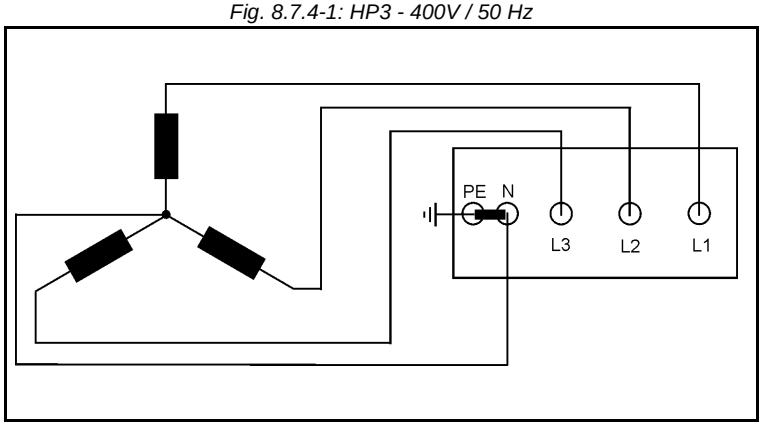

### 8.7.3 HP2 - 120V / 60 Hz - Duo

*Fig. 8.7.3-1: HP2 - 120V / 60 Hz - Duo*



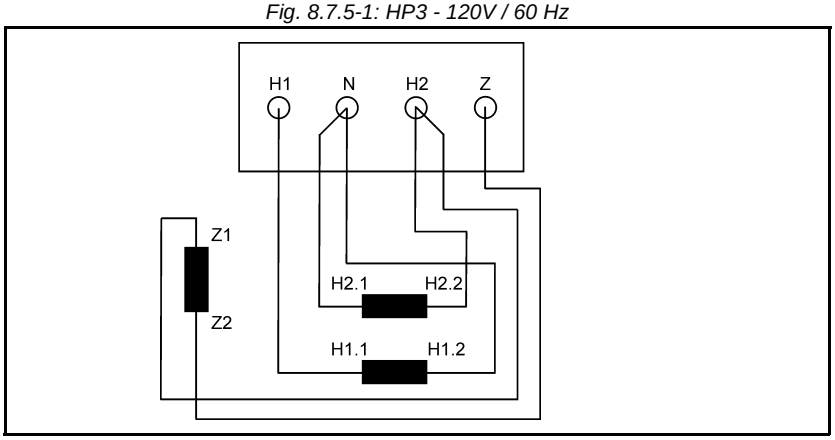

## 8.7.4 HP3 - 400V / 50 Hz

*Fig. 8.7.4-1: HP3 - 400V / 50 Hz*



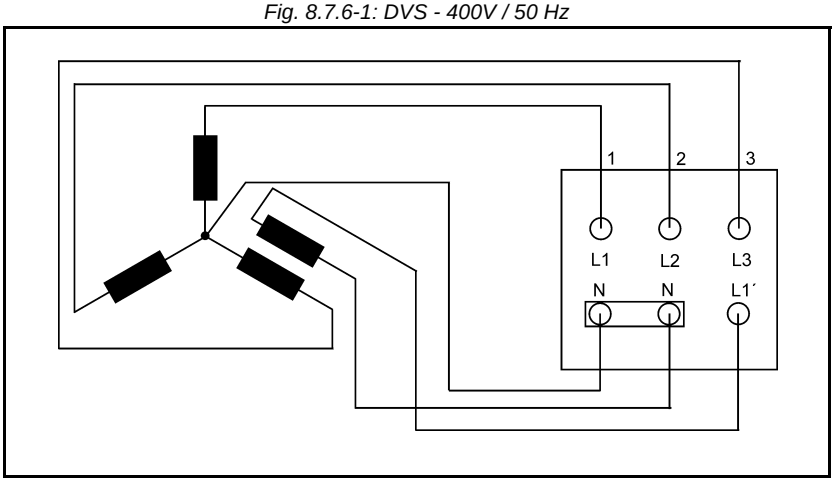

## 8.7.5 HP2 - 120V / 60 Hz

*Fig. 8.7.5-1: HP3 - 120V / 60 Hz*



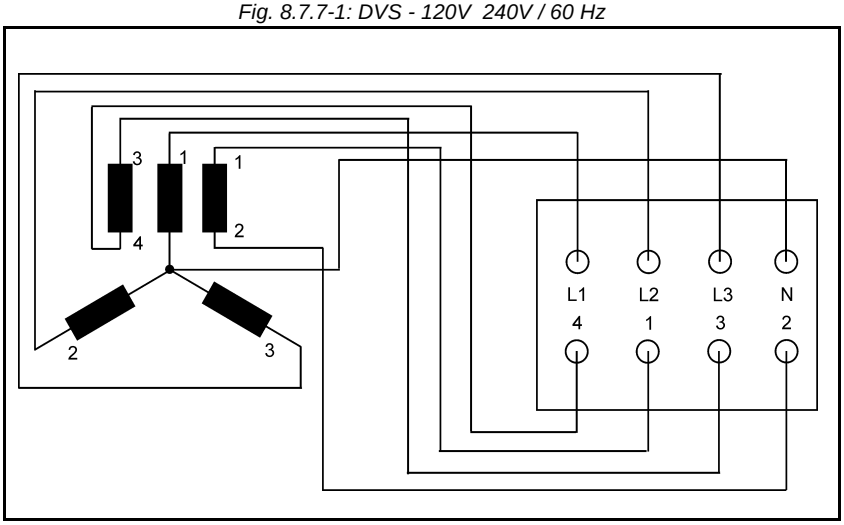

## 8.7.6 DVS - 400V / 50 Hz

*Fig. 8.7.6-1: DVS - 400V / 50 Hz*




## 8.7.7 DVS - 120V 240V / 60 Hz

*Fig. 8.7.7-1: DVS - 120V 240V / 60 Hz*




# 8.8 Resistor & inductance of the generator coil

*Fig. 8.8-1: Resistor + inductance generator coil HP1*

| | L-N[Ohm] | L-Z[Ohm] | | | L-N[Ohm] | L-Z[Ohm] |
|---|---|---|---|---|---|---|
| **Mains** | **120V / 60Hz** | | | **Mains** | **120V / 60Hz** | |
| Panda 8000 | ca. 0,7 | ca. 0,7 | | Panda 8000 | ca. 2,8 | ca. 2,8 |
| Panda 9000 | ca. 0,65 | ca. 0,65 | | Panda 9000 | ca. 2,8 | ca. 2,8 |
| Panda 12000 | ca. 0,45 | ca. 0,45 | | Panda 12000 | ca. 3,5 | ca. 3,5 |
| Panda 18 | ca. 0,2 | ca. 0,2 | | Panda 18 | ca. 3,2 | ca. 3,2 |
| Panda 24 | ca. 0,06 | ca. 0,06 | | Panda 24 | ca. 0,3 | ca. 0,3 |
| **Mains:** | **230V / 50Hz** | | | **Mains:** | **230V / 50Hz** | |
| Panda 8000 | ca. 0,9 | ca. 0,9 | | Panda 8000 | ca. 3,7 | ca. 3,7 |
| Panda 9000 | ca. 0,8 | ca. 0,8 | | Panda 9000 | ca. 3,7 | ca. 3,7 |
| Panda 12000 | ca. 0,3 | ca. 0,3 | | Panda 12000 | ca. 3,5 | ca. 3,5 |
| Panda 14000 | ca. 0,25 | ca. 0,25 | | Panda 14000 | ca. 2,3 | ca. 2,3 |
| Panda 18 | ca. 0,25 | ca. 0,25 | | Panda 18 | ca. 1,8 | ca. 1,8 |
| Panda 24 | ca. 0,17 | ca. 0,17 | | Panda 24 | ca. 1,3 | ca. 1,3 |
| Panda 30 | ca. 0,1 | ca. 0,1 | | Panda 30 | ca. 0,9 | ca. 0,9 |

