Fischer Panda®

Power wherever you are™

Manual

Panda 4800i PMS

230 V - 50 Hz / 3,8 kW

Super silent technology

Fischer Panda GmbH

Current revision status

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Dear Customer,

Thank you for purchasing a Fischer Panda Generator and choosing Fischer Panda as your partner for mobile power on board. 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 on board, 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 tasks 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

1.1 Safety first!

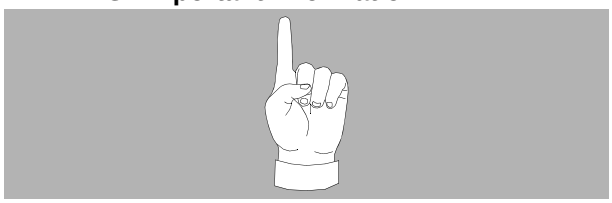
These symbols are used throughout this manual and on labels on the machine itself to warn of the possibility of personal injury of lethal danger during certain maintenance work or operations. Read these instructions carefully.

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

Danger for life! Working at a running generator can result in severe personal injury.

The generator can be equipped with a automatic start device. This means, an external signal may trigger an automatic start-up. To avoid an unexpected starting of the generator, the starter battery must be disconnected before working at the generator.

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 of hearing damages.

WARNING: Hearing damage

Warning of magnetic field.

WARNING: Magnetic field

Warning of overpressure.

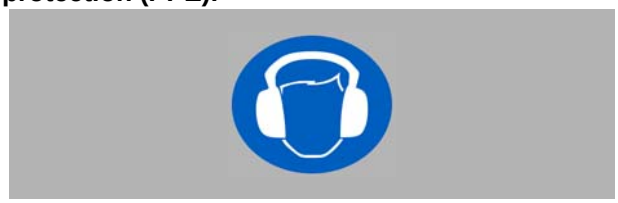
WARNING: Overpressure

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 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 battery bank 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 life span 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 °C (61 °F) 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“, as 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 °C, 195 °F.

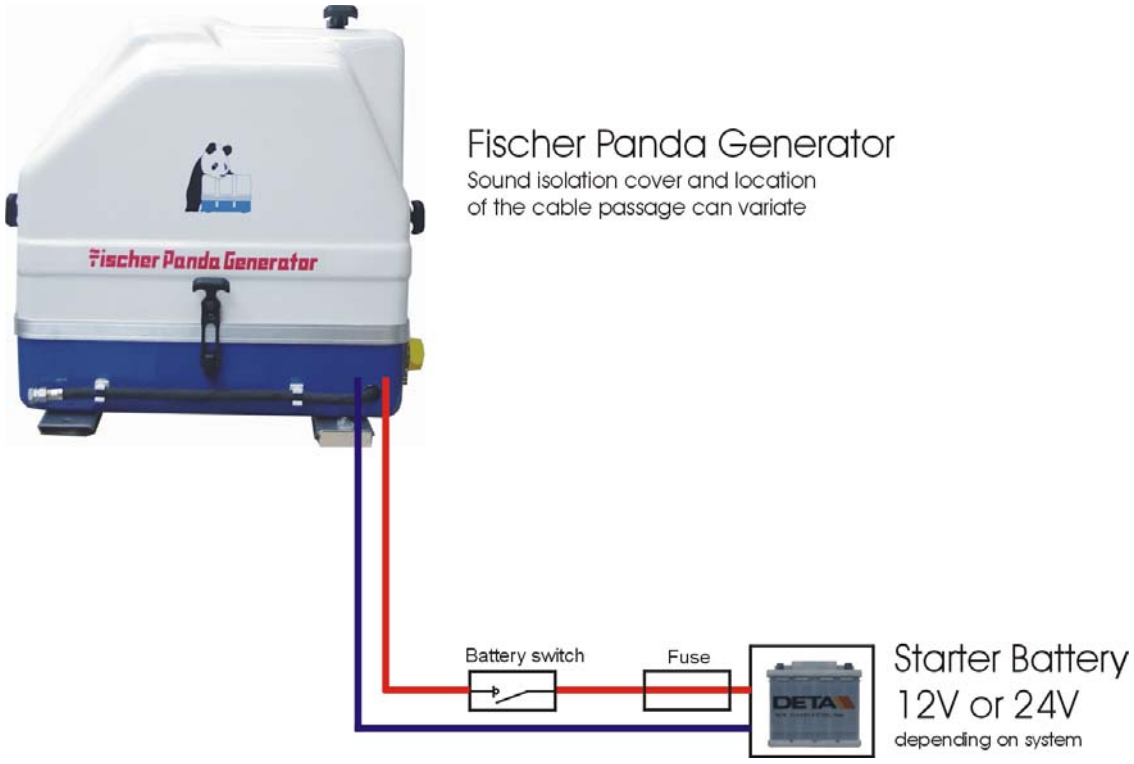
Install the battery cables in such a way that the insulation cannot be removed by chafing or other mechanical stresses.

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

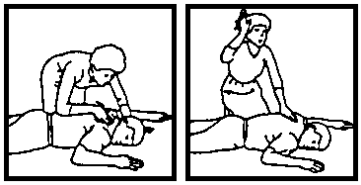
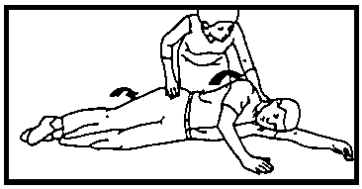
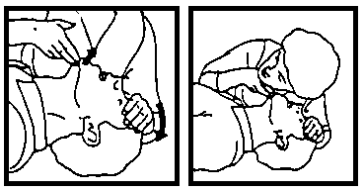
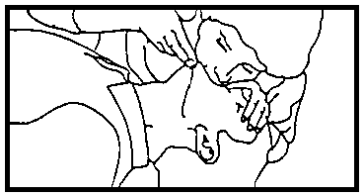
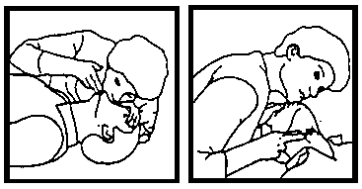


	First Aid in case of accidents by electrical shocks 5 Safety steps to follow if someone is the victim of electrical shock	
1	Do not touch the injured person while the generator is running.	
2	Switch off the generator immediately.	
3	If you cannot switch off the generator, pull, push, or lift the person to safety using a wooden pole, rope or some nonconducting material.	
4	Call an emergency doctor as soon as possible.	
5	Immediately start necessary first aid procedures.	

2.7 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

3.1 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 mechanical 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 (sometimes external) components, the remote control panel and the VCS (voltage control system).

Sufficient amount of fuel and combustion air is necessary for this process. Arising exhaust and heat must be conducted according to the specification.

If the electrical power is fed to a local net, the regulations and installation instructions of the system operator and the regional authorities with reference to the power network/shipboard power supply system must be respected. Safety applications and safety devices (including lightening conductor, personal protection switch, ect.) have to be installed.

Misapplication 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 circuit, ect. 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!

3.2 Purpose of the manual and description of the definitions of the trained persons/operators/users

This manual contains the working instructions and operating guidelines 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. It 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 should be in accordance with the law as required by the country and special situation. All work has to be undertaken according to the state of the technology.

3.2.1 Trained persons

Qualified persons for the mechanical components are motor mechanics or persons with similar qualification and training.

Trained persons for the electrical components are electricians or persons with similar qualification and training.

After the installation the trained person has to instruct the owner about the operation and maintenance of the generator. This must include the hazards of the generator use.

3.2.2 Operator

The operator is responsible for the operation of the generator.

After the installation, the operator must be instructed concerning the operation and maintenance of the generator. This has to include the hazards during operation of the generator, different operating conditions, and instructions for the maintenance.

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

3.2.3 User

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

The operator has to ensure that the user has read and understood the manual and that all hazard notes and safety instructions are respected. The user must be instructed by the operator regarding his activity at the generator, especially concerning the maintenance.

3.3 Components of the i system

1. Panda i PMS Generator

Permanent-Magnet-Generator

representative picture

Fig. 3.3-1: Panda i generator

2. Panel Panda iControl with electronic board at the generator

representative picture

Fig. 3.3-2: iControl panel

3. Panda PMGi Inverter AC/AC

representative picture

Fig. 3.3-3: PMGi inverter

4. Fischer Panda manual

The Fischer Panda manual comprises the following components:

a.- Transparent envelope with general information, warranty terms, installation certificates, and service list.

b.- Generator manual

c.- Spare parts catalogue „Installation & Service Guide“

d.- Engine manual from the engine manufacturer

e.- Generator circuit diagram

representative picture

Fig. 3.3-4: Manual

3.4 Range of operation

Reliable power supply on sailing boats.

3.5 Panda transport box

3.5.1 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

3.5.2 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 at the bottom of the transport box
5. Remove the sidewalls
6. Open the generator attachment

3.6 Opening the MPL sound insulation capsule

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

Fig. 3.6-1: Sound insulation capsule, side part

Closure locked

Fig. 3.6-2: Closure locked

Closure open

Fig. 3.6-3: Closure open

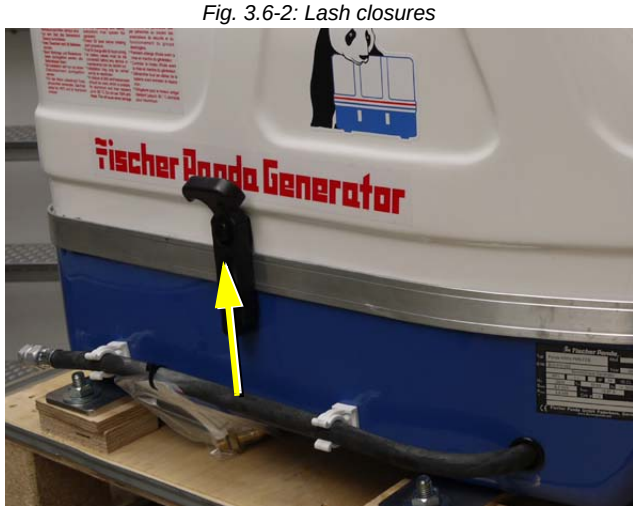
3.6.1 Opening the GFK sound insulation capsule

GFK sound insulation capsule with lash closures

Fig. 3.6-1: Lash closures

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

Fig. 3.6-2: Lash closures



3.7 Transport and Loading/Unloading

3.7.1 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.

3.7.2 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. 3.7-1: Lifting yoke (example)

3.8 Special Service Instructions and Measures for Extended Machine Downtimes and Decommissioning

The decommissioning and storage must be undertaken and proved regarding the operation and storage situation.

Note:

Fischer Panda takes no responsibilty for damages through wrong decommissioning and storage.

Downtimes are categorised in the following groups:

- Short downtime (1 to 3 months)
- Medium term downtime / hibernation (3 to 6 months)
- Extended downtime / decommissioning (more than 6 months)

3.8.1 Instructions for the starter battery for extended downtimes

Starter batteries

Note: Information starter battery

Self-discharge of batteries is a physical and chemical process and cannot be avoided even if the battery is disconnected

- For extended downtimes, the battery shall be disconnected from the genset.
- Charge battery regularly. Observe instructions of the battery manufacturer.

Depending on the battery type, check the acid level before charging and refill each cell up to the marking using distilled water as necessary.

Modern starter batteries are typically maintenance-free.

Deep discharge will damage the battery and can render it unusable.

Keep battery clean and dry. Clean battery poles (+ and -) and terminals regularly and coat with acid-free and acid-resistant grease. During assembly, ensure good contact of the terminal connections.

General limits for lead-acid batteries:

2.1 V / cell corresponds with full battery (charged).

1.95 V / cell corresponds with empty battery - recharge.

For a 12 V battery, the following applies:

- 11.7 V lower open-circuit voltage (battery empty), recharge battery.

- 12.6 V upper open-circuit voltage (full battery) - trickle charge full battery at 13.2 V.

For a 24 V battery, the following applies:

- 23.4 V lower open-circuit voltage (battery empty), recharge battery.

- 25.2 V upper open-circuit voltage (full battery) - trickle charge full battery at 26.4 V.

These values are based on a battery temperature of 20-25°C. Observe the instructions from the battery manufacturer.

Fischer Panda recommends:

- Install battery circuit breaker and switch to OFF on the machine. (Cutting the battery circuit.)
- Secure the battery plus terminal close to the battery.
- Regularly check contacts for corrosion.

Note: Starter battery recommendation

3.8.2 Measures for short downtimes

Short downtime (1 to 3 months)

- Measure battery charge status based on open-circuit voltage.
- During downtimes >7 days, disconnect battery (e.g. battery main switch to position 0).
- Check the battery within 2 months and allow the engine to warm up for min. 10 min.

3.8.3 Measures for medium term downtimes / hibernation

Medium term downtimes (3 to 6 months)

3.8.3.1 Courses for preservation:

- Check battery charge status and recharge regularly, roughly every 2 months, as necessary. Observe instructions of the battery manufacturer.
- Check cooling water anti-freeze level and refill as necessary.

  The anti-freeze agent must not be older than 2 years. The anti-freeze content shall be between 40 % and 60 % to ensure corrosion protection of the cooling water circuit. Top off coolant if necessary.

  If the cooling water is drained, e.g. after engine surface protection is applied, no water may remain inside the engine during the downtime. The control unit must be marked accordingly with a note specifying „NO COOLING WATER“.
- Drain engine oil as specified. Refill engine with preservative oil to the max. level on the oil dipstick.
- Drain diesel from tank and refill with a protective mixture (90 % diesel and 10 % preservative oil) (level to full).

Crank engine without start.

- Dismount V-belt as specified, wrap and store in a dry location. Protect against UV radiation.

Cover alternator apertures.

Cleaning fluids and preservatives must not enter the alternator. Risk of destroying the alternator.

Attention!

- Clean engine as per manufacturer's instructions.
- Spray engine parts and V-belt disks with preservative.

- Clean air filter housing and spray with preservative (metal housing only).
- Close off intake and exhaust apertures (e.g. with tape or end caps).

Before recommissioning, remove preservatives and protective measures.

Attention!

3.8.3.2 Measures for removing surface protection after medium term downtimes (3 to 6 months).

- Check battery charge status and recharge if necessary. Observe instructions of the battery manufacturer.
- Check cooling water anti-freeze level and cooling water level and refill as necessary.
- Drain engine oil. Replace oil filter and engine oil as per the specification.
- Remove preservatives from the engine with petroleum spirit.
- Degrease V-belt disks and mount V-belt according to instructions. Check V-belt tension!
- If applicable, open turbocharger oil pressure line and fill clean engine oil into channel.
- Hold engine stop lever in zero delivery position and crank engine manually several times.
- Clean air filter housing with petroleum spirit, check air filter and replace if necessary.
- Remove covers from exhaust aperture and intake apertures.
- Connect battery. Close battery main switch.
- Hold stop lever on generator motor in neutral position and crank starter for approx. 10 seconds. Then, pause for 10 seconds. Repeat this procedure 2 times.
- Perform visual check of the generator similar to initial commissioning and start up generator.

3.8.4 Measures for extended downtimes / decommissioning

Downtimes (more than 6 months)

3.8.4.1 Courses for preservation:

- Check battery charge status and recharge regularly, roughly every 3 months, as necessary. Observe instructions of the battery manufacturer.
- Check cooling water anti-freeze level and refill as necessary.

  The anti-freeze agent must not be older than 2 years. The anti-freeze content shall be between 40 % and 60 % to ensure corrosion protection of the cooling water circuit. Top off coolant if necessary.

  If the cooling water is drained, e.g. after engine surface protection is applied, no water may remain inside the engine during the downtime. The control unit must be marked accordingly with a note specifying „NO COOLING WATER“.
- Drain engine oil as specified. Refill engine with preservative oil to the max. level on the oil dipstick.
- Drain diesel from tank and refill with a protective mixture (90 % diesel and 10 % preservative oil) (level to full).

Crank engine without start.

- Dismount V-belt as specified, wrap and store in a dry location. Protect against UV radiation.
- Disconnect battery. Coat terminals with acid-free grease.

Cover alternator apertures. **Attention!**

Cleaning fluids and preservatives must not enter the alternator. Risk of destroying the alternator.

- Clean engine as per manufacturer's instructions.
- Spray engine parts and V-belt disks with preservative.
- Clean air filter housing and spray with preservative (metal housing only).
- Spray preservative on intake and exhaust side of exhaust turbocharger (where applicable) and reconnect the lines.
- Remove valve cover and spray inside of valve cover, valve stems, springs, rocker, etc. with preservative oil.
- Remove injection nozzle and coat cylinder surface with preservative oil. Hold stop lever in zero delivery position and crank engine manually several times. Refit injection nozzles with new seals (at an operation hour of min. 100 hours after the last change). Observe torque values.
- Spray radiator cover and tank cover or radiator cover on expansion tank lightly with preservative oil and refit.
- Close off intake and exhaust apertures (e.g. with tape or end caps).

For storage for more than 12 months, the preservation measures shall be checked annually and supplemented as necessary. **Note:**

Before recommissioning, remove preservatives and protective measures. **Attention!**

3.8.4.2 Measures for removing surface protection after extended downtimes / recommissioning (over 6 months):

- Check battery charge status and recharge if necessary. Observe instructions of the battery manufacturer.
- Check cooling water anti-freeze level and cooling water level and refill as necessary.
- Drain engine oil. Replace oil filter and oil as per the specification.
- Remove preservatives from the engine with petroleum spirit.
- Degrease V-belt disks and mount V-belt according to instructions. Check V-belt tension!
- If applicable, open turbocharger oil pressure line and fill clean engine oil into channel.
- Hold engine stop lever in zero delivery position and crank engine manually several times.
- Clean air filter housing with petroleum spirit, check air filter and replace if necessary.
- Remove covers from exhaust aperture and intake apertures.
- Connect battery. Close battery main switch.
- Hold stop lever on generator motor in neutral position and crank starter for approx. 10 seconds. Then, pause for 10 seconds. Repeat this procedure 2 times.
- Perform visual check of the generator similar to initial commissioning and start up generator.

Fischer Panda recommends: **Note:**

After extended downtimes, a full 150 h inspection as per the inspection list should be performed.

3.9

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4. The Panda Generator

4.1 Type plate at the Generator

Fig. 4.1-1: Type plate at the generator - Picture shows 4000s SC

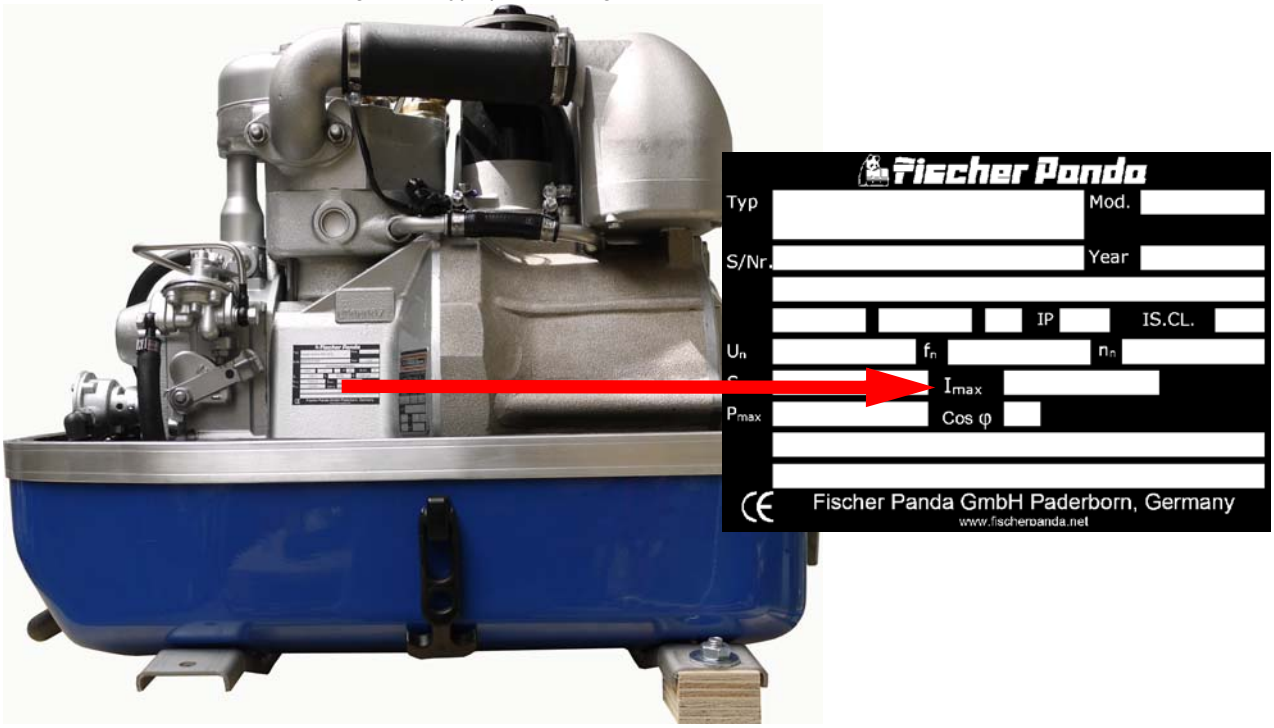
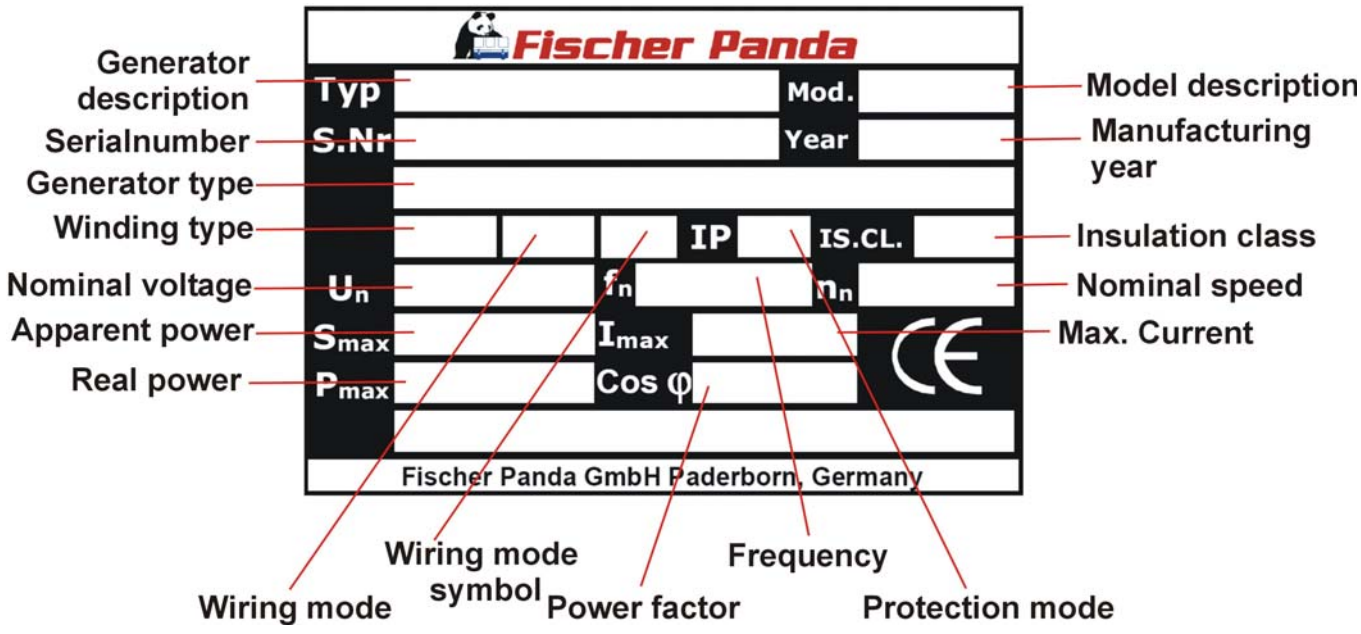


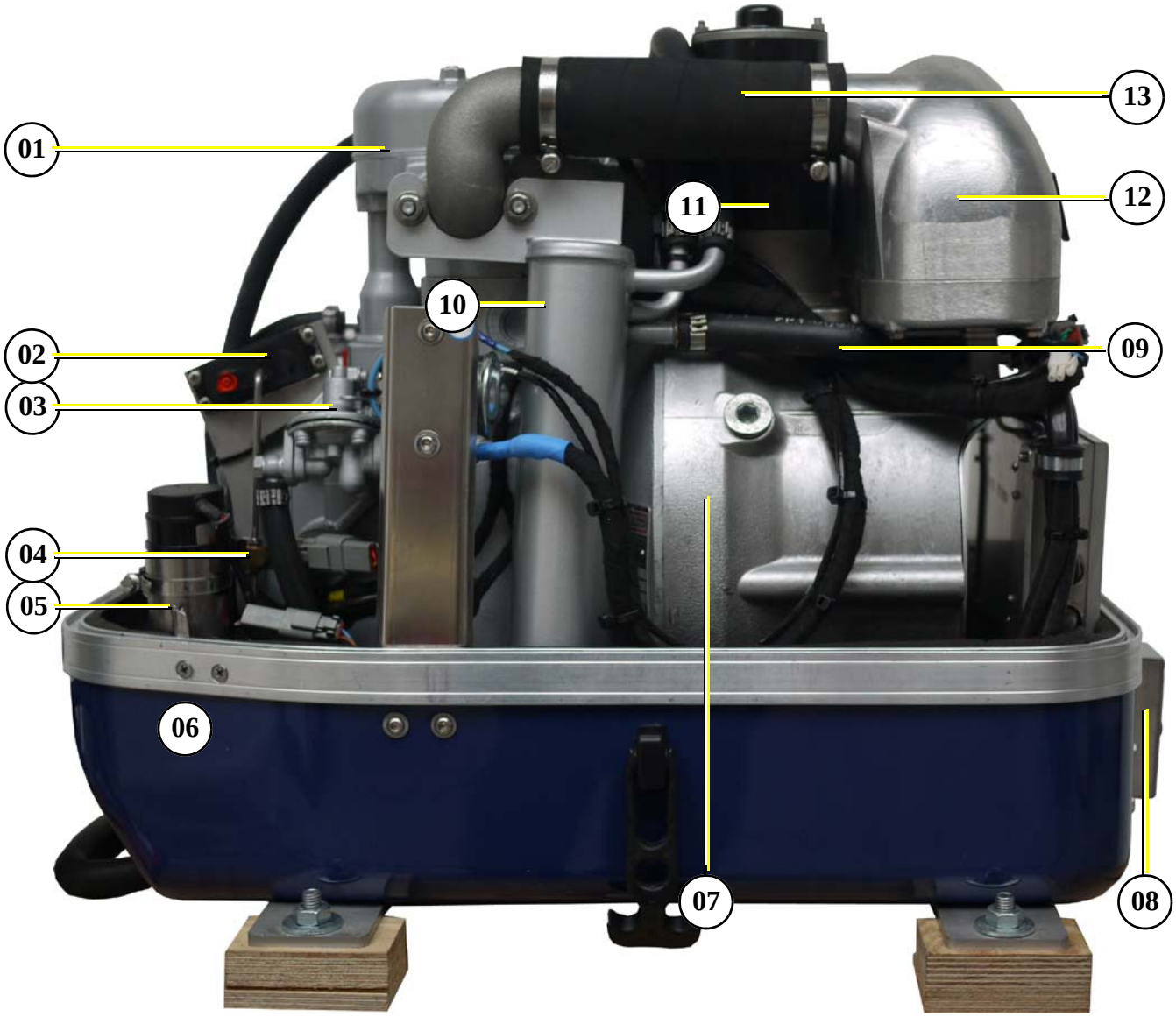
Fig. 4.1-2: Description type plate



4.2 Description of the Generator 4800i PMS

4.2.1 Right Side View 4800i PMS

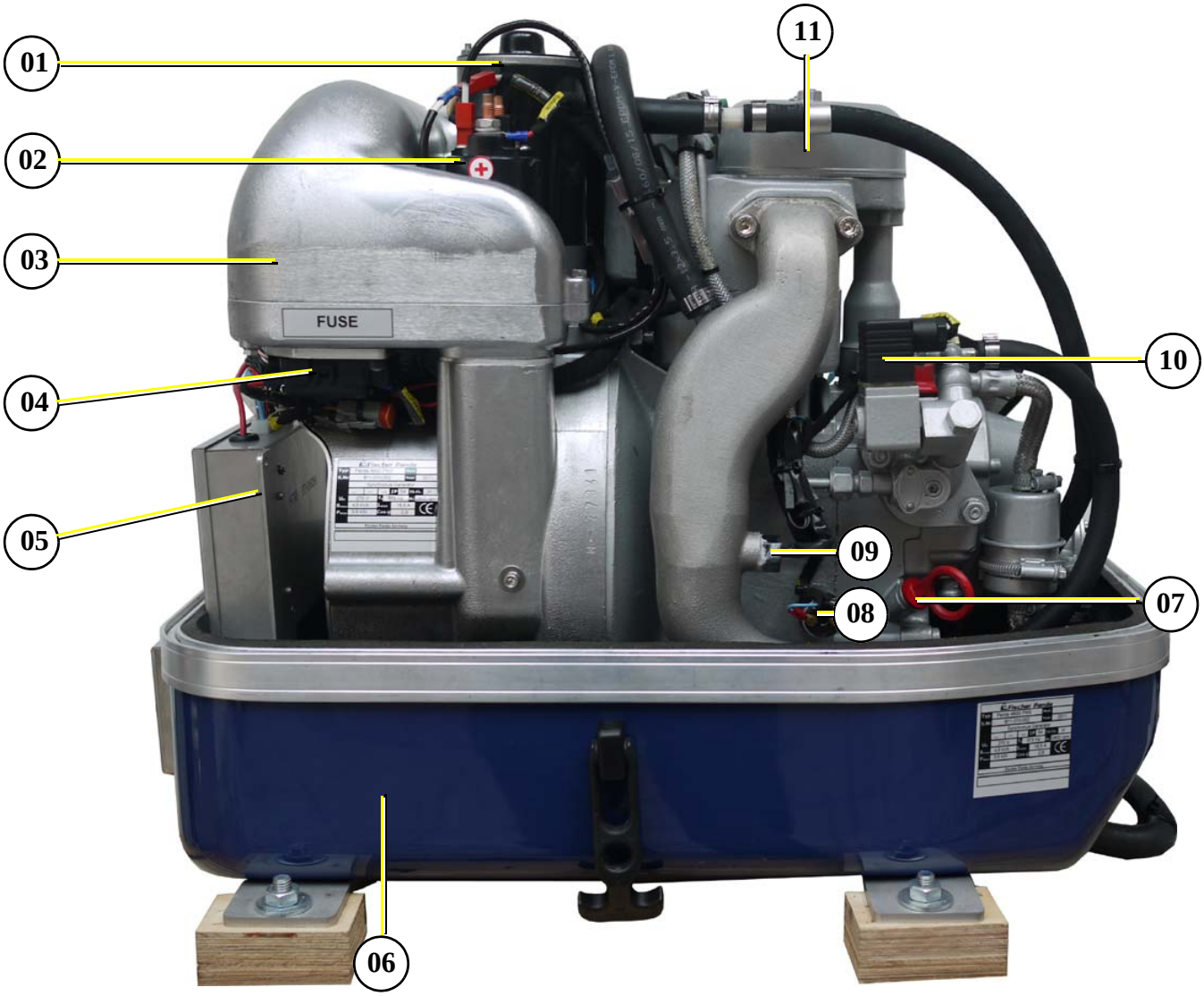
Fig. 4.2.1-1: Right side view



01) Cylinder head
02) Actuator
03) Mechanical fuel pump
04) Speed adjust lever
05) Fresh water pump
06) Sound cover base part
07) Generator housing with coil
08) Combustion air intake
09) Cooling water out at winding
10) Heat exchanger
11) Starter motor
12) Generator air filter housing
13) Air suction hose

4.2.2 Left Side View 4800i PMS

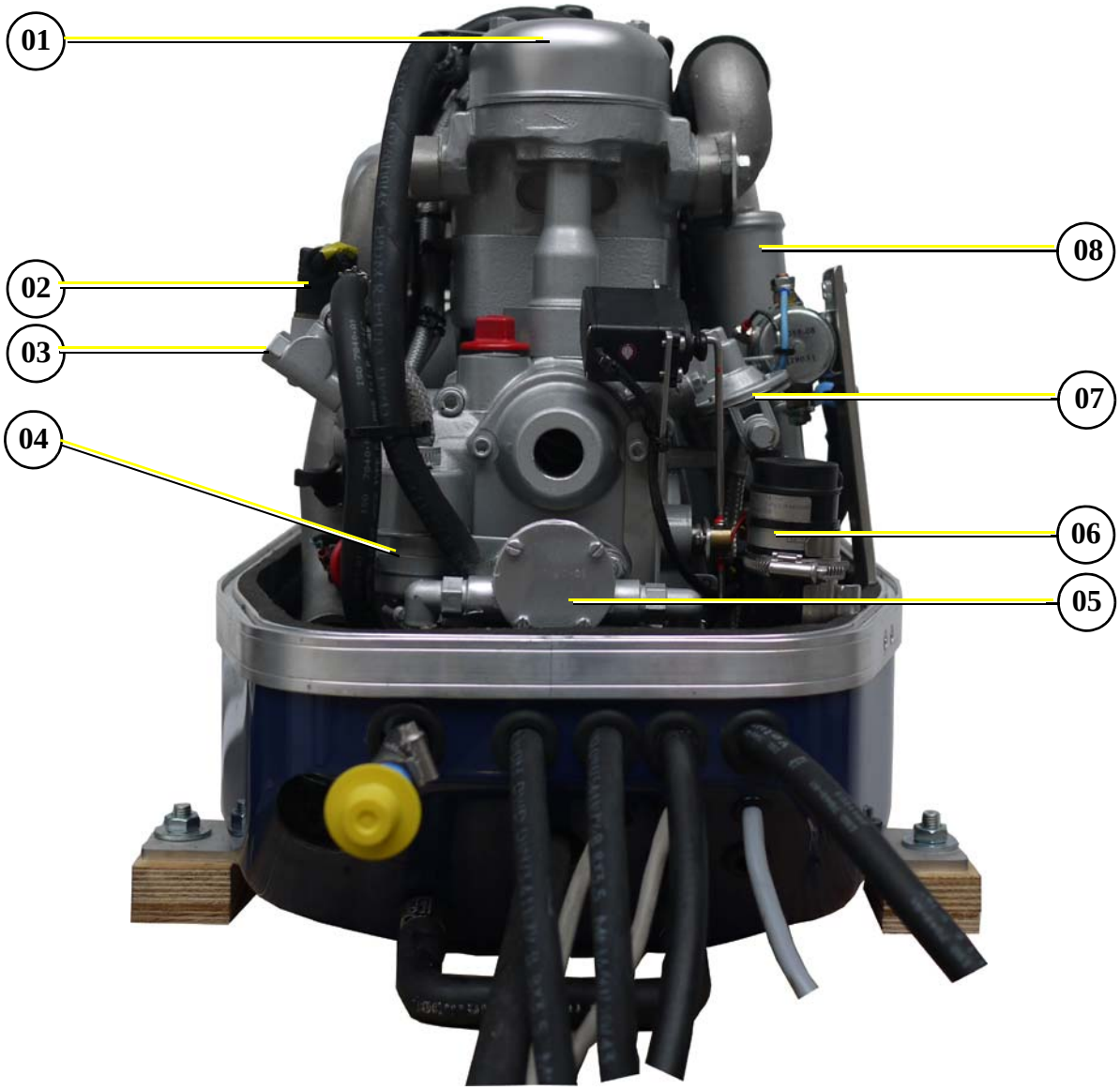
Fig. 4.2.2-1: Left side view



01) Starter motor
02) Solenoid switch for starter motor
03) Generator air filter housing
04) Fuse DC
05) Plug for optional electrical fuel pump inside box)
06) Sound cover base part
07) Oil dipstick
08) Oil pressure switch
09) Thermo switch exhaust elbow
10) Fuel solenoid valve
11) Cylinder head/valve cover

4.2.3 Front View 4800i PMS

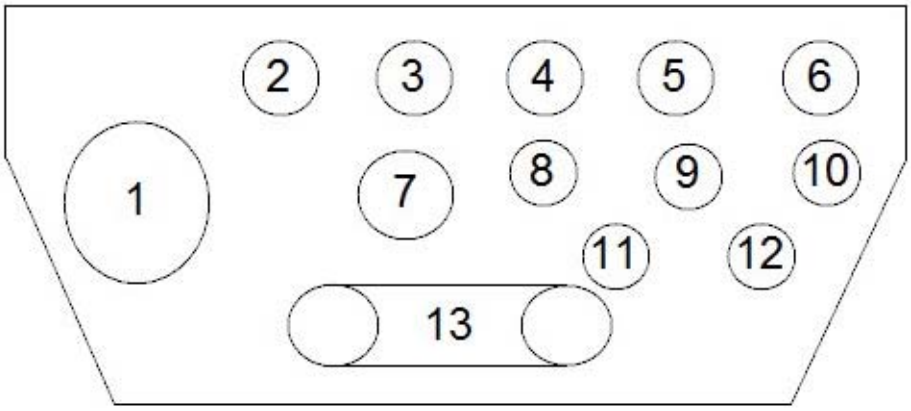
Fig. 4.2.3-1: Front view



01) Cylinder head
02) Fuel solenoid valve
03) Ventilation screw solenoid valve
04) Fuel filter
05) Raw water pump
06) Fresh water pump
07) Fuel pump
08) Heat exchanger

4.2.3.1 Front connections 4800i PMS

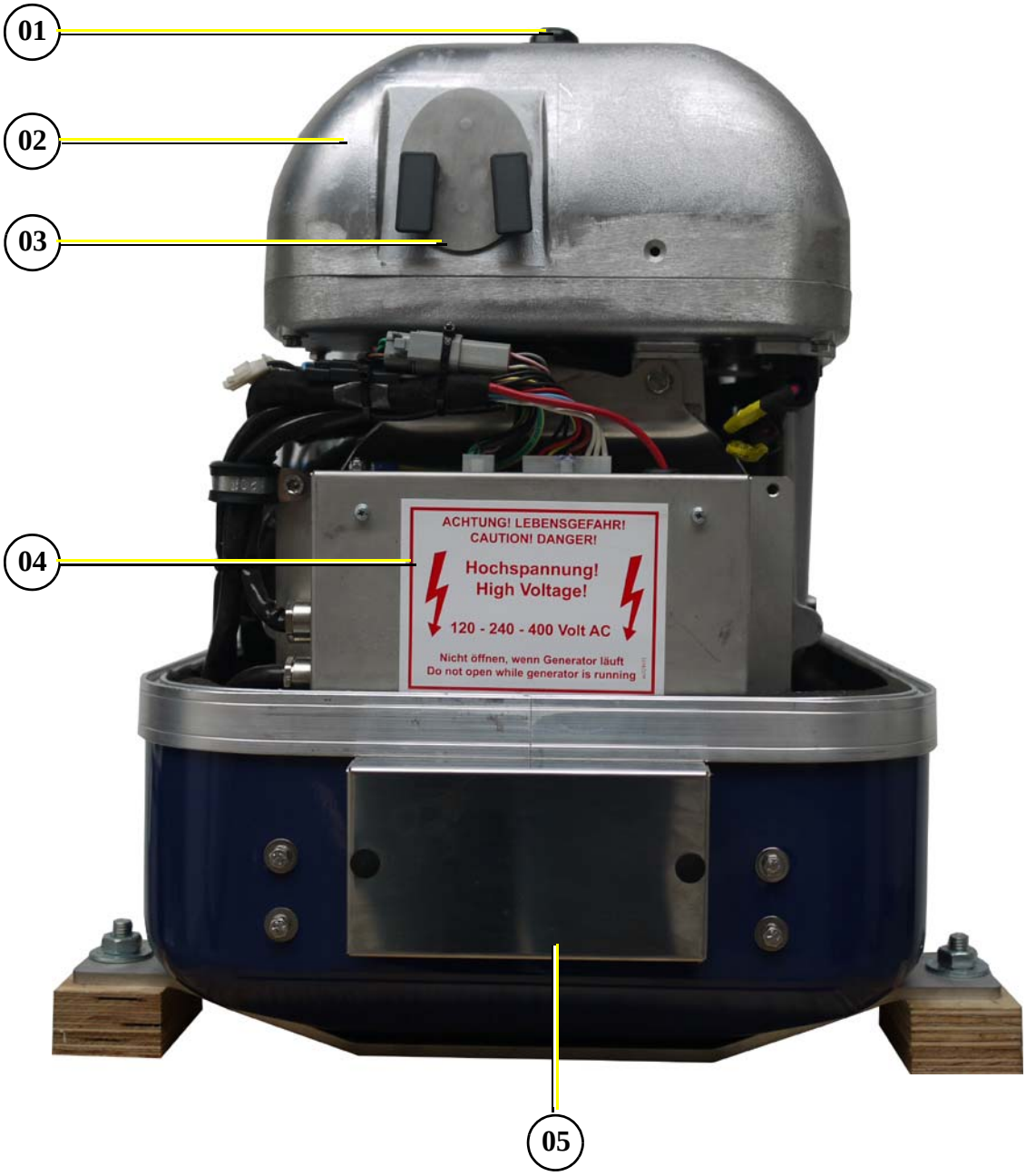
Fig. 4.2.3.1-1: Front connections 4800i PMS