*Fig. 8.8-2: Resistor 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 | ca. 0,7 | ca. 0,7 | ca. 0,7 | ca. 0,15 | ca. 0,15 | |
| Panda 9000 | ca. 0,65 | ca. 0,65 | ca. 0,65 | ca. 0,17 | ca. 0,17 | |
| Panda 12000 | ca. 0,45 | ca. 0,45 | ca. 0,45 | ca. 0,15 | ca. 0,15 | |
| Panda 18 | ca. 0,2 | ca. 0,2 | ca. 0,2 | ca. 0,05 | ca. 0,05 | |
| Panda 24 | ca. 0,06 | ca. 0,06 | ca. 0,06 | | | |
| **Mains:** | **230V / 50Hz** | | | | | |
| Panda 8000 | ca. 0,9 | | ca. 0,9 | | ca. 0,9 | ca. 0,4 |
| Panda 9000 | ca. 0,8 | | ca. 0,8 | | ca. 0,8 | ca. 0,4 |
| Panda 12000 | ca. 0,3 | | ca. 0,3 | | ca. 0,3 | ca. 0,2 |
| Panda 14000 | ca. 0,25 | ca. 0,25 | ca. 0,25 | ca. 0,12 | | |
| Panda 18 | ca. 0,25 | ca. 0,25 | ca. 0,25 | ca. 0,1 | | |
| Panda 24 | ca. 0,17 | ca. 0,17 | ca. 0,17 | ca. 0,1 | | |
| Panda 30 | ca. 0,1 | ca. 0,1 | ca. 0,1 | ca. 0,08 | | |

*Fig. 8.8-3: 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 | ca. 2,8 | ca. 2,8 | ca. 2,8 | ca. 0,8 | ca. 0,8 | |
| Panda 9000 | ca. 2,8 | ca. 2,8 | ca. 2,8 | | ca. 0,9 | ca. 0,9 |
| Panda 12000 | ca. 3,5 | ca. 3,5 | ca. 3,5 | ca 1,0 | ca. 1,0 | |
| Panda 18 | ca. 3,2 | ca. 3,2 | ca. 3,2 | | ca. 0,4 | ca. 0,4 |
| Panda 24 | ca. 0,3 | ca. 0,3 | ca. 0,3 | | | |
| **Mains:** | **230V / 50Hz** | | | | | |
| Panda 8000 | ca. 3,7 | ca. 3,7 | ca. 3,7 | ca. 2,3 | | |
| Panda 9000 | ca. 3,7 | ca. 3,7 | ca. 3,7 | ca. 2,3 | | |
| Panda 12000 | ca. 3,5 | ca. 3,5 | ca. 3,5 | ca. 2,3 | | |
| Panda 14000 | ca. 2,3 | ca. 2,3 | ca. 2,3 | ca. 1,5 | | |
| Panda 18 | ca. 1,8 | ca. 1,8 | ca. 1,8 | ca. 1,1 | | |
| Panda 24 | ca. 1,3 | ca. 1,3 | ca. 1,3 | ca. 0,8 | | |
| Panda 30 | ca. 0,9 | ca. 0,9 | ca. 0,9 | ca. 0,6 | | |

## 8.9 Voltage values stator coil

*Fig. 8.9-1: Voltage values stator coil HP3*

| 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 | |

*Fig. 8.9-2: Voltage values stator coil HP1*

| 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 | |

*If your generator is not mentioned, ask your local Fischer Panda Dealer for the technical datas coil.*

Power - wherever you are

Manual


# Generator Control Panel P6+

12V version - 21.02.02.046H

24V special version - 21.02.02.047H

Option automatic adapter - 21.02.02.016H

Option master-slave adapter - 21.02.02.015H

Fischer Panda GmbH

# Current revision status P6+ manual

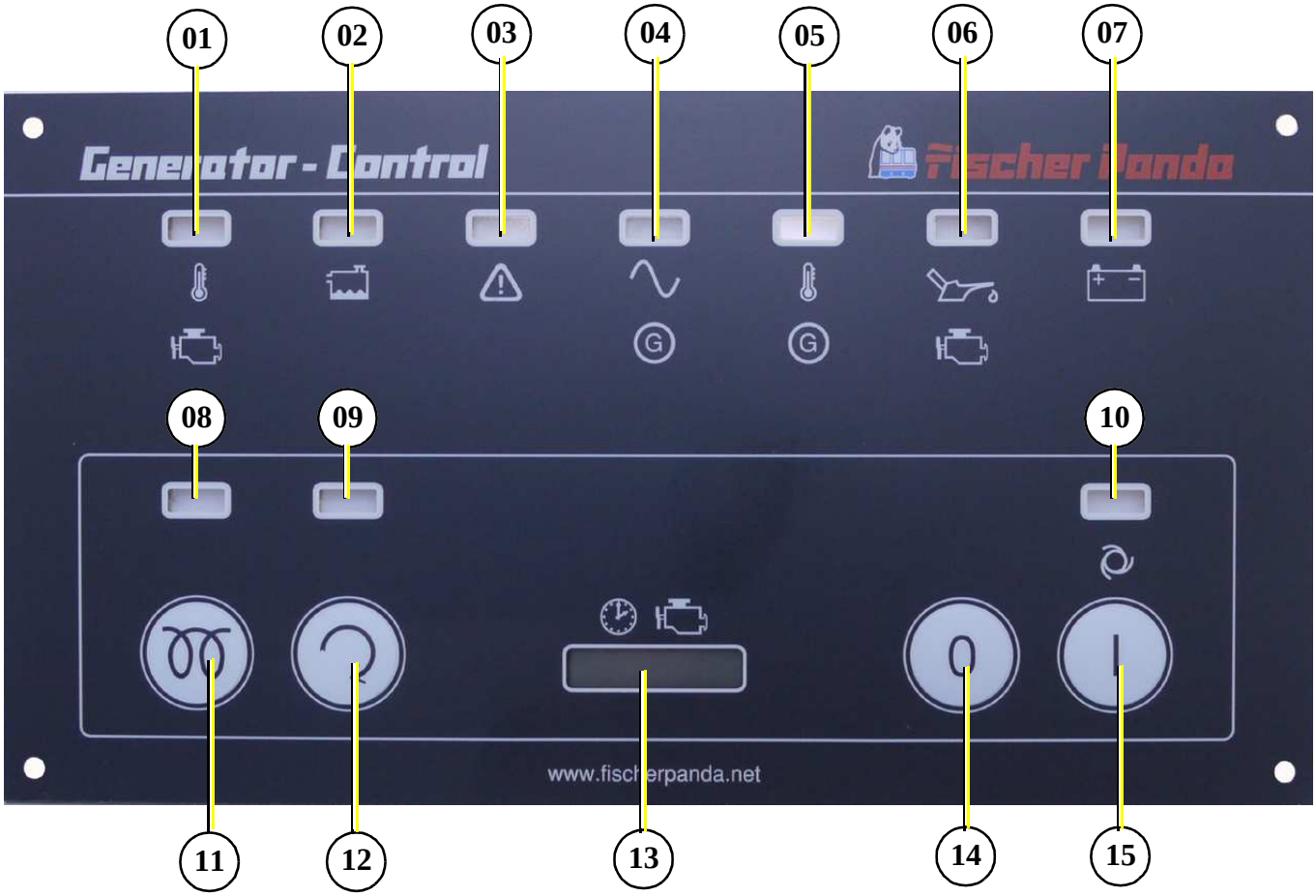
| | Document |
|---|---|
| **Actual:** | Panel Generator Control P6+ RE0703_Kunde_eng.R06.1_3.5.11 |
| **Replace:** | Panel Generator Control P6+ RE0703_Kunde_eng.R06 |

| Revision | Page |
|---|---|
| Upgrade the whole manual | |
| Safety instruktion See valve added | |
| Hole pattern changed | |
| New display foil | |
| | |
| | |