01) Passage exhaust hose
02) Cooling water in
03) Connection hose to external expansion tank 8mm
04) Connection hose from external expansion tank 10mm
05) Connection fuel OUT
06) Connection fuel IN
07) Oil drain hose
08) FP-Bus cable to inverter
09) Cable for control panel
10) Load cable to inverter
11) Battery cable (-)
12) Battery cable (+)
13) Connection external ventilation valve

4.2.4 Back View 4800i PMS

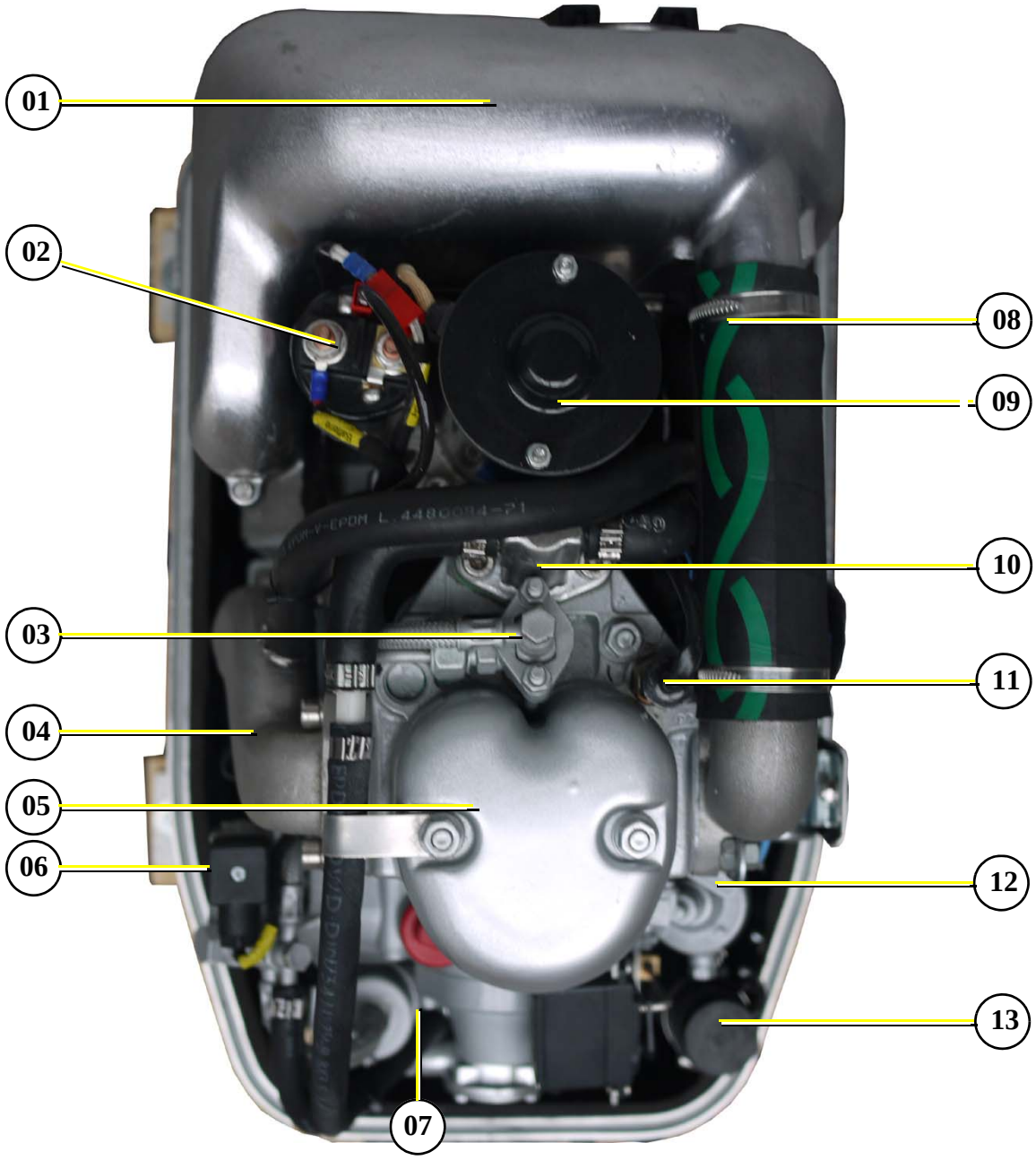
Fig. 4.2.4-1: Back view



01) Starter motor
02) Generator power air filter housing
03) Air filter holder
04) Boxed i-control 2 main board
05) Air inlet

4.2.5 View from above 4800i PMS

Fig. 4.2.5-1: View from above



01) Generator power terminal box and air filter housing
02) Solenoid switch for starter motor
03) Injection nozzle
04) Water-cooled exhaust elbow
05) Valve cover
06) Fuel solenoid valve
07) Fuel filter
08) Air suction hose
09) Starter motor
10) Cooling water connection block
11) Thermo-sensor cylinder head
12) Fuel pump
13) Fresh water pump

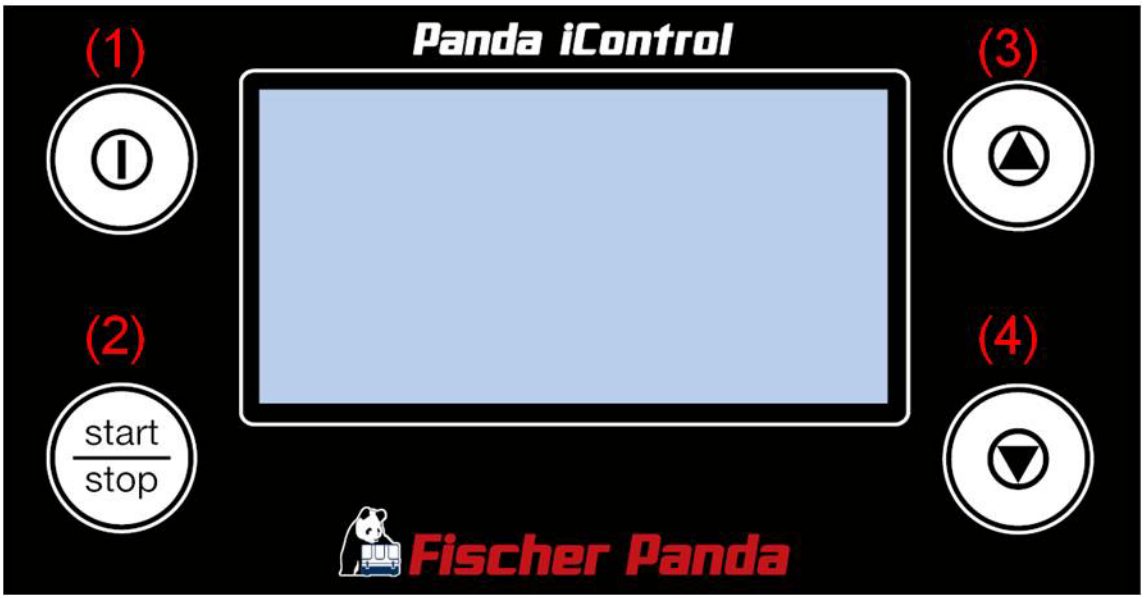
4.3 Details of Functional Units

4.3.1 The Panda iControl2 panel

The "Panda iControl2 panel" control panel is the control and display unit for the Panda iControl2 control system and represents the interface between the user and the Panda iControl2 controller. The integrated display serves to present the most important data of the system as well as warnings and error messages.

The control panel is equipped with four buttons for operating the Panda iControl2 controller:

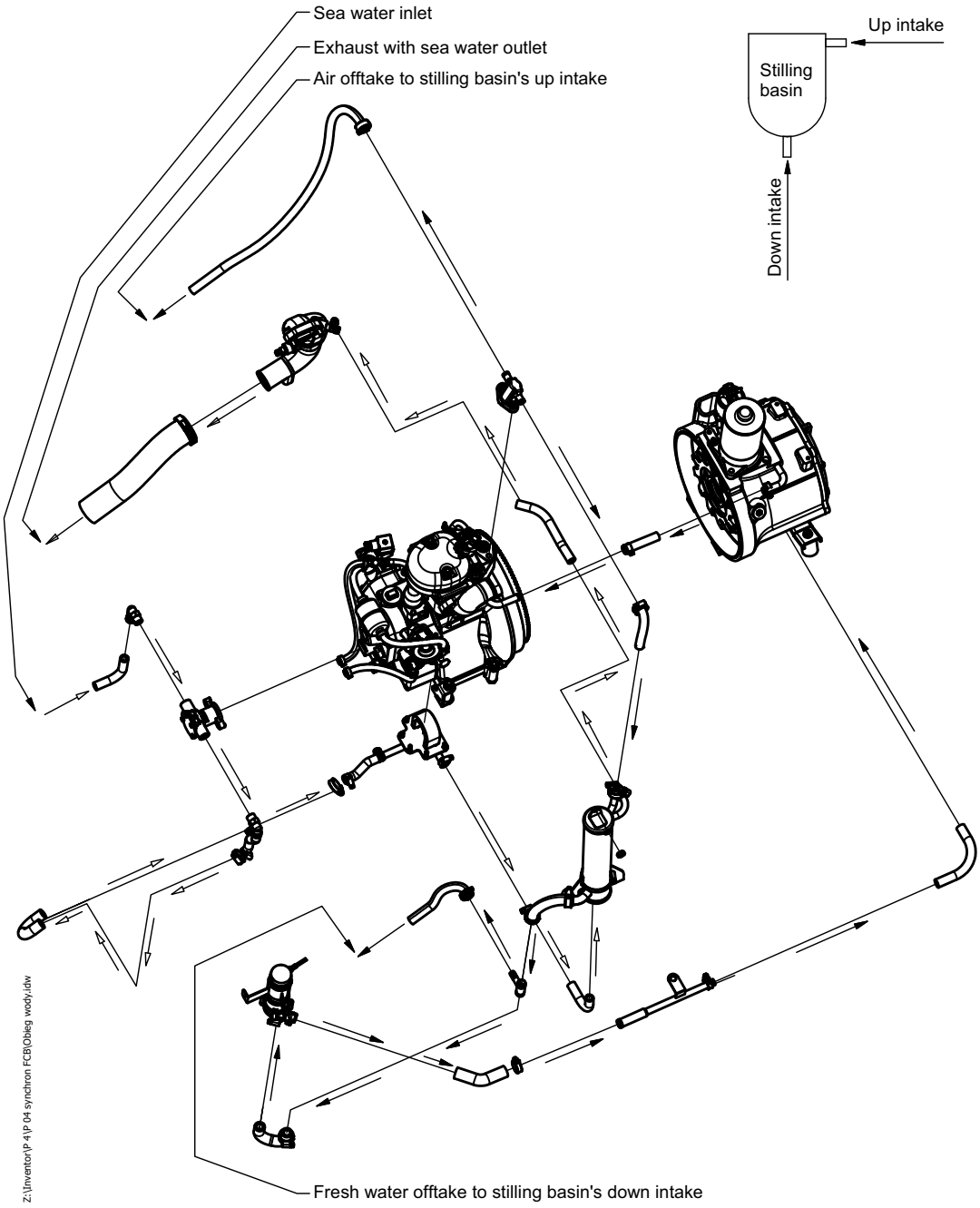
Fig. 4.3-1: Panda iControl 2 panel



1. *On/Off button:* Switching the Panda iControl2 controller on and off
2. *Start/Stop button:* Starting and stopping the generator, confirming values in selection menus (Enter key)
3. *Cursor-up button* Switching between display screens (up), counting values up in selection menus
4. *Cursor-down button* Switching between display screens (down), counting values down in selection menus.

4.3.1.1 Components of Cooling System (Raw water) 4800i

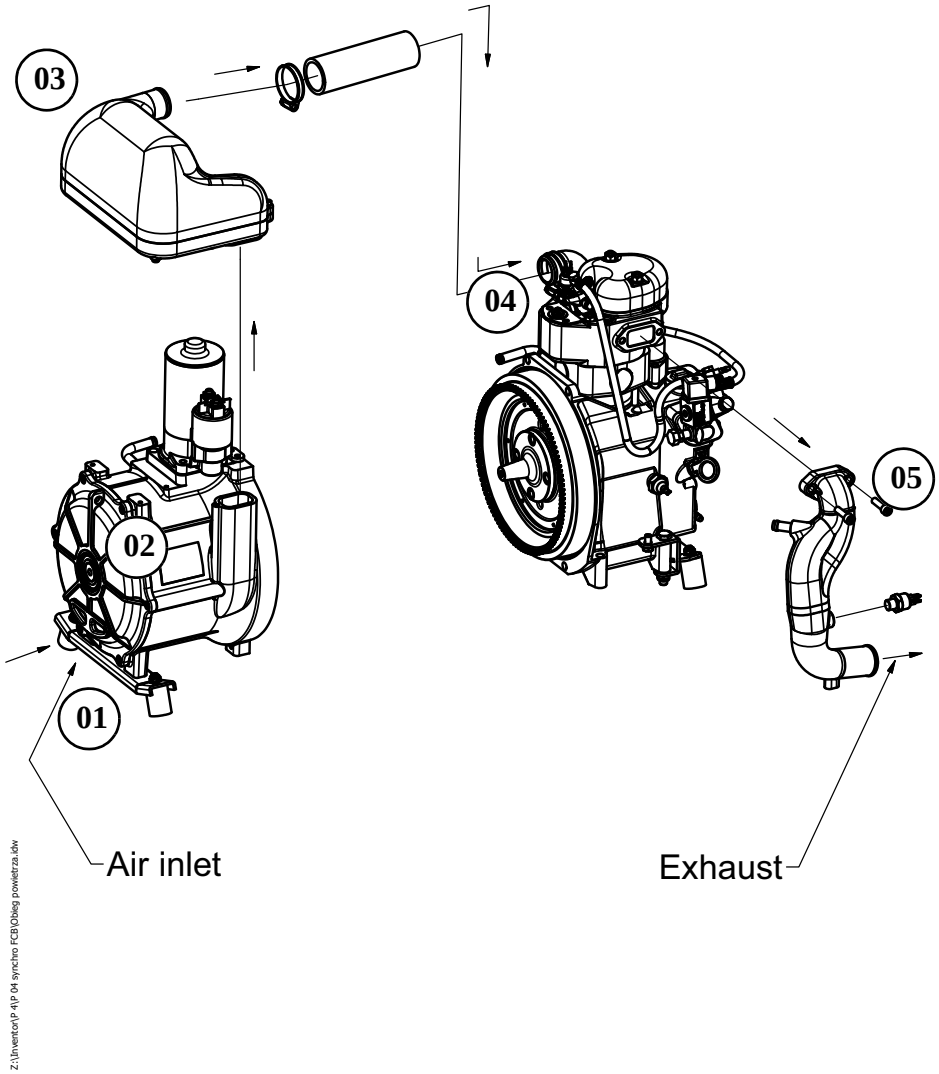
Fig. 4.3.1-1: Two circle system



01) Cooling water in (raw water in)
02) Raw water pump
03) Connection hose for cooling circle ventilation valve
04) Oil cooler (heat exchanger)
05) Generator housing with coil
06) Cooling water in at engine
07) Water connection block (cooling water out at engine)
08) Water cooled exhaust elbow
09) Bypass between generator housing and cooling water connection block

4.3.2 Components of combustion air 4800i PMS

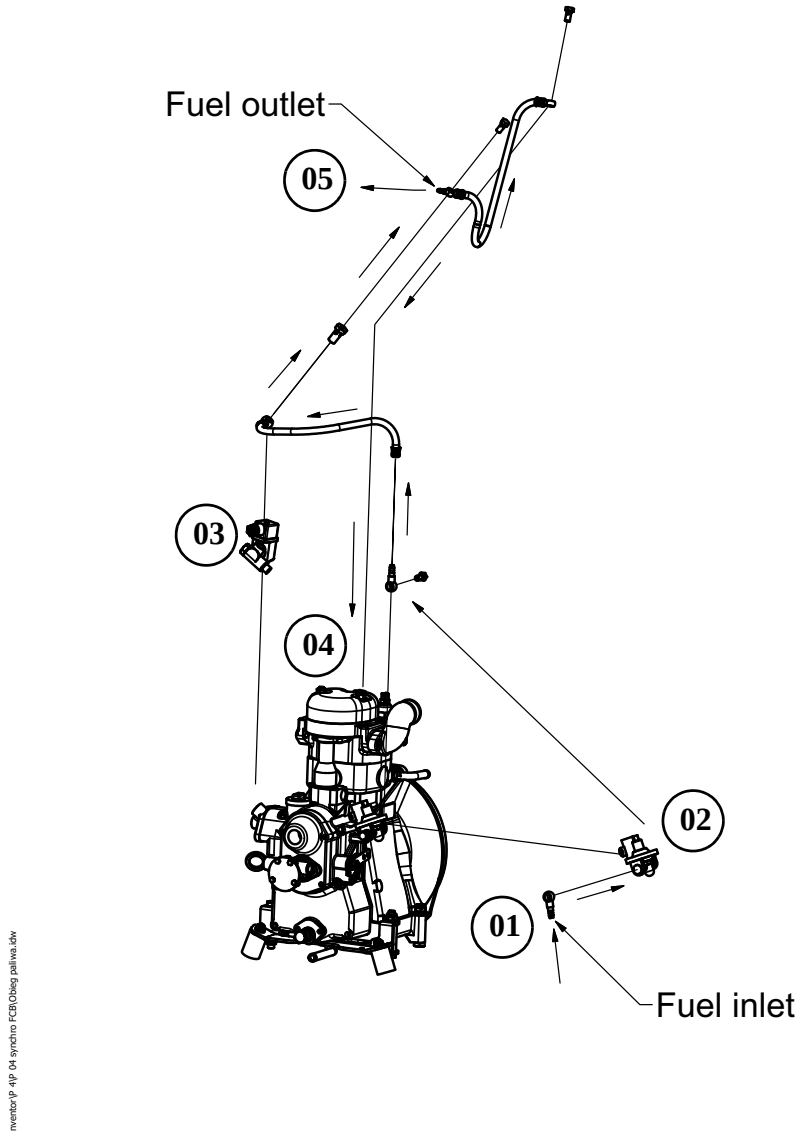
Fig. 4.3.2-1: Combustion Air circle



01) Air inlet
02) Generator housing with coil
03) Generator air filter housing
04) Air in at engine
05) Water cooled exhaust elbow

4.3.3 Components of the Fuel System 4800i PMS

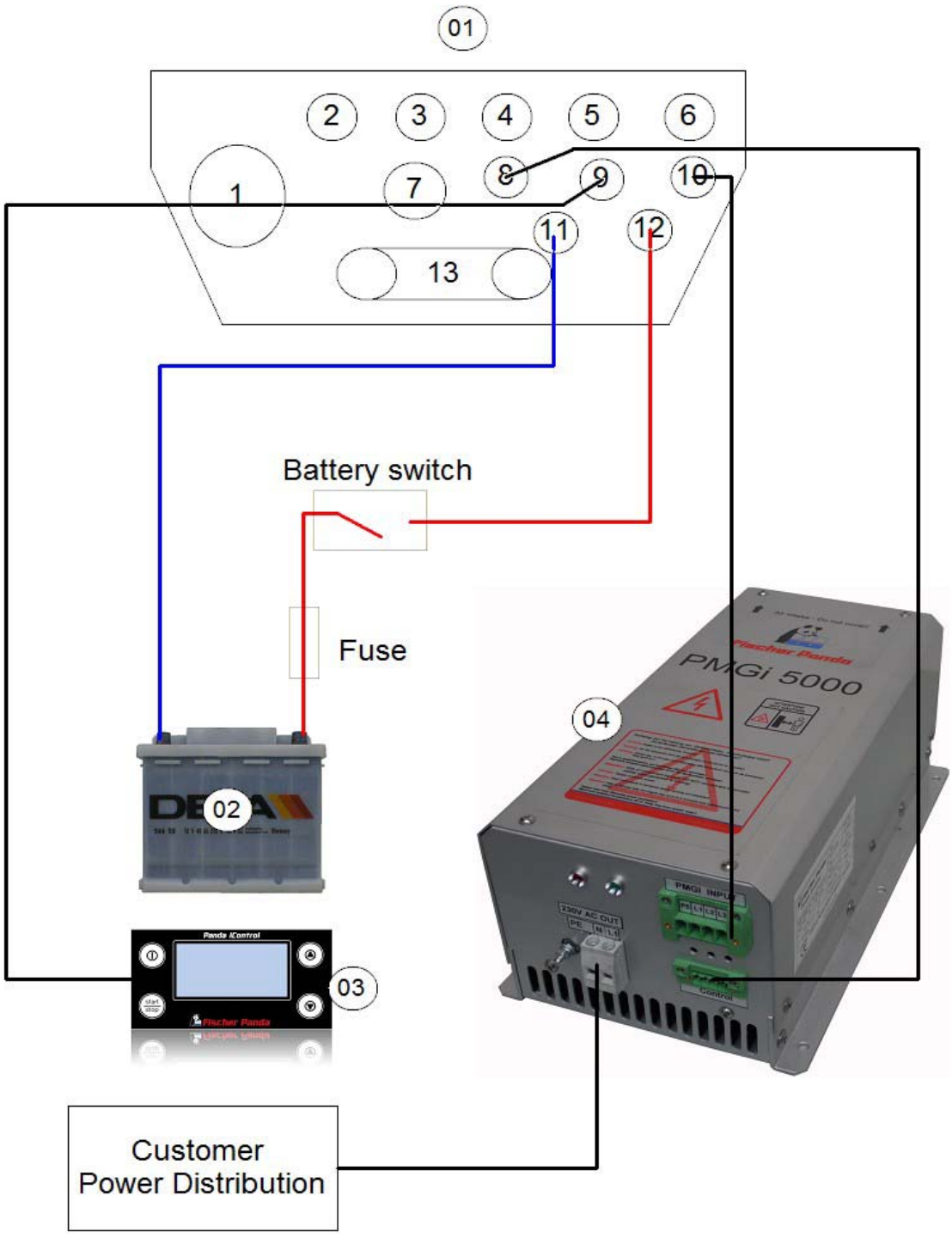
Fig. 4.3.3-1: Fuel circle



01) Fuel in
02) Fuel pump
03) Fuel stop solenoid
04) Injection nozzle at engine
05) Fuel out (Fuel return line)

4.3.4 Electrical Connection 4800i PMS

Fig. 4.3.4-1: Electrical Connection 4800i PMS



01) Front Connections of the 4800i PMS
02) Starter battery
03) iControl 2 remote control panel
04) PMGi 5000 inverter

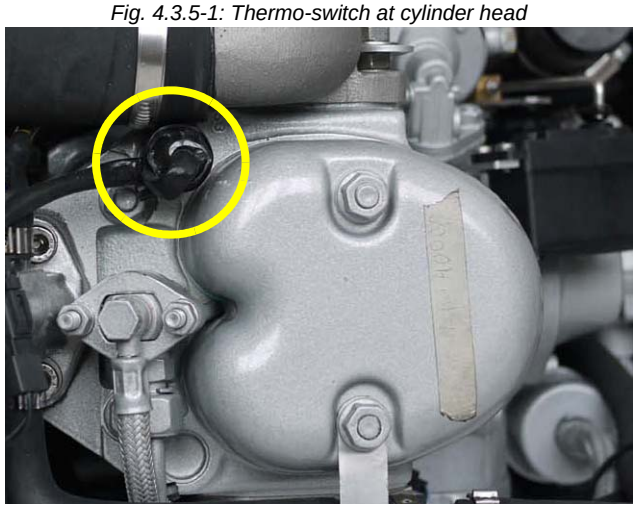
Fig. 4.3.4-2:

4.3.5 Sensors and Switches for Operation Surveillance

Thermo-sensor at cylinder head

The thermo-sensor at the cylinder head serves to monitor the generator temperature.

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 union and serves to monitor the temperature of the fresh water cooling system. It takes a measurement at the hottest spot, since the combustion gases are guided from the cylinder head for the exhaust elbow.

Fig. 4.3.5-2: Thermo-switch at exhaust elbow

Thermo-switch in the generator coil

1. Generator coil

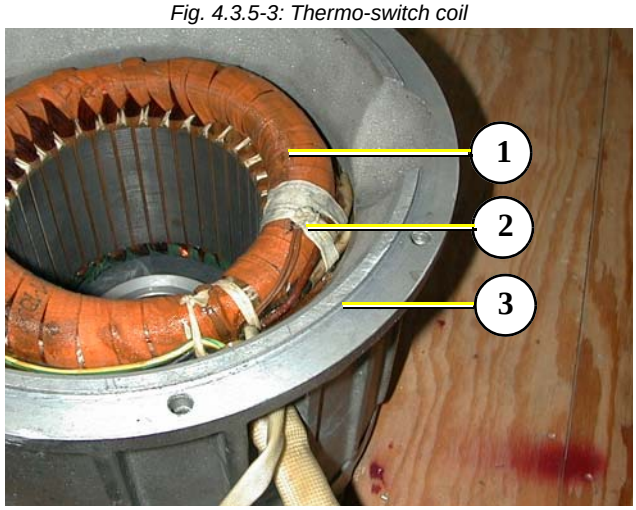
2. Thermo-switch

3. Housing

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

Sample picture

Fig. 4.3.5-3: Thermo-switch coil



Oil pressure switch

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

Fig. 4.3.5-4: Oil pressure switch

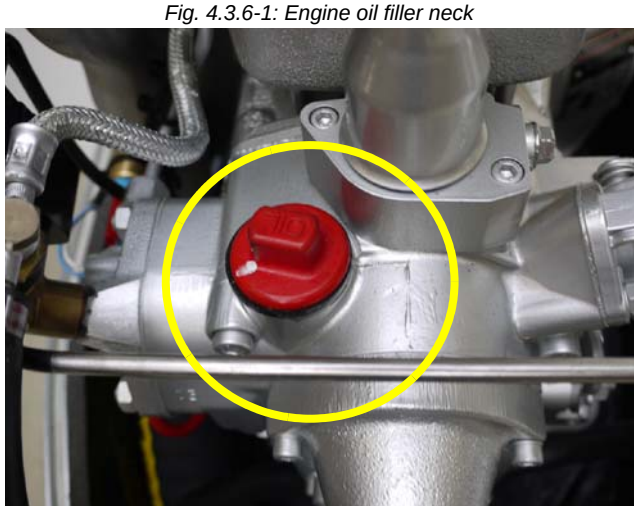
4.3.6 Components of Oil Circuit 4800i PMS

Oil filler neck with cap

Normally the filler neck for the engine oil is on the top side of the valve cover. A second filler neck is additionally attached at the operating side for numerous generator types. Please ensure that the filler necks are always well secured after filling with engine oil.

Consider also the references to the engine oil specification.

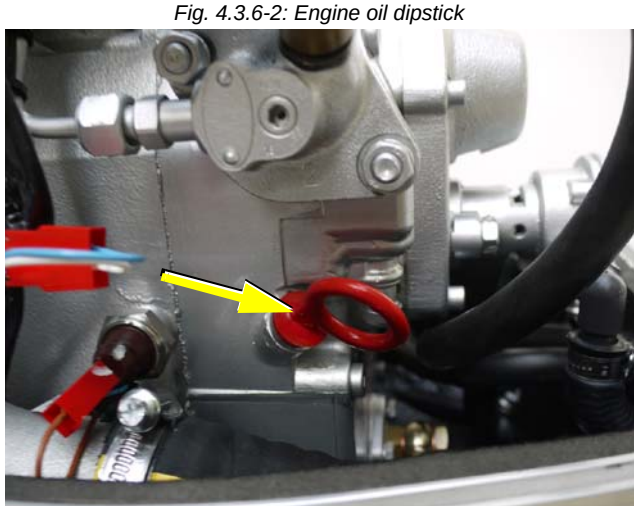
Fig. 4.3.6-1: Engine oil filler neck



Oil dipstick

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

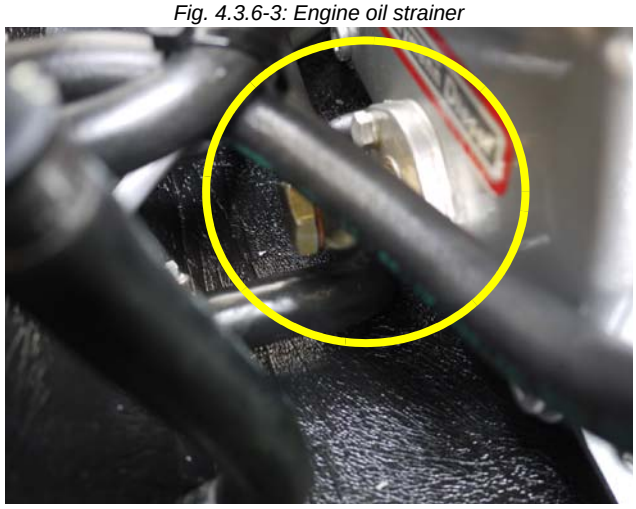
Fig. 4.3.6-2: Engine oil dipstick



Engine oil strainer

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

Fig. 4.3.6-3: Engine oil strainer



Oil drain hose

The Panda generator is so equipped that the engine oil can be drained by a drain hose. The generator should always be installed in such a way, that a collecting basin can be placed deep enough.

f this is not possible, an electrical oil drain pump must be installed.

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

Fig. 4.3.6-4: Engine oil drain hose

4.4 Operation manual

4.4.1 Preliminary remarks

Advices regarding Starter Battery

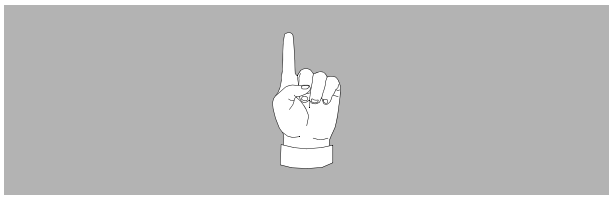
Fischer Panda recommends to use a normal starter battery. If the generator is required for extreme winter conditions, the starter battery capacity should be doubled. It is recommended to regularly charge the starter battery by a suitable battery-charging device (i.e. at least every two months). A correctly charged starter battery is necessary for low temperatures.

4.4.2 Daily routine checks before starting

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

   True, the diesel motor automatically switches off when there is a lack of oil, but it is very damaging for the motor, if the oil level drops to the lowest limit. Air can be sucked in suddenly when the boat rocks in heavy seas, if the oil level is at a minimum. This affects the grease in the bearings. It is therefore necessary to check the oil level daily before initially running the generator. The oil level must be topped up to the 2/3 maximum level, if the level drops below the mark between maximum and minimum levels.

Notice!:OIL PRESSURE CONTROL!



You should change the oil independently from the ambient temperature - see section 8.3, “Engine oil,” on page 126. Engine oil volume see section 8.2, “Technical Data Engine,” on page 125.

2. State of cooling water.

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

3. Open sea cock for cooling water intake.

   For safety reasons, the 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. Check all hose connections and hose clamps are leakage.

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

6. Check all electrical lead terminal contacts are firm.

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

7. Check the motor and generator mounting screws are tight.

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

8. Switch the land electricity/Generator switch to zero before starting or switching off all load.

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

9. Check the automatic controls functions and oil pressure.

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

4.4.3 Starting Generator- see remote control panel data sheet

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.

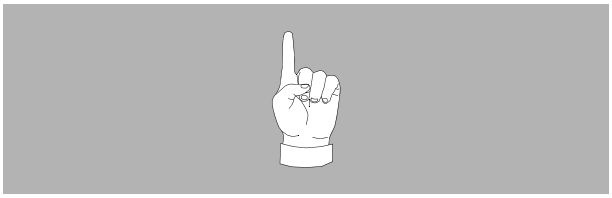
Once the engine is running, be sure to open the inlet valve!

Attention!:

4.4.4 Stopping Generator - see remote control panel data sheet

If the generator switches itself off for temperature reasons during operation with load, examine immediately what the cause was. A possible cause could be an error at the cooling system or any error in the range of the outside of the cooling system.

Notice!:



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 should be 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.

Attention!: Adapt system correctly.

5.1 Personal requirements

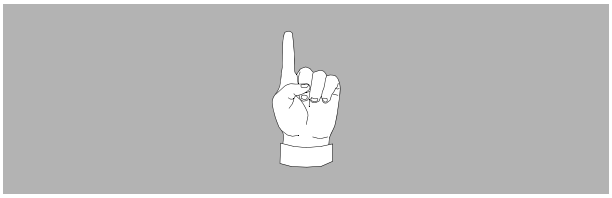
The described installation must be done by a technical trained person or a Fischer Panda service point.

5.1.1 Hazard notes for the installation

see “Safety first!” on Page 10.

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

Notice:



DANGER TO LIFE! - Incorrect handling may lead to health damage and to death.

Always disconnect the battery bank (first negative terminal than positive terminal) before you work at the generator or the electric system of the generator so that the generator may not be started unintentionally.

Warning!: Automatic start

Improper installation can result in severe personal injuries or material damage. Therefore:

- 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 available tools and special tools. Incorrect or damaged tools can result injuries.

Warning!: Risk of injury

Oil and fuel vapours can ignite at contact with ignition sources. Therefore:

- 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. Therefore:

- Avoid skin contact with engine oil, fuel and antifreeze.
- Remove oil and fuel splashes and antifreeze from the skin immediately.
- Do not inhale oil and fuel vapours.

Danger!: Danger of poisoning

DANGER TO LIFE! - Improper handling can result in severe personal injury and death.

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!

During operation an over pressure in the cooling system may be established.

Warning!: Hot surface/material

Batteries contain corrosive acids and bases.

Improper handling can lead to heating of the batteries and bursts. Corrosive acids and bases may leak. Under bad conditions it may lead to an explosion.

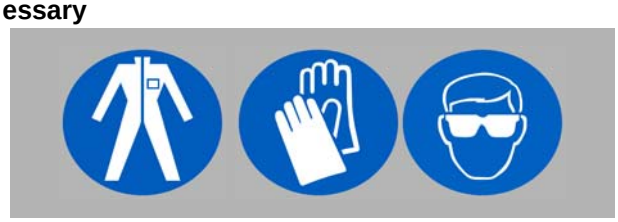
Consider the instructions of the battery manufacturer.

Warning: Danger of chemical burns

During installation/maintenance personal protective equipment is required to minimize the health hazards:

- Protective clothing
- Safety boots
- Protective gloves
- Ear defender
- Safety glasses

Instruction!: Personal protective equipment necessary



Disconnect all load during the work at the generator to avoid damages at the load.

Attention!: Disconnect all load.

5.2 Place of installation

5.2.1 Preliminary remark

- There must be sufficient fresh air supply for the combustion air.
- It has to be ensured that the cooling air supply from underneath or sidewise is sufficient.
- During operation the sea cock has to be opened.
- The generator may only be opened by a technical trained person.
- The generator may only be operated by a trained person.

5.2.2 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. plywood). 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.

As the generator sucks in its combustion air via several drill holes in the capsule base, the capsule base must be installed with sufficient space to the basement so that the air supply is guaranteed (at least 12mm/½“)

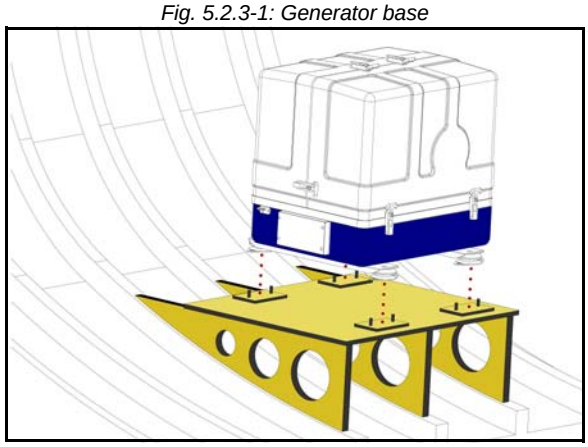
The generator sucks its air from the surrounding engine room. Therefore it must be ensured that sufficient ventilation openings are present, so that the generator cannot overheat.

High temperature of the intake air declines 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 these effects as small as possible, the temperature in the engine room should not be higher than 15 ° C in relation to the outside temperature.

5.2.3 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“ downwards, the combustion air can be sucked in unhindered. In addition the vibrations are void which would arise with a closed capsule base.

Fig. 5.2.3-1: Generator base



5.3 Generator Connections

See chapter 3 for the original position of the connections

All electrical wires are connected 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 cables supplied are 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 Cooling System Installation - Raw water

See chapter 3 for the original position of the connections

ATTENTION! 7

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:

5.4.2 Fischer Panda installation kit - raw water

The following additional components will be required for the specified installation. You can purchase them as an installation kit or separately at Fischer Panda.

Note:

Through hull fitting with strainer

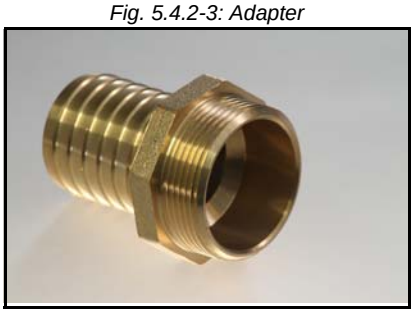
Fig. 5.4.2-1: Thru hull fitting with strainer

Sea cock

Fig. 5.4.2-2: Sea cock

Adapter

Fig. 5.4.2-3: Adapter

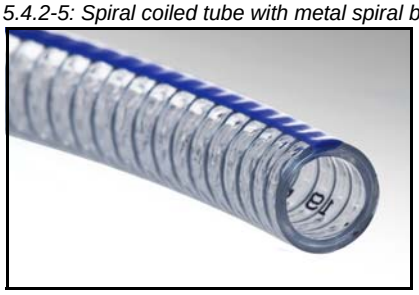


Raw water filter

Fig. 5.4.2-4: Raw water filter

Spiral coiled tube with metal spiral bead

Fig. 5.4.2-5: Spiral coiled tube with metal spiral bead



Ventilation valve

Fig. 5.4.2-6: Ventilation valve

Hose clamps

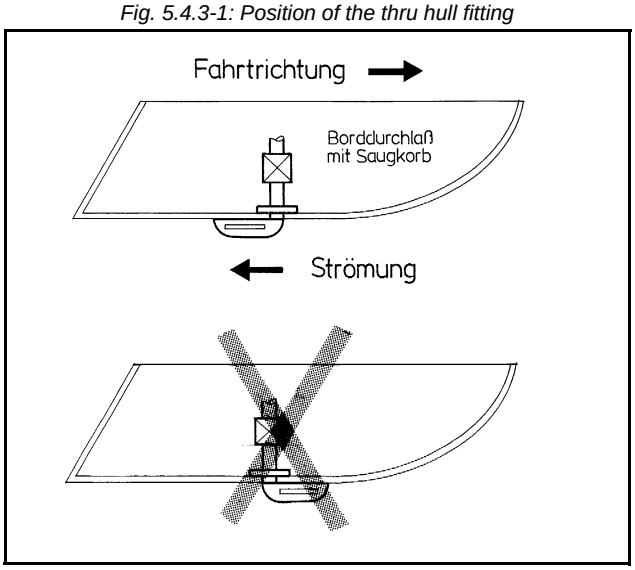
Fig. 5.4.2-7: Hose clamps

5.4.3 Installation of the through hull fitting in Yachts - Schema

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

For Panda generators, the through 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. 5.4.3-1: Position of the thru hull fitting



5.4.4 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 must have an inner diameter of at least 1" (25 mm).