# 9. General operation

## 9.1 Panel Generator Control

*Fig. 9.1-1: Panel front*



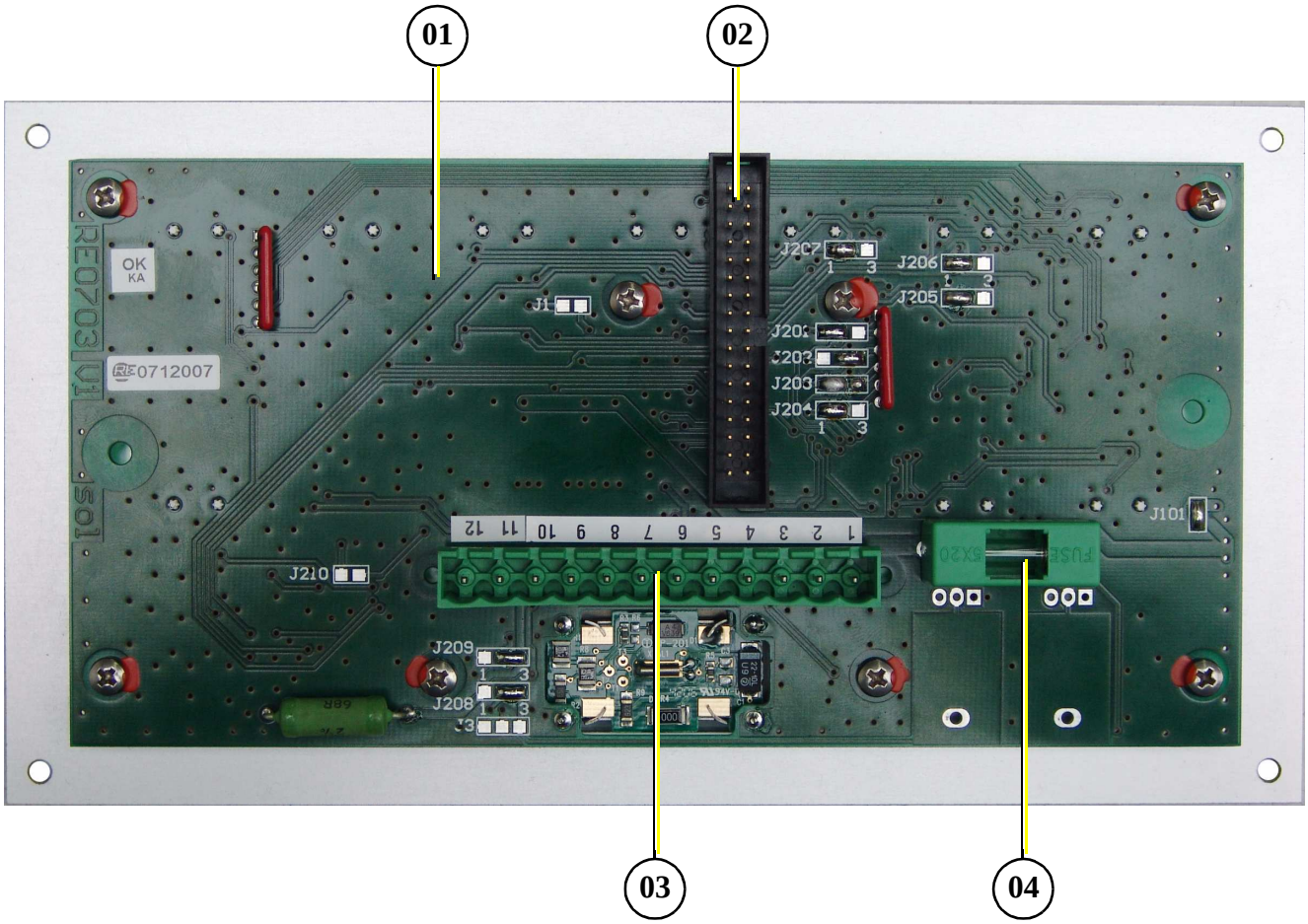

01. LED for coolant temperature red[1]
02. LED for waterleak red/yellow[1] (sensor optional)
03. LED for AC-voltage fault red/yellow[1]
04. LED for AC-voltage ok green[1]
05. LED for winding temperature red[1]
06. LED for oil pressure red[1]
07. LED for battery charge voltage fault green/red[1]
08. LED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

Fischer Panda Art. No. 21.02.02.009H

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

## 9.2 Rear view 12V-version

*Fig. 9.2-1: Panel rear view 12V-version*

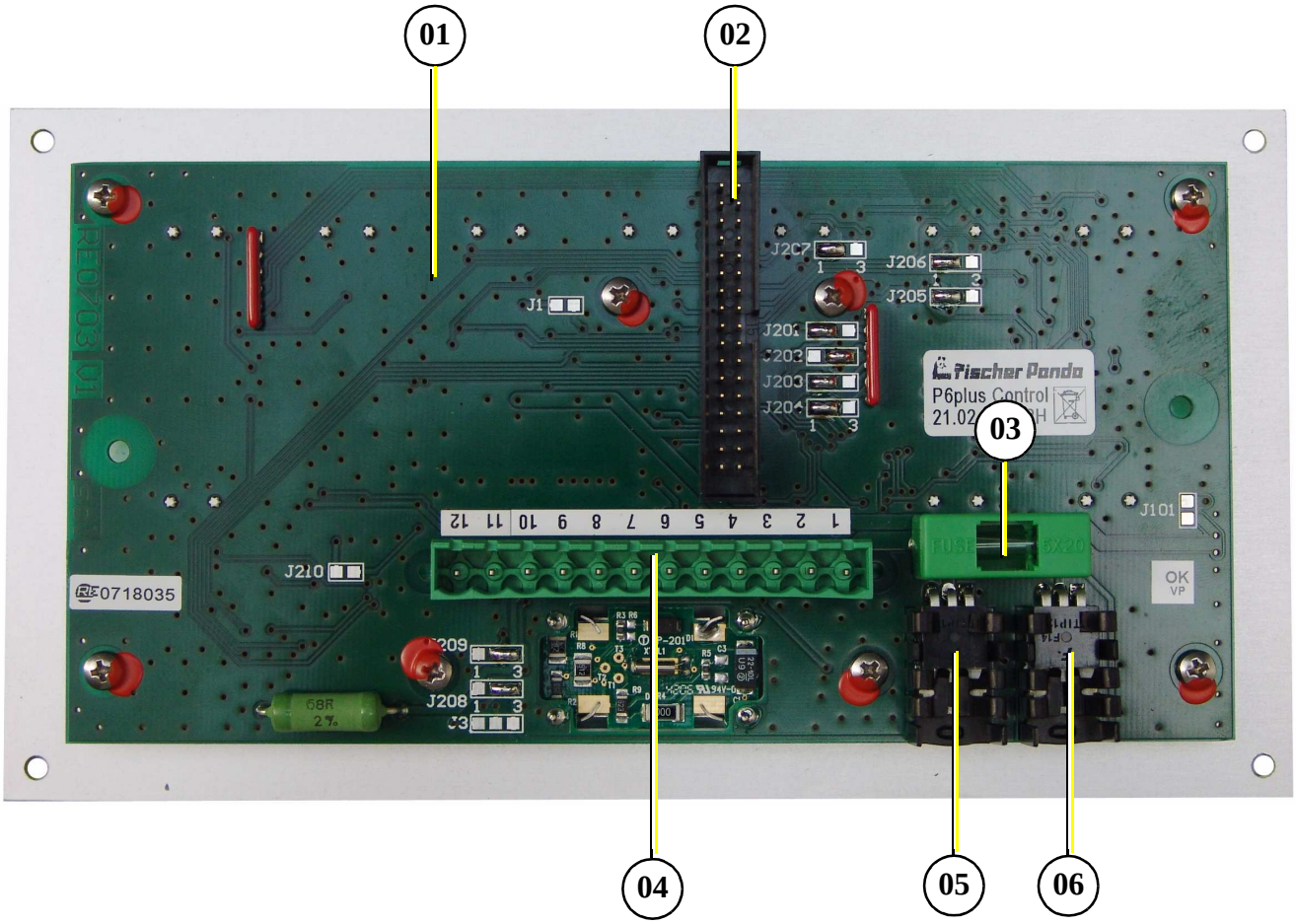



01. Control board
02. Terminal block (master-slave adapter: left row; automatic adapter: right row)
03. Terminals 1-12 (see Kapitel 9.4.2, “Terminal connections,” auf Seite 214)
04. Fuse 630mA slow-blow

Fischer Panda Art. No. 21.02.02.009H

## 9.3 Rear view 24V-version

*Fig. 9.3-1: Panel rear view 24V-version*




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 Kapitel 9.4.2, “Terminal connections,” auf Seite 214)
05. Linear controller 24V
06. Linear controller 24V

Fischer Panda Art. No. 21.02.02.012H

## 9.4 Installation of the remote control panel

### 9.4.1 Placement.

Install the remote control panel at a dry, good accessible and shady place.

Connect the remote control panel to the standard 12 core cable at the generator. (1:1)

### 9.4.2 Terminal connections

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

*Fig. 9.4.2-1: Terminal connections*

| Clamp no. | Clamp name | IN / OUT | Description |
|---|---|---|---|
| 1 | Vbat | IN | power supply + 12V (or optional 24V, must be adjusted by jumper) |
| 2 | GND | IN | power 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.<br>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.<br>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.<br>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.<br>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. |

*Notes:*
*Power rating of the output: max. 0,5A in continuous operation and briefly 1,0A.*
*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.*
*The output has a free wheeling diode, which short circuits negative voltages (related to GND).*
*The output has a Z-diode, which prevents a supply of positive voltage (related to GND) into the output.*

## 9.4.3 Function of the jumpers

*Fig. 9.4.3-1: Function of the solder jumper*

| 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 |

*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.*

## 9.4.4 Configuration and adjustment

### 9.4.4.1 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.

*Fig. 9.4.4.1-1: Settings of soldered jumper for this configuration (column Conf.)*

| 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 |
| 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 |

*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.*

### 9.4.4.2 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.

*Fig. 9.4.4.2-1: Einstellung der Lötjumper für diese Konfiguration (Spalte Konf.)*

| 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) |
| 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 |

*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.*

### 9.4.4.3 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.

*Fig. 9.4.4.3-1: Einstellung der Lötjumper für diese Konfiguration (Spalte Konf.)*

| 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) |
| 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 |

*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.*

### 9.4.4.4 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.

*Fig. 9.4.4.4-1: Einstellung der Lötjumper für diese Konfiguration (Spalte Konf.)*

| 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) |
| 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 |

*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.*

## 9.5 Starting preparation / Checks (daily)

### 9.5.1 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).

### 9.5.2 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).

# 9.6 Starting and stopping the generators

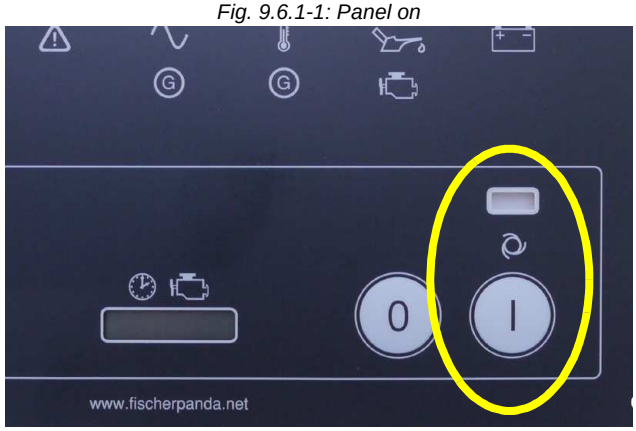
## 9.6.1 Starting the generator

**Danger for life! - The generator can be equipped with a automatik start device. This means the generator can be started by an external signal. To avoid an unexpected starting of the generator, the starter battery must be disconected before start working at the generator.**