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

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

After start-up the cooling water quantity must be measured (e.g. by catching at the exhaust). The flow rate, as well as the necessary cross section of the cooling water pipe see section 8.10, “Diameter of conduits,” on page 224

5.4.5 Generator installation above waterline

The Panda is equipped with a water intake pump mounted 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

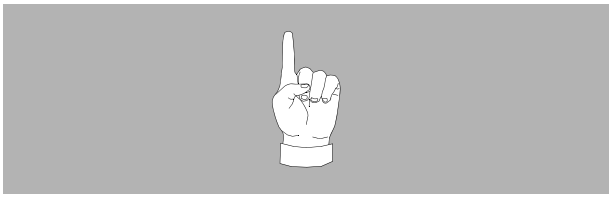
If the generator is installed above the waterline, it is possible that the impeller will wear out faster, because after starting, the pump runs dry for some seconds. The raw water hose should form a loop as near as possible to the raw water inlet of the generator (see picture below). This ensures the 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.With the installation of a non return valve in the raw water inlet line, which is under the waterline, this problem can be restricted.

When starting the generator you should always consider when raw water runs out of the exhaust system. If this takes longer than 5 seconds you should replace the impeller pump because it sucks in air for too long before it delivers raw water. The impeller has lost its effect and cannot suck in raw water anymore. This results to an overheating of the motor. If the impeller is not exchanged early enough the impeller blades may break into pieces and plugging the cooling water cycle. It is very important to exchange the impeller after a couple of months.

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.

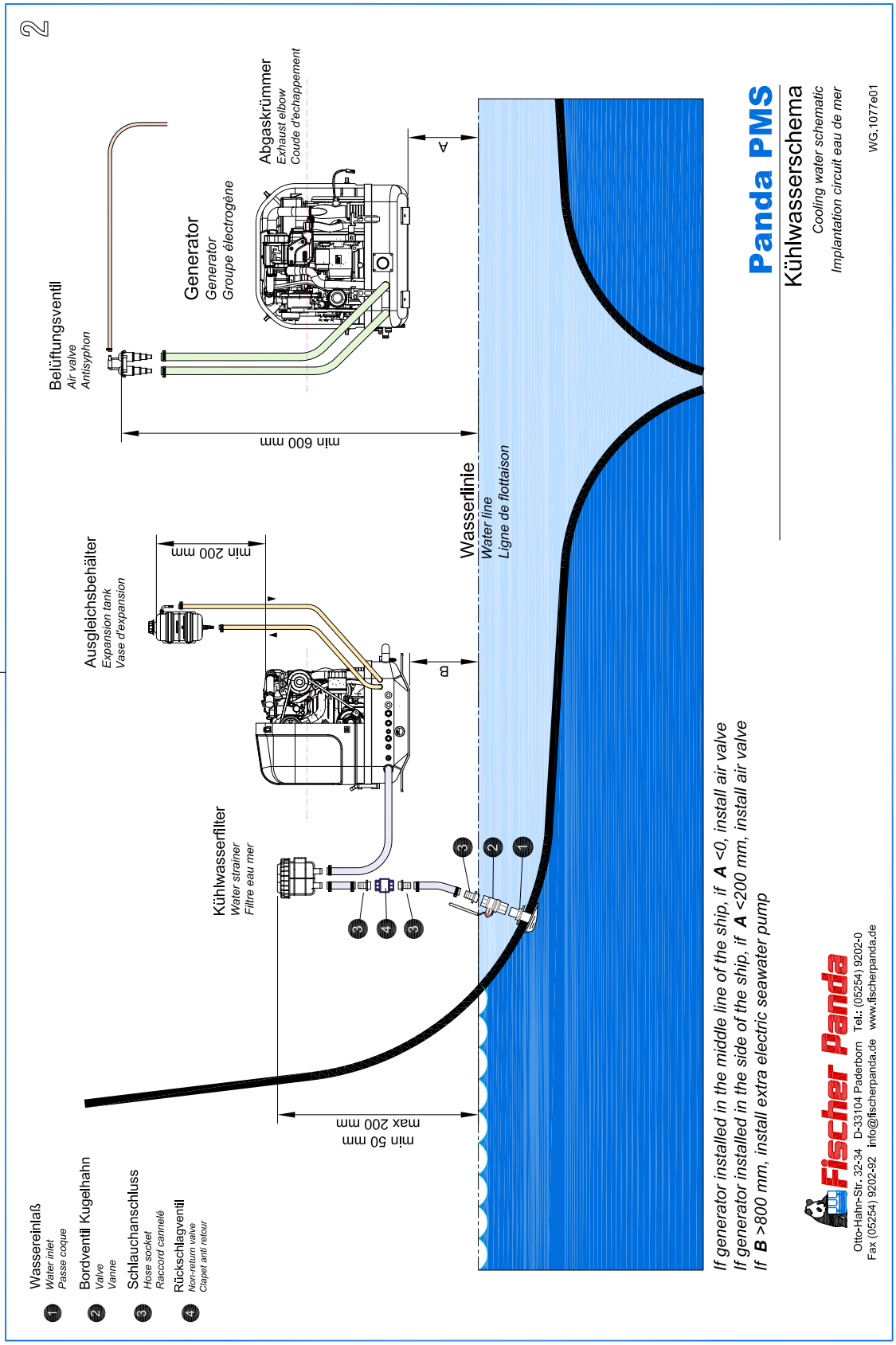
Replacement impeller and also a spare pump should always be on board. The old pump can be sent back to Fischer Panda for cost-effective repair.

NOTE:



5.4.6 Raw water installation schema

Fig. 5.4.6-1: Raw water installation schema



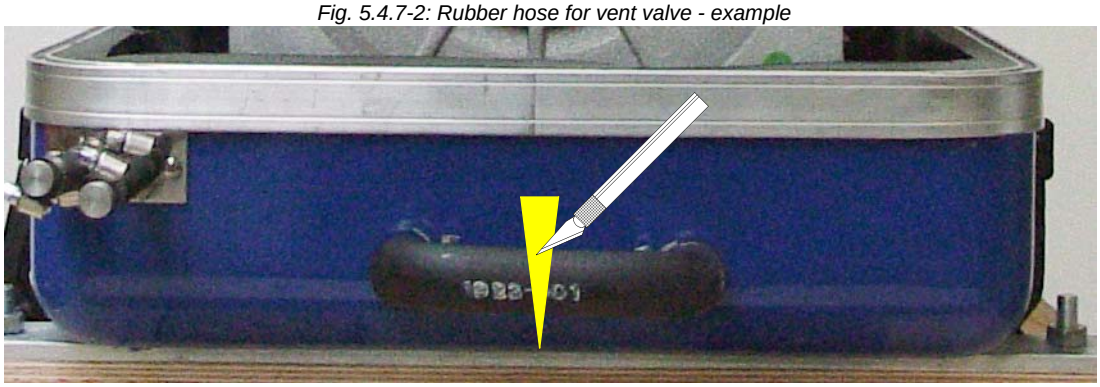
5.4.7 Generator installation below waterline

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 capsule. 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, 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. If the valve jams the cool water line cannot be de-aerated after stopping the generator, the water column is not discontinued and water can penetrate into the combustion chamber of the engine. This will lead to damage the engine in a short term!

Fig. 5.4.7-1: Vent valve

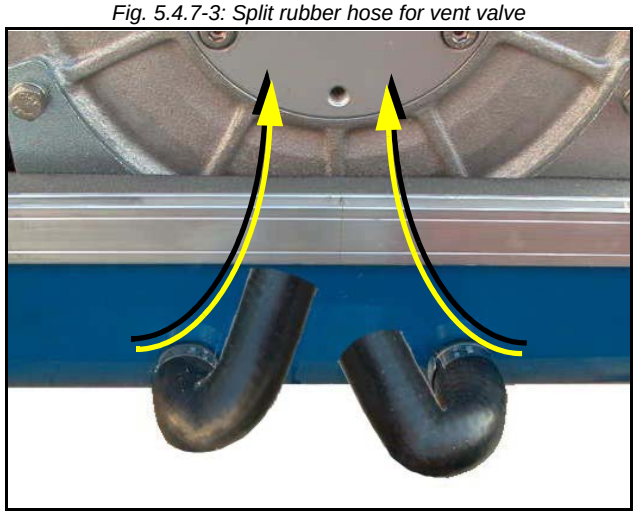
Fig. 5.4.7-2: Rubber hose for vent valve - example



The rubber hose for the external vent valve will be cut...

...and bend upwards.

Fig. 5.4.7-3: Split rubber hose for vent valve

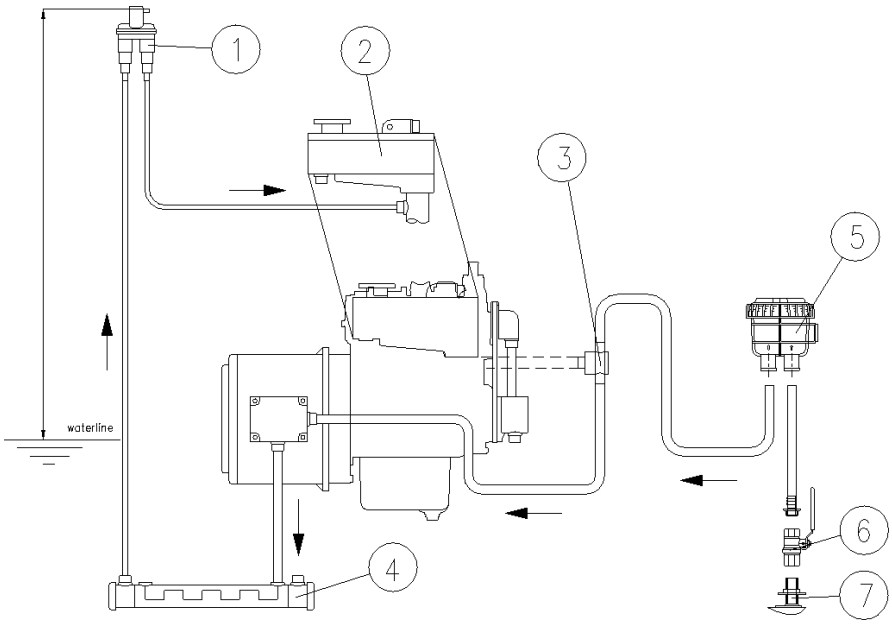


Both hose ends will be extended respectively with a hose and connected with a vent valve 600 mm over the waterline.

Example

5.4.8 Generator Housing cooled by Raw Water

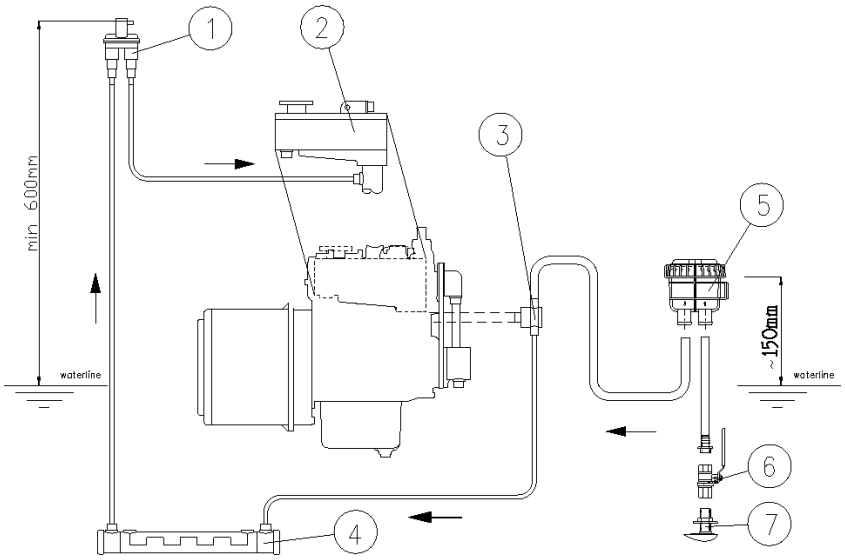
Fig. 5.4.8-1: Installation Scheme for Direct Cooling



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. Through hull

5.4.9 Indirect Cooling of the Genset Housing (by the Heat Exchanger)

Fig. 5.4.9-1: Installation Scheme Indirect Cooling of the 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 water cooled exhaust system

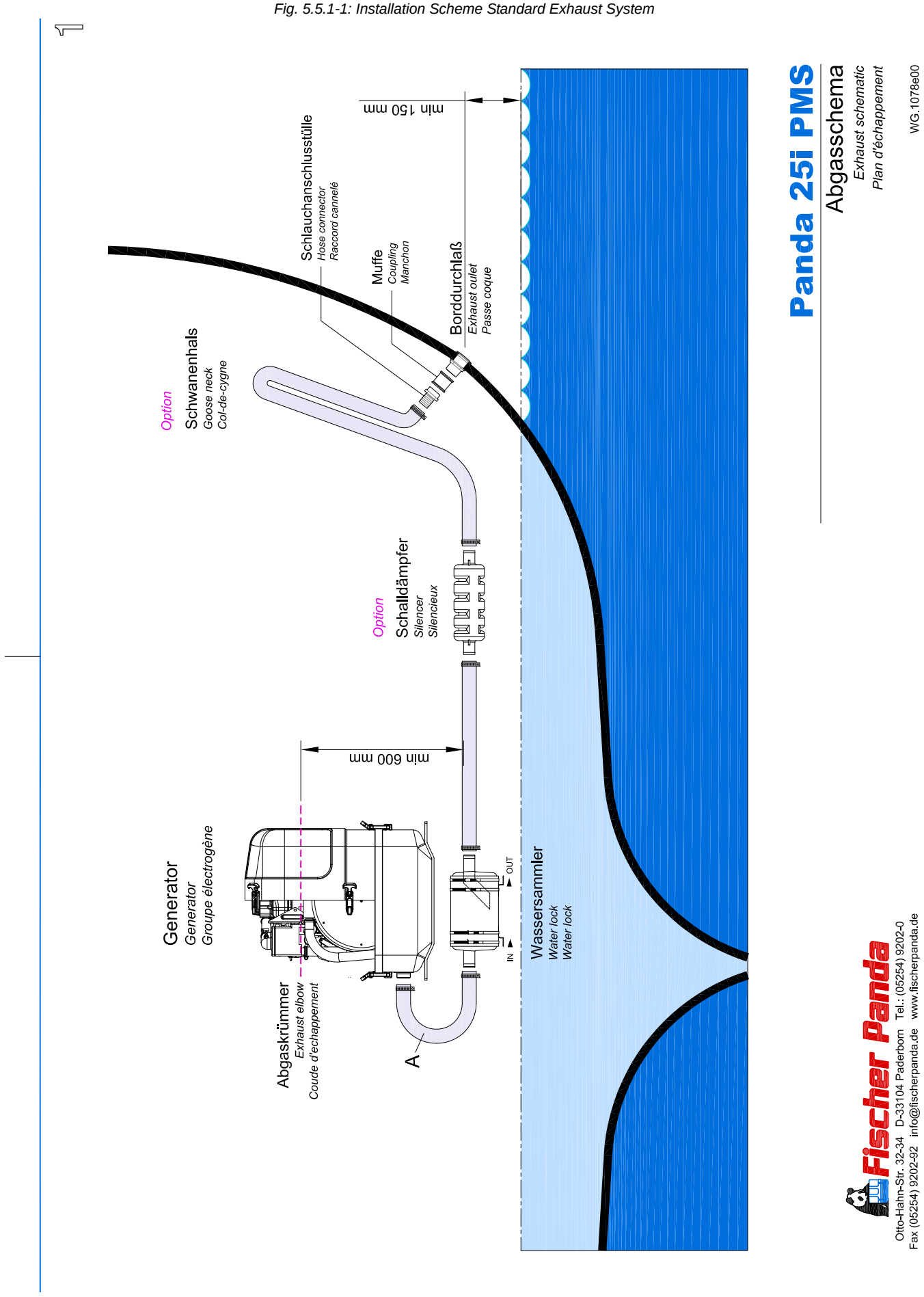
5.5.1 Installation of the standard exhaust system

The generator exhaust system must remain completely independent and separate from the exhaust system of any other unit(s) on board. The 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 6,3 m.

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 224

Fig. 5.5.1-1: Installation Scheme Standard Exhaust System



5.6 .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 installation 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.

5.6.1 Possible cause for water in the exhaust hose

5.6.1.1 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.

5.6.1.2 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 checked 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 role:

5.6.2 Installation area of the waterlock

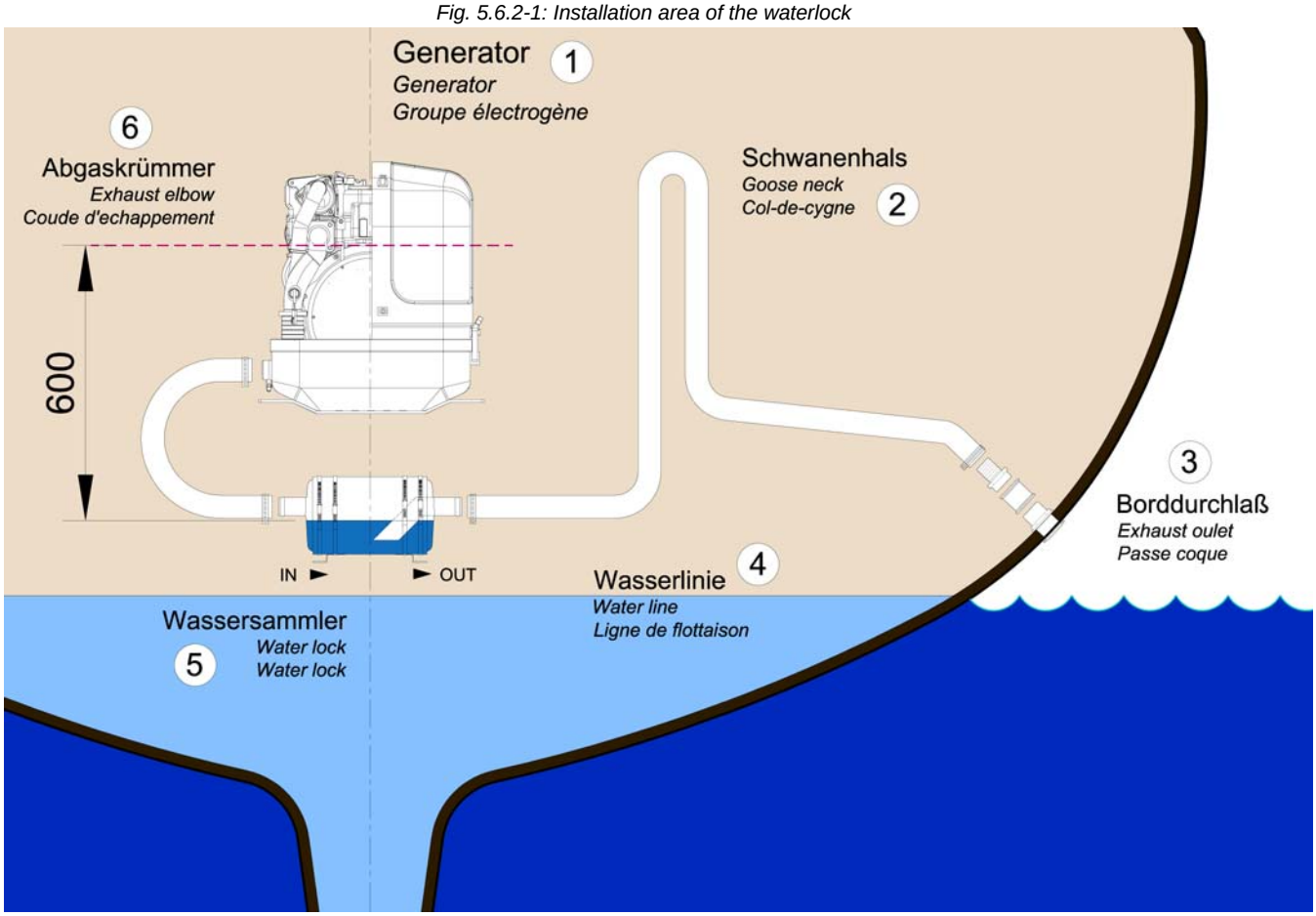
Concerning a water-cooled exhaust system, it must be regarded that - under no circumstances - cooling water from the exhaust hose can get into the exhaust elbow area at the engine. If this happens, the cooling water can get into the combustion chamber via an open discharge valve. This would lead to irreparable 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 picture below shows that 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. 5.6.2-1: Installation area of the waterlock



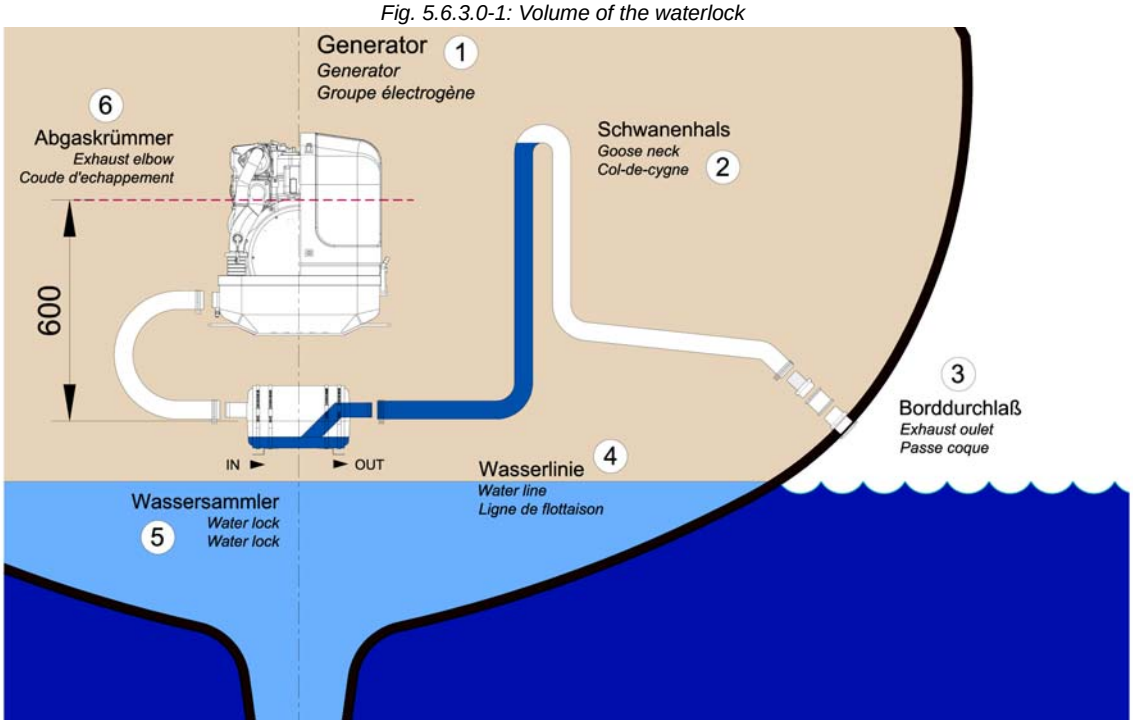
5.6.3 The volume of the waterlock

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 con-

tinues to cart cooling water through the cooling water pump, as long as it keeps on rotating.

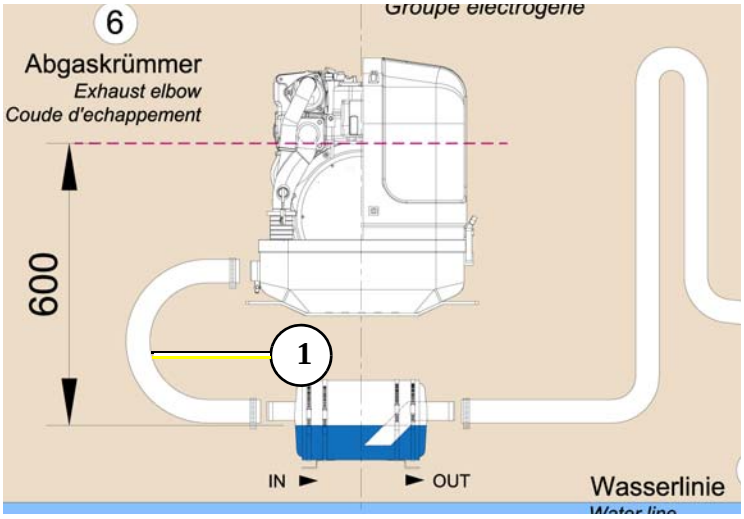
The waterlock must necessarily be measured large enough that it can take the entire amount of cooling water and, at the same time, does not exceed the prescribed vertical height of 600 mm up to the critical point at the exhaust elbow.

Fig. 5.6.3.0-1: 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. 5.6.3.0-2: Testing the cooling water level

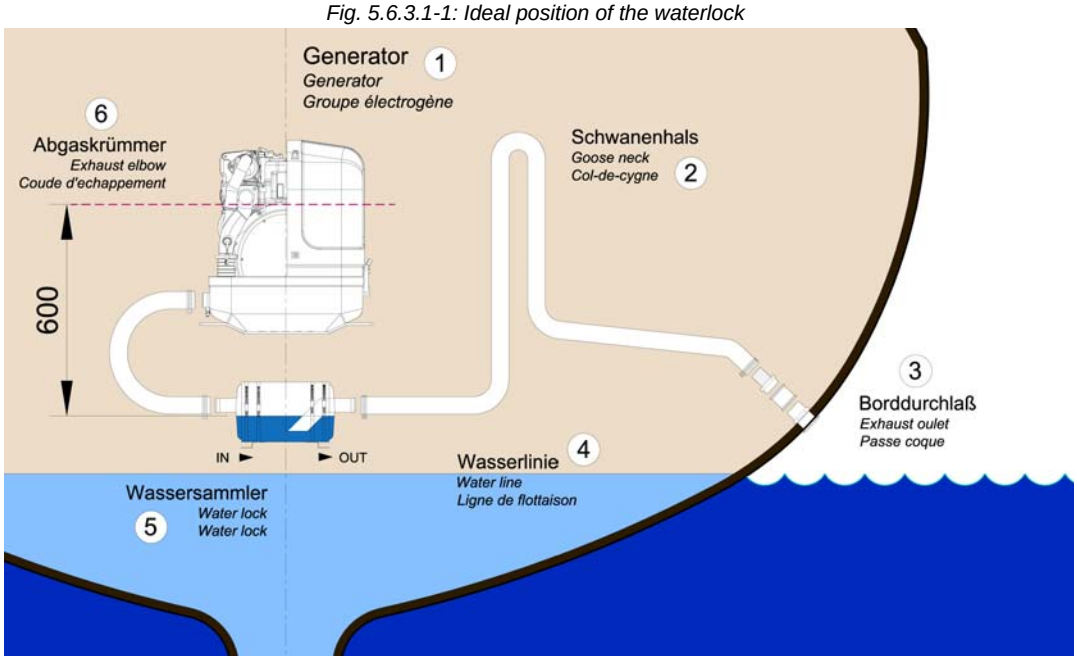


5.6.3.1 Ideal position of the waterlock

Important Note!

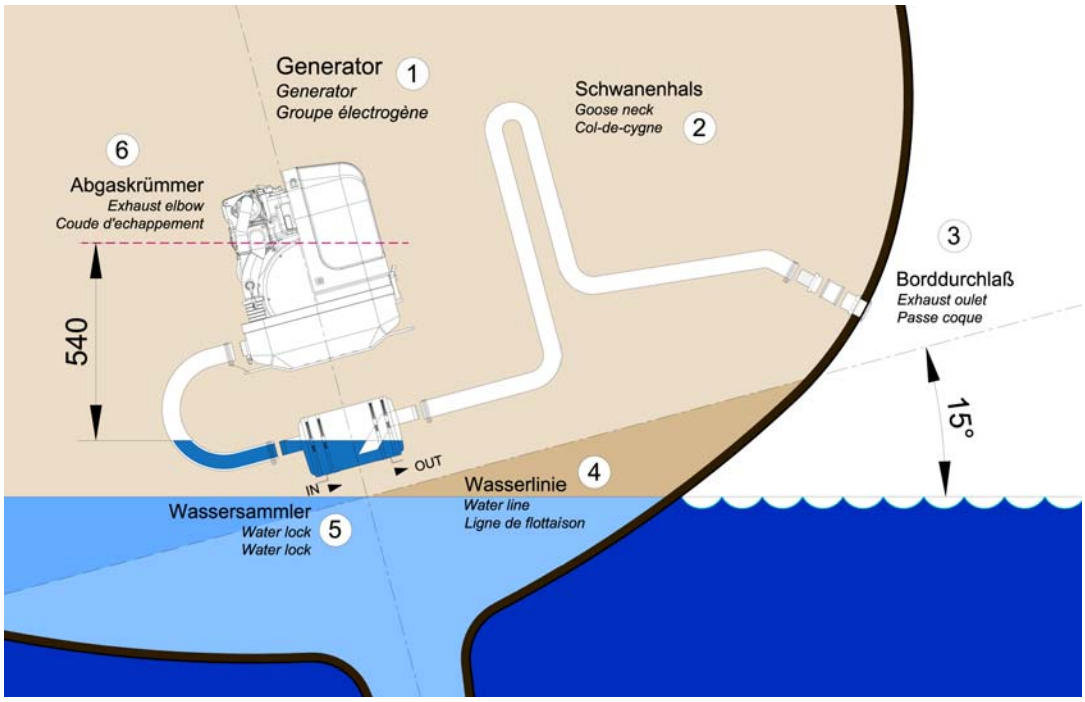
The ideal position of the waterlock would be in center underneath the generator. Only in this position it is assured that the water level cannot change drastically in tilted position by the waterlock moving out of the center line. See the following pictures:

Fig. 5.6.3.1-1: Ideal position of the waterlock



In Fig. 5.6.3.1-1, the waterlock is mounted in center underneath the generator. When the ship tilts, the position of the waterlock related to the critical point at the exhaust hose, changes only slightly.

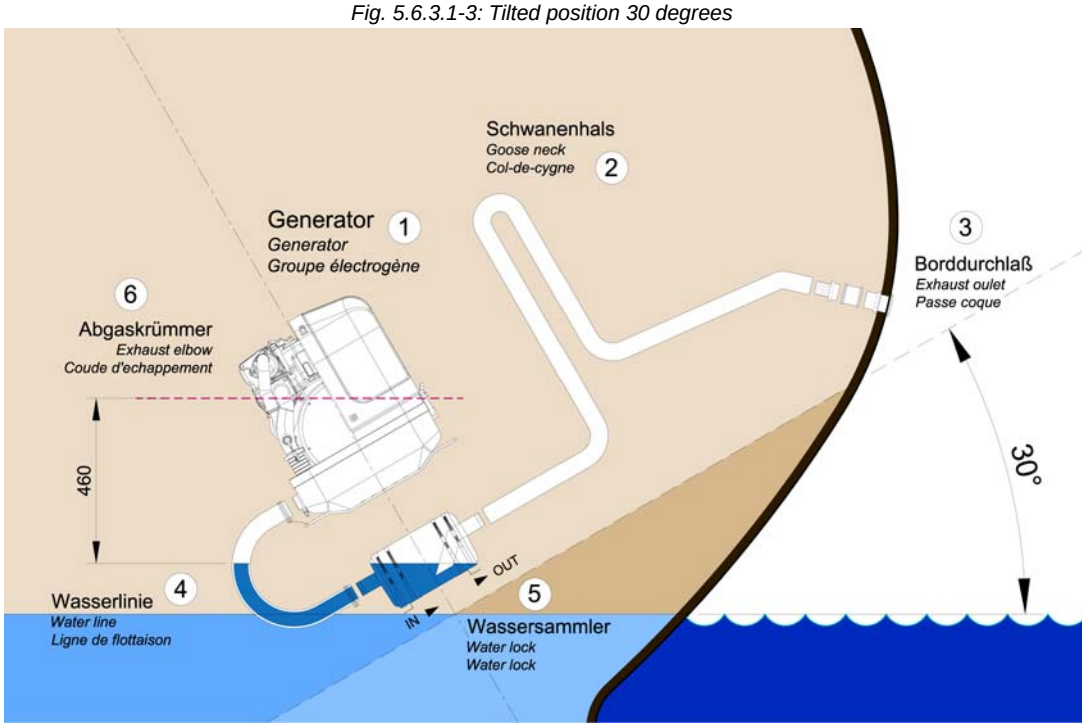
Fig. 5.6.3.1-2: Tilted position 15 degrees



Tilted position 15 degrees - Fig. 5.6.3.1-2

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

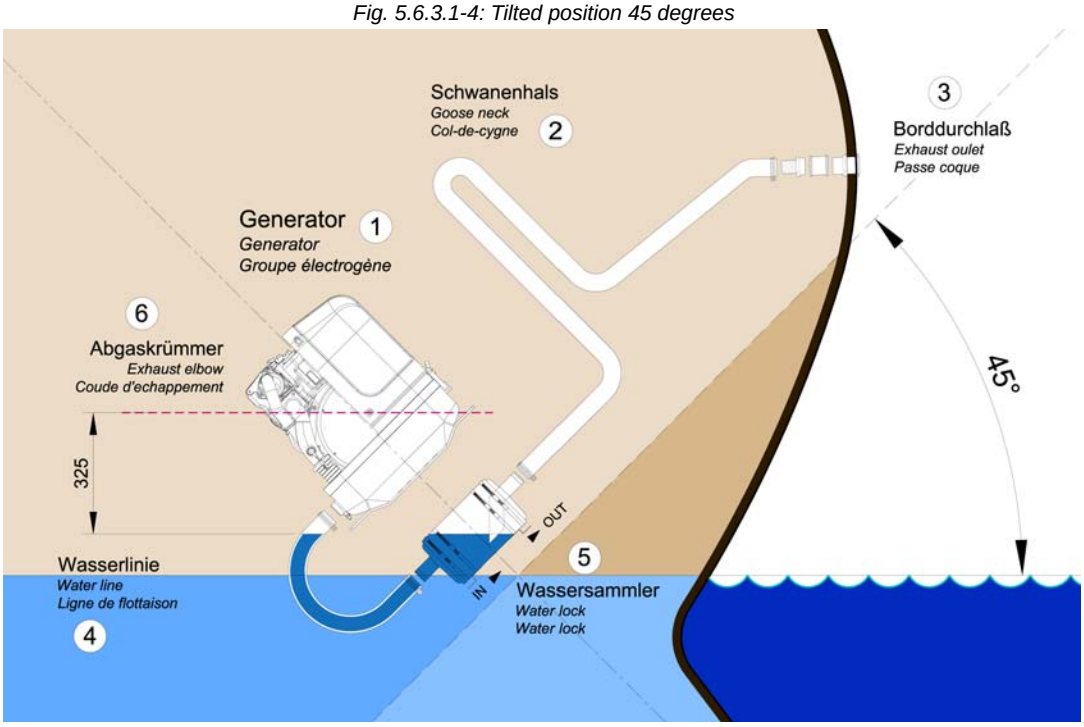
Fig. 5.6.3.1-3: Tilted position 30 degrees



Tilted position 30 degrees - Fig. 5.6.3.1-3

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. 5.6.3.1-4: Tilted position 45 degrees



Tilted position 45 degrees - Fig. 5.6.3.1-4

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

Even when the water lock 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 motions („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.