**Warning!: Automatic start**

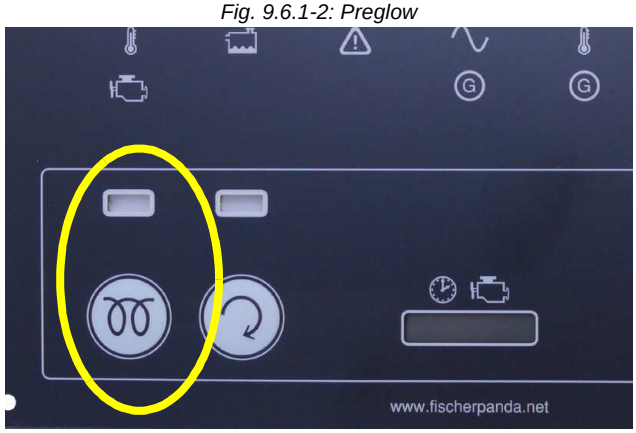
1. Press button „on“ (switch on).
   LED for "on“ = green.

*Fig. 9.6.1-1: Panel on*




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℃.

*Fig. 9.6.1-2: Preglow*




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℃ 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.

*Fig. 9.6.1-3: Start*

**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!*

**Attention!:**

## 9.6.2 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℃) 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.

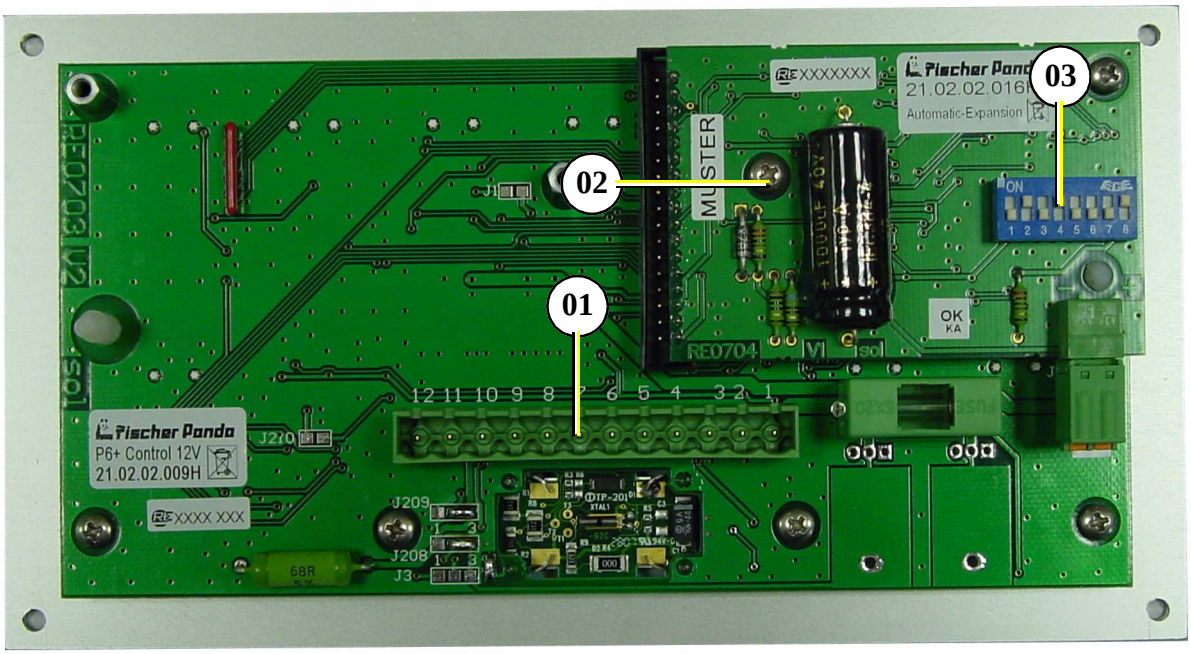
*Fig. 9.6.2-1: Stop*


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

**Attention!:**

## 9.7 Automatic adapter - optional

*Fig. 9.7-1: Panel 21.02.02.009H with Automatic adapter 21.02.02.016H*




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

Fischer Panda Art. No. 21.02.02.016H

### 9.7.1 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 power 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 power supply (generator the control panel must have been separate from the power supply for at least 60s).

### 9.7.2 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.

*Fig. 9.7.2-1: Data*

| **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% |

*Fig. 9.7.2-2: Settings*

| 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 |

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

**Attention:**

## 9.7.3 Terminal connections

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

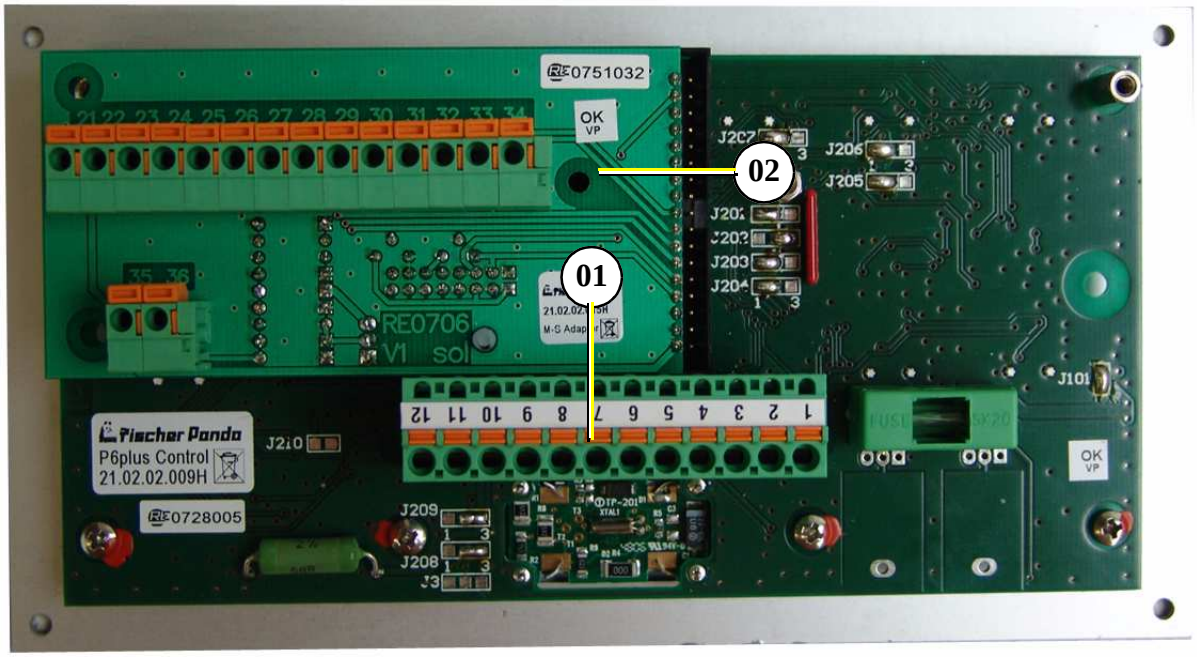
*Fig. 9.7.3-1: Terminal connections automatic adapter*

| Pin-no. | Pin-name | I / O | Description |
|---|---|---|---|
| 1 | VBF | O | power supply + (operation voltage behind fuse) |
| 3 | GND | O | power supply - (ground) |
| 5 | VBFS | O | power supply + switched (voltage Pin 1, with panel switched on) |
| 7 | 12V | O | power 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 | power supply - (ground) |
| 11 | GND | O | power 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 | power supply - (ground) |
| 19 | GND | O | power supply - (ground) |
| 21 | GND | O | power supply - (ground) |
| 23 | GND | O | power supply - (ground) |
| 25 | GND | O | power 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 | power supply - (ground) |

## 9.8 Master-Slave adapter - optional

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

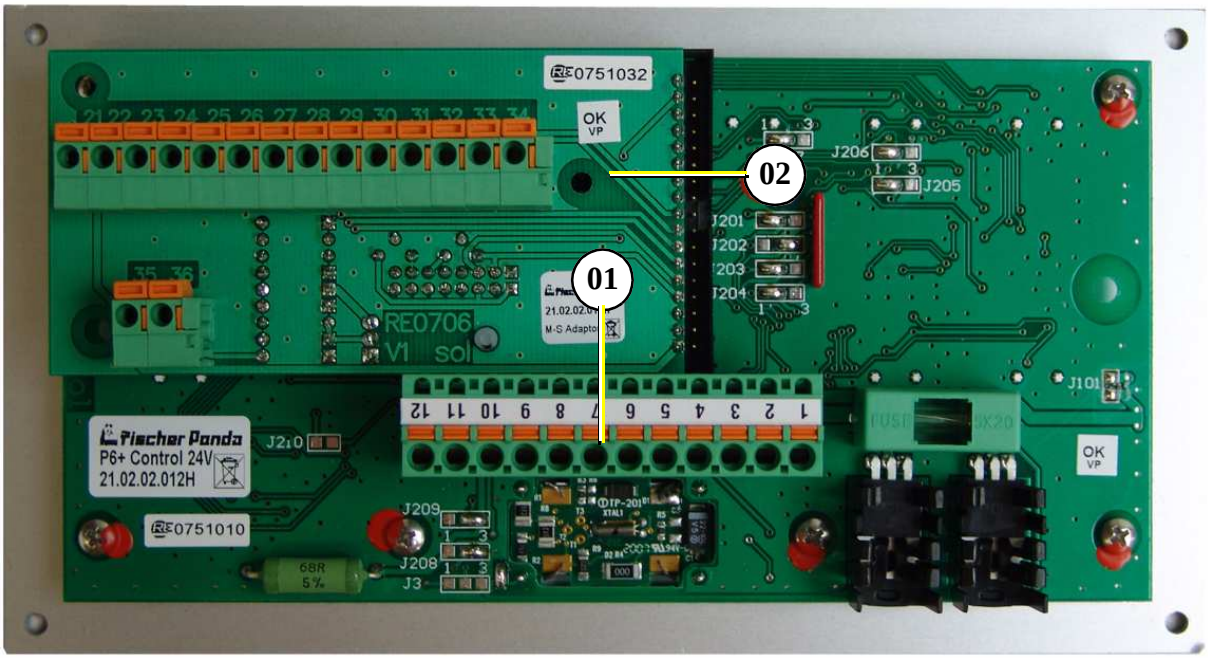
*Fig. 9.8.1-1: Panel 21.02.02.009H with master-slave adapter 21.02.02.015H*




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

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

*Fig. 9.8.2-1: Panel 21.02.02.012H with master-slave adapter 21.02.02.015H*




01. Main terminals
02. 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.

## 9.8.3 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.

## 9.8.4 Fuse:

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

## 9.8.5 Terminal connections

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

*Fig. 9.8.5-1: Terminal connections terminal X2 (IN/OUT from the view of the master-control-panel)*

| Pin-No. | Pin-name | IN / OUT | Description |
|---|---|---|---|
| 21 | VBF | O | power supply + (operation voltage behind fuse 12Vdc or 24Vdc depending on system) |
| 22 | GND | O | power 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 |
| 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 | power supply + switched (otherwise like 21, VBF) |

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.