5.6.3.2 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. 5.6.3.2-1: waterlock, 500 mm next to the center line

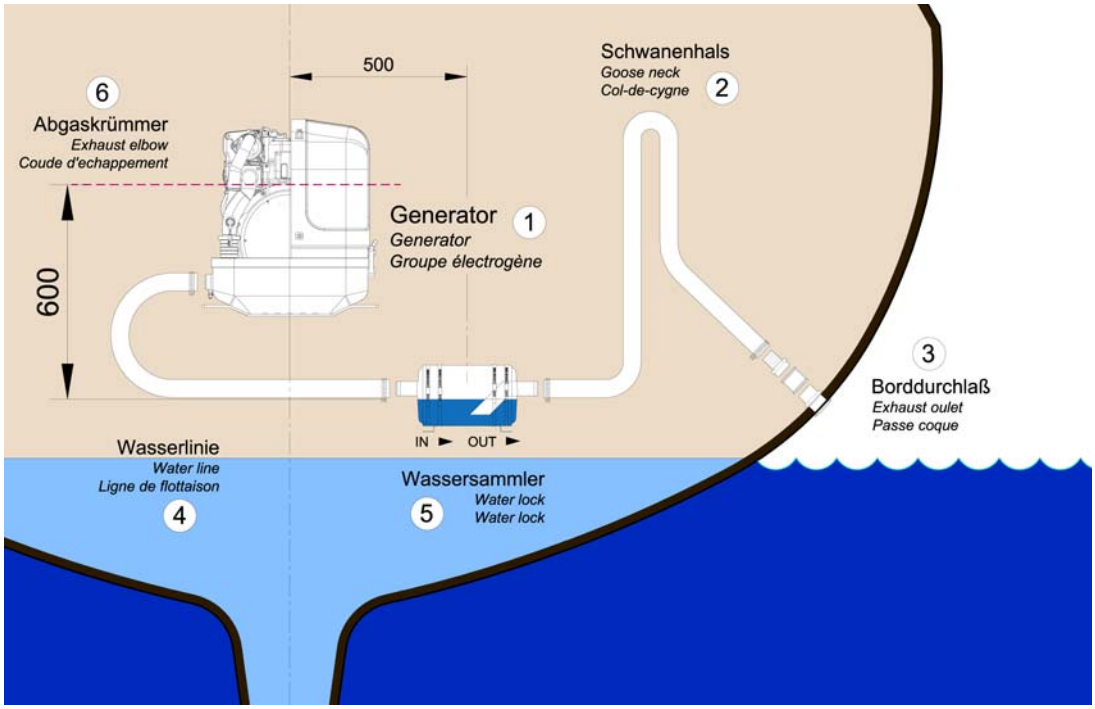
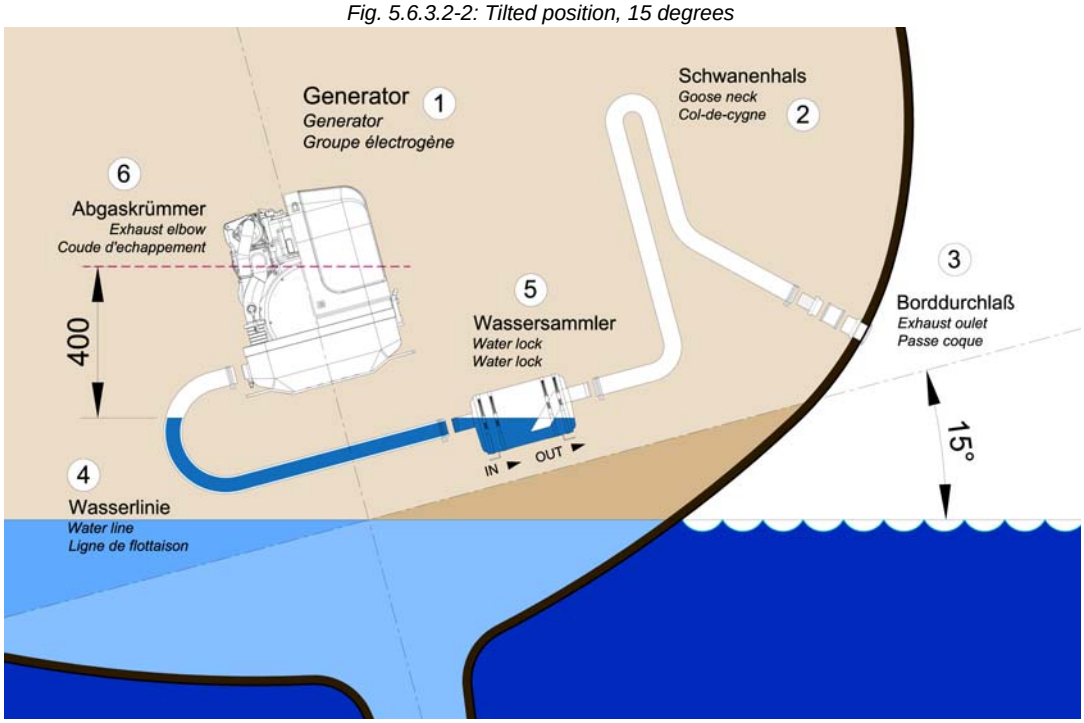


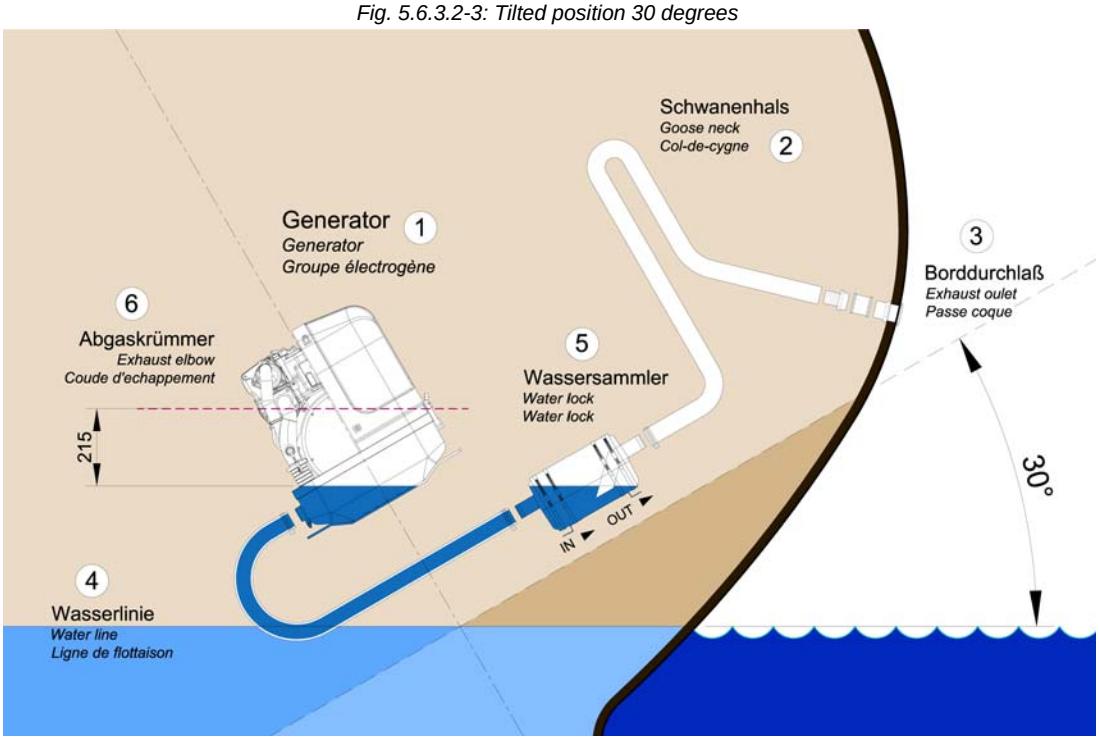
Fig. 5.6.3.2-2: Tilted position, 15 degrees



Tilted position 15 degrees - Fig. 5.6.3.2-2

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

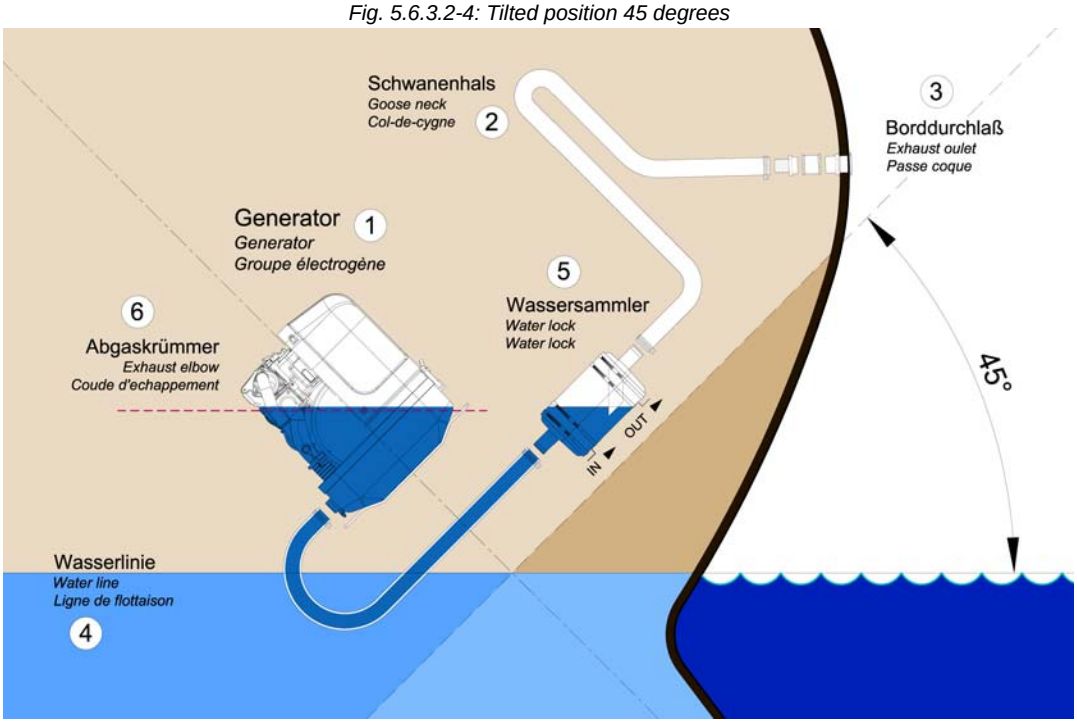
Fig. 5.6.3.2-3: Tilted position 30 degrees



Tilted position 30 degrees - Fig. 5.6.3.2-3

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. 5.6.3.2-4: Tilted position 45 degrees



Tilted position 45 degrees - Fig. 5.6.3.2-4

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.

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

Fig. 5.6.3.2-5: waterlock, 1000 mm next to center line

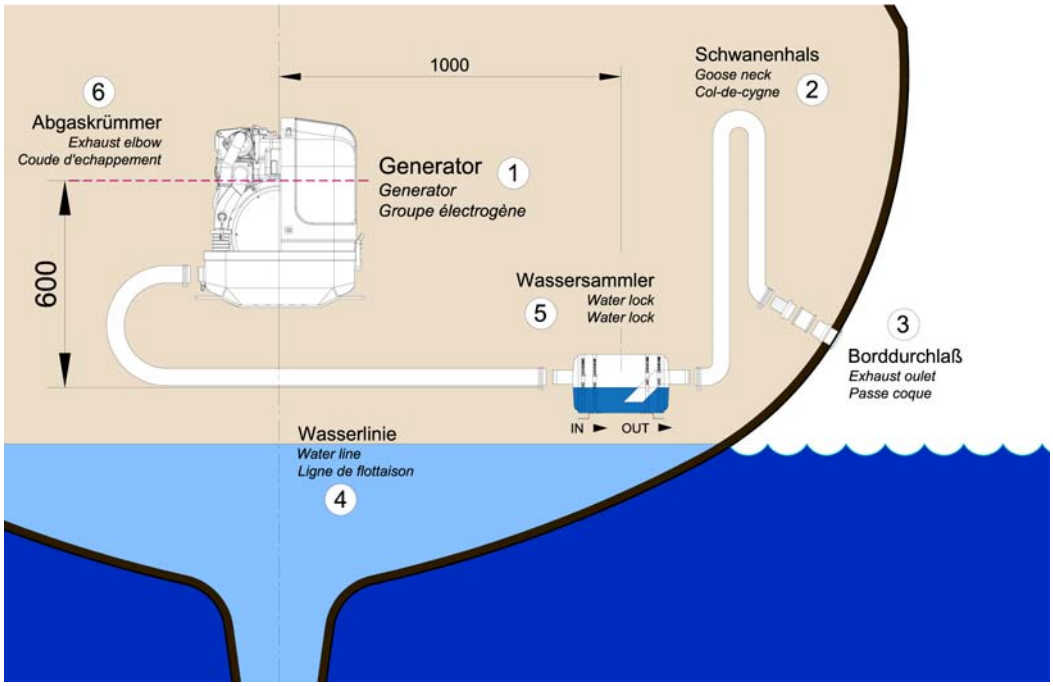
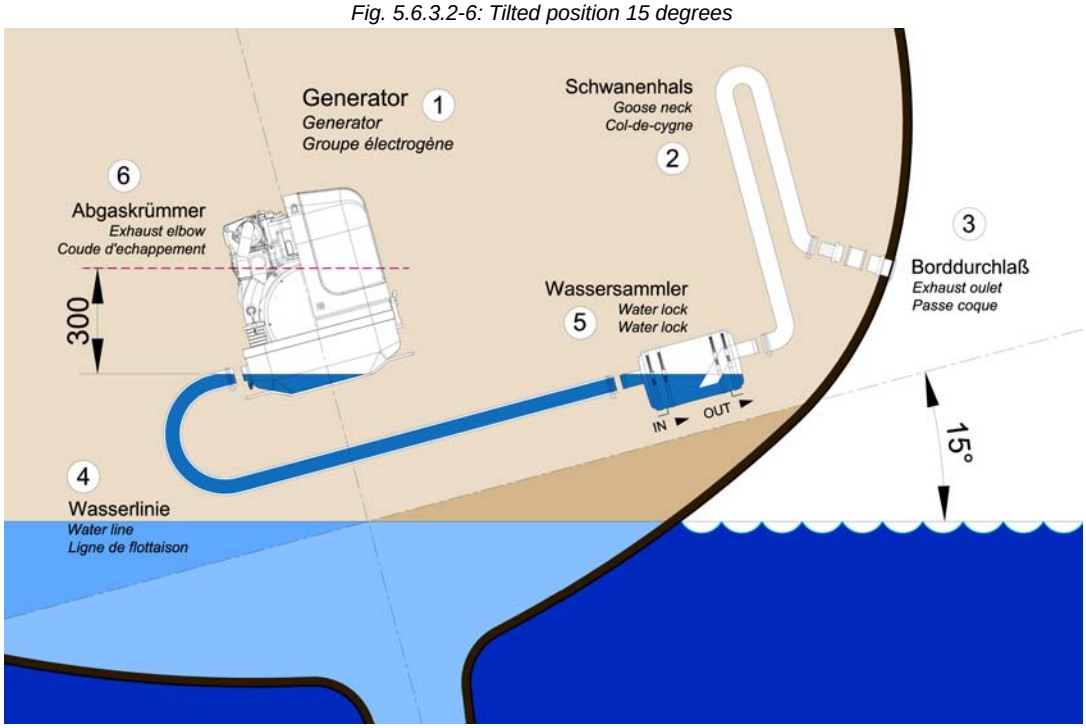


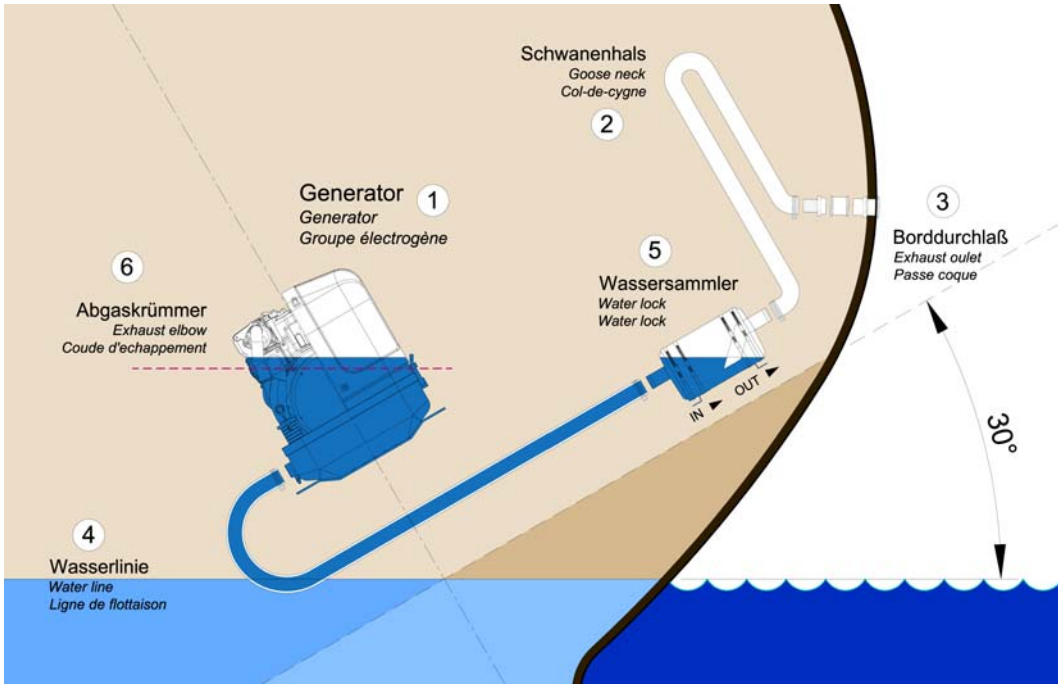
Fig. 5.6.3.2-6: Tilted position 15 degrees



Tilted position 15 degrees - Fig. 5.6.3.2-6

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

Fig. 5.6.3.2-7: Tilted position 30 degrees



Tilted position 30 degrees - Fig. 5.6.3.2-7

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.

Summary:

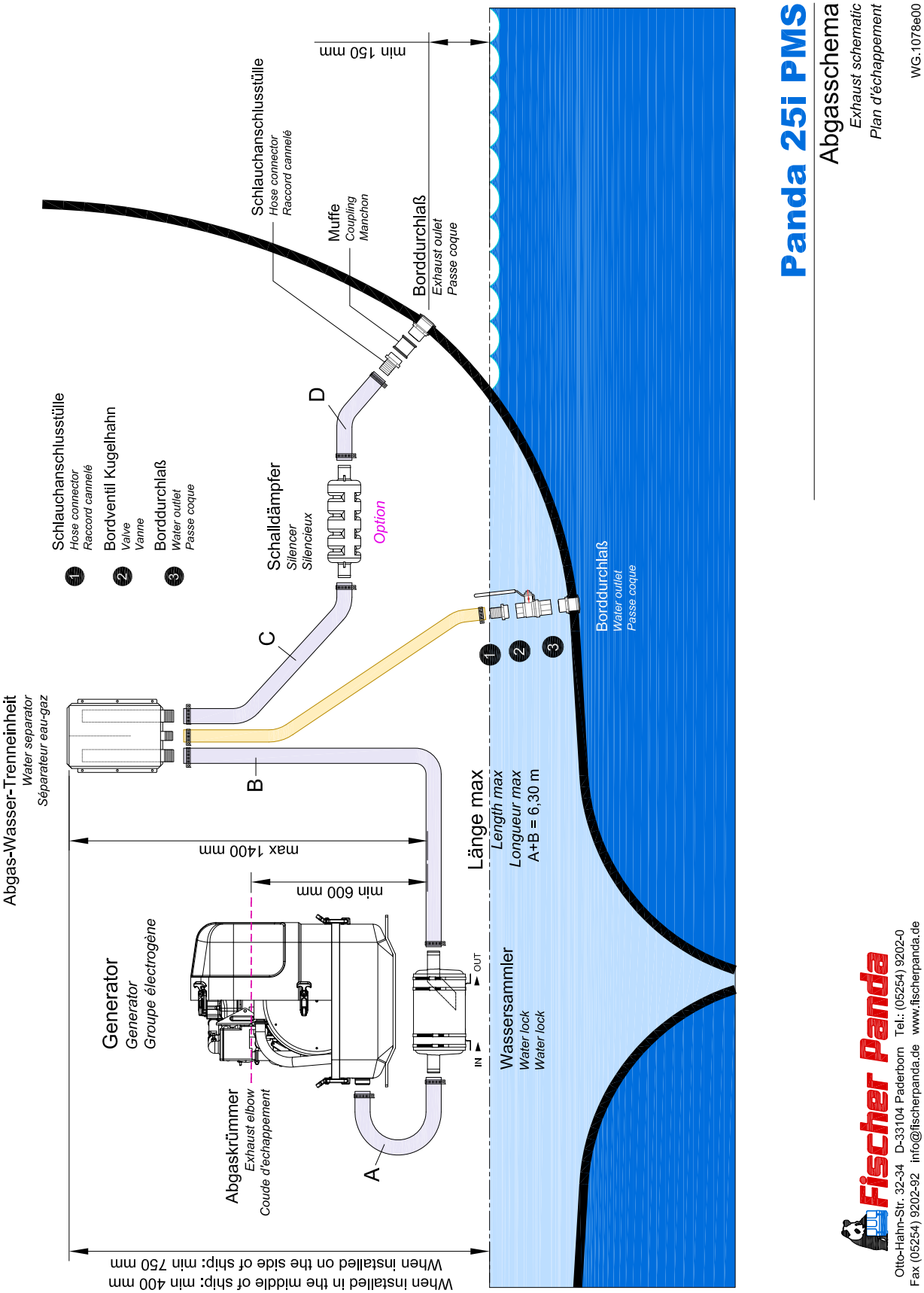
Concerning sailing yachts it must be regarded, that the waterlock is mounted in center underneath the generator, at least in reference to the ships' center line. Thus the waterlock is prevented from „leaking" very strongly when the ship is tilted.

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 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 through-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".

Fig. 5.7.0-1: Installation Scheme exhaust / water separator



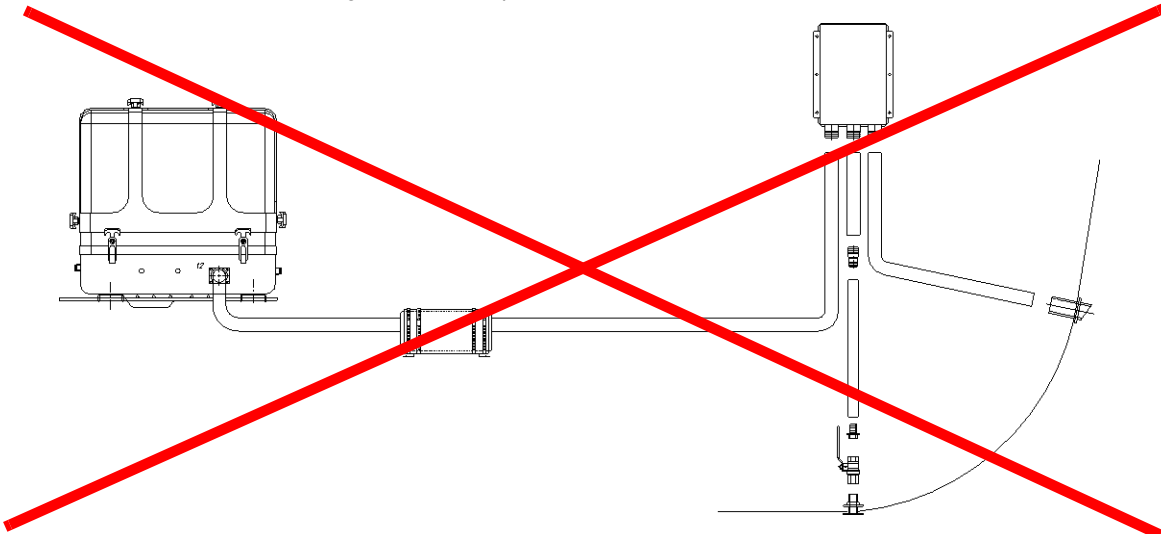
5.7.1 Installation exhaust water separator

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 through-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 in the through-hull outlet. For such long exhaust routes, the exhaust hose diameter should also be increased, f.e. 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. 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. 5.7.1-1: Example 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 Fuel system installation

5.8.1 Fischer Panda installation kit - Fuel system

The following additional components will be required for the specified installation. You can purchase them as an installation kit or separately at Fischer Panda.

Note:

Fuel hose

representative picture

Fig. 5.8.1-1: Fuel hose

No return valve

representative picture

Fig. 5.8.1-2: No return valve

Pre filter with water separator

representative picture

Fig. 5.8.1-3: Pre filter with water separator

Pre filter with water separator

Alternative Article

representative picture

Fig. 5.8.1-4: Pre filter with water separator

Quick connector for fuel lines

representative picture

Fig. 5.8.1-5: Quick connector for fuel lines

Hose clamps

representative picture

Fig. 5.8.1-6: Hose clamps

5.8.1.1 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 external Fuel pump should be installed near the tank

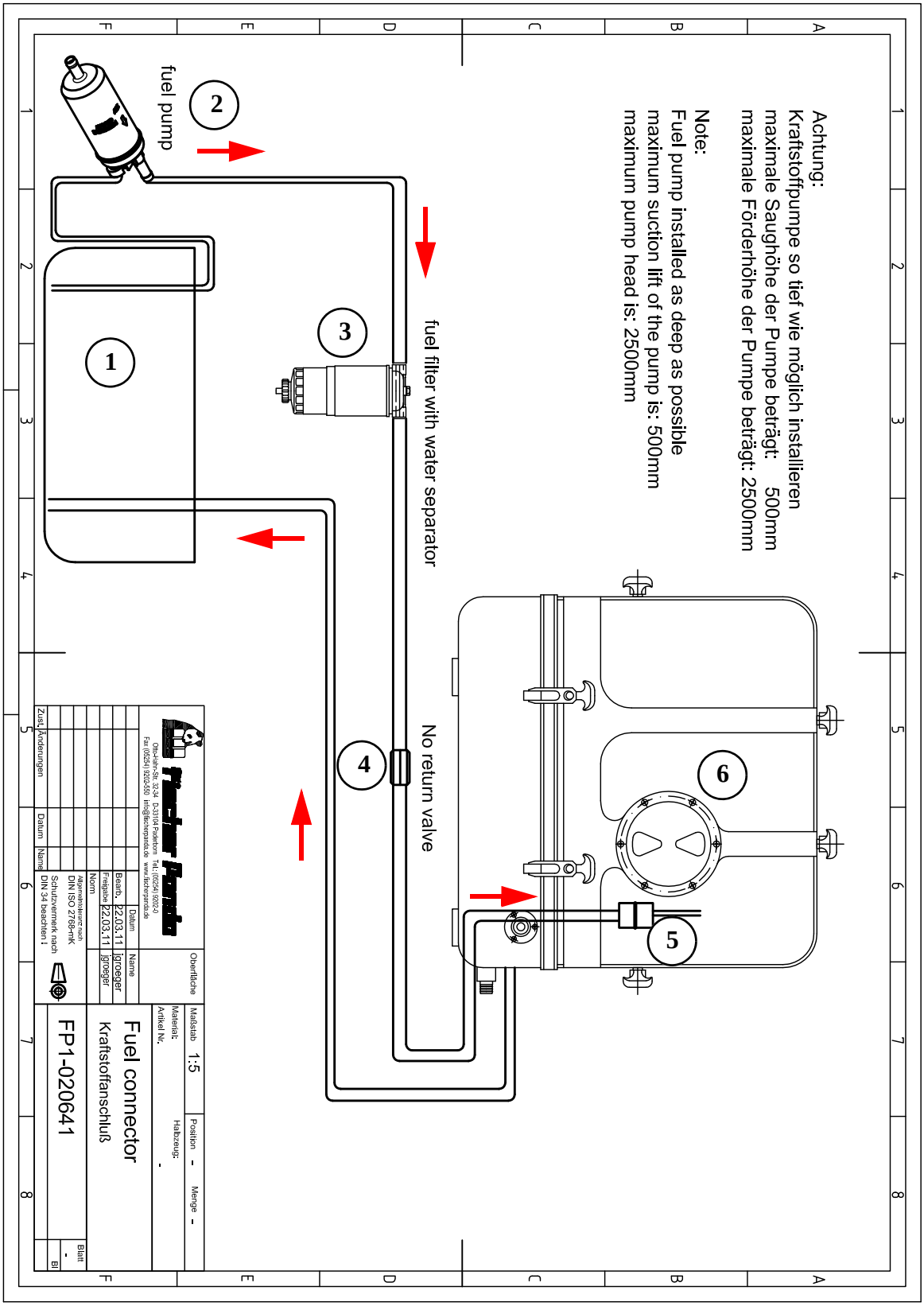
Electrical fuel pump

With the Fischer 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 is prepared at the generator.

Some generators (f.e. with Deutz diesel engine) has an engine driven internal fuel pump. At these generators the electrical fuel pump is optional,.

Fig. 5.8.1-1: electrical fuel pump

Fig. 5.8.1-2: Fuel system - schema



1. Fuel tank
2. external fuel pump
3. external fuel prefilter with water separator
4. Non return valve
5. Fuel fine filter
6. Generator

External fine filter

At generators with Kubota EA 300 or Farymann engines, the fine filter is delivered with the generator. This fine filter should be installed in the fuel feed line next to the generator.

representative picture

Fig. 5.8.1-3: externer Feinfilter

5.8.2 Connection of the fuel lines at the tank

General fuel feed and return line must be connected to the tank at separate connection points.Lead the return fuel pipe connected to the day tank to the floor

Note:

Connection of the return pipe to the tank

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!

5.8.3 Position of the pre-filter with water separator

Inside the generator capsule itself, there is the fuel filter installed (exception: Panda 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.

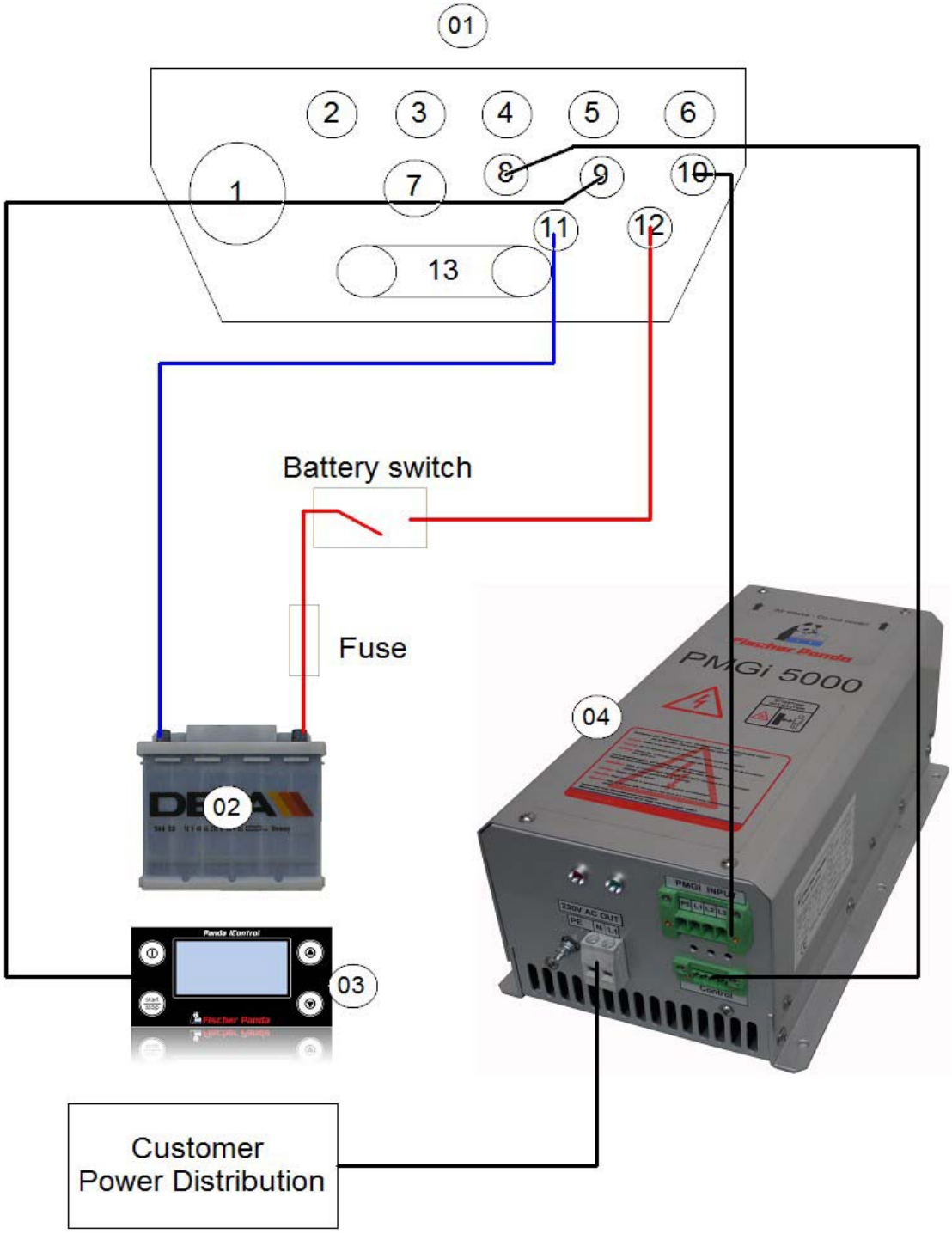
Additionally to the standard fine filter a pre-filter with water separator must be installed outside of the sound insulation capsule in the fuel system line (not included in the delivery).

representative picture

Fig. 5.8.3-1: Pre-filter with water separator

5.9 Electrical Connection 4800i PMS

Fig. 5.9-1: Electrical Connection 4800i PMS



01) Front Connections of the 4800i PMS
02) Starter battery
03) iControl 2 remote control panel
04) PMGi 5000 inverter

5.10 Generator DC system installation

The generator can be attached to the existing starting battery of the main engine or be supplied with its own battery.

The Panda 4000s is not equipped with its own 12V battery loading installation. Thus that the starting battery is charged during the generator operation, at the exit of the generator a battery charger is ensured is normally attached. This battery charger should be selected in such a way that the rated output approx. 10% of battery capacity correspond. (120Ah starting battery requires a battery charger with approx. 10 - 12A charging current).

In the Panda accessories program special battery chargers are available, which are designed to load in connection with the generator particularly effectively. This is however necessary only if the electrical system is to be loaded hereby. For loading the generator and/or starting battery a simple, low-priced battery charger is sufficient.

5.10.1 Connection of the 12V starter battery

Use the prepared protective tube for the battery (+) cable.

Attention!:

Make sure that the voltage of the starter battery fits to the start system voltage

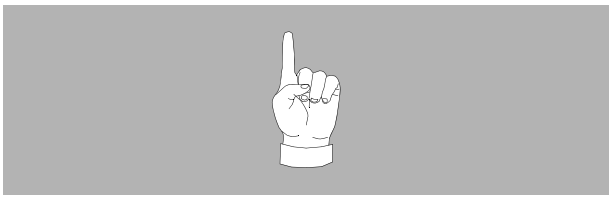
f.e. 12 V starter battery for a 12 V start system

f.e. 24 V starter battery for a 24 V start system (2x12 V batteries 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 battery, 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 °C, 195 °F.

The batteries must be installed 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.

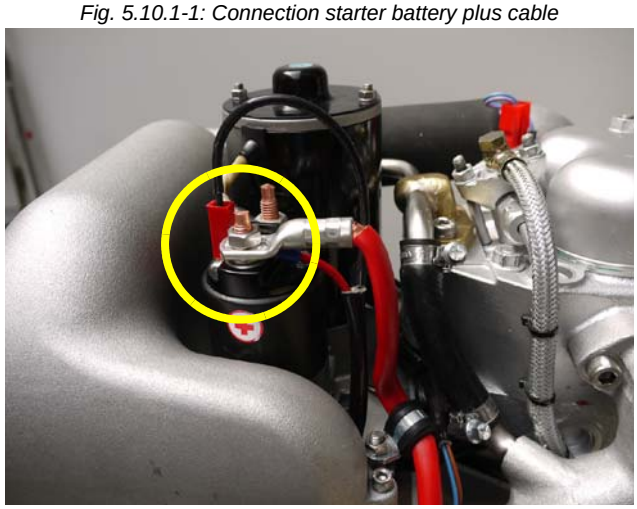
Examine regularly the cable laying and the electrical connections.

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

Connection of the battery (-)

Sample picture 4000s FC

Fig. 5.10.1-1: Connection starter battery plus cable

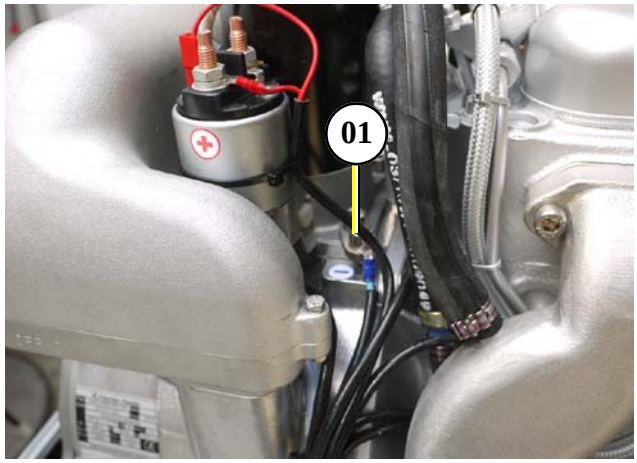


Connect the battery (-) with the connection point at the engine foot

1. Battery (-) connection point

Sample picture 4000s FC

Fig. 5.10.1-2: Connection starter battery minus cable

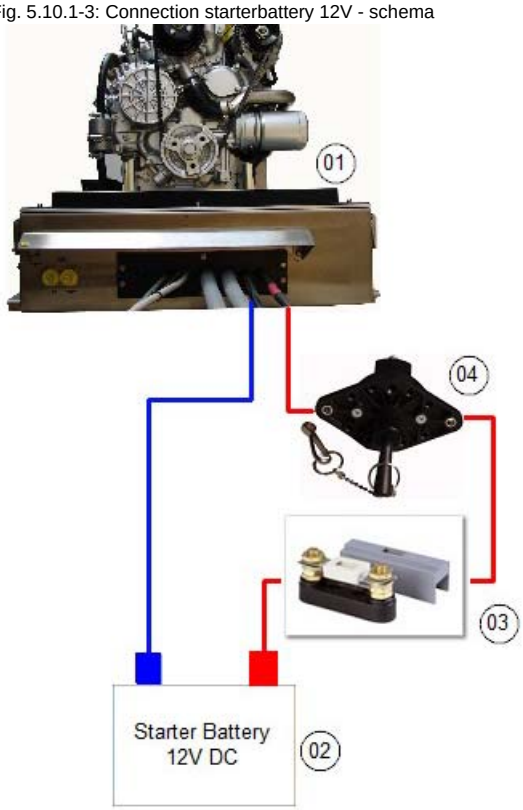


The Panda 4000s has no DC-Alternator (Dynamo).

Attention!

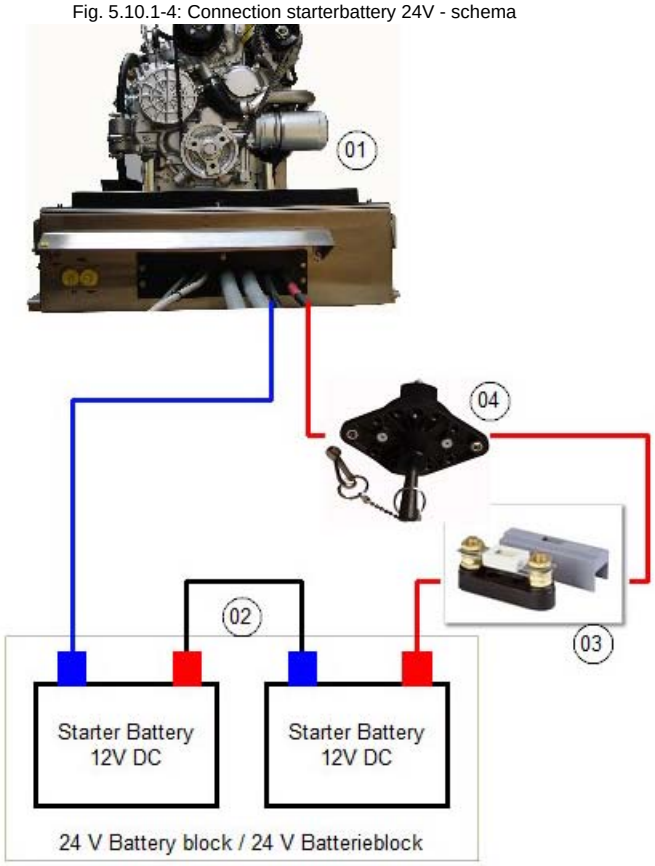
The starter batttery must be charged by an external battery charger.

Fig. 5.10.1-3: Connection starterbattery 12V - schema



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

Fig. 5.10.1-4: Connection starterbattery 24V - schema



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

5.10.2 How to connect two 12V batteries to a 24V battery bank

The starter batteries have to be connected in this order:

1. (+) cable of first battery

Fig. 5.10.2-1: Installation starter battery

2. (-) cable of second battery

Fig. 5.10.2-2: Installation starter battery

3. (+) cable of second battery

Fig. 5.10.2-3: Installation starter battery

4. (-) cable of first battery

Disconnect the batteries in reverse procedure.

Fig. 5.10.2-4: Installation starter batterie

5.10.3 Relays and DC fuse

The Panda generator Panda 4000s is equipped with two various DC-relays and one electrical fuse, which can be found at the terminal strip. The various relays and fuse have the following tasks (also see the DC circuit diagram):

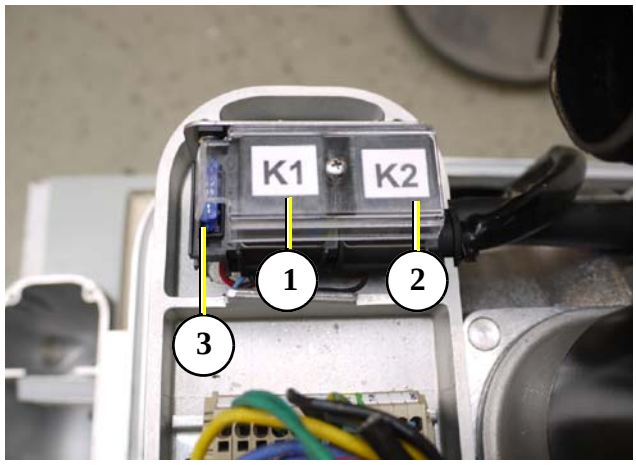
1. Starter relay K1

2. Fuel pump start relay K2

3. Electrical fuse (15A)

Sample picture 4000s FC

Fig. 5.10.3-1: Relays and fuse



5.10.4 Connection of the remote control panel - see separate control panel manual

5.10.5 Connection of the AC system

Before the electrical system is installed, READ the section "Safety Instructions - Safety First!" on page 17 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!: Danger to Life - High voltage

5.10.5.1 Connection of the PMGi inverter to the generator - see PMGi data sheet

5.10.5.2 Connection of the Inverter to the on board AC system

All electrical safety installations have to be made on board.

A power source selector switch must be installed between the inverter and the ships electrical supply system. This switch must used to ensure that all AC load can be switched off at once. This switch should also

be installed to keep the generator and shore (grid) power systems separate.

A 3-way cam-type 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.

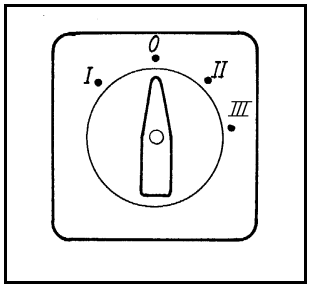
0. OFF

I. Generator

II. Shore power connection

III. Inverter

Fig. 5.10.5-1: Power source selector switch



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.

Electrical fuses

It is absolutely essential that the electrical system installation is inspected by a qualified electrical technician.

Required cable cross-sections

The following recommended electrical cable dimensions (cross sections) are the minimum required sizes for a safe installation. *(see Table 8.2.1, “Technical Data Generator 4800i,” on page 126.*

6. Maintenance Instructions

6.1 Personal requirements

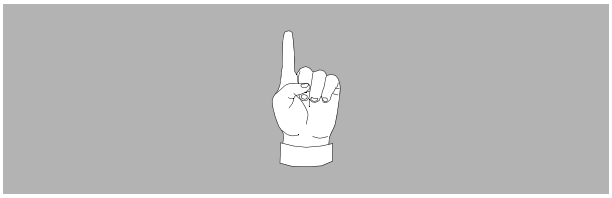
All maintenance, if not special marked, can be done by the trained persons.

Further maintenance must be done by technical personal or Fischer Panda service points.