### 9.8.5.2 Terminal X3

*Fig. 9.8.5.2-1: Terminal connections 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) |

*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.*

## 9.8.6 Configuration and adjustment

### 9.8.6.1 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.

*Fig. 9.8.6-1: Settings of soldered jumper for this configuration (column Conf.)*

| 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 |

*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.*

## 9.8.6.2 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.

*Fig. 9.8.6.2-1: Settings of soldered jumper for this configuration (column Conf.)*

| 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 |

*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,*

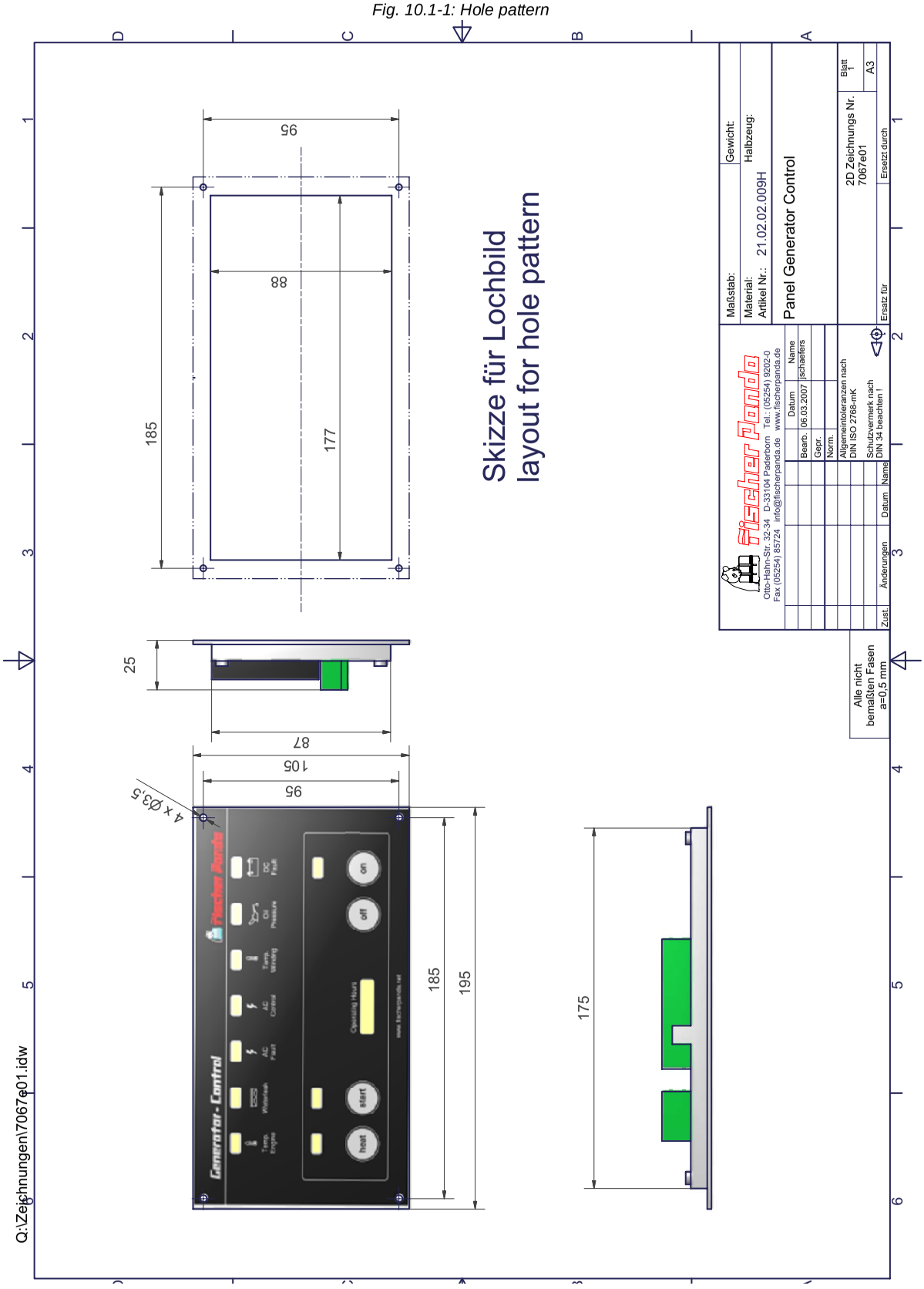
*(1): Equivalent resistance for load control lamp e.g. for use with three-phase alternator also integrated automatic controller of Bosch. The resistance value is 68Ω 3W, i.e. only for 12V.*

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

# 10. Measurements

## 10.1 Hole pattern

*Fig. 10.1-1: Hole pattern*



Leere Seite / Intentionally blank