6.2 Hazard notes for the maintenance

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

Notice!:



Danger for life! - The generator can be equipped with a automatic 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 disconnected 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 is stopped and the starter battery is disconnected 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 severe 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 available tools and special tools. incorrect or damaged tools can result injuries.

Warning!: Risk of injury

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

- 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 immediately.
- Do not inhale oil and fuel vapours.

Danger!: Danger of poisoning

Danger for Life. Improper handling, operation, installation and maintenance can result in severe 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/maintenance personal protective equipment is required to minimize the health hazards.

- Protective clothing
- safety boots
- protective gloves
- Ear defender
- safety glasses

Instruction!: Personal protective equipment necessary.

Disconnect all load during the work at the 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!:

Batteries contain corrosive acids and lyes.
Improper handling can cause the batteries to heat up and burst. Corrosive acid/lye may leak. Under unfavourable conditions, the battery may explode.

Observe the instructions from your battery manufacturer.

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 Maintenance Requirements

Control before starting

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

Once a week

- Lubrication of actuator-trapezoid thread spindle

6.5 Maintenance interval

For the maintenance intervals, see the „General information for vehicles generators“ which are attached to this manual.

For generators with dynamic maintenance interval (for example generators with iControl2). Further informations are in the remote control panel manual/data sheet.

With the dynamic operation hours the service interval can be raised up to 30% (200h max.). Make sure that the dynamic operation hours are not reset accidently between the service interval.

Note:

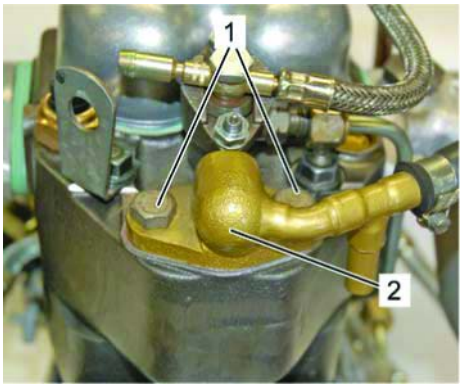
6.5.1 Check of hoses and rubber parts in the sound insulated capsule

Check all hoses and hose connections for good condition. The rubber hoses are very sensitive to environmental influences. They wear 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.

6.6 Removing, installing and checking thermostat

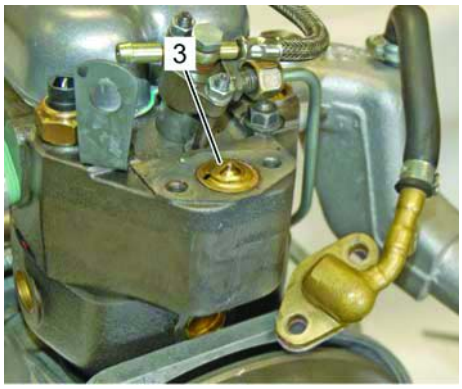
1. Switch off engine and let it cool down to the ambient temperature.
2. Drain coolant and collect in a suitable container.
3. Unscrew both bolts (1).
4. Remove thermostat housing (2) with gasket.

Fig. 6.6-1:



5. Remove thermostat (3).

Fig. 6.6-2:



Functional check

6. Fill a container with water.
7. Attach thermostat (3) to a wire (4) and submerge in the water.
8. Heat the water slowly using, for example, a submersible heater.

Fig. 6.6-3:

9. Measure the water temperature with a suitable temperature measuring instrument.
10. The thermostat must be completely open at 50 °C water temperature (for the salt water version) or at 70 °C water temperature (for the fresh water version).

Fig. 6.6-4:

Example: Thermostat completely opened (see arrow).

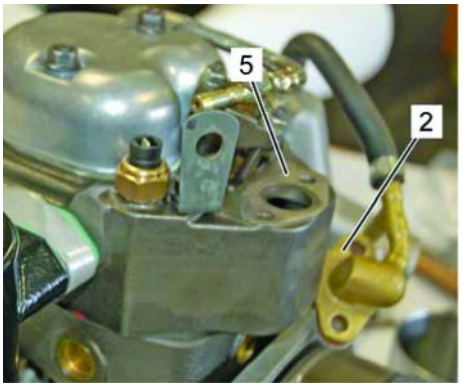
Fig. 6.6-5:

Example: Thermostat closed (see arrow).

Fig. 6.6-6:

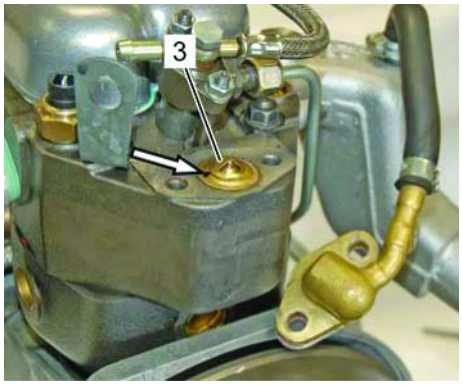
11. Remove deposits and gasket residues on the cylinder head (5) and on the thermostat housing (2); in doing so, ensure that no dirt gets into the water channel in the cylinder head.

Fig. 6.6-7:



12.Install thermostat (3).

Fig. 6.6-8:



Ensure when installing the thermostat that the small bore hole (see arrow) is not covered or closed and that the split pin is in the hole.

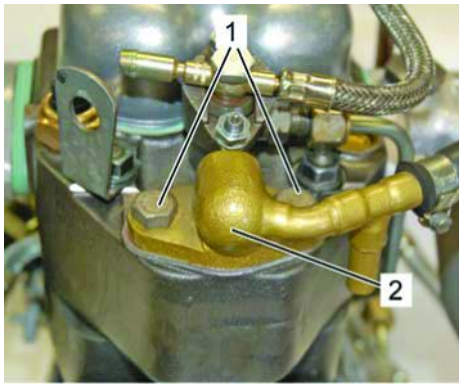
NOTE!

13. Replace thermostat housing (2) with new gasket.
14. Screw in and tighten both bolts (1).

Tightening torque 10 Nm

15. Fill with coolant (for engines with radiator) or water (for engines with neoprene impeller pump).
16. Start engine and check cooling system for leaks.

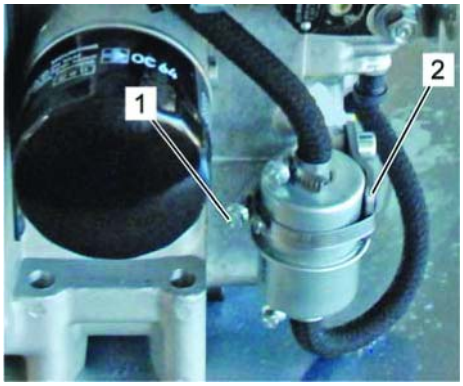
Fig. 6.6-9:



6.7 Replacing fuel filter (standard) Farymann Dieselengine 15W/18W

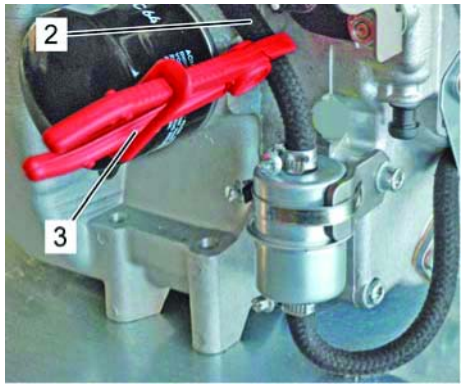
1. Switch off the engine.
2. Undo hose clamp (1) on the mounting (2) of the fuel filter.

Fig. 6.7-1:



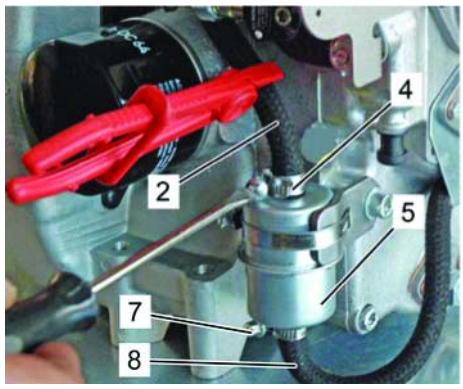
3. Disconnect fuel line (2) using special fuel line disconnecting tool (3).

Fig. 6.7-2: Kraftstoffleitung abklemmen



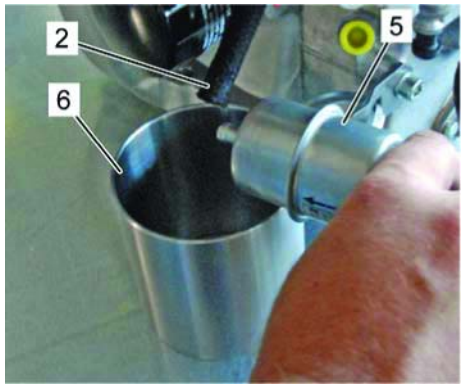
4. Undo hose clamp (4) and pull off the fuel line (2) from the fuel filter (5).

Fig. 6.7-3: Schlauchschelle lösen



5. Collect the fuel from the fuel line (2) and from the fuel filter (5) in a suitable container (6) and dispose of in accordance with the environmental regulations.
6. Undo hose clamp (Fig. 71/7) and pull off the fuel line (Fig. 71/8) from the fuel filter (Fig. 71/5).

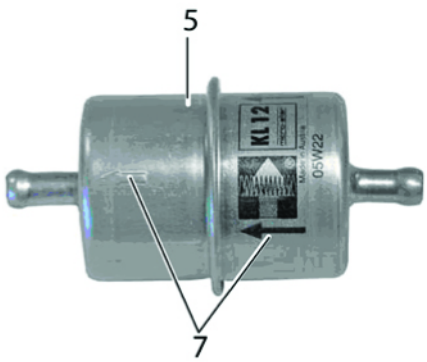
Fig. 6.7-4: Kraftstoff auffangen



7. Install new fuel filter (5) and pay attention to the flow direction. The arrow (7) must point in the direction of the injection pump.

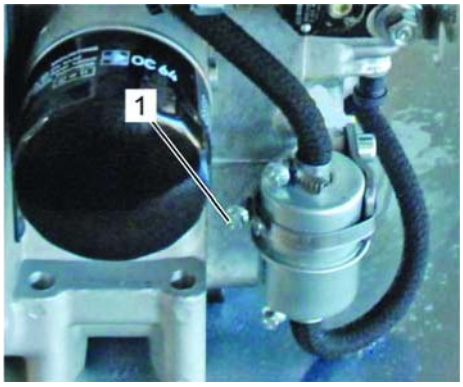
Assembly is in the reverse order to the dismantling.

Fig. 6.7-5: Kraftstofffilter



8. Tighten screw (1) of the hose clamp on the mounting.
9. Start engine and check the fuel system for leaks.

Fig. 6.7-6: Kraftstofffilter einbauen



6.8 Changing engine oil at the Farymann Dieselengine 15W/18W

Only change engine oil when the engine is at a standstill and at operating temperature. Always replace engine oil and oil filter together.

NOTE!

Fig. 6.8-1: Ölablassschraube

1. Switch off the engine
2. Slacken oil drain plug (1) (e.g. with a ring spanner SW 13).
3. Place a suitable container underneath.
4. Screw out oil drain plug by hand.

Caution: Engine oil can be hot.

5. Collect old oil in a suitable container and dispose of in accordance with the environmental regulations.

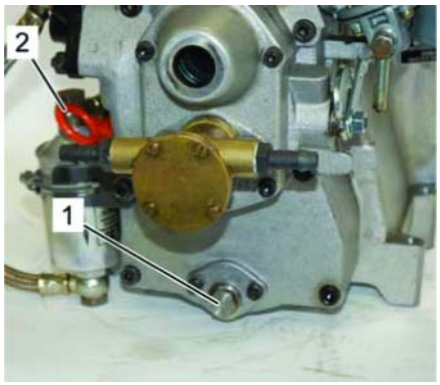


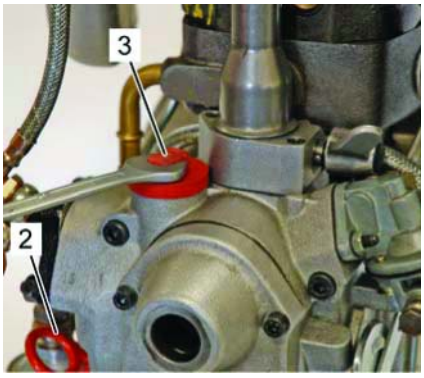
Fig. 6.8-2: Ölablassschraube mit Dichtung

6. Check oil drain plug (1) for damage and replace if necessary.
7. Always replace the copper seal (2).
8. Screw in oil drain plug by hand and tighten with e.g. ring spanner SW 13.

Tightening torque: 12 Nm

9. Release oil filler cap (3) e.g. with a flat wrench (wrench size: 13 mm) and screw off by hand.
10. Fill with engine oil.
11. Pull out oil dipstick (2) and clean the bottom end with a clean and fluff-free cloth.
12. Replace the oil dipstick (2) and pull it out again.
13. Check the oil level quantity. The oil level should be just under the Max. marking.
14. Only tighten the oil filler cap (3) by hand (risk of breakage).

Fig. 6.8-3: Öleinfüllverschlussdeckel



15. Start engine and check for leaks.

6.9 Filling with engine oil at the Farymann Dieselengine 15W/18W

Engine damage due to incorrect oil quantity! **CAUTION!**

Too high or too low an engine oil level can result in

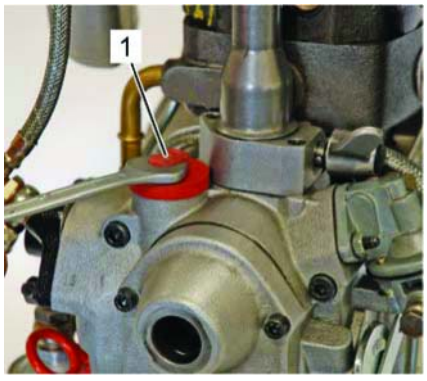
damage to the engine.

Therefore:

- Never exceed the maximum level.
- Never drop below the minimum level.
- The engine must stand up straight for checking the oil level.

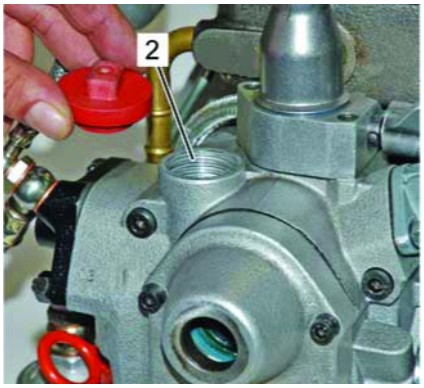
1. Release oil filler cap (1) e.g. with a 13mm jaw spanner and screw off by hand.

Fig. 6.9-1: Öleinfüllverschlussdeckel öffnen



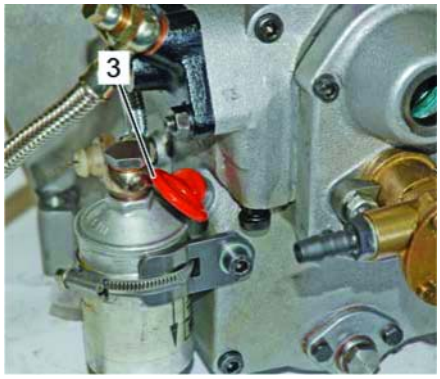
2. Fill engine oil into the filling opening (2).

Fig. 6.9-2: Motoröl einfüllen



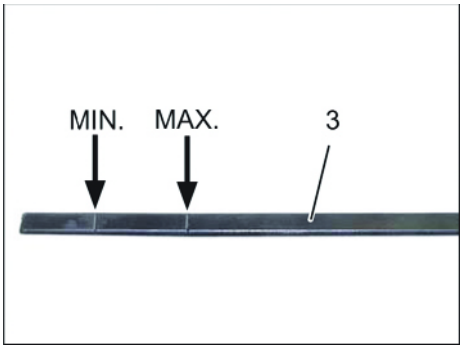
3. Pull out oil dipstick (3) and clean the bottom end with a clean and fluff-free cloth.
4. Replace the oil dipstick (3) and pull it out again..

Fig. 6.9-3: Ölstand kontrolle



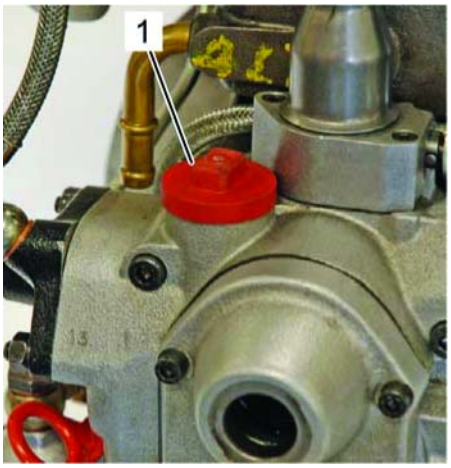
5. Check the oil level quantity. The oil level should be just under the Max. marking.
6. Fill with engine oil if needed.

Fig. 6.9-4: Ölpeilstab



7. **Only tighten** the oil filler cap (1) **by hand** (risk of breakage)

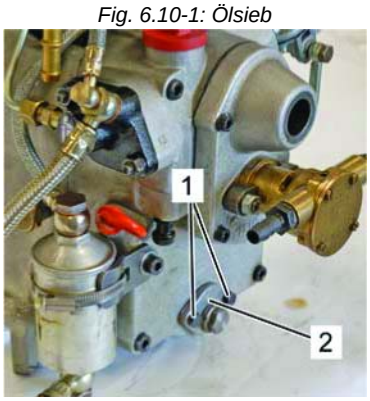
Fig. 6.9-5: Ölverschlussdeckel festschrauben



6.10 Removing and installing oil strainer

1. Place a suitable container underneath.
2. Drain engine oil
3. Unscrew both bolts (1).
4. Remove oil strainer housing (2).
5. Collect old oil in a suitable container and dispose of in accordance with the environmental regulations.
6. Clean oil strainer with cold cleaning agent or diesel.

Fig. 6.10-1: Ölsieb

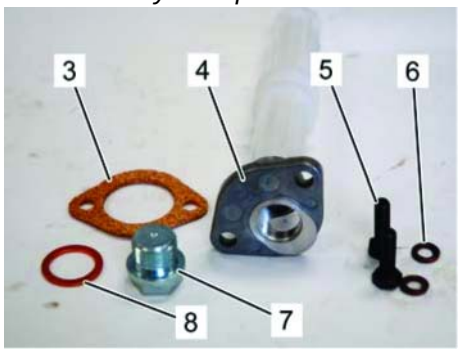


If the oil strainer is deformed or damaged, it must absolutely be replaced.

Note:

7. Install cleaned or new oil strainer (4) with new gasket (3) carefully.
8. Screw in both bolts (5) with new copper seals (6) and tighten.

Fig. 6.10-2: absolutely be replaced Ölsieb mit Anbauteilen

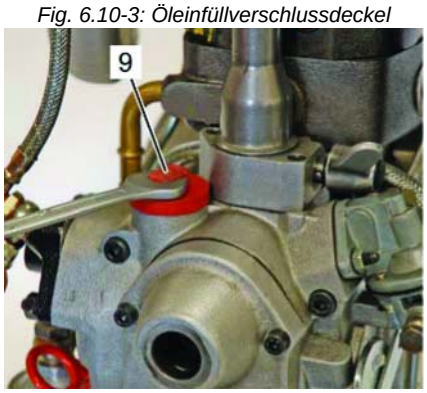


Tightening torque: 3 – 4 Nm

9. Screw in oil drain plug (7) with new copper seal (8) and tighten with ring spanner SW 13.

Tightening torque: 12 Nm

Fig. 6.10-3: Öleinfüllverschlussdeckel



10. Release oil filler cap (9) e.g. with a flat wrench (wrench size: 13 mm) and screw off by hand.
11. Fill with engine oil.
12. Pull out oil dipstick (Fig. 47/2) and clean the bottom end with a clean and fluff-free cloth.
13. Replace the oil dipstick (Fig. 47/2) and pull it out again.
14. Check the oil level quantity. The oil level should be just under the Max. marking.
15. Only tighten the oil filler cap (9**) by hand** (risk of breakage).
16. Start engine and check for leaks.

6.11 Adjusting valve clearance at the Farymann Dieselengine 15W/18W

Safety

Risk of injury due to starting the engine!

WARNING!

The engine can be accidentally started when adjusting the valve clearance and thereby cause severe injuries.

Therefore:

– Disconnect the high pressure line on the injection nozzle holder before starting work.

Personnel

This work must only be carried out by trained specialist personnel. In the absence of the required qualifications, arrange for the work to be carried out by a Greaves Farymann Diesel service partner.

Prerequisites

Only check and adjust the valve clearance when the engine is cold (less than 35 °C).

Settings

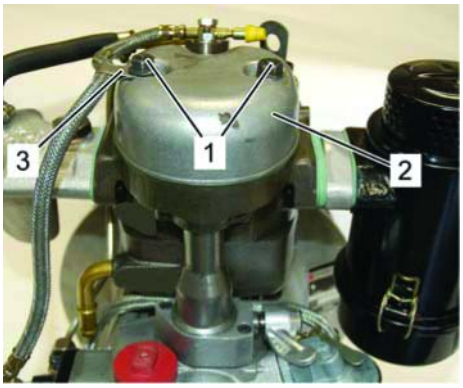
Exhaust valve 0.2 mm

Intake valve 0.2 mm

Preparations

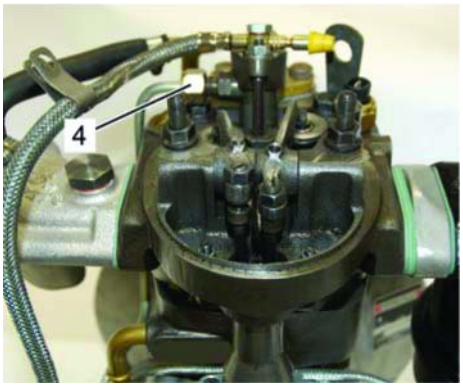
1. Switch off engine and let it cool down to the ambient temperature.
2. Unscrew both nuts (1) on the valve cover (2) and remove bracket (3) for fuel line and plastic seals, valve cover and valve cover gasket.

Fig. 6.11-1: Ventildeckel



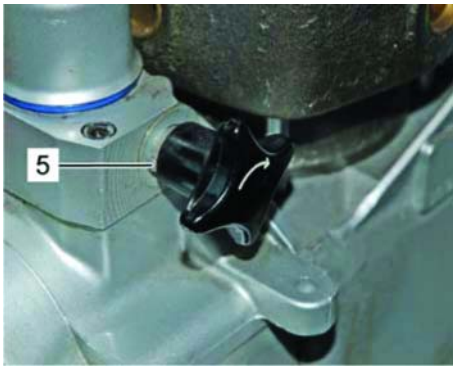
3. Detach the high pressure line (4) on the injection nozzle holder in order to prevent accidental starting of the engine.

Fig. 6.11-2: Hochdruckleitung



4. Turn automatic decompression to operating position (5). Pin faces forward (9 o'clock position).

Fig. 6.11-3: Dekompression



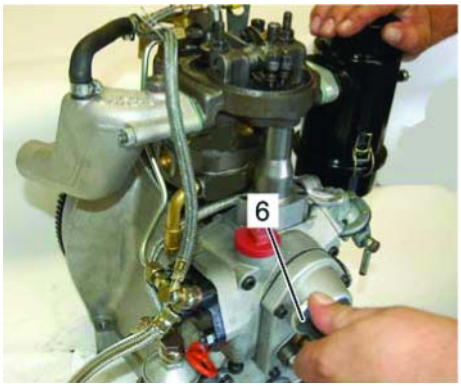
The decompression must be turned off at the valve adjustment (operating position: pin faces forward: 9 o'clock position), only in this way is a correct adjustment of the valves guaranteed.

NOTE!

Adjusting exhaust valve

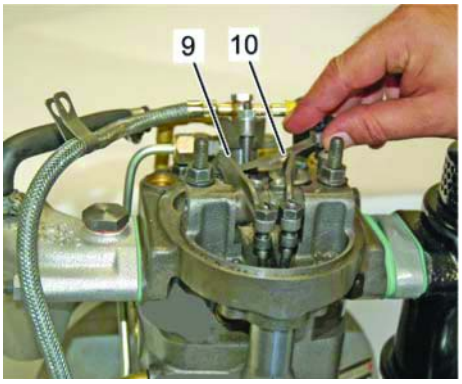
5. Insert crank handle (6) into the starting handle support bearing and slowly turn the crankshaft in the engine rotation direction (anticlockwise) until the inlet valve's spring is pushed down completely (inlet valve is now fully open).

Fig. 6.11-4: Einlassventil vollständig öffnen



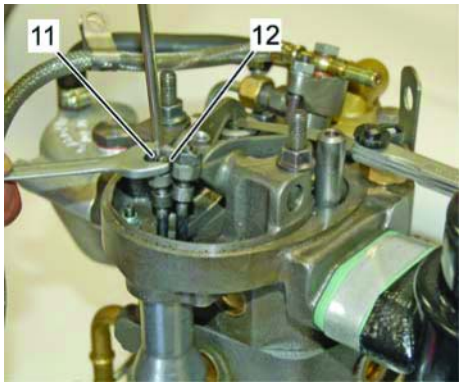
6. **6.** Slide a feeler gauge (10) with thickness 0.2 mm between rocker arm (9) and the exhaust valve stem and check the valve clearance of the exhaust valve. The feeler gauge must be able to be pulled through without noticeable resistance (drag).

Fig. 6.11-5: Auslassventil prüfen



7. If the clearance is too large or too small, undo the lock nut (12) and adjust the clearance with the adjusting screw (11). The feeler gauge must be able to be pulled through without noticeable resistance (drag).
8. Hold the adjusting screw in place with a screwdriver and tighten the lock nut.
9. Check the valve clearance again.

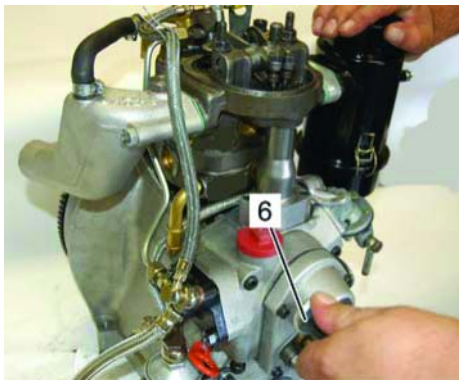
Fig. 6.11-6: Auslassventil einstellen



Adjusting intake valve

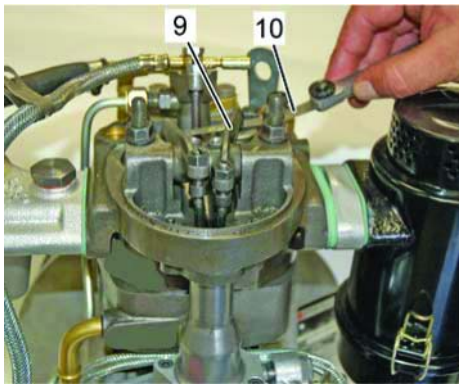
10. Insert crank handle (6) into the starting handle support bearing and slowly turn the crankshaft in the engine rotation direction (anticlockwise) until the exhaust valve's spring is pushed down completely (exhaust valve is now fully open).

Fig. 6.11-7: Auslassventil vollständig öffnen



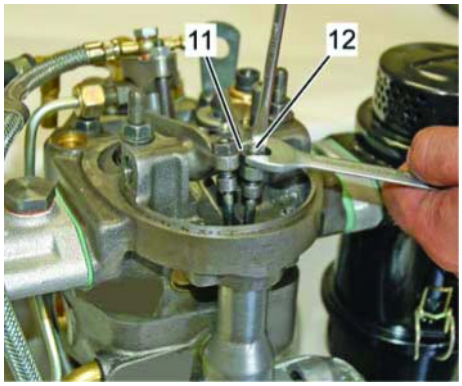
11. Slide a feeler gauge (10) with thickness 0.2 mm between rocker arm (9) and the inlet valve stem and check the valve clearance of the inlet valve. The feeler gauge must be able to be pulled through without noticeable resistance (drag).

Fig. 6.11-8: Einlassventil prüfen



12. If the clearance is too large or too small, undo the lock nut (11) and adjust the clearance with the adjusting screw (12). The feeler gauge must be able to be pulled through without noticeable resistance (drag).
13. Hold the adjusting screw in place with a screwdriver and tighten the lock nut.
14. Check the valve clearance again.

Fig. 6.11-9: Einlassventil einstellen

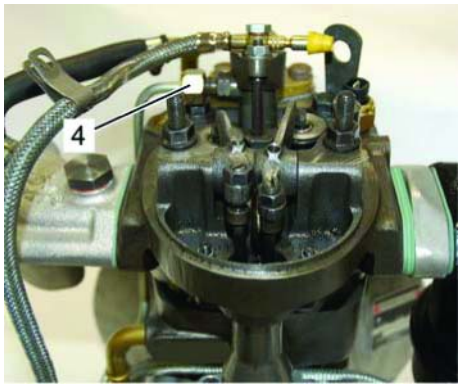


Reassambling

15. Tighten the high pressure line (4) on the injection nozzle holder.

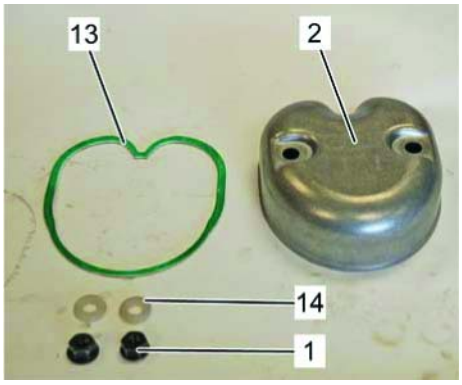
Tightening torque 25 Nm

Fig. 6.11-10: Hochdruckleitung anschließen



16. Replace valve cover gasket (13).

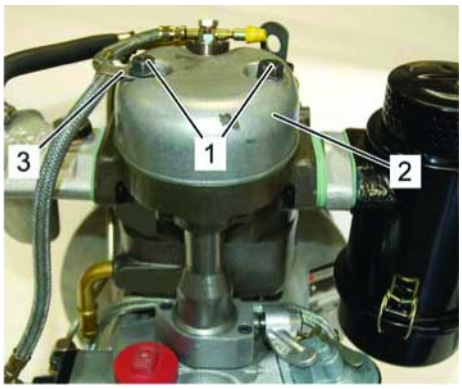
Fig. 6.11-11: Ventildeckeldichtung erneuern



17. Install valve cover (2) using two new plastic seals (14).
18. Mounting bracket (3) of the fuel line.
19. Tighten both nuts (1) of the valve cover (2).

Tightening torque 8–12 Nm

Fig. 6.11-12: Ventildeckel montieren



Always replace the valve cover gasket and the two plastic seals under the nuts of the valve cover. **NOTE!**

6.12 Ventilating the fuel system

Normally, the fuel system is designed to bleed out air itself i.e. as soon as the electric starter motor starts operation

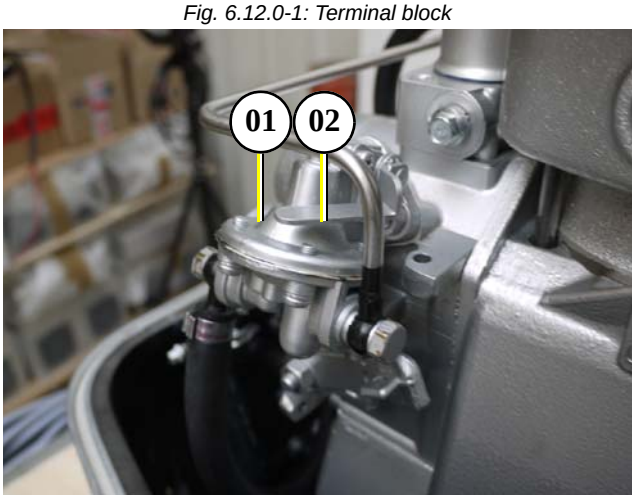
the fuel pump starts working and the fuel system will be de-aerated after some time automatically. It is nevertheless essential to bleed the system as follows prior to the first operation (as all hoses are empty):

Using the lever on the fuel pump, pump by hand until the counter pressure becomes noticeable. This builds up the primary pressure in the fuel system snd accelebrates the venting

01. Fuel pump

02. lever at fuel pump

Fig. 6.12.0-1: Terminal block



6.12.1 Checking the water separator in the fuel supply

The pre-filter with water separator has a cock at its lower surface, with this cock the downward sunk water can be discharged.

This is simply possible, water is heavier due to its density than the Diesel.

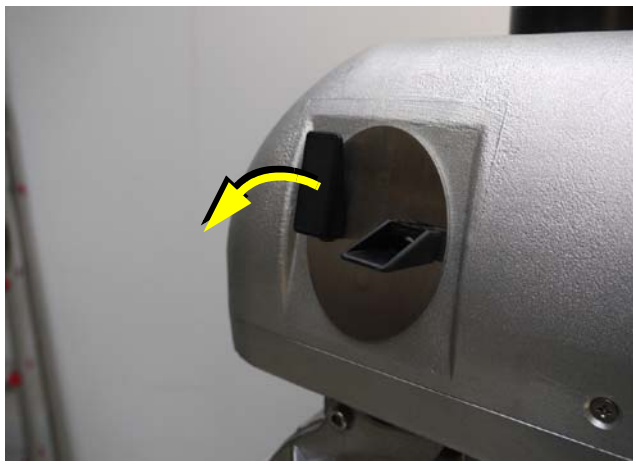
This pre-filter does not belong to the scope of supply.

Fig. 6.12.1-1: Fuel filter with water separator

6.13 Replace the air filter element

Pull the holder out to change the element.

Fig. 6.13-1: Air suction housing



Open the air suction holder by loosen the two quick release fasteners.

Fig. 6.13-2: Air filter element

If no change of the cooling water level can be determined, the generator is started for 5 minutes. Afterwards repeat the de-aeration two - three times.

It is meaningful to repeat the de-aeration procedure also after some days again to guarantee that in the system

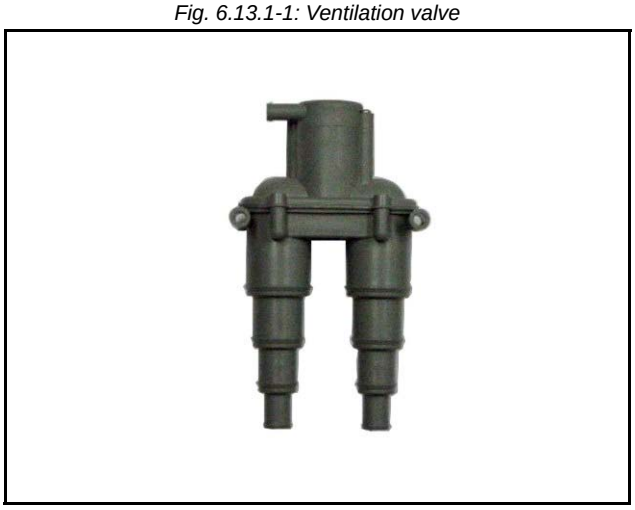
remained bubbles are removed.

6.13.1 Draining the coolant

In principle only describes here, how the cooling water of the raw water cycle can be drained. See measures for the preparation of the winter storage.

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

Fig. 6.13.1-1: Ventilation valve



6.14 The raw water circuit

6.14.1 Clean raw water filter

The raw water filter should be released regularly from arrears. In each case the water cock must be closed before. It is mostly sufficient to beat the filter punnet.

If water should seep through the cover of the raw water filter, this may be sealed in no case with adhesive or sealant. Rather must be searched for the cause for the leakage. In the simplest case the sealing ring between caps and filter holders must be replaced.

Fig. 6.14.1-1: Raw water filter

6.14.2 Causes with frequent impeller waste

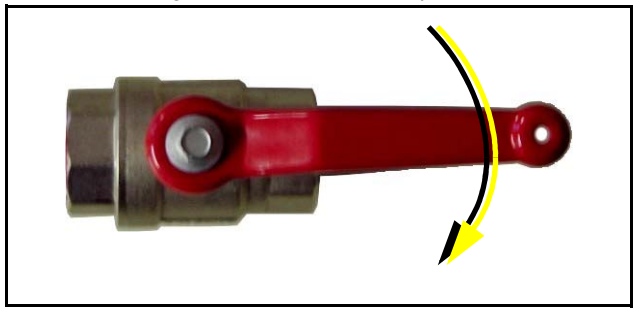
The impeller of the cooling water pump must be regarded as wearing part. The life span of the impeller can be extremely different and exclusively depends on the operating conditions. The cooling water pumps of the PANDA generators are laid out in such a way that the number of revolutions of the pump lies low compared with other gen-sets. This is for the life span of the pump a positive effect. Unfavorably affects the life span of the impeller, if the cool-

ing water sucking in way is relatively long or the supply is handicapped, so that the cooling water sucking in range develops a negative pressure. This can reduce first of all the power of the cooling water pump extremely that the wings of the impeller are exposed to very strong loads. This can shorten the life span extremely. Further the operation of the impeller pump loaded in waters with a high portion of suspended matters. The use of the impeller pump is particularly critical in coral waterbodies. Cases are well-known, which a impeller pump had so strongly run after 100 hours already that the lip seal on the wave was ground in. In these cases sharp crystal parts of the coral sand assess in the rubber seal and affect like an abrasive the high-grade steel shank of the impeller pump. If the generator were mounted over the water level it is particularly unfavorable for the impeller pump. After the first start some seconds will pass by, until the impeller can suck in cooling water. This short unlubricated operation time damages the impeller. The increased wear can lead after short time to the loss. (see special notes: "Effects on the impeller pump, if the generator is mounted over the waterline")

6.14.3 Replace the impeller

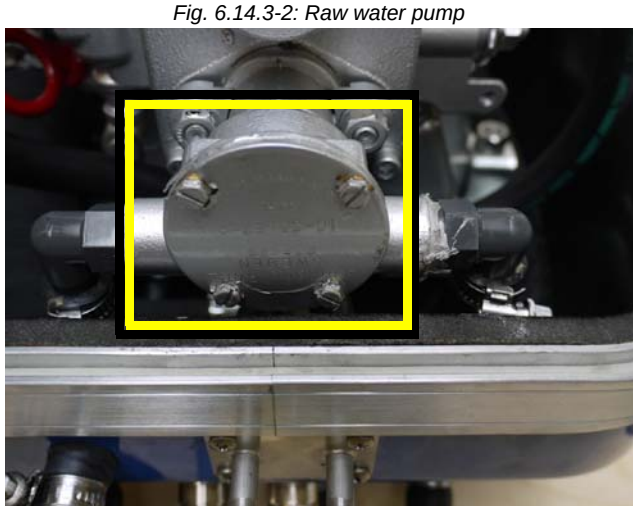
Close the raw water stop cock.

Fig. 6.14.3-1: Raw water stop cock



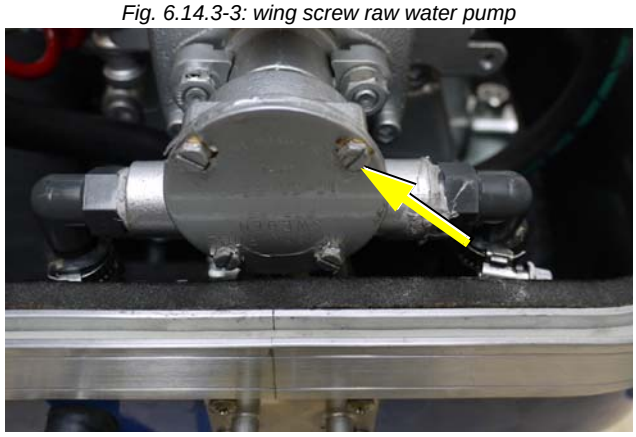
Raw water pump on the front side of the genset.

Fig. 6.14.3-2: Raw water pump



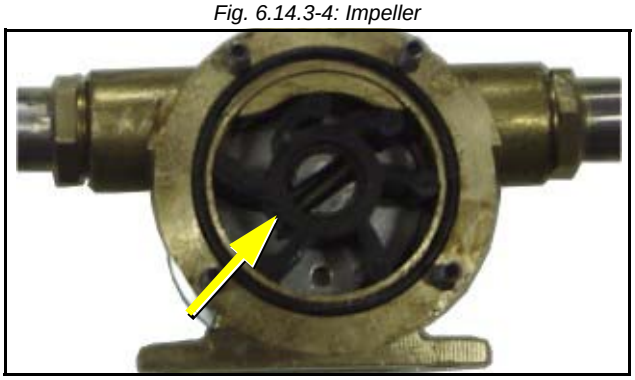
Remove the cover of the raw water pump by loosen the 4 wing screws from the housing.

Fig. 6.14.3-3: wing screw raw water pump



Pull to the impeller with a multigrip pliers of the wave.

Fig. 6.14.3-4: Impeller



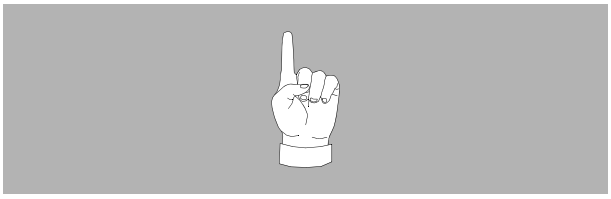
Check to the impeller for damage and replace it if necessary.

Fig. 6.14.3-5: Impeller

Before the reinsertion into the housing the impeller should have been lubricated with glycerin or with a non-mineral oil based lubricant e.g. silicone spray.

Mark the impeller, to make sure that these is used in the correct position at re-installation. This is very important, because the impeller can dissolve otherwise very fast.

Notice!:



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

Fastening the cover and use a new gasket.

Fig. 6.14.3-6: Gasket

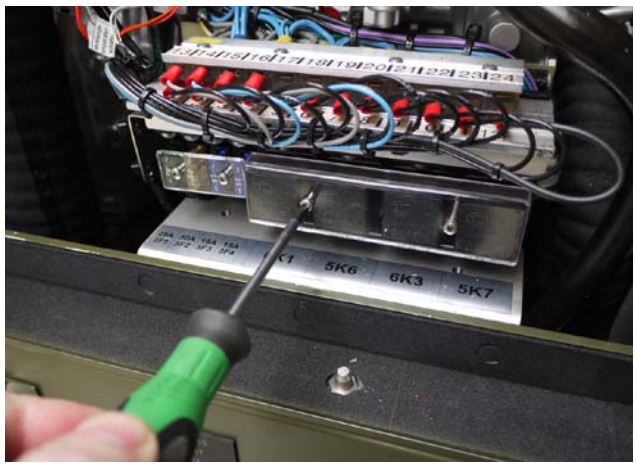
6.15 Replacing the Operating Current Relays

The described procedure is representative for Fischer Panda generators. The original location of the item must be taken from the generator description of this manual. All replacements and repairs can be done by the user.

NOTE:Representative procedure

1. Remove the two fixing screws of the plastic cover using a size 0 or 1 phillips screwdriver.

Fig. 6.15-1: Relay

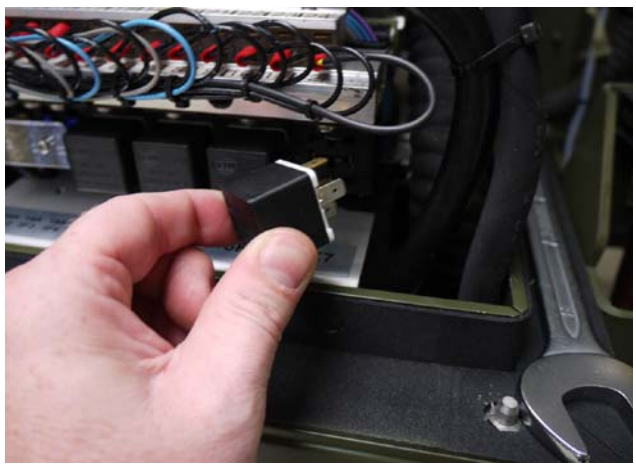


2. Remove the plastic cover.

Fig. 6.15-2: Relay

3. Pull relay from the socket and replace with new relay.
4. To reinstall, reverse the order of steps.

Fig. 6.15-3: Relay



6.16 Replacing the fuses

The described procedure is representative for Fischer Panda generators. The original location of the item must be taken from the generator description of this manual. This replacement can be done by the user.

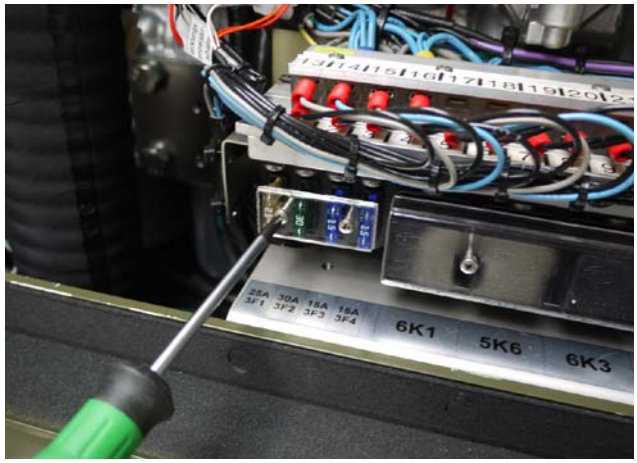
NOTE:Representative procedure

The fuses should be replaced every 2000 operating hours.

Figures similar!

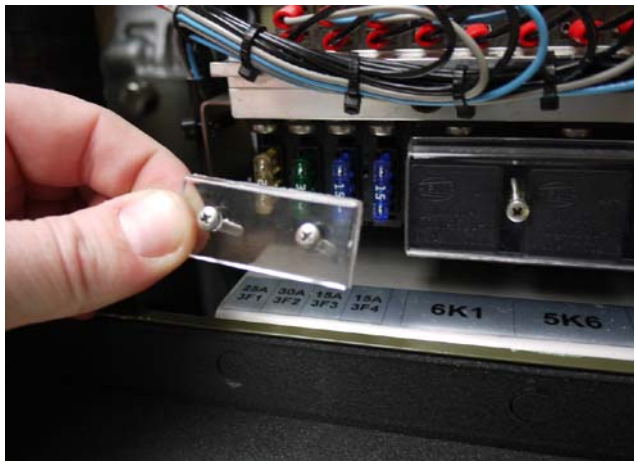
1. Remove the two fixing screws of the plastic cover using a size 0 or 1 phillips screwdriver.

Fig. 6.16-1: Fuse



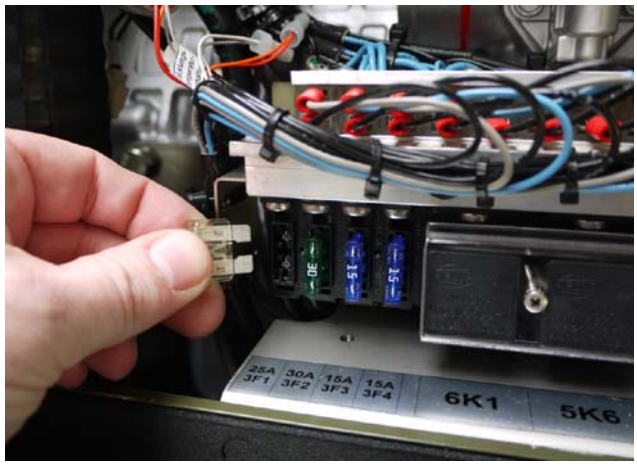
2. Remove the plastic cover.

Fig. 6.16-2: Fuse



3. Using the fuse extraction tool, remove the fuse and replace it with a new one.

Fig. 6.16-3: Fuse



4. To reinstall, reverse the order of steps.

6.17 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).

6.17.1 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 acid-free 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°C. Consider the specifications of the battery manufacturer.

Fischer Panda recommendation:

Notice:

- 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.

6.17.2 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

6.17.3 Arrangements at a medium-term standstill / winter storage

Medium-term stand still (3 to 6 months)

6.17.3.1 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. **Attention!**

No cleaning fluids or preserving 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.
- 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!**

6.17.3.2 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.

6.17.4 Arrangements at a long-term standstill / shutdown

Standstill (more than 6 months)

6.17.4.1 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 de-conservation before recommissioning.

Attention!

6.17.4.2 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 oil pressure 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:

7. Generator Failure

7.1 Personal requirements

The work described here, unless otherwise indicated, are performed by the operator.

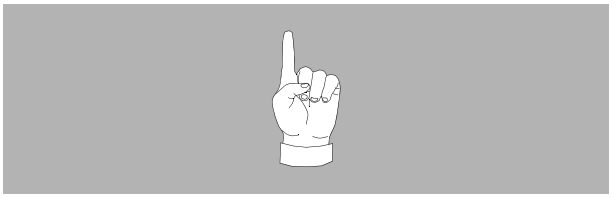
More repair work may be performed only by specially trained personnel or by authorized repair shops (Fischer Panda service points). This is especially for working on the valve timing, fuel injection system and the engine repair.

7.2 Safety instructions for this chapter

see “Safety Instructions - Safety First!” on Page 17.

Also consider the general safety instructions at the first pages of this manual.

Notice!:



Danger for life! - The generator can be equipped with a automatic 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 disconnected 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 is stopped and the starter battery is disconnected 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 severe 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 available tools and special tools. incorrect or damaged tools can result injuries.

Warning!: Risk of injury

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

- 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 immediately.

- Do not inhale oil and fuel vapours.

Danger!: Danger of poisoning

Danger for Life. Improper handling, operation, installation and maintenance can result in severe 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/maintenance personal protective equipment is required to minimize the health hazards.

- Protective clothing

- safety boots

- protective gloves

- Ear defender

- safety glasses

Instruction!: Personal protective equipment necessary.

Disconnect all load during the work at the 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, following tools and measuring instruments should belong to the equipment on board:

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

7.4 Overloading the Generator - see PMGi data sheet

7.5 Starting Problems

7.5.1 Fuel Solenoid Valve

The fuel solenoid valve is located in front of the injection pump. It opens automatically, if the „START“-button is pressed on remote control panel. If the generator is switched to „OFF“, the solenoid valve closes. It takes some seconds, before the generator stops.

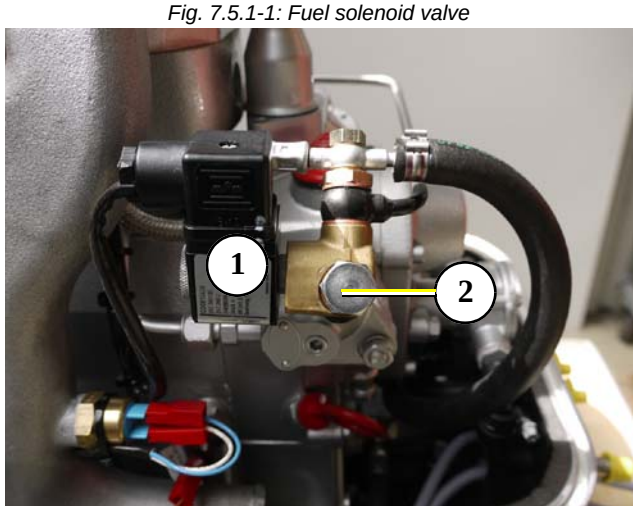
If the generator fails to start, runs rough, does not reach the proper RPM, or does not stop properly, the first item to suspect in most cases is the fuel solenoid valve and should be inspected first.

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. Ventilation screw

Fig. 7.5.1-1: Fuel solenoid valve



7.5.2 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.

7.5.3 Troubleshooting Table

For troubleshooting see “Troubleshooting” on Page 123.

8. Tables

8.1 Troubleshooting

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

STARTER IS TURNING MOTOR, BUT FAILS TO START	
Cause	**Solution**
Fuel inlet solenoid valve not opening.	Check wire connections and circuitry to solenoid valve. (ref. DC wiring diagram: Relay K2, Fuse)
Fuel pump not working.	Check fuel-filter and pump: clean if necessary.
Lack of fuel.	Check fuel supply.
Glow-plugs not working correctly.	Check glow plugs and heating time.
Too much air in fuel lines.	Test fuel system for leakage. Bleed air from fuel system
Fuel-filter blocked.	Replace fuel filter.

MOTOR RUNS IRREGULARLY	
Cause	**Solution**
Faulty centrifugal injector governor.	Have the centrifugal governor inspected by a Farymann-Service technician.
Too much air in fuel lines.	Bleed air from fuel system.

MOTOR DOES ACHIEVE ENOUGH SPEED DURING STARTING PROCESS	
Cause	**Solution**
Starter battery voltage insufficient.	Check battery.
Damaged bearing(s) piston (seized).	Repairs need to be carried out by Farymann-Service. (refer to Farymann motor-manual)

MOTOR DOES ACHIEVE ENOUGH SPEED DURING STARTING PROCESS	
Cooling water in combustion chamber.	1. Turn generator „OFF“ at control panel. 2. Remove the glow plug (see Farymann-manual). 3. Rotate the motor by hand carefully. 4. Check if there is water in the oil and change both oil and filter if necessary. 5. Determine cause for excess water in the combustion chamber. The excess water can be caused by a defective air vent in the cooling water system, which should be checked and cleaned, or replaced if faulty.

MOTOR SPEED DROPS	
Cause	**Solution**
Lack of fuel	Check fuel supply system: - fuel filter, renew if necessary - check fuel pump - check fuel lines (bleed if necessary)
Lack of intake air.	Check air intake paths. Check and clean air filter (and intake muffler if installed).
Generator overloaded by too many load.	Reduce the electrical load (switch off load).
Generator overloaded by over-energizing.	Check that the proper capacitor type is installed and that they are connected correctly.
Defective generator (windings, bearings, or other).	Generator must be sent to manufacturer for repair of damaged bearings or winding.
Damaged engine.	Repair of bearing damage, etc., by Farymann-Service.

MOTOR RUNS IN OFF POSITION	
Cause	**Solution**
Fuel inlet solenoid valve or throttle shut solenoid is not switching off.	Check wire connections to solenoid. Check valve functions as in the „Fuel Solenoid Valve“ or in the throttle shut off solenoid sections. Replace if necessary.

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

SOOTY, BLACK EXHAUST	
Cause	**Solution**

SOOTY, BLACK EXHAUST	
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 Farymann.

GENERATOR MUST BE SHUT OFF IMMEDIATELY IF:	
Cause	**Solution**
- motor rpm suddenly rises or drops - unusual noise comes from genset - exhaust colour suddenly becomes dark - leakage in the cooling water system.	Refer to respective section of manual and if necessary, have repaired by Farymann-Service, or Panda representative.

8.2 Technical Data Engine

Fig. 8.2-1: Technical Data Engine

Type	Farymann 18W430
Governor	mechanical
Cylinder	1
Bore	82 mm
Stroke	55 mm
Stroke volume	290 cm^3
max. power (DIN 6271 IFN-ISO)	5,7 kW
Nominal speed 60 Hz	3600 rpm
Idle running speed [a]	3690 rpm
Valve clearance (engine cold)	0,2 mm
Cylinder head nut torque	30-33 Nm
Compression ratio	20:1
Lubrication oil capacity	1,25 l
Fuel consumption [b]	approx. 0,42- 1,12 l
Oil consumption	max. 1% of the fuel consumption
Cooling water requirement for raw water circuit	10-12 l/min
Permissible max. permanent tilt of engine	a) 25° across the longitudinal axis b) 20° in the longitudinal direction

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

8.2.1 Technical Data Generator 4800i

Fig. 8.2.1-1: Technical Data Generator 4800i

Generator	Panda 4800i
Nominal power	4,8 kW, 3000mtr nn., 50°C
Nominal voltage	270V 3 phase for use with Fischer Panda i-inverter
max. current	8,1 A
Frequency	400Hz
Coolant hoses [Ø / mm]	Raw water: 12
Exhaust hose [Ø / mm]	40
Fuel hose [Ø / mm]	Supply / return: 8

8.3 Engine oil

8.3.1 Engine oil classification

8.3.1.1 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.

8.3.1.2 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

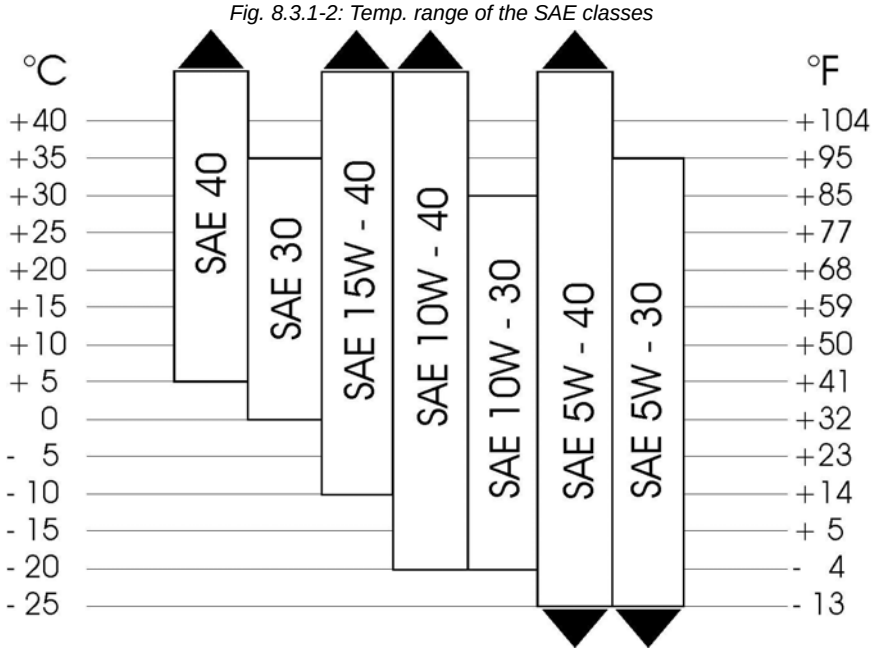
API CGEngine oil for highest demands, turbo-tested

See technical data for the specificated engine oil **Notice!:**

Fig. 8.3.1.2-1: Engine oil type.

Engine oil type	
over 25°C	SAE30 or SAE10W-30 SAE10W-40
0°C to 25°C	SAE20 or SAE10W-30 SAE10W-40
below 0°C	SAE10W or SAE10W-30 SAE10W-40

Fig. 8.3.1-2: Temp. range of the SAE classes



8.4 Coolant specifications

Use a mixture of water and antifreeze. The antifreeze needs to be suitable for aluminium. The antifreeze concentration must be regularly checked in the interests of safety.

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°C	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

8.4.1 Coolant mixture ratio

Water/antifreeze	Temperature
70:30	-20°C
65:35	-25°C
60:40	-30°C
55:45	-35°C
50:50	-40°C

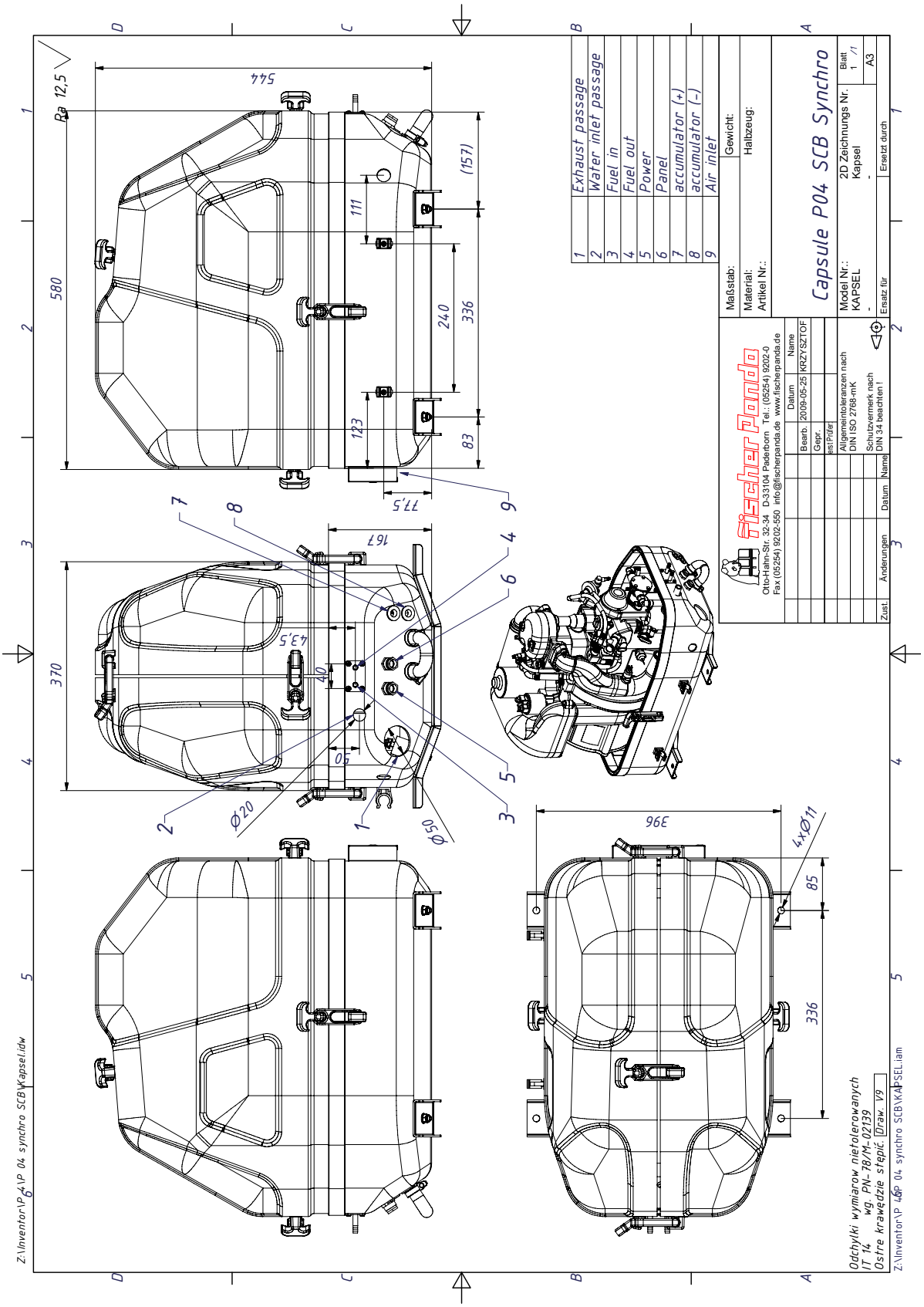
8.5 Fuel

Use a clean No. 2 Diesel fuel oil (SAE J313 JUN87) according to ASTM D975 and EN 590.

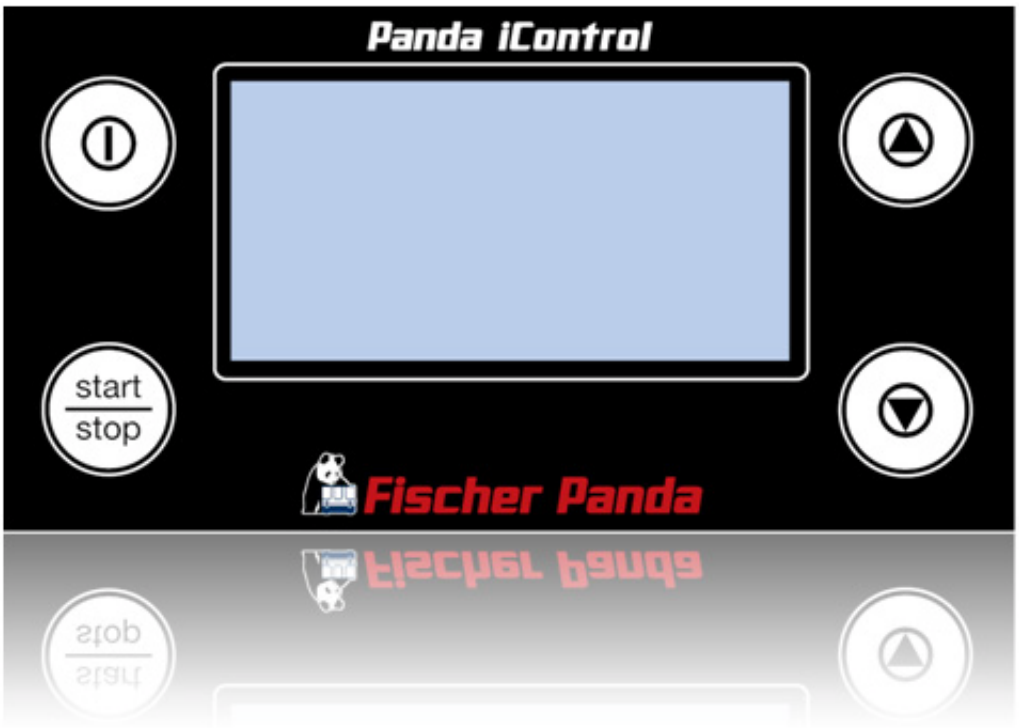
Do not use alternative fuel, because its quality is unknown or it may be inferior in quality. Kerosene, which is very low in cetane rating, adversely effects the engine.

8.6 Capsule measurements

Fig. 8.6-1: Capsule measurements



Leere Seite / Intentionally blank



Panda iControl2

Operating Manual

Open-loop and closed-loop control system for Fischer Panda generators

Fischer Panda GmbH

Current revision status

	Document
Current:	Panda iControl2_eng.R05_14.2.13
Replaces:	Panda iControl2_eng.R04_28.11.11

Revision	Page
Displayseiten 3-phasig hinzugefügt R04	
Sicherheitshinweis Seeventil hinzugefügt R05	

Hardware

Generator	Revision	Modification Strike Plate	Date	Upgrade

Created by

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web: www.fischerpanda.de

1. Safety instructions for the Panda iControl2

1.1 Personnel

The settings described here can be performed by the operator unless highlighted differently.

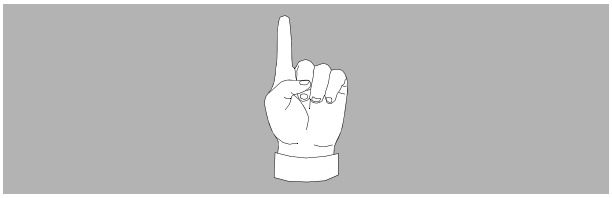
The installation should be implemented by specially trained technical personnel or by authorised workshops (Fischer Panda Service Points), only.

1.2 Safety instructions

Ensure compliance with the safety instructions in the Fischer Panda genset manual.

If these instructions are not on hand, they can be requested from Fischer Panda GmbH, 33104 Paderborn, Germany.

NOTE:



An external signal may trigger an automatic start-up.

WARNING: Automatic start-up

The generator must not be operated with the cover removed.

WARNING:

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 capsule will be produced at the place of installation, then well-placed signs must show that the generator can only be switched on with the capsule closed.

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

Electric voltage - DANGER TO LIFE!

WARNING: Electric voltage

Electric voltages of more than 48V are potentially lethal in any situation. The rules of the respective regional authority must be adhered to for installation and maintenance.

For safety reasons, only an electrician may carry out the installation of the electrical connections of the generator.

Disconnect battery before working on the generator

The battery must always be disconnected (first the negative terminal, then the positive terminal) if work on the generator or electrical system is to be carried out, so that the generator cannot be unintentionally started.

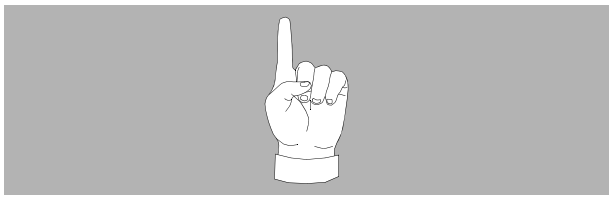
This applies in particular to systems with an automatic start-up function. The automatic start-up function shall be deactivated before starting work.

The flooding valve must be closed. (For PMS version only.)

Also observe the safety instructions for the other components of your system.

WARNING:

NOTE:



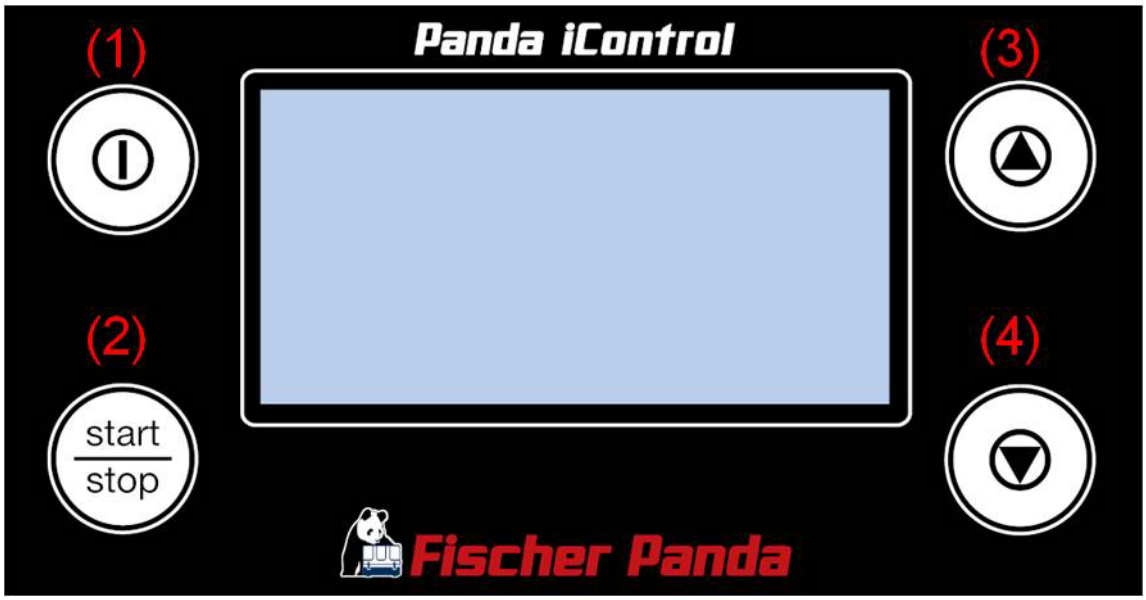
2. General operation

2.1 The Panda iControl2 panel

The "Panda iControl2 panel" control panel is the control and display unit for the Panda iControl2 control system and represents the interface between the user and the Panda iControl2 controller. The integrated display serves to present the most important data of the system as well as warnings and error messages.

The control panel is equipped with four buttons for operating the Panda iControl2 controller:

Fig. 2.1-1: Panda iControl 2 panel



1. *On/Off button:* Switching the Panda iControl2 controller on and off
2. *Start/Stop button:* Starting and stopping the generator, confirming values in selection menus (Enter key)
3. *Cursor-up button* Switching between display screens (up), counting values up in selection menus
4. *Cursor-down button* Switching between display screens (down), counting values down in selection menus.

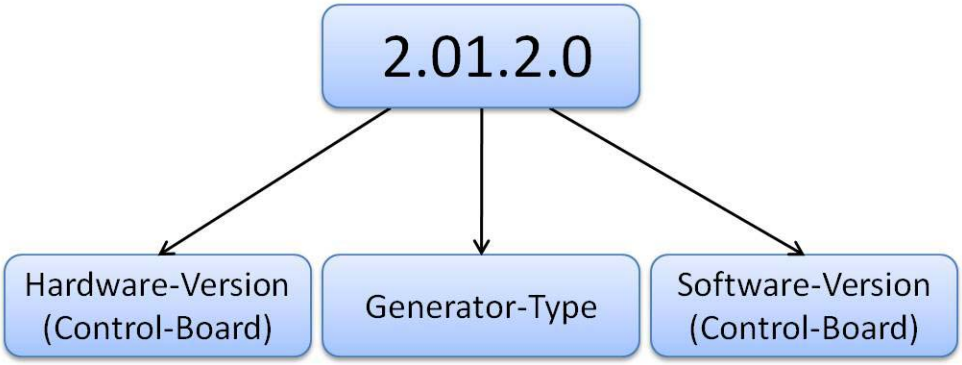
2.1.1 Switching the controller on and off

The Panda iControl2 controller is switched on and off with the On/Off button on the Panda iControl2 panel. Press and hold the On/Off button until the start screen with the panda bear appears on the display. The controller is switched off by actuating the On/Off button once more.

On the start screen, the hardware version, the generator type, and the software version are shown at the bottom left.

Fig. 2.1.1-1: .Panda iControl2 start screen

Fig. 2.1.1-2: Hardware version, generator type, and software version in default display



Example:

Hardware version:2 → iControl2 controller

Generator type:01 → Panda 5000i PMS

Software version: 2.0 → iControl2, compatible with iControl-Panel2

Note:

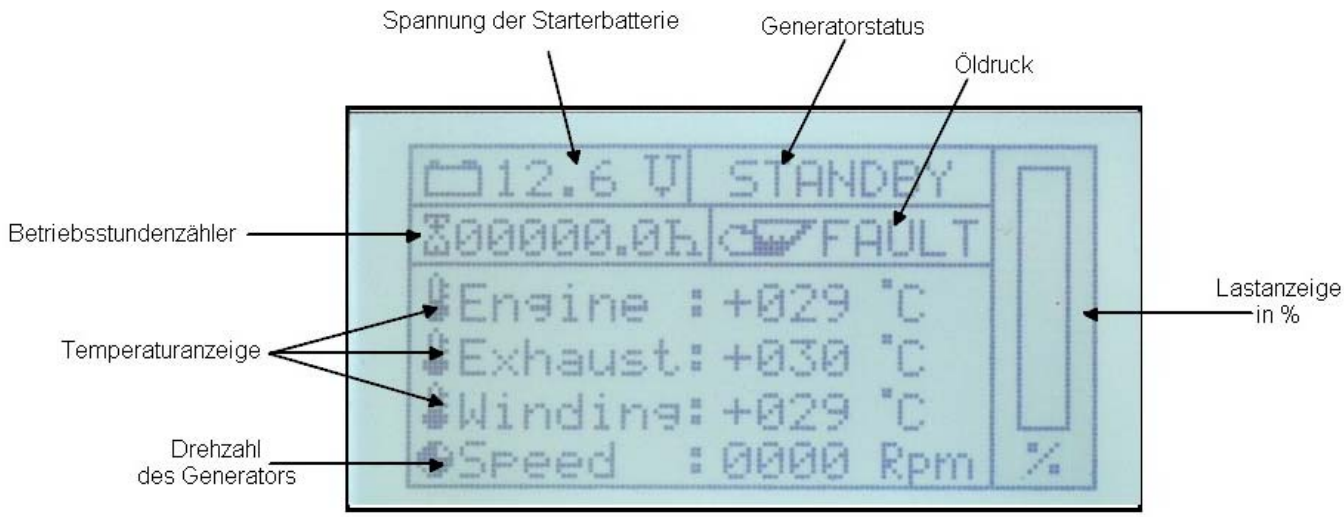
2.1.2 The default display screen

Five seconds after the controller is switched on, the display will change to the default display screen. On the default display screen, you will find information on the battery voltage, operating hours of the generator, temperatures of cylinder head, exhaust manifold, and winding, RPM, and the oil pressure status. Also, a bar graph display at the right hand edge of the display shows the utilisation of the generator in percent.

Data output on the default display screen:

- Battery voltage (supply voltage)
- Status field for operating modes (stand-by, pre-heat, starting, override, running, autostart, stopping)
- Operating hours of the generator
- Oil pressure status
- Cylinder head temperature
- Temperature of exhaust manifold
- Winding temperature
- Speed/RPM
- Utilisation in percent

Fig. 2.1.2-1: Default display screen



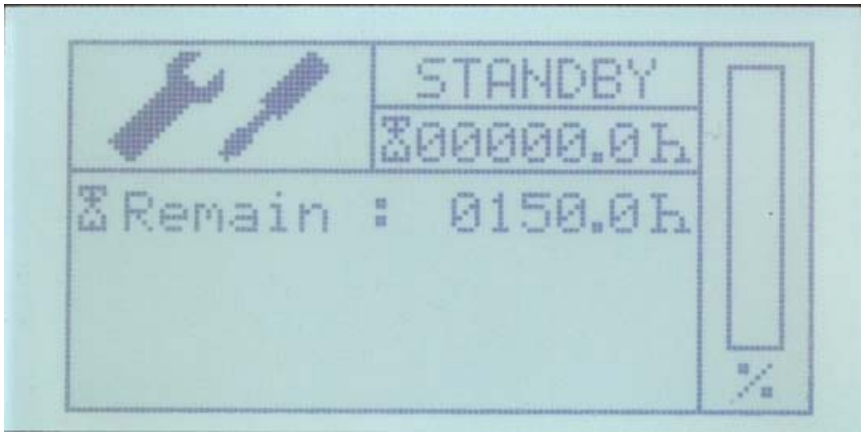
2.1.3 Operating modes

The Panda iControl2 controller offers different operating modes.

2.1.3.1 Stand-by mode

After the controller is switched on with the On/Off button, the system is in stand-by mode. This is indicated by the output "STANDBY" in the status field in the top right corner of the default display screen. In this operating mode, the system can be switched off with the On/Off button, and the generator can be started up with the Start/Stop button. With the cursor buttons, the service information screen can be accessed.

Fig. 2.1.3.1-1: Service information screen



The total operating hours of the generator are given on the default display screen and on the service information screen. By actuating the cursor-up and cursor-down button in stand-by mode, the service screen can be accessed. This screen is marked with a screwdriver/spanner symbol. Here, the time until the next service is given. By actuating the cursor-up or cursor-down button, you can return to the default screen.

With the dynamic operation hours the service interval can be raised up to 30% (200h max.). Make sure that the dynamic operation hours are not reset accidently between the service interval. see “Resetting the service interval ("Service")” on page 146.

Note:

In the set-up menu of the controller, you can reset the service interval after performing maintenance. See “Set-up menu” on Page 142.

2.1.3.2 Start-up mode

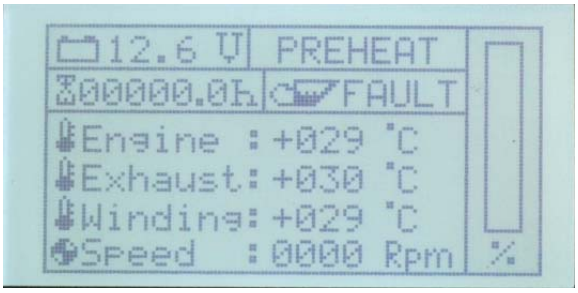
The start-up mode represents the transition from stand-by mode to operation mode, i.e., generator operation. By actuating the Start/Stop button in stand-by mode, you can initiate the start-up process of the generator.

The pre-heating is the first step. During this stage, the status field at the top right of the default display screen shows the word "PREHEAT".

The pre-heating is always implemented for a duration of 10 seconds, regardless of the cylinder head temperature.

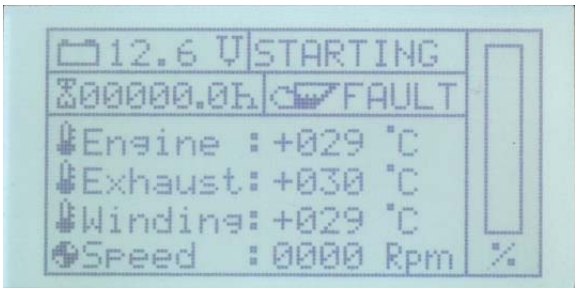
In temperatures below 0°C, the pre-heating time is always 40 seconds.

Fig. 2.1.3.2-1: Default display screen during pre-heating



After pre-heating, the starter is initiated, accompanied by the text output "STARTING" in the status field of the default display screen.

Fig. 2.1.3.2-2: Default display screen during start-up



The controller will only perform one starting attempt. If the generator could not be started, the text output "STARTING FAILS" informs you of the failure of the generator starting attempt.

Note:

Acknowledging the message with the cursor-up, cursor-down, or the Start/Stop button on the Panda iControl2 panel will return the system to stand-by mode.

If there is difficulty in starting - close the seacock (Panda Marine Generators only)

ATTENTION:

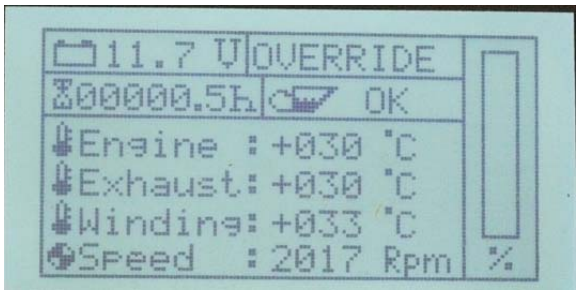
If the generator engine does not start immediately and further start attempts are necessary, then the seacock MUST be closed (i.e. for ventilating the fuel lines ect.) The cooling water impeller pump turns automatically and draws cooling water as long as the motor is turning. If the diesel motor is running, the cooling water is blown out by the exhaust system gases. The cooling water cannot be pressed through the exhaust as long as the diesel motor does not run at sufficient speed. This leads to severe motor damage.

Open the sea valve as soon as the generator is started.

2.1.3.3 Override mode

The override mode follows directly after the successful start-up of the generator. In this mode, no fault analysis is performed. The duration of the override mode is 10 seconds. The status indicator on the display reads "OVERRIDE".

Fig. 2.1.3.3-1: Default display screen in override mode



2.1.3.4 Operation mode

Operation mode signifies the operating mode in which the generator is running and all operating data are within their normal range. The status field of the default display screen shows "RUNNING".

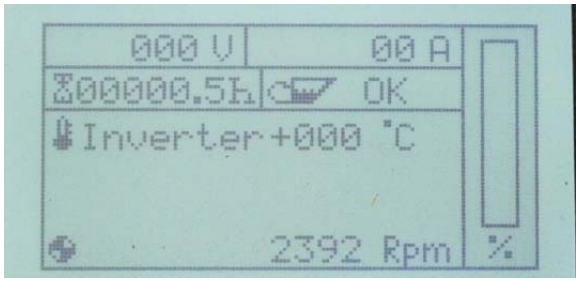
In operation mode, the electrical load is given on the right hand side of the default display screen and in the inverter screen as a bar graph. The bar graph merely provides a guide value for the load of the generator and gives the values as a percentage.

Fig. 2.1.3.4-1: Default display screen in operation mode

Display screen for single phase generators

With the single phase i-series generators, there is an additional screen in operation mode for the inverter data. This screen provides the current inverter output voltage and the inverter temperature. You can access the inverter screen by actuating the cursor-up button while in operation mode.

Fig. 2.1.3.4-2: Inverter screen in operation mode



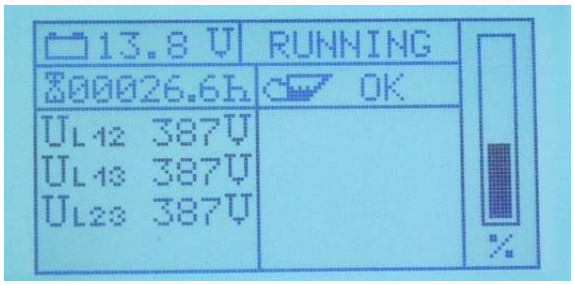
Display screens for 3-phase generators

With the 3-phase i-series generators, there are 5 additional screen in operation mode for the inverter data. This screen provides the inverter coil-voltage and the conductor current. You can access the inverter screen by actuating the cursor-up button while in operation mode.

Fig. 2.1.3.4-3: Inverter screen coil-voltage and conductor current

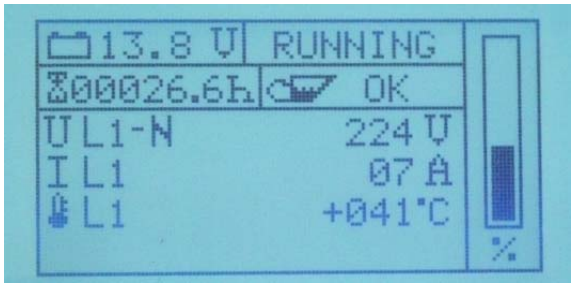
This screen provides the latest inverter phase voltages. You can access the inverter screen by actuating the cursor-up button while in operation mode.

Fig. 2.1.3.4-4: Inverter screen phase voltages



This screen provides the latest inverter output voltage of the single phases with the matching conductor current and the circuit board temperature. The inverter will be switched off at a circuit board temperature of 75 °C. You can access the inverter screen by actuating the cursor-up button while in operation mode.

Fig. 2.1.3.4-5: Phase voltage L1

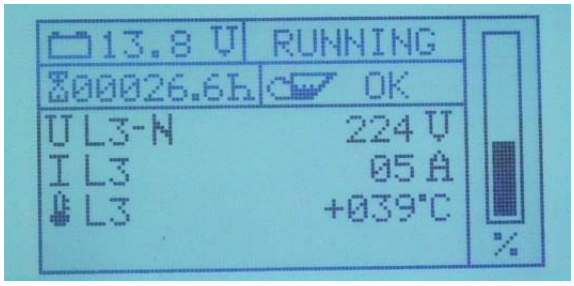


This screen provides the latest inverter output voltage of the single phases with the matching conductor current and the circuit board temperature. The inverter will be switched off at a circuit board temperature of 75 °C. You can access the inverter screen by actuating the cursor-up button while in operation mode.

Fig. 2.1.3.4-6: Phase voltage L2

This screen provides the latest inverter output voltage of the single phases with the matching conductor current and the circuit board temperature. The inverter will be switched off at a circuit board temperature of 75 °C. You can access the inverter screen by actuating the cursor-up button while in operation mode.

Fig. 2.1.3.4-7: Phase voltage L3



2.1.3.5 Stop mode

By actuating the Start/Stop button in operation mode, i.e., while the generator is running, you will stop the generator. After stopping the generator, the system will return to stand-by mode. The display status field reads "STOPPING".

If the generator is manually started up and stopped while in automatic start-up mode, it will switch to stand-by mode for safety reasons.

Note: Manual start in autostart mode

If necessary, the autostart mode must be reactivated.

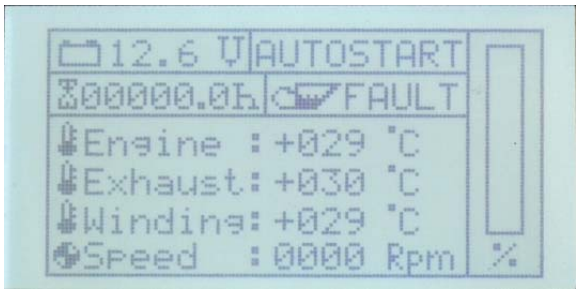
2.1.3.6 Autostart mode

The Panda iControl2 panel is equipped with an autostart function. A jumper between pin 6 (UBAT) and pin 7 (USTARTI of the Phoenix jack of the control panel starts up the generator with a delay of 5 seconds when the autostart function is active. Removing the jumper will stop the generator - also with a delay of 5 seconds.

To activate the autostart function, you must first check the "Autostart" flag in the set-up menu. To activate the autostart function, read See “Activating/deactivating the autostart function ("Autostart")” on Page 144.

The display status field reading "AUTOSTART" indicates that the autostart function is active, or, if it reads "STANDBY", this means that the autostart function was deactivated.

Fig. 2.1.3.6-1: Default display screen in autostart mode



The autostart function will remain active even after the controller is switched off and on again with the On/Off button. To deactivate the autostart function, the flag in the EEPROM must be reset with "Disable". See “Activating/deactivating the autostart function ("Autostart")” on Page 144.

.Warning!: Automatic start-up

If the generator is manually started up and stopped while in automatic start-up mode, it will switch to stand-by mode for safety reasons.

Note: Manual start in autostart mode

If necessary, the autostart mode must be reactivated.

2.2 Other operating functions

2.2.1 Set-up menu

In the set-up menu, a series of parameters can be modified directly using the control panel. To access the set-up menu, you have to actuate the cursor-down button immediately after switching on the controller with the On/Off button and while the start screen with panda bear is still being displayed. This will open a menu with the following sub-items:

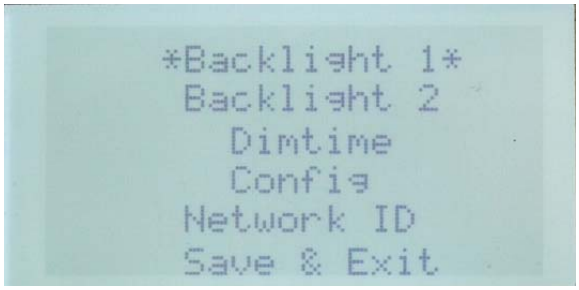
Fig. 2.2.1-1: Set-up menu

Menu item	Settings range for
backlight 1	Setting the brightness value for the standard backlighting to 0-9
backlight 2	Setting the brightness value for the dimmed backlighting to 0-9
Dimtime (dimming time)	Time until the display switches to dimmed mode, 0-225s, 0= function deactivated
Config	Password protected area for Fischer Panda associates and Fischer Panda service points
Network ID	Settings for the network ID of the panel
Save & Exit	Saving the values and exiting the set-up menu
Autostart	Activating and deactivating the automatic start-up function
Service	Resetting the "Operating hours to service" indication
Prime fuel	Activation of the fuel pump to prime the generator fuel system
Degree C/F	Switches the display between °C and °F

With the cursor-up and cursor-down buttons, you can navigate through the menu. The currently selected menu item is marked with two asterisks (*), e.g. "backlight 2":

Set-up menu with item highlighted: *backlight 2*

Fig. 2.2-2: Set-up menu

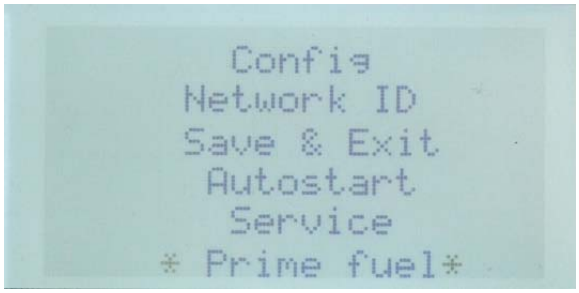


The Start/Stop button is used for confirming a selection in the set-up menu. If you confirm the row marked with the * with the Start/Stop button, you will access the selected sub-menu.

Note:

Set-up menu

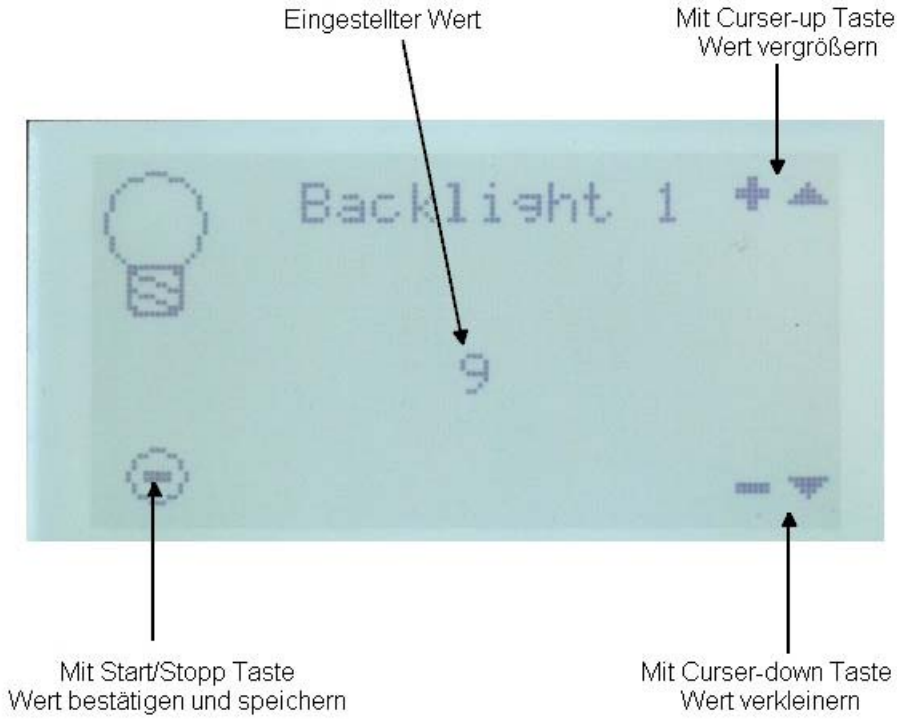
Fig. 2.2-3: Set-up menu



2.2.2 Setting the brightness of the backlight ("backlight" and "dimtime")

The brightness of the display backlight of the Panda iControl2 panel can be varied in ten increments (0-9). Also, the display can be dimmed with a timer if no button is actuated on the control panel for a parameter is able period. To adjust the default brightness and the dimmed brightness, the set-up menu offers the items "backlight 1" (default brightness) and "backlight 2" (dimmed brightness). These service menu screens are highlighted with the light bulb symbol:

The period after which the backlight is to switch to the dimmed level can be specified with the menu item "dimtime". In this screen, you can enter the time in seconds, values between 0s and 255s are possible.



In the sub-menus, set the desired values with the cursor buttons, and then confirm your settings with the Start/ Stop button.

Note:

After setting all parameters, you can exit the set-up menu with the menu item "Save & Exit". In doing so, all settings entered in the sub-menus backlight 1, backlight 2, dimtime, and Network ID are saved to the EEPROM. Then, the goodbye screen appears for 3 seconds, and the controller is switched off.

At the next start of the controller, the changes will take effect.

2.2.3 The configuration menu ("config")

Settings in this area must only be entered by Fischer Panda associates and Fischer Panda service points.

STOP!

The "config" sub-menu is a password protected area in which the generator type can be selected, and generator parameters in the EEPROM can be modified.

2.2.4 The network ID

Settings in this area must only be entered by Fischer Panda associates and Fischer Panda service points.

Changing the network ID can result in malfunction.

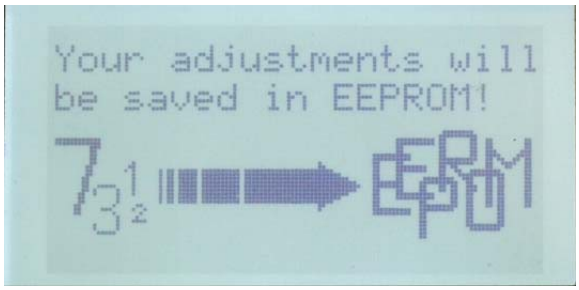
STOP! Network ID must not be modified

2.2.5 Saving settings and exiting the set-up menu ("Save & Exit")

After setting all parameters, you can exit the set-up menu with the menu item "Save & Exit".

In doing so, all settings entered in the sub-menus backlight 1, backlight 2, dimtime, and Network ID are saved to the EEPROM.

Fig. 2.2.5-1: Saving the values to the EEPROM



Then, the goodbye screen appears for 3 seconds, and the controller is switched off. At the next start of the controller, the changes will take effect.

2.2.6 Activating/deactivating the autostart function ("Autostart")

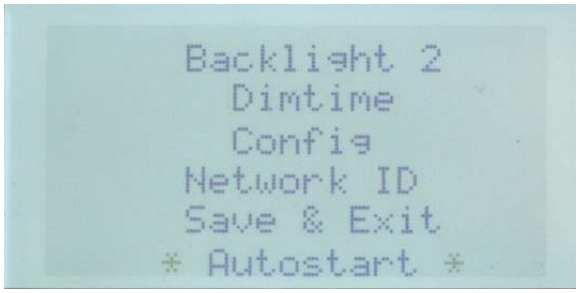
DANGER TO LIFE! - Improper operation can result in health impairment and death.

While the automatic start-up function is active, the generator can start up automatically. Before activating it, ensure that the generator capsule is closed and that the corresponding warning signs are affixed to the generator.

WARNING: Automatic start-up

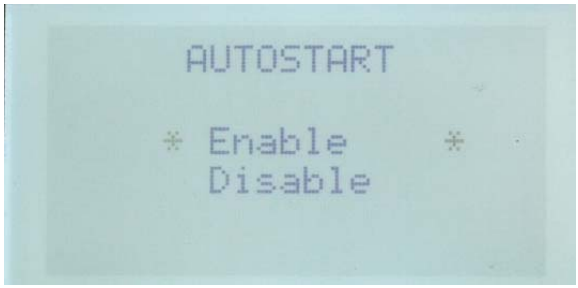
To activate the autostart function, select the item "Autostart" in the set-up menu using the cursor buttons and confirm the selection with the Start/Stop button.

Fig. 2.2.6-1: Set-up menu



In the "Autostart" sub-menu, you can select between the options "Enable" and "Disable" using the cursor buttons:

Fig. 2.2.6-2: "Autostart" sub-menu



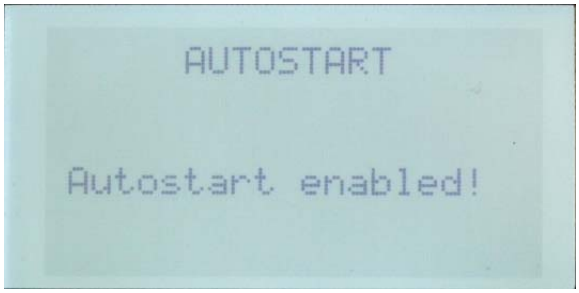
To activate the autostart function, select "Enable" and again confirm your selection with the Start/Stop button.

To deactivate the function, use the menu item "Disable".

The Panda iControl will then confirm your input:

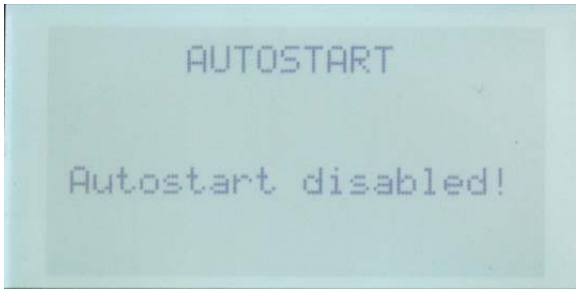
Message "Autostart enabled" after confirming the selection

Fig. 2.2.6-3: Message "Autostart enabled" after confirming the selection



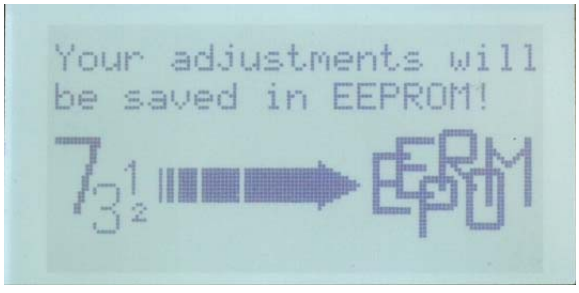
Message "Autostart disabled" after confirming the selection

Fig. 2.2.6-4: Message "Autostart disabled" after confirming the selection



The activation/deactivation of the autostart function is then saved to the EEPROM of the control panel.

Fig. 2.2.6-5: Selection is saved to the EEPROM

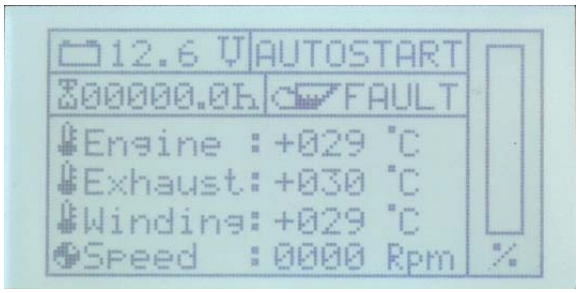


Then, the controller is shut down.

Fig. 2.2.6-6: Goodbye screen prior to shutting down

After switching the controller back on, the display status field reading "AUTOSTART" indicates that the autostart function is active, or, if it reads "STANDBY", this means that the autostart function was deactivated:

Fig. 2.2.6-7: Default display screen in autostart mode



The autostart function will remain active even after the controller is switched off and on again with the On/Off button. To deactivate the autostart function, the flag in the EEPROM must be reset with "Disable" as described above.

.Warning!: Automatic start-up

The autostart function of the Panda iControl2 is now ready. While the autostart function is active, you can manually start and stop the generator with the Start/Stop button, as well.

If the generator is manually started up and stopped while in automatic start mode, it will switch to stand-by mode for safety reasons.

Note: Manual start in autostart mode

If necessary, the autostart mode must be reactivated.

2.2.7 Resetting the service interval ("Service")

As the indication of operating hours remaining until the next service interval can be reset at any time, it serves only as an orientation guide. The service intervals shall be implemented using the actual operating hours and shall be properly documented in the service log of the generator.

Note

With the dynamic operation hours the service interval can be raised up to 30% (200h max.). Make sure that the dynamic operation hours are not reset accidently between the service interval.

Note:

In the set-up menu, select the menu item "Service" and confirm as usual, using the Start/Stop button. This will open the screen with the service information discussed above, supplemented with the instruction to actuate the Start/Stop button to reset the service interval.

Resetting the time until the next service

Fig. 2.2.7-1: Resetting the time until the next service

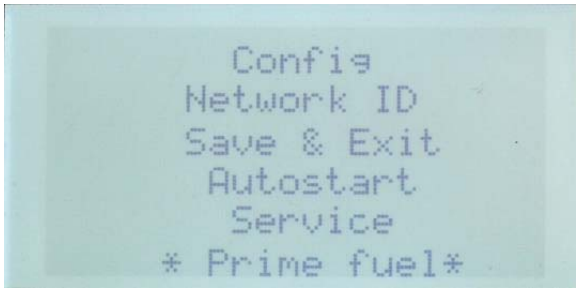
By actuating the Start/Stop button again, you can reset the service interval to the original interval. The service interval for each generator type is stored in the software.

The controller is switched off after resetting the service interval. After restart, the new value will be displayed in the service screen.

2.2.8 Priming the fuel system ("Prime Fuel")

To prime the fuel system, the Panda iControl2 offers the option of separately activating the fuel pump. In the set-up menu, select the menu item "Prime fuel" and confirm your selection using the Start/Stop button.

Fig. 2.2.8-1: Set-up menu



Actuating the Start/Stop button again will switch on the fuel pump for a duration of max. 30 seconds. After that, the fuel pump will shut off automatically.

Naturally, you can also switch off the fuel pump manually.

For this purpose, confirm the menu item "Prime fuel" again, and switch off the fuel pump using the Start/Stop button.

2.2.9 Selecting and saving a unit for the temperature value output

With the Panda iControl2 panel, you can output the temperature values on the display in degrees Celsius [°C] or in degrees Fahrenheit [°F]. The unit can be switched with the control panel. In the set-up menu, select the menu item "Degree C/F" and confirm your selection using the Start/Stop button.

Using the cursor buttons, select 0' for outputting all temperatures in degrees Celsius [°C] or 1' for outputting them in degrees Fahrenheit [°F]. To confirm your selection, actuate the Start/Stop button.

You can enter additional settings in the set-up menu, or you can exit the set-up menu with "Save & Exit". Your selections will then be saved to the EEPROM of the Panda iControl2 panel.

After restarting the system with the On/Off button, your settings will take effect, and all temperatures will be output with the selected unit.

Settings options:

0 Output of all temperatures in degrees Celsius [°C]

1 Output of all temperatures in degrees Fahrenheit [°F]

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3. Installation

All connecting wires and instructions for installation are designed and adequate for „standard“ installation situations.

As Fischer Panda does not know the specific installation and operating situation (e.g. special vehicle shapes, high travel speeds, and special application conditions, etc.), this installation specification can only serve as a guideline and example. The installation must be adjusted and implemented by a competent specialist based on the local conditions and requirements.

If damage occurs due to wrong installation without adjusting for specific conditions, it is not covered by the warranty.

WARNING: Properly dimension your system.

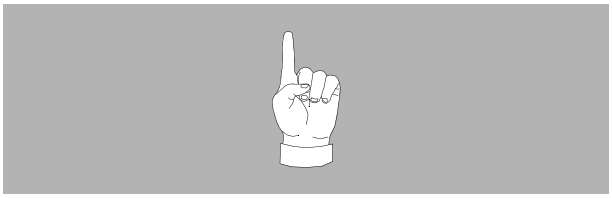
3.1 Personnel

The installation described herein must be implemented by specially trained technical personnel or by authorised workshops (Fischer Panda Service Points), only.

3.1.1 Hazard warnings for installation

Ensure compliance with the general safety instructions at the beginning of this manual.

Note:



DANGER TO LIFE! - Improper operation can result in health impairment and death.

The battery must always be disconnected (first the negative terminal, then the positive terminal) if work on the generator or electrical system is to be carried out, so that the generator cannot be unintentionally started.

.Warning!: Automatic start-up

Improper installation can cause severe injury and/or substantial property damage. Therefore:

- Always turn off motor to perform installation work.
- Ensure adequate space for assembly prior to starting work.
- Ensure order and cleanliness at the work place! Parts and tools loosely stacked or lying on the floor represent accident hazards.
- Use only standard tools and special tools for installation work. Incorrect or damaged tooling can result in injury.

WARNING: Risk of injury!

DANGER TO LIFE! - Improper operation can result in health impairment and death.

Electric voltages of more than 48 V are potentially lethal in any situation. 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.

WARNING: Electric voltage

Generator and cooling water may be hot during and after operation. Burn/scalding hazard!

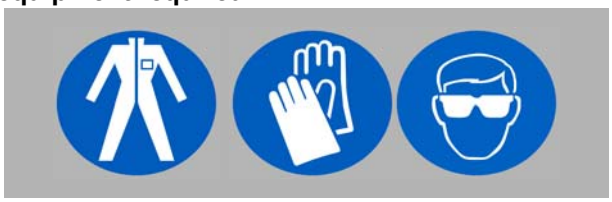
During operation, overpressure may build up in the cooling system.

WARNING: Hot surface/material

For installation work, personal protective equipment is compulsory. This includes:

- Tightly fitting protective clothing
- Safety shoes
- Safety gloves
- Hearing protection
- Safety goggles if applicable

MANDATORY INSTRUCTION: Protective equipment required



All loads must be disconnected prior to working on the generator to avoid damage to the devices.

WARNING: Switch off all loads.

3.2 Disposal of the components

Electronics components are hazardous to the environment and contain rare raw materials.

Collect and properly dispose of components that are no longer needed!

MANDATORY INSTRUCTION: Protect the environment.

The iControl2 board is typically pre-installed on the generator, and the corresponding connecting lines for connecting it to the iControl2 panel and the PMGi are prepared. See generator manual.

3.2.1 Panda iControl2 panel with installation housing

Fig. 3.2.1-1: Panda iControl2 panel with panel connecting cable and closed housing

3.2.2 Terminal assignments on the Panda iControl2 panel

The Panda iControl2 panel is connected via a 7-pin Phoenix jack.

Fig. 3.2.2-1: Terminal assignment on the Panda iControl2 panel

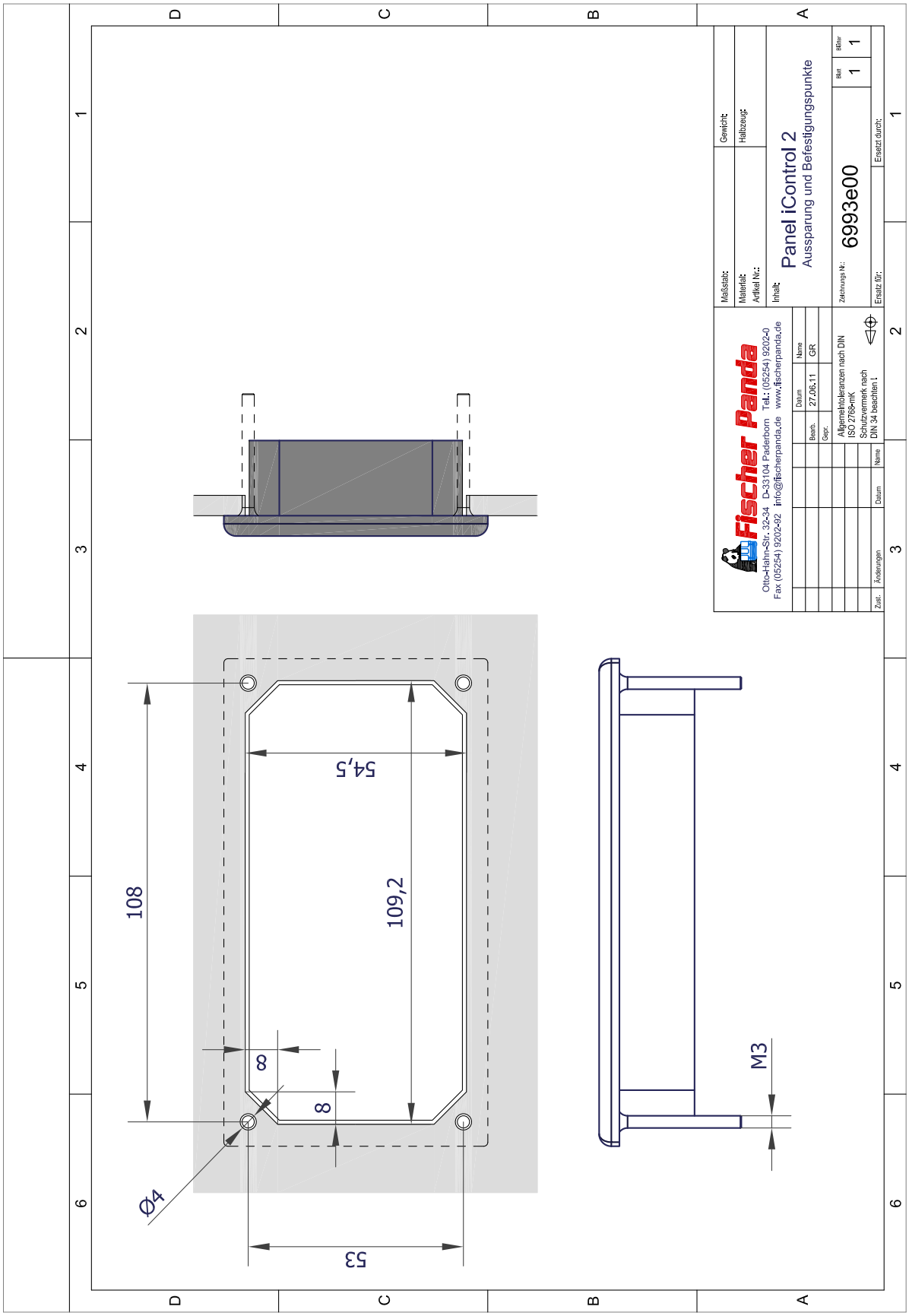
Terminal	Terminal description	Cable colour	Function
1	UBUS	white (WH)	Bus supply voltage
2	GND	brown + shielding (BN)	Fischer Panda bus ground, ground connection between Panda iController and Panda iControl panel
3	REIZ	green (GN)	Exciter wire, is switched to ground if the controller is to switch on
4	DATA-A	pink (PK)	Fischer Panda bus data line A
5	DATA-B	Grey (GY)	Fischer Panda bus data line B
6	UBATT	--	Autostart[a]
7	USTART/STOPP	--	Autostart[b]

a. A jumper between terminal 6 and 7 closes the autostart contact.
b. A jumper between terminal 6 and 7 closes the autostart contact.

Note: **Use only original Fischer Panda connecting cables.**

3.3 Dimensions

Fig. 3.3-1: Housing of the Panda iControl2 panel



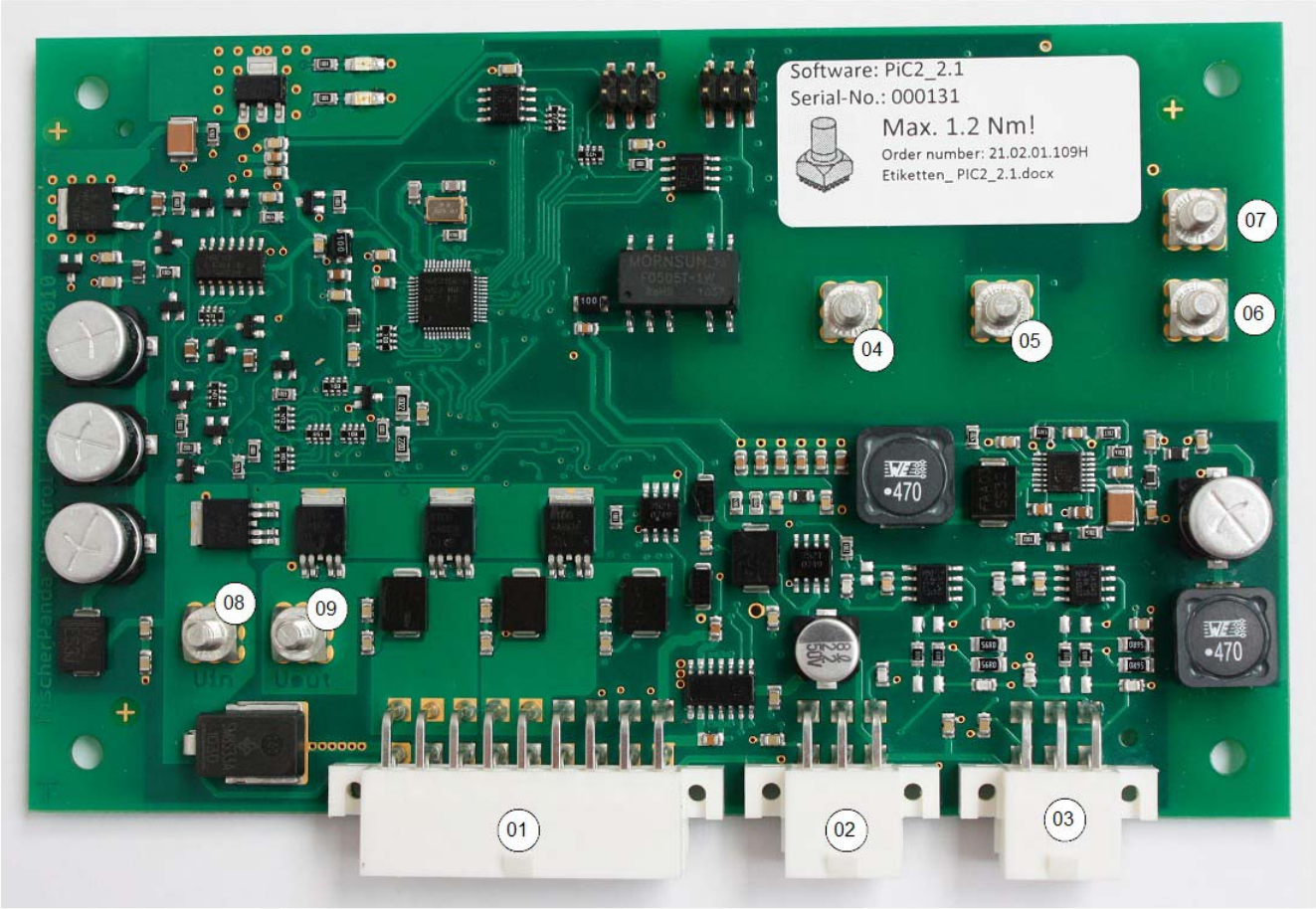
Due to the terminals being exposed, the protection class IP 04 applies to the iControl2 panel.

If properly installed with a seal (e.g. Sikaflex), up to IP66 can be achieved.

Please note!

3.4 Wiring of the Panda iControl2 controller

Fig. 3.4-1: Wiring of the Panda iControl2 controller



The Panda iControl2 controller is connected to the wire harness with the 18-pin jack. The centre 6-pin jack is designed for the Fischer Panda standard bus. The Panda iControl2 panel is connected to this jack. The Fischer Panda CAN bus is connected to the 6-pin jack at the bottom right of the circuit board. The configuration of the connectors is given in the subsequent tables. See “Terminal assignments on the Panda iControl2 controller” on Page 154.

1. Connecting jack for wire harness, 18-pin
2. Connecting jack, 6-pin, Fischer Panda standard bus
3. Connecting jack, 6-pin, Fischer Panda CAN bus for optional use
4. Connecting bolt for phase L3 (load output to inverter) and input from winding L3
5. Connecting bolt for phase L2 (load output to inverter) and input from winding L2
6. Connecting bolt for winding L1
7. Connecting bolt for phase L1 (load output to inverter)
8. Input for supply voltage +12V
9. Pre-heating output

3.4.1 Terminal assignments on the Panda iControl2 controller

3.4.1.1 Terminal assignment of 18-pin connector

Fig. 3.4.1.1-1: Terminal assignment of 18-pin connector

Terminal	IN / OUT	Function
1	--	Actuator (optional)
2	I	Cylinder head temperature
3	IN	Exhaust manifold temperature
4	IN	Winding temperature
5	IN	Reserve temperature
6	IN	Oil pressure
7	IN	Emergency stop
8	--	GND, ground for all temperature sensors
9	--	GND
10	--	Actuator (optional)
11	--	+5V servo motor (red wire)
12	OUT	PWM servo motor (yellow wire)
13	OUT	Booster (optional, depending on generator type)
14	OUT	Fuel pump
15	OUT	Fuel pump
16	OUT	Electric starter
17	OUT	Electric starter
18	OUT	Electric starter

3.4.1.2 Fischer Panda standard bus

Fig. 3.4.1.2-1: Fischer Panda standard bus terminal assignment

Terminal	Terminal description	Function
1	UBUS	Bus supply voltage
2	GND	Fischer Panda bus ground, ground connection between Panda iControl2 controller and Panda iControl2 panel
3	REIZ	Exciter line, is switched to ground by the panel if the controller is to switch on
4	DATA+	Fischer Panda bus data line A
5	DATA-	Fischer Panda bus data line B
6	UBAT	Battery voltage

3.4.1.3 Fischer Panda CAN bus

Fig. 3.4.1.3-1: Fischer Panda CAN bus terminal assignment

Terminal	Terminal description	Function
1	UBUS	Bus supply voltage
2	GND	Fischer Panda bus ground, ground connection between iControl2 controller and Panda iControl2 panel
3	REIZ	Exciter line, is switched to ground by the panel if the controller is to switch on
4	CAN-L	CAN-Low
5	CAN-H	CAN-High
6	UBAT	Battery voltage

3.5 Start-up

After completing the installation, the system must be started up.

For this purpose, the start-up log for the generator is processed and filled in by the specialist installing the equipment. The completed log shall be handed over to the operating company.

The operating company shall be instructed in the operation, maintenance, and hazards of the generator. This applies to both the maintenance steps and hazards described in the manual and to additional steps and hazards that result from the specific installation conditions and the connected components.

The original start-up log of the generator must be sent to Fischer Panda to obtain the full warranty. Make sure that you retain a copy for your records.

Note:

The corresponding forms are included in the generator manual.

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4. Maintenance

4.1 Maintenance of the iControl2 controller

The iControl2 controller is maintenance-free. The fuses of the controller are self-healing.

4.1.1 Cleaning the iControl2 controller

The housing shall be cleaned within the scope of the overall generator cleaning. The housing can be wiped off with a soft, lightly dampened cloth. In doing so, it must be ensured that no moisture enters the jacks and the housing.

4.2 Maintenance of the iControl2 remote control panel

The iControl2 remote control panel is maintenance-free.

4.2.1 Cleaning the iControl2 controller

The display can be cleaned with a soft cloth dampened lightly with soapy water. Harsh cleaning agents are not suitable and can cause the display film to turn dull.

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5. Warnings and error messages

To enable the safe operation of the generator, the Panda iControl2 controller is programmed with a series of warnings and error messages that influence the generator operation.

5.1 Warnings

Warnings are issued when the variable being monitored, e.g. temperature, reaches a defined warning threshold. The warnings are issued on the Panda iControl2 panel display via the cyclical display of the word „HIGH“ or „LOW“, alternating with the measured value, e.g. the temperature. Warnings do not become active until the time between reaching the threshold value and the defined delay has expired.

Warnings do not result in the generator or the controller being switched off.

Note:

5.1.1 Examples of warnings on the display:

Warning: „Battery power too low“

Fig. 5.1.1-1: Warning: „Battery power too low“

Warning: „Winding temperature too high“

Fig. 5.1.1-2: Warning: „Winding too high“

5.1.2 Warning messages

All warning messages defined for the Panda iControl 2 and the corresponding display output are compiled in the subsequent table.

Fig. 5.1.2-1: Warning messages

Warning message on the display	Meaning of warning message
„HIGH“ flashes, alternating with the temperature value of the cylinder head	Cylinder head temperature is too high, the warning threshold was reached
„HIGH“ flashes, alternating with the temperature value of the winding	Winding temperature is too high, the warning threshold was reached
„HIGH“ flashes, alternating with the temperature value of the exhaust manifold	Exhaust manifold temperature is too high, the warning threshold was reached
„LOW“ flashes, alternating with the voltage value of the starter battery	Starter battery voltage is too low, the warning threshold was reached

5.2 Faults

Error messages are issued when the monitored variable, e.g. a temperature, reaches the defined fault threshold.

With the temperature sensors, a loose connection or a broken cable will result in a fault, as well, and cause the generator to shut down.

An error message is typically preceded by a warning, as the warning threshold is reached before the fault threshold. Error messages are output on the Panda iControl2 panel display in the form of the error text shown on a cleared display page. Faults do not become active until the time between reaching the fault threshold and the defined delay has expired.

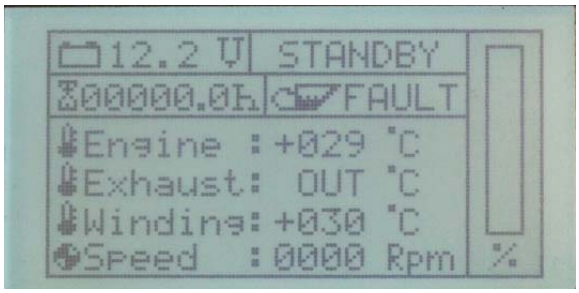
Faults result in the generator shutting down. If a fault occurs due to the battery voltage being too low, the controller is completely shut down to prevent the battery from discharging too much.

Examples of an error message on the display:

Fault: „Exhaust manifold temperature out of range“

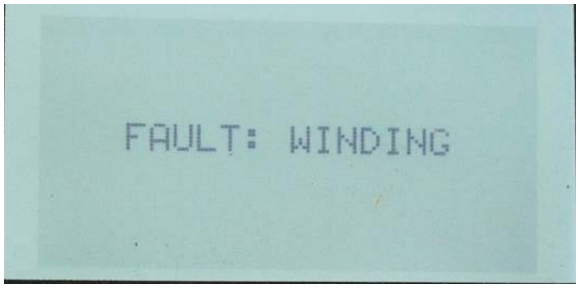
(broken cable)

Fig. 5.2-1: Fault: „Cylinder head temperature out of range“



Fault: „Winding“, winding temperature too high

Fig. 5.2-2: Fault: „STARTING FAILS“, start-up process was not successful



5.2.1 Error messages

All error messages defined for the Panda iControl 2 and the corresponding display texts are compiled in the subsequent table.

Fig. 5.2.1-1: Error messages

Error message on the display	Meaning of error message
FAULT: CYL.HEAD	Cylinder head temperature too high
FAULT: WINDING	Winding temperature too high
FAULT: EXHAUST	Exhaust manifold temperature too high
NO CONNECTION BUS ERROR	Communication error on Fischer Panda bus
STARTING FAILS	Generator start has failed
PROBLEM WITH FUEL SUPPLY!	Fuel supply not suitable
FAULT: OILPRESS	Oil pressure error
BATTERY LOW	Battery power too low
Inverter overtime	Inverter temperature too high
Inverter overload	Generator was overloaded, message is also issued when the generator output cable is not connected to the inverter
INIT FAILED!	Parameters were not correctly adopted into the EEPROM when the generator type was initialised. Generator type must be reset.
„OUT“ is output instead of a temperature	„Out of range“ - broken cable on corresponding temperature sensor

Error messages can be acknowledged with the Start/Stop button, The controller will then return to stand-by mode.

5.2.2 Warning and fault thresholds

The threshold values resulting in triggering warnings and faults depend on the generator type and are compiled in table 2-3.

Fig. 5.2.2-1: Warning and fault thresholds for different generator types

Generator type	Warning/fault	Warning threshold	Fault threshold
5000i marine	Cylinder head temperature Delay	85 °C 5 s	95 °C 5 s
	Winding temperature Delay	130 °C 5 s	135 °C 5 s
	Exhaust manifold temperature Delay	70 °C 1 s	75 °C 1 s
5000i vehicle	Cylinder head temperature Delay	90 °C 5 s	95 °C 5 s
	Winding temperature Delay	130 °C 5 s	135 °C 5 s
	Exhaust manifold temperature Delay	100 °C 1 s	105 °C 1 s
P8000i / P10000i marine	Cylinder head temperature Delay	90 °C 5 s	95 °C 5 s
	Winding temperature Delay	130 °C 5 s	135 °C 5 s
	Exhaust manifold temperature Delay	70 °C 1 s	75 °C 1 s
P8000i / P10000i vehicle	Cylinder head temperature Delay	90 °C 5 s	95 °C 5 s
	Winding temperature Delay	130 °C 5 s	135 °C 5 s
	Exhaust manifold temperature Delay	100 °C 1 s	105 °C 1 s

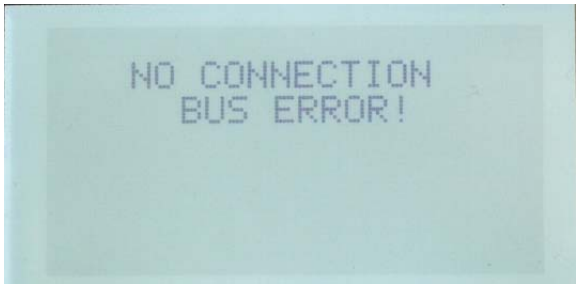
Generator type	Warning/fault	Warning threshold	Fault threshold
P8-P50 marine	Cylinder head temperature Delay	90 °C 5 s	95 °C 5 s
	Winding temperature Delay	130 °C 5 s	135 °C 5 s
	Exhaust manifold temperature Delay	70 °C 1 s	75 °C 1 s
P8-P50 vehicle	Cylinder head temperature Delay	95 °C 5 s	100 °C 5 s
	Winding temperature Delay	160 °C 5 s	165 °C 5 s
	Exhaust manifold temperature Delay	100 °C 1 s	105 °C 1 s
P15000i marine	Cylinder head temperature Delay	90 °C 5 s	95 °C 5 s
	Winding temperature Delay	130 °C 5 s	135 °C 5 s
	Exhaust manifold temperature Delay	70 °C 2 s	75 °C 2 s
P15000i vehicle	Cylinder head temperature Delay	90 °C 5 s	95 °C 5 s
	Winding temperature Delay	130 °C 5 s	135 °C 5 s
	Exhaust manifold temperature Delay	95 °C 2 s	100 °C 2 s
All generator types	Starter battery voltage low Delay	11.8 V 30 s	10.8 V 30 s
	Starter battery voltage high	15.0 V 5 s	-- --

5.2.3 Bus errors

If the communication connection is lost on the Fischer Panda bus, an error is output on the display after a period of 10 seconds:

This error will occur if at least one of the two data lines of the Fischer Panda bus is disconnected. Once the connection is restored, the error message can be acknowledged with the Start/Stop button.

Fig. 5.2.3-1: Error: „NO CONNECTION“, error in the communication (Fischer Panda bus)



If the communication connection is lost, the generator shall be secured (open battery disconnect switches), and all plug-in connections and cables shall be checked for firm seating or damage.

6. Annex

6.1 Technical data

6.1.1 Technical data for iControl2 control unit

Fig. 6.1.1-1: Technical data for iControl 2 control unit

	iControl 2 control unit
Supply voltage	12V-13.5V (12V automotive)
Current consumption, nominal	175 mA
Current consumption, stand-by	2.5 mA
Operating temperature	-20°C to +85°C
Storage temperature	-30°C*to +85°C
Current sensor Hall element	max. 20A
max. tightening torque for connecting bolts	1.2 Nm

6.1.2 Technical data for iControl2 remote control panel

Fig. 6.1.2-1: Technical data for iControl2 remote control panel

	iControl 2 control unit
Supply voltage	12V-24V (12V or 24V automotive)
Current consumption, off	0 mA
Current consumption, stand-by - backlight brightness 9	45 mA
Current consumption, stand-by - backlight brightness 4	33 mA
Current consumption, stand-by - backlight brightness 0	25 mA
Operating temperature	-20°C to +70°C
Storage temperature	-30°C*to +80°C

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Fischer Panda Datenblatt / Datasheet

7. Inverter Panda PMGi 5000

Art Nr..	21.07.03.034P
Bez.	Panda PMGi 5000

	Document	Hardware	Software
Actual:	R03		
Replace:	R02		

Fischer Panda Datenblatt / Datasheet

7.1 Safety instruction

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

The rotating parts (belt-pulley, belts, etc) must be covered and protected so that there is no danger to life and body!

If a sound insulation cover must be produced at the place of installation, then well-placed signs must show that the generator can only be switched on with a closed capsule.

All servicing-, maintenance or repair work may only 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. Only an electrician may carry out installation of the electrical connections for safety reasons.

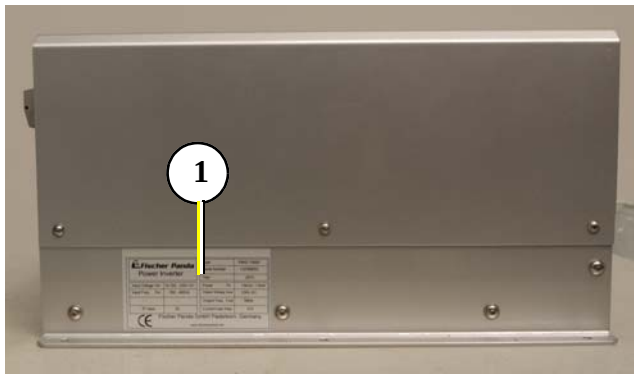
Before start working at the Panda i-series Generator (service, repair ect), diconnect the starter battery (First minus cable, then positive cable). This avoid unexpected start of the generator.

Electrical power: DANGER TO LIVE!

7.2 Type plate

1. Location of the type plate

Fig. 7.2-1: Location Type plate



Fischer Panda Datenblatt / Datasheet

Fig. 7.2-2: Type plate 230V 50 Hz version

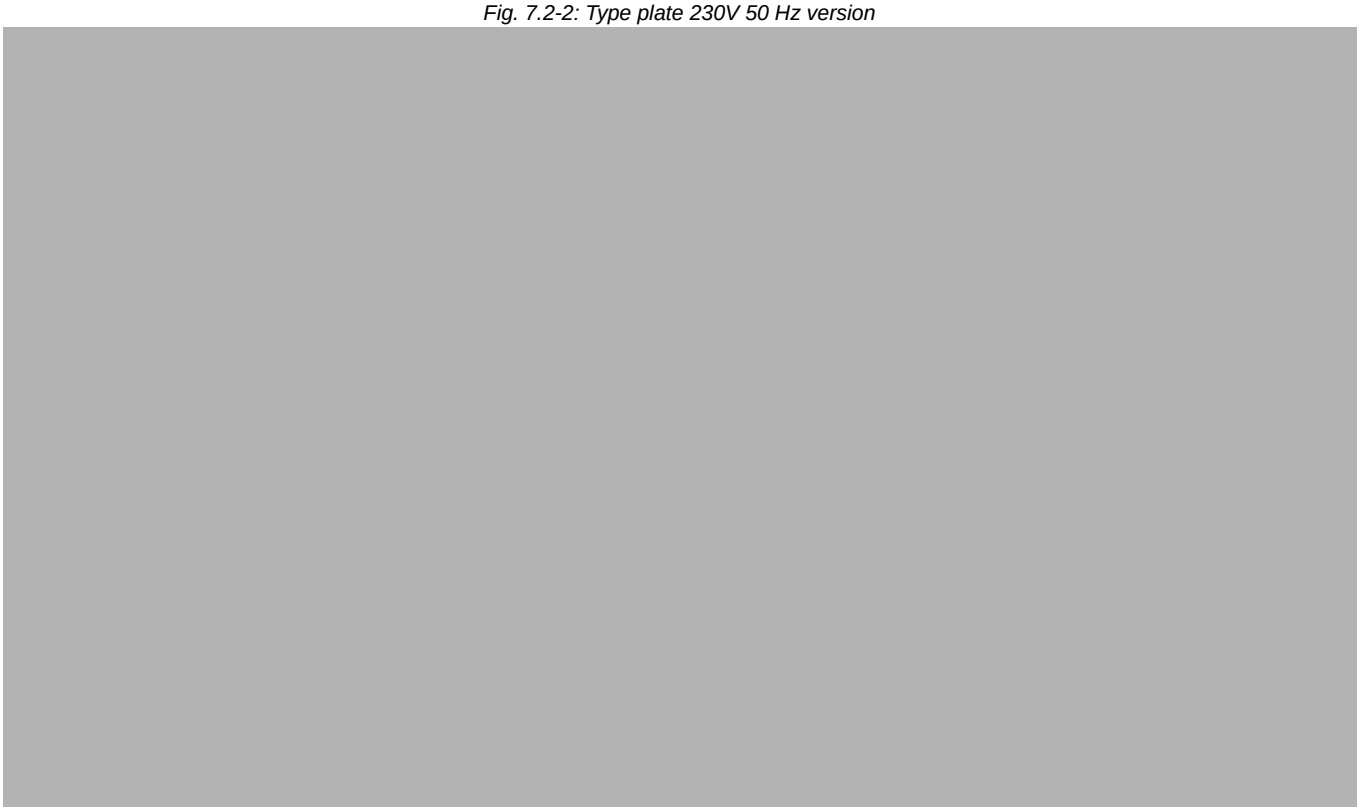
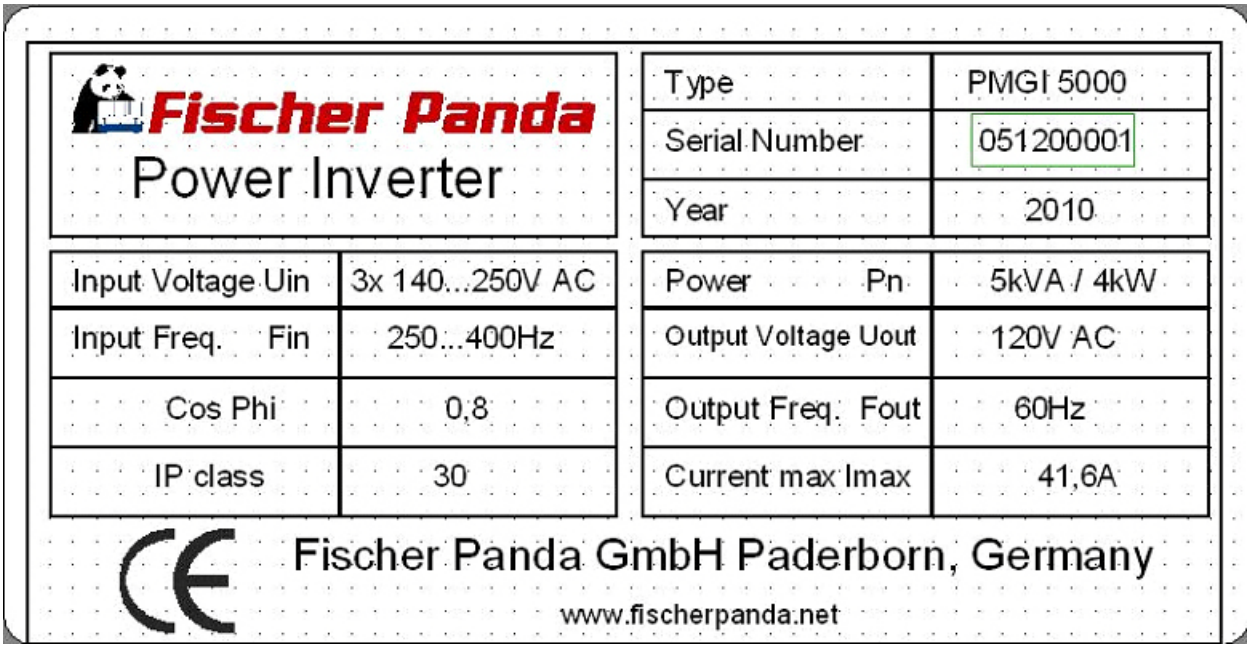


Fig. 7.2-3: Type plate 120V 60 Hz version



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7.3 Front side/connection side

Fig. 7.3-1: Connection side 230V Version

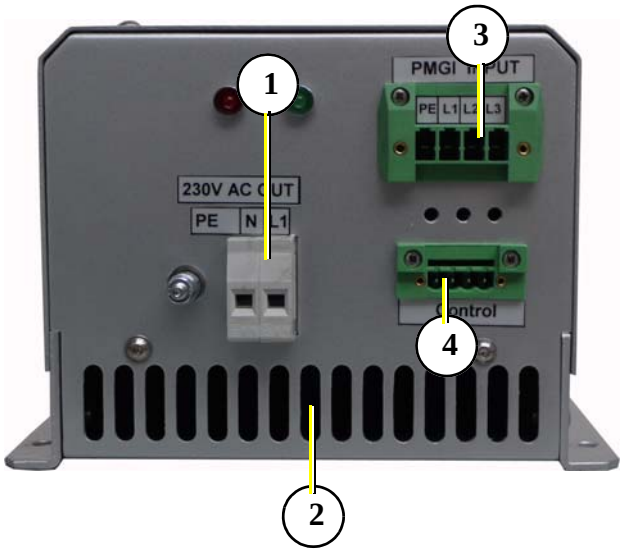


Fig. 7.3-2:

To connect the PMGi 5000 use the prepared cable with t he 4pin plug and connect to socket 3 (PMGi in-450V/400Hz)

Connect your termination box with the socket 1. Use a 3pin plug (230V/50Hz AC - PMGi out)

Do not cover the Air out grille (2)

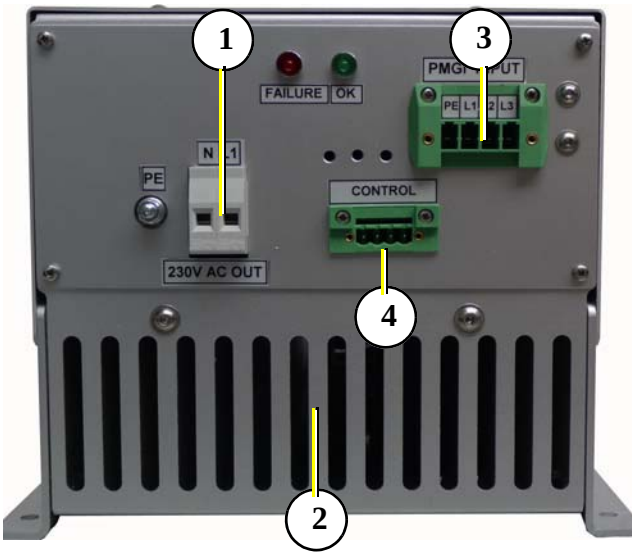
1. Socket for Load

2. Air out grille

3. Socket for generator connection

4. FP- Bus socket connection to generator

Fig. 7.3-3: Connection side 120V Version



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7.3.1 Socket pins of the PMGi 5000

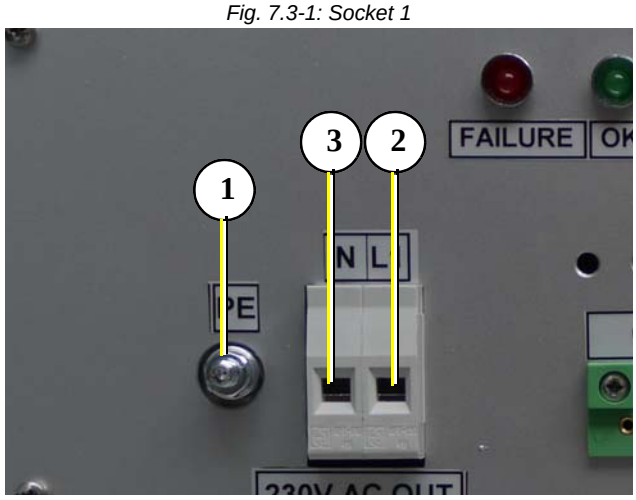
Socket 1 - 230V / 50Hz AC - PMGi out

1. Ground (cabel green/yellow)

2. Live (cabel brown)

3. Neutral (cabel blue)

Fig. 7.3-1: Socket 1



Attention!

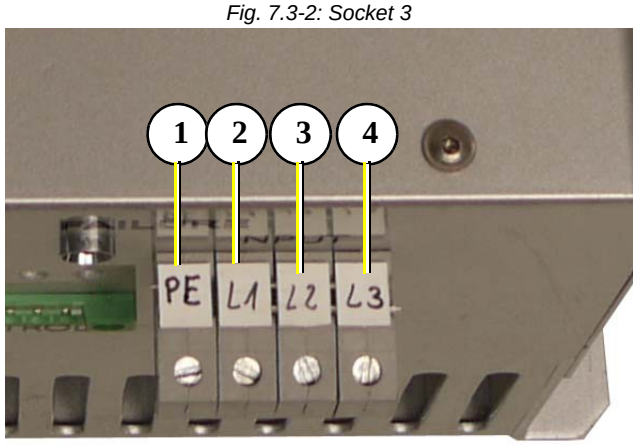
Connecting one of the three Phase with the earth pin will destroy the PGMi

Socket 3 - PMGi in

1. Ground

2-4. Phase 1-3

Fig. 7.3-2: Socket 3



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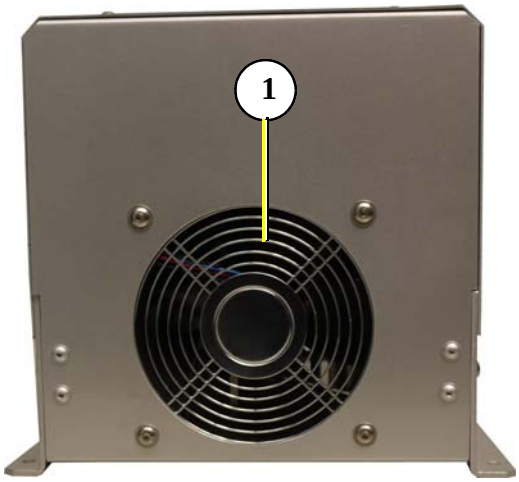
7.4 Back side - Top side

Fig. 7.4-1: Back side



Inside of the PMGi a fan is mounted. The air holes and air grille should not be covered.

01. Air holes

Inside of the PMGi are up to 550VAC. The cover of the PMGi should only be opened by special trained persons !!! Danger for Live“

Attention!

Make sure that the connection between the generater and the PMGi is secured. Never connect or disconnect the PMGi while the generator is running. This will destroy the PMGi (it may burn or explode).

Attention!

7.5 Settings for the use of iGenerators with power inverter

For the use of power inverter with the PMGi, the settings of the power inverter must be modified.

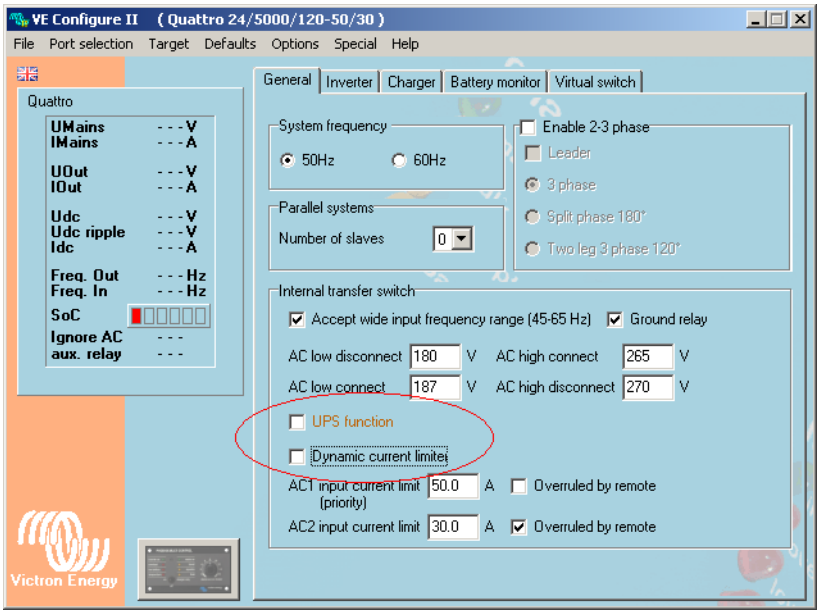
ATTENTION: Wrong settings can destroy the PMGi

Wrong settings can damage or destroy the PMGi.

The settings for the Victron power inverter must be adapted for the power inverters of other brands.

7.5.1 Settings in the Victron VE Configure II Software - General

Fig. 7.5.1-1: Settings in the Victron VE configure II Software



7.5.1.1 Uninterrupted AC power (UPS function)

Due to the fact that the power inverter connects the shore power immediately to the domestic grid (to fast), the PMGi gets overloaded and shut down with an error.

UPS Function must be deactivated.

7.5.1.2 Dynamic current limiter

With inductive load the dynamic current limiter will raise up the Voltage in the DC circuit. These over voltage can damage or destroy the PMGi.

Dynamic current limiter must be deactivated.

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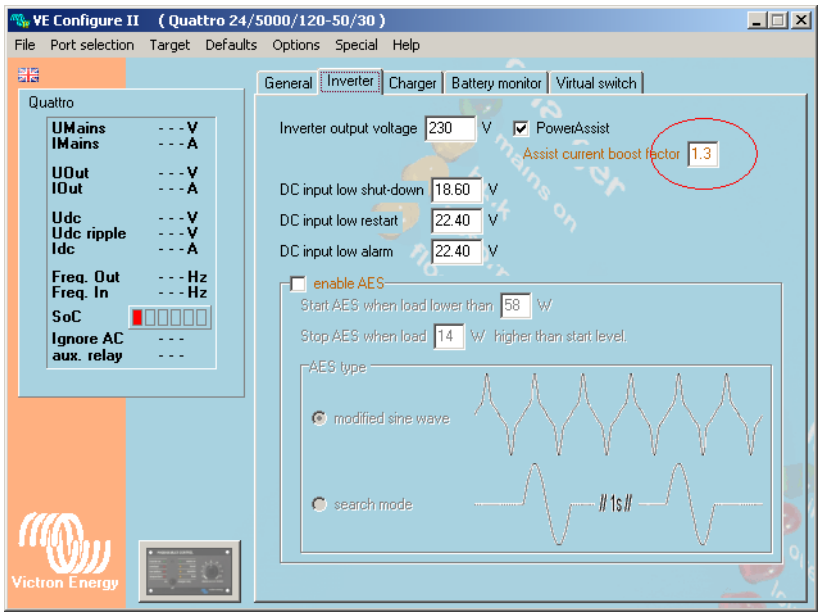
7.5.2 Settings in the Victron VE Configure II Software - Inverter

Fig. 7.5.2-1: Settings in the Victron VE configure II Software



7.5.2.1 Assist current boost factor

To reduce the action of the power inverter on the iGenerator, the Assist current boost factor must be reduced from 2.0 to1.3. Wrong settings will cause bad rpm control of the generator.

7.6 Operation manual

7.6.1 Primary remarks / Winter operation

The PGMi can operate in the range of -20°C to +40°C.

7.6.2 Load at the PMGi

Do not overload the PMGi. It will go on error.

7.6.3 Automatic start

The generator can start (depending on the remote control panel) by an external signal (atomatic start)

If you use this option make sure that the load is connected to the PMGi after the output has reached the nominal 230V / 50Hz and not to overload the PMGi (some electronic devices, such like air conditions, need an higher start current). May use a relay which connect the load at 230V.

7.7 Status LED´s

Red - Green

LED - Red	Red LED lights for the very first seconds (about 10 sec) after the running of the engine. During this time no output is provided by the PMGi. Red LED starts to blink when an overload condition is reached. During this time the green LED continiues to light. When an overload condition stays for too long the red LED stops blinking and stays permanently switched on, while the green LED switch off.
LED-Green	Green LED permanently lights alone when the PMGi output is available and it value stays in the spacification

7.8 Cooling of the PMGi

Inside of the PMGi a fan is mounted.

Do not cover the air holes and grille.

The heat sink and the fan of the PMHGi may become dirty as a consequence of tzhe use of the generator, and so the unit can loose a part of their heat transfer carateristic. Every 6 months it is necessary to visual inspect the heat sinks and clean it with compressed air. At every Generator service the fan of the PMGi should be cleaned by the special trained person.

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7.9 Installation of the PMGi

The PMGi must be mounted vertical, with the electrical connection down. So you can read the writing on the PMGi.

The surface where the PMGi is mounted should be smoothed and support the heat transfer. The Air holes and Air grille must be not covered and enough cooling air must be pleasant at any time for the PMGi.

To mount the PMGi use the four fixing holes diameter 6,5mm.

See the safety instruction in your Generator and iControl Manual. **Note!**

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.

7.9.1 Electrical connection.

Only special trained persons are allowed to make the electrical connection.

When an extension cable is required, be sure to use a though rubber sheeted flexible and fireproof cable. Limit length of extension cables depends on the voltage drop along the cable. This drop must be less than 2,5% value of the nominal output voltage.

Pay attention to the right pin assignment. See “Socket pins of the PMGi 5000” on page 169.

7.9.1.1 Connection to a system with RCD

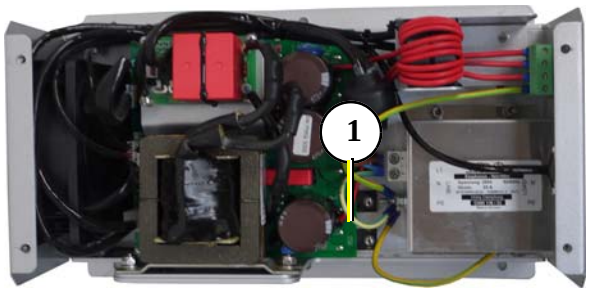
The PMGi is prepared for the use in a RCD protected grid.,

The PMGi out must be connected 1:1 (PE,N,L) to the customers electrical cabinet. The Life wire and neutral wire will be connected to the RCD. The PE will be connected to the PE of the electrical cabinet. After installation the function of the RCD must be tested.

PE-N Bridge

Fig. 7.9-1: PE-N bridge

Inside of the PMGi a PE-N bridge



7.9.1.2 Connection to a system with isolation control

For the use of the PMGi with an isolation controlled grid, the internal PWE-N Bridge must be disconnected.

A Manual for this modification can be downloaded under:

http://www.fischerpanda.de/images/gensets/M_AC_50_INV_PMS_8000i/operatormanual/PMGi/Modification_PMGi_isolation_control.eng.pdf

7.10 Technical Data

7.10.1 General Data

PMGi is part of the Panda i-series generator. It´s not allowed to be used with other generators or aplications.

Storage temperature	**PMGi**	-20°C to +55°C
Working temperature	**PMGi**	Minimum: -20°C Maximum: +40°C Maximale internel temperature of the PMGi: +60°C

7.10.2 Generator Spezification

PMG Generator out		3 phase
Voltage Phase	minimum 250V AC	Maximum 330V AC
Frequency	minimum 250 Hz	Maximum 400 Hz

7.10.3 PMGi out

Fig. 7.10.3-1: Technische Daten PMGit / Technical Data PMGi / PMGi Out

		PMGi 4000 230 V	PMGi 5000 230 V	PMGi 6000 230 V
Nominale Ausgangsspannung **Nominal Voltage** Tension de sortie nominale:	NOV_{AC}	230 V VAC +/- 5 % ohne Last / without Load / sans charge	230 V VAC +/- 5 % ohne Last / without Load / sans charge	120 V VAC +/- 5 % ohne Last / without Load / sans charge
Regelung **Regulation** Réglage	R	5 %	5 %	5 %
Stabilität (Kurzzeit (30sec)) **Stability (short term (30sec))** Stabilité (courte durée (30s))	D_S	5 %	5 %	5 %
Stabilität (Langzeit (4h)) **Stability (Long term (4h))** Stabilité (longue durée (4h))	D_l	5 %	5 %	5 %
Spannungsabweichung **Voltage offset** Divergence de tension	V_{offset}	+-5 V -20 °C bis +40 °C +-5 V -20 °C to +40 °C +-5 V -20 °C à +40 °C	+-5 V -20 °C bis +40 °C +-5 V -20 °C to +40 °C +-5 V -20 °C à +40 °C	+-5 V -20 °C bis +40 °C +-5 V -20 °C to +40 °C +-5 V -20 °C à +40 °C
Stromstärke **Current** Courant	$Stromstärke_{Nominal}$ @230 $V_{eff.}$ $Current_{Nominal}$ @230 $V_{eff.}$ $Courant_{Nominal}$ 230 $V_{eff.}$	17.4 A	17,4 A	26 A
	$Stromstärke_{Maximum}$@230 $V_{eff.}$ $Current_{Maximum}$@230 $V_{eff.}$ $Courant_{Maximum}$@230 $V_{eff.}$	19.5 A @ cos phi 0,8	22 A @ cos phi 0,8	29 A @ cos phi 0,8
Leistung **Power** Puissance	Nominal Nominal power Nominale	4,3 kVA	5,0 kVA	6,6 kVA
	Dauer Long term	4,0 kW	4,0 kW	6,0 kW
Frequenz **Frequency** Fréquence	Nominale Frequenz Nominal Frequency Fréquence nominale	50 Hz +/-2 %	50 Hz +/-2 %	50 Hz +/-2 %
	Regulierung Regulation Réglage	4 %	4 %	4 %
	Stabilität (Kurzeitig) (30sec)) Stability (short term (30sec)) Stabilité (courte durée (30s))	3 %	3 %	3 %
	Stabilität (Langzeit (4h)) Stability (Long term (4h)) Stabilité (longue durée (4h))	3 %	3 %	3 %
Krestfaktor **Crestfactor** Facteur de crête		3:1	3:1	3:1
Empfohlene Absicherung **Recommend protection fuse** Sécurisation recommandée		20 A	25 A	32 A
Empfohlener Kabelquerschnitt **Recommend cable cross** Section de câble recommandée		2,5 mm²	2,5 mm²	4,0 mm²

Fig. 7.10.3-2: Technische Daten PMGi / Technical Data PMGi / PMGi Out

		PMGi 8000 230 V	PMGi 10000 230 V	PMGi 10000 120 V
Nominale Ausgangsspannung **Nominal Voltage** Tension de sortie nominale:	NOV_{AC}	230 V VAC +/- 5 % ohne Last / without Load / sans charge	230 V VAC +/- 5 % ohne Last / without Load / sans charge	120 V VAC +/- 5 % ohne Last / without Load / sans charge
Regelung **Regulation** Réglage	R	5 %	5 %	5 %
Stabilität (Kurzzeit (30sec)) **Stability (short term (30sec))** Stabilité (courte durée (30s))	D_s	5 %	5 %	5 %
Stabilität (Langzeit (4h)) **Stability (Long term (4h))** Stabilité (longue durée (4h))	D_l	5 %	5 %	5 %
Spannungsabweichung **Voltage offset** Divergence de tension	V_{offset}	+-5 V -20 °C bis +40 °C +-5 V -20 °C to +40 °C +-5 V -20 °C à +40 °C	+-5 V -20 °C bis +40 °C +-5 V -20 °C to +40 °C +-5 V -20 °C à +40 °C	+-5 V -20 °C bis +40 °C +-5 V -20 °C to +40 °C +-5 V -20 °C à +40 °C
Stromstärke **Current** Courant	$Stromstärke_{Nominal}$ @230$V_{eff.}$ $Current_{Nominal}$ @230$V_{eff.}$ $Courant_{Nominal}$ 230$V_{eff.}$	26,0 A	34,8 A	66,7 A
	$Stromstärke_{Maximum}$@230 V eff. $Current_{Maximum}$@230 $V_{eff.}$ $Courant_{Maximum}$@230 $V_{eff.}$	34 A @ cos phi 0,8	43,5 A @ cos phi 0,8	83,3 A @ cos phi 0,8
Leistung **Power** Puissance	Nominal Nominal power Nominale	8,0 kVA	10,0 kVA	10,0 kVA
	Dauer Long term	6,4 kW	8,0 kW	8,0 kW
Frequenz **Frequency** Fréquence	Nominale Frequenz Nominal Frequency Fréquence nominale	50 Hz +/-2 %	50 Hz +/-2 %	60 Hz +/-2 %
	Regulierung Regulation Réglage	4 %	4 %	4 %
	Stabilität (Kurzeitig) (30sec)) Stability (short term (30sec)) Stabilité (courte durée (30s))	3 %	3 %	3 %
	Stabilität (Langzeit (4h)) Stability (Long term (4h)) Stabilité (longue durée (4h))	3 %	3 %	3 %
Krestfaktor [1)] **Crestfactor** [1)] Facteur de crête		3:1	3:1	3:1
Empfohlene Absicherung **Recommend protection fuse** Sécurisation recommandée		32 A	40 A	80 A
Empfohlener Kabelquerschnitt **Recommend cable cross** Section de câble recommandée		4 mm²	6 mm²	25 mm²

1) Peak Strom darf den 3-fachen Nennstrom erreichen
1) Peak current is allowed to reach 3 times of the nominal current

Fig. 7.10.3-3: Technische Daten PMGi / Technical Data PMGi / PMGi Out

		PMGi 15000 230 V	PMGi 15000 120 V	PMGi 25 230 V
Nominale Ausgangsspannung **Nominal Voltage**	NOV_{AC}	230 V VAC +/- 5 % ohne Last / without Load / sans charge	230 V VAC +/- 5 % ohne Last / without Load / sans charge	120 V VAC +/- 5 % ohne Last / without Load / sans charge
Regelung **Regulation**	R	5 %	5 %	5 %
Stabilität (Kurzzeit (30sec)) **Stability (short term (30sec))**	D_s	5 %	5 %	5 %
Stabilität (Langzeit (4h)) **Stability (Long term (4h))**	D_l	5 %	5 %	5 %
Spannungsabweichung **Voltage offset** Divergence de tension	V_{offset}	+-5 V -20 °C bis +40 °C +-5 V -20 °C to +40 °C +-5 V -20 °C à +40 °C	+-5 V -20 °C bis +40 °C +-5 V -20 °C to +40 °C +-5 V -20 °C à +40 °C	+-5 V -20 °C bis +40 °C +-5 V -20 °C to +40 °C +-5 V -20 °C à +40 °C
Stromstärke **Current** Courant	$Stromstärke_{Nominal}$ @230 $V_{eff.}$ $Current_{Nominal}$ @230 $V_{eff.}$ $Courant_{Nominal}$ 230 $V_{eff.}$	52 A	100 A	87 A
	$Stromstärke_{Maximum}$@230 $V_{eff.}$ $Current_{Maximum}$@230 $V_{eff.}$ $Courant_{Maximum}$@230 $V_{eff.}$	52 A @ cos phi 0,8	100 A @ cos phi 0,8	108 A @ cos phi 0,8
Leistung **Power** Puissance	Nominal Nominal power Nominale	15 kVA	15 kVA	25 kVA
	Dauer Long term Continue	12 kW	12 kW	20 kW
Frequenz **Frequency**	Nominale Frequenz Nominal Frequency Fréquence nominale	50 Hz +/-2 %	60 Hz +/-2 %	50 Hz +/-2 %
	Regulierung Regulation Réglage	4 %	4 %	4 %
	Stabilität (Kurzeitig) (30sec)) Stability (short term (30sec)) Stabilité (courte durée (30s))	3 %	3 %	3 %
	Stabilität (Langzeit (4h)) Stability (Long term (4h)) Stabilité (longue durée (4h))	3 %	3 %	3 %
Krestfaktor **Crestfactor** Facteur de crête		3:1	3:1	3:1
Empfohlene Absicherung **Recommend protection Fuse** Sécurisation recommandée		63 A	100 A	125 A
Empfohlener Kabelquerschnitt **Recommend cable cross** Section de câble recommandée		10 mm² (PUR Kabel einsetzen / use PUR cable / Mise en place du câble PUR)	25 mm² (PUR Kabel einsetzen / use PUR cable /)Mise en place du câble PUR	35 mm²
Wassertemperatur max. **Water temperature max.**			40 °C	40 °C
Umgebungstemperatur max. **Ambient temperature**			60 °C	60 °C

Fig. 7.10.3-4: PMGi protections

7.10.4 Overload - switch point

Output type	Max. current	Comments
230VAC	30,0A +/- 0.5A	When protection takes place the engine must be switched off and all apliances detached

7.10.5 Short circiut

To operate the short circiut protection a fuse must be put in series with the live wire. The minimum requested feature for this fuse are the following.

Rated current	1.2	1.5	2.75	4.0	10.0
26A	>1h	<30min	5ms to 150ms	2ms to 15ms	<2ms

Note!

The electrical Data refer to the system running in accordance with all the limits defined in the „General Specification“ table